

Curriculum Book
and
Assessment and Evaluation Scheme

based on

Outcome Based Education (OBE)

and

Choice-Based Credit System (CBCS)

in

Bachelor of Agriculture Science

B.Sc. (Hons.) Ag.

4 Year Degree Program

Revised as on 01 August 2023

Applicable w.e.f. Academic Session 2023-24



AKS University

Satna 485001, Madhya Pradesh, India

Faculty of Agriculture Science & Technology
AKS University, Satna



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Forwarding

I am thrilled to observe the updated curriculum of the Department of Agriculture Science Program, which seamlessly integrates the most recent technological advancements and adheres to the guidelines set forth by ICAR. The revised curriculum also thoughtfully incorporates the directives of NEP-2020 and the Sustainable Development Goals.

The alignment of course outcomes (COs), Programme Outcome (POs) and Programme specific outcomes (PSOs) has been intricately executed, aligning perfectly with the requisites P.G restructuring committee of ICAR and NAAC standards. I hold the belief that this revised syllabus will significantly enhance the skills and employability of our students.

With immense satisfaction, I hereby present the revised curriculum for the Agriculture Science program for implementation in the upcoming session.

01 August 2023

ER. Anant Soni
Pro Chancellor & Chairman
A.K.S. University, Satna



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From the Desk of the Vice - Chancellor

AKS University is currently undergoing a process to revamp its curriculum into an outcome-based approach of quality lies in the implementation of a curriculum that aligns with both societal and value needed needs focusing a relevant agriculture out comes. This entails dedicated and inspired faculty members, as well as impactful agriculture developments. Hence, it is of utmost importance to begin by designing an outcome-based curriculum in collaboration with academia and subject expert.



In the curriculum, I am pleased to observe that the Agriculture Department has diligently adhered to the future prospects of the agriculture science. To achieve excellence in the curriculum planning pertaining to agriculture by periodically updating it in order to provide to students with sound technical knowledge of outcome based education and to strengthen the research activities in agriculture science by under taking innovative approaches for the developing the field of agriculture. This curriculum will be beacon of light particularly to the student of agriculture science job/Career prospects in the field of teaching, research and extension activities in either Government or Private sector.

Furthermore, the curriculum takes into account the specific needs of restructuring of B.Sc. curriculum and academic regulation for the discipline under agriculture science. This curriculum effectively integrates the principles to improve the existing syllabus and to make it none contextual and pertinent to cater the needs of students in terms of global competitiveness and employability.

I am confident that the updated curriculum for agriculture will not only enhance student's technical skills but also contribute significantly to their employability during the process of revising. This curriculum has been adopted as par the guideline of ICAR 5th dean committee.

Curriculum revision in an ongoing and dynamic process designed to address the continuous evolution of technological advancement and both local and global concerns. AKS University warmly invites input and suggestion from horticulture experts researchers and alumni students to enhance the curriculum and make it more students cantered your valuable insights will gently contribute to shaping as education that best serves the needs and aspirations of the students.

01 August 2023

Professor B. A. Chopade
Vice - Chancellor
AKS University, Satna



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Preface

As part of our commitment to ongoing enhancement, the department of agriculture consistently reviews and updates its B.Sc. (Ag.) Hons. program curriculum every four and two years. Through this process, we ensure that the curriculum remains aligned with the latest technological advancements, as well as local and global industrial and social demands.

During this procedure, the existing curriculum for the B.Sc.(Ag.) Hons. program undergoes evaluation by a panel of technocrats, industry specialists, and academics. Following meticulous scrutiny, the revised curriculum has been formulated and is set to be implemented starting from August 01, 2023. This implementation is contingent upon the endorsement of the curriculum by the University's Board of Studies and Governing Body.

This curriculum as per guidelines of 5th dean committee of ICAR. In order to foster the holistic skill development of students, a range of practical activities, including Hands-On Training, Industrial Visits, Project planning and execution, Thesis Writing, Seminars, have been incorporated.

To ensure a comprehensive learning experience, detailed evaluation schemes and rubrics have also been meticulously provided.

For each course, a thorough mapping of Course Outcomes, Program Outcomes, and Programme Specific Outcomes has been undertaken. As the course syllabus is being meticulously developed, various elements such as session outcomes, laboratory instruction, classroom instruction, self-learning activities, assignments, and mini projects are meticulously outlined.

We hold the belief that this dynamic curriculum will undoubtedly enhance independent thinking, skills, and overall employability of the students.

Dr. S.S. Tomar
Dean

Department of Agriculture Science & Technology
AKS University, Satna

01 August 2023



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Introduction:

Under Faculty of Agriculture science and Technology the Department of Horticulture Established in 2013, at AKS University, Satna (M.P.) offers highly specialized programs to meet the growing needs of India, both domestically and internationally. We offer M.Sc. (Horticulture) programs with specializations in Vegetable Science and Floriculture and landscaping. At AKS University, we are committed to equipping our students with the skills and knowledge required to fulfill the needs of India, particularly Madhya Pradesh. Our comprehensive curriculum prepares you for real-world challenges and ensures you are ready to make a meaningful impact in the industry. The demand for trained manpower in the field of Horticulture is skyrocketing. With horticultural crops earning foreign exchange for the country and India's position as the second-highest producer of fruits and vegetables globally, there has never been a better time to pursue a career in horticulture. Our programs open doors to diverse opportunities in farming, processing, marketing, research, and more.

Vision:

Providing excellent teaching and research activities to the students and farmers in Horticulture for frontline areas of vegetable production, propagation, ornamental and landscaping practices, and post-harvest management.

Mission:

M-1: We strive to provide students with a solid foundation in agricultural sciences, encompassing plant science, soil science, animal science, agricultural economics, and agricultural engineering.

M-2: Foster a culture of curiosity, creativity, and critical thinking, encouraging students to explore new ideas, conduct research, and develop innovative solutions to agricultural problems



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M-3: We empower students to become leaders and change-makers in the agricultural industry and beyond. Through experiential learning, leadership development programs, and opportunities for community engagement and service learning, we help students develop the confidence, communication skills, and ethical awareness needed to make positive contributions to society.

M-4: We are dedicated to advancing the frontiers of agricultural knowledge through cutting- edge research and innovation.

M-5: We recognize the importance of agriculture in addressing global challenges such as hunger, poverty, environmental degradation, and climate change.

PROGRAM EDUCATIONAL OBJECTIVES (PEO)

PEO1: To develop technical and managerial skills among the students with practical knowledge to work under different field and environmental conditions for crop production.

PEO2: To apply the acquired knowledge and abilities to academics and development, and make a major contribution to meet the fulfillment of the society.

PEO3: To participate in interdisciplinary and multidisciplinary research sectors to offer superior solutions for production related challenges and fresh concepts for sustainable vegetable production.

PEO4: Entrepreneurship development by harnessing the acquired knowledge and skills of advanced production technologies in crop production.

PEO5: To become a face among the farming community through providing support in advance crop production technologies.

PROGRAM OUTCOMES (POS)

PO1: Manage agricultural enterprises with different scales in area of agricultural production, process and trade

PO 2: Hold a post on supply in administration and policy

PO 3: Analyze and control commercial and economical process in the field of agriculture

PO 4: Teach how to control and manage agricultural production

PO 5: Introduce general production technologies

PO 6: Teach how to implement and manage production technologies

PO 7: Prepare for managerial and social responsibilities



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PROGRAMME SPECIFIC OUTCOMES (PSOS)

On completion of B.Sc. Agriculture, the students will achieve the following program specific outcomes:-

PSO1: Student will identify different underutilized crops.

PSO2: Student will practice different breeding techniques used in crop production.

PSO3: Student will recognize different insect pest and diseases and their symptoms of crops.

PSO4: Student will apply different recent techniques in crop production.

Consistency/Mapping of PEOs with Mission of the Department

PEO	M1	M2	M3	M4	M5
PEO1	2	3	2	3	3
PEO2	3	2	3	2	3
PEO3	2	2	2	2	3
PEO4	3	3	2	2	2
PEO5	2	2	3	3	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) 4: No correlation

GENERAL COURSE STRUCTURE & THEME

1. Definition of Credit

1Hr.Lecture (L) per week	1 Credit
1Hr.Tutorial (T) per week	1 Credit
2Hours Practical (P) per week	1 Credit



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2. Range of Credits:

In the light of the fact that a typical Model Two-year Post Graduate degree program in Agricultural has about 160 credits, the total number of credits proposed for the Two-year M.Sc. Horticulture in Vegetable Science is kept as Pg Restructuring comity for ICAR 169 considering NEP-20 and NAAC guidelines.

Components of the Curriculum

(Program curriculum grouping based on course components)

Sl.No.	Course Components	% of total number of credits of the program	Total number of Credits
1	Agronomy	11.41	21
2	Genetics and Plant Breeding	7.07	13
3	Soil Science & Agricultural Chemistry	4.35	8
4	Entomology	4.89	9
5	Agricultural Economics	5.43	10
6	Agricultural Engineering	4.35	8
7	Plant Pathology	7.07	13
8	Horticulture	5.43	10
9	Food Science & Technology	1.09	2
10	Agriculture Extension and Communication	4.89	9
11	Biochemistry/Physiology/Microbiology/Environmental Studies	6.52	12
12	Statistics, Computer Applicaion and I.P.R.	2.72	5
13	Animal Production	2.17	4
14	Language	1.09	2
15	Remedial Courses	2.17	4
16	NSS/NCC/Physical Education & Yoga Practices	1.09	2
17	Human Value and Ethics	0.54	1
18	Educational Tour	1.09	2
19	Elective Course	4.89	9
20	RAWE	10.87	20
21	ELP	10.87	20
	Total	184	100



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General Course Structure and Credit Distribution

Curriculum of B.Sc. (Hons.) Agriculture Science

Semester I		Semester II	
Course Title	Credit	Course Title	Credit
Fundamentals of Soil Science	2:0:1=3	Fundamentals of Agricultural Economics	2:0:0=2
Introduction to Forestry	1:0:1=2	Fundamentals of Horticulture	1:0:1=2
Comprehension & Communication Skills in English	1:0:1=2	Fundamentals of Crop Physiology	1:0:1=2
Fundamentals of Agronomy	3:0:1=4	Fundamentals of Plant Pathology	3:0:1=4
Introductory Biology* (For Ag and Math)	1:0:1=2	Fundamentals of Entomology	3:0:1=4
Elementary Mathematics* (For Ag and Bio)	2:0:0=2	Communication Skills and Personality Development	1:0:1=2
Rural Sociology & Educational Psychology	2:0:0=2	Fundamentals of Plant Breeding	2:0:1=3
Human Values & Ethics (non gradial)**	1:0:0=1	Environmental Studies and Disaster Management	2:0:1=3
NSS/NCC/Physical Education & Yoga Practices(non gradial)**	0:0:2=2	Statistical Methods	1:0:1=2
Fundamentals of Genetics	2:0:1=3		
Agriculture Heritage* (For All)	1:0:0=1		
Total Credit (For Bio group)	22(15+7)		
Total Credit (For Math Group)	22(14+8)		
Total Credit (For Ag Group)	24 (16+8)	Total Credit	24 (16+8)
Semester III		Semester IV	
Course Title	Credit	Course Title	Credit
Agricultural Microbiology	1:0:1=2	Soil and Water Conservation Engineering	1:0:1=2
Fundamentals of Agricultural Extension Education	2:0:1=3	Crop Production Technology –II (<i>Rabi Crops</i>)	1:0:1=2
Crop Production Technology–I (<i>Kharif Crops</i>)	1:0:1=2	Manures, Fertilizers and Soil Fertility Management	2:0:1=3
Agricultural Finance and Cooperation	2:0:1=3	Production Technology for Ornamental Crops, MAP and Landscaping	1:0:1=2



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Agri- Informatics	1:0:1=2	Diseases of Field and Horticultural Crops and their Management -I	2:0:1=3
Farm Machinery and Power	1:0:1=2	Rainfed Agriculture & Watershed Management	1:0:1=2
Production Technology for Vegetables and Spices	1:0:1=2	Protected Cultivation and Secondary Agriculture	1:0:1=2
Principles of Integrated Pest and Disease Management	2:0:1=3	Farm Management, Production & Resource Economics	1:0:1=2
Crop Improvement-I (<i>Kharif Crops</i>)	1:0:1=2	Introductory Agro-meteorology & Climate Change	1:0:1=2
Practical Crop Production – I (<i>Kharif crops</i>)	2:0:0=2	Elective Course	3 credit
Total Credit	23 (14+09)	Total Credit	23 {(11+9)+3}
Semester V		Semester VI	
Course Title	Credit	Course Title	Credit
Livestock and Poultry Management	3:0:1=4	Fundamentals of Plant Biochemistry and Biotechnology	2:0:1=3
Renewable Energy and Green Technology	1:0:1=2	Farming System & Sustainable Agriculture	1:0:1=2
Production Technology for Fruit and Plantation Crops	1:0:1=2	Entrepreneurship Development and Business Communication	1:0:1=2
Principles of Seed Technology	1:0:2=3	Post-harvest Management and Value Addition of Fruits and Vegetables	1:0:1=2
Agricultural Marketing Trade & Prices	2:0:1=3	Geoinformatics and Nano-technology and Precision Farming	1:0:1=2
Pests of Crops and Stored Grain and their Management	2:0:1=3	Management of Beneficial Insects	1:0:1=2
Problematic Soils and their Management	2:0:0=2	Crop Improvement-II (<i>Rabi crops</i>)	1:0:1=2
Intellectual Property Rights	1:0:0=1	Practical Crop Production –II (<i>Rabi crops</i>)	0:0:2=2
Diseases of Field and Horticultural Crops and their Management-II	2:0:1=3	Principles of Organic Farming	1:0:1=2
Weed Management	2:0:1=3	Principles of Food Science and Nutrition	2:0:0=2
Elective Course	3 credit	Educational Tour	0:0:2=2



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		Elective Course	3 credit
Total Credit	29{(17+9)+3}	Total Credit	26 {(11+12)+3}
Semester VII		Semester VIII	
Course Title	Credit	Course Title	Credit
Rural Agricultural Work Experience and Agro-industrial Attachment (RAWE & AIA) ++	20 Credit	Experiential Learning Program/ HOT #	20 Credit
		Module I	10 Credit
		Module II	10 Credit
Total Credit	20	Total Credit	20

* Remedial Courses

** Non Gradual Courses

Total Credit (for class 12th Maths/Bio group students)	183	
Total Credit (for class 12th Agri group students)	185	

S.No.	Rural Agricultural Work Experience and Agro-industrial Attachment (RAWE & AIA)		
	Activities	No. of weeks	Credit Hours
1	General orientation & On campus training by different faculties	1	14
2	Village attachment	8	
	Unit attachment in Univ./ College. KVK/ Research Station	5	
3	Plant clinic	2	2
	Agro-Industrial Attachment	3	4
4	Project Report Preparation, Presentation and Evaluation	1	
Total weeks for RAWE & AIA		20	20



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List of Elective Coursesⁱ

S.No.	Courses	Credit Hours
1.	Agribusiness Management	2:0:1=3
2.	Biopesticides & Biofertilizers	2:0:1=3
3.	Micro propagation Technologies	1:0:2=3
4.	Hi-tech. Horticulture	2:0:1=3
5.	Weed Management	2:0:1=3
6.	Agricultural Journalism	2:0:1=3

List of Elective Modulesⁱⁱ

S. No.	Title of the module	Credits
1.	PRODUCTION TECHNOLOGY FOR BIOAGENTS AND BIOFERTILIZER	0+10
2.	SEED PRODUCTION AND TECHNOLOGY	0+10
3.	MUSHROOM CULTIVATION TECHNOLOGY	0+10
4.	FLORICULTURE AND LANDSCAPING	0+10
5.	FOOD PROCESSING	0+10
6.	AGRICULTURE WASTE MANAGEMENT	0+10
7.	ORGANIC PRODUCTION TECHNOLOGY	0+10
8.	Poultry Production Technology	0+10
9.	Dairy Technology	0+10

i. Student will select one course from list of electives in IV, V and VI semester.

ii. Student will select two modules of choice for VIIIth semester.



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Induction Program

Induction program for student has to be offered right at the start of the first year. It is mandatory. AKS University has design an induction program for 1st year student, details are below:

Physical activity

1. Creative Arts
2. Universal Human Values
3. Literary
4. Proficiency Modules
5. Lectures by Eminent People
6. Visits to local Areas
7. Familiarization to Dept./Branch & Innovations

Mandatory Visits/Workshop/Expert Lectures:

1. It is mandatory to arrange one industrial visit every semester for the students.
2. It is mandatory to conduct a One-week workshop during the winter break after fifth semester on professional/ industry/ entrepreneurial orientation.
3. It is mandatory to organize at least on expert lecture per semester for each branch by inviting resource persons from industry.

Evaluation Scheme:

For Theory Courses:

1. The weight age of Internal assessment is 50% and
2. End Semester Exam is 50%

The student has to obtain at least 40% marks individually both in internal assessment and end semester exams to pass.

For Practical Courses:

1. The weight age of Internal assessment is 50% and
2. End Semester Exam is 50%

The student has to obtain at least 40% marks individually both in internal assessment and end semester exams to pass.



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For Summer Internship/Projects/Seminar etc.

Evaluation is based on work done, quality of report, performance in viva-voce, presentation etc

Semester wise Course Structure

Semester wise Brief of total Cerits and Teaching Hours

Semester		L	T	P	Total Hour	Total Credit
Semester-I		16	0	8	24	24
Semester-II		16	0	8	32	24
Semester-III		14	0	9	30	23
Semester-IV		11	0	9	29	20
Semester-V		17	0	9	31	23
Semester-VI		11	0	12	33	23
Semester-VII	Module 1	0	0	10	20	20
	Module 2	0	0	10	20	
Semester-VIII		0	0	20	40	20
Total		85	0	95	261	180

Details of Semester Wise Course Structure

Semester – I

SN	Category	Code	Course Title	L	T	P	Total Hour	Credit
1	B.Sc.	21SC122	Fundamentals of Soil Science	2	0	1	4	3
2	B.Sc.	21FO123	Introduction to Forestry	1	0	1	3	2



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3	B.Sc.	21SD124	Comprehension & Communication Skills in English	1	0	1	3	2
4	B.Sc.	21AN125	Fundamentals of Agronomy	3	0	1	5	4
5	B.Sc.	21BI126-A	Introductory Biology* (For Ag and Math)	1	0	1	3	2
6	B.Sc.	21MS126-B	Elementary Mathematics* (For Ag and Bio)	2	0	0	0	2
7	B.Sc.	21EX128	Rural Sociology & Educational Psychology	2	0	0	0	2
8	B.Sc.	21NC129	Human Values & Ethics (non gradial)**	1	0	0	0	1
9	B.Sc.	21NC177	NSS/NCC/Physical Education & Yoga Practices(non gradial)**	0	0	2	4	2
10	B.Sc.	21GP121	Fundamentals of Genetics	2	0	1	4	3
11	B.Sc.	21AN127	Agriculture Heritage* (For All)	1	0	0	0	1
Total				16	0	8	26	24

Semester – II

SN	Category	Code	Course Title	L	T	P	Total Hour	Credit
1	B.Sc.	21EC22 9	Fundamentals of Agricultural Economics	2	0	0	2	2
2	B.Sc.	21HO22 1	Fundamentals of Horticulture	1	0	1	3	2
3	B.Sc.	21HO22 2	Fundamentals of Crop Physiology	1	0	1	3	2
4	B.Sc.	21PP223	Fundamentals of Plant Pathology	3	0	1	5	4
5	B.Sc.	21EN22 4	Fundamentals of Entomology	3	0	1	5	4
6	B.Sc.	21SD22 5	Communication Skills and Personality Development	1	0	1	3	2
7	B.Sc.	21GP226	Fundamentals of Plant Breeding	2	0	1	4	3
8	B.Sc.	21EV22 7	Environmental Studies and Disaster Management	2	0	1	4	3
9	B.Sc.	21MS228	Statistical Methods	1	0	1	3	2
Total				16	0	8	32	24



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Semester – III

SN	Category	Code	Course Title	L	T	P	Total Hour	Credit
1	B.Sc.	21BT321	Agricultural Microbiology	1	0	1	3	2
2	B.Sc.	21EX322	Fundamentals of Agricultural Extension Education	2	0	1	4	3
3	B.Sc.	21AN323	Crop Production Technology–I (<i>Kharif Crops</i>)	1	0	1	3	2
4	B.Sc.	21EC324	Agricultural Finance and Cooperation	2	0	1	4	3
5	B.Sc.	21CS325	Agri- Informatics	1	0	1	3	2
6	B.Sc.	21AE326	Farm Machinery and Power	1	0	1	3	2
7	B.Sc.	21HO327	Production Technology for Vegetables and Spices	1	0	1	3	2
8	B.Sc.	21EN328	Principles of Integrated Pest and Disease Management	2	0	1	4	3
9	B.Sc.	21GN329	Crop Improvement-I (<i>Kharif Crops</i>)	1	0	1	3	2
10	B.Sc.	21AN380	Practical Crop Production – I (<i>Kharif crops</i>)	2	0	0	0	2
Total				14	0	9	32	23

Semester – IV

SN	Category	Code	Course Title	L	T	P	Total Hour	Credit
1	B.Sc.	21AE421	Soil and Water Conservation Engineering	1	0	1	3	2
2	B.Sc.	21AN422	Crop Production Technology –II (Rabi Crops)	1	0	1	3	2
3	B.Sc.	21SC423	Manures, Fertilizers and Soil Fertility Management	2	0	1	4	3
4	B.Sc.	21HO424	Production Technology for Ornamental Crops, MAP and Landscaping	1	0	1	3	2
5	B.Sc.	21HO426	Diseases of Field and Horticultural Crops and their Management -I	2	0	1	4	3
6	B.Sc.	21AN427	Rainfed Agriculture & Watershed Management	1	0	1	3	2
7	B.Sc.	21AE428	Protected Cultivation and Secondary Agriculture	1	0	1	3	2
8	B.Sc.	21EC429	Farm Management, Production & Resource Economics	1	0	1	3	2
9	B.Sc.	21AN430	Introductory Agro-meteorology & Climate Change	1	0	1	3	2
Total				13	0	10	33	24



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Semester – V

SN	Category	Code	Course Title	L	T	P	Total Hour	Credit
1.	B.Sc.	21AH521	Livestock and Poultry Management	3	0	1	5	4
2.	B.Sc.	21AE522	Renewable Energy and Green Technology	1	0	1	3	2
3.	B.Sc.	21HO523	Production Technology for Fruit and Plantation Crops	1	0	1	3	2
4.	B.Sc.	21AN524	Principles of Seed Technology	1	0	2	5	3
5.	B.Sc.	21EC525	Agricultural Marketing Trade & Prices	2	0	1	4	3
6.	B.Sc.	21EN530	Pests of Crops and Stored Grain and their Management	2	0	1	4	3
7.		21SC526	Problematic Soils and their Management	2	0	0	0	2
8.	B.Sc.	21AG527	Intellectual Property Rights	1	0	0	0	1
9.	B.Sc.	21AG527	Diseases of Field and Horticultural Crops and their Management-II	2	0	1	4	3
10	B.Sc.	21AG529	Weed Management	2	0	1	4	
Total				17	0	9	31	20

Semester – VI

SN	Category	Code	Course Title	L	T	P	Total Hour	Credit
1	B.Sc.	21BT62 1	Fundamentals of Plant Biochemistry and Biotechnology	2	0	1	4	3
2	B.Sc.	21AN62 2	Farming System & Sustainable Agriculture	1	0	1	3	2
3	B.Sc.	21AN62 3	Geoinformatics and Nano-technology and Precision Farming	1	0	1	3	2
4	B.Sc.	21MT62 4	Entrepreneurship Development and Business Communication	1	0	1	3	2
5	B.Sc.	21HO62 5	Post-harvest Management and Value Addition of Fruits and Vegetables	1	0	1	3	2
6	B.Sc.	21EN62 6	Management of Beneficial Insects	1	0	1	3	2
7	B.Sc.	21AN62 7	Crop Improvement-II (Rabi crops)	1	0	1	3	2
8	B.Sc.	21AN67 7	Practical Crop Production –II (Rabi crops)	0	0	2	4	2



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9	B.Sc.	21AN62 8	Principles of Organic Farming	1	0	1	3	2
10	B.Sc.	21FT62 9	Principles of Food Science and Nutrition	2	0	0	0	2
11	B.Sc.	21AG678	Educational Tour	0	0	2	4	2
Total				12	0	11	30	23

Semester – VII

SN	Category	Code	Course Title	L	T	P	Total Hour	Credit
Rural Agricultural Work Experience and Agro-industrial Attachment (RAWE & AIA)								
1	B.Sc.	21AG771	General Orientation & On Campus Training	0	0	1	2	1
2	B.Sc.	21AG772	Village Attachment	0	0	8	16	8
3	B.Sc.	21AG773	Unit Attachment in University, KVK/ Research Station Attachment	0	0	5	10	5
4	B.Sc.	21AG774	Plant Clinic	0	0	2	4	2
5	B.Sc.	21AG775	Agro-Industrial Attachment	0	0	3	6	3
6	B.Sc.	21AG776	Project Report Preparation, Presentation and Evaluation	0	0	1	2	1
Total				0	0	20	40	20

Semester – VIII

SN	Category	Code	Course Title	L	T	P	Total Hour	Credit
ELECTIVE: CHOOSE ANY TWO MODULES OF THESE								
1.	B.Sc.	21AG871	PRODUCTION TECHNOLOGY FOR BIOAGENTS AND BIOFERTILIZER	0	0	10	20	10
2.	B.Sc.	21AG872	SEED PRODUCTION AND TECHNOLOGY	0	0	10	20	10
3.	B.Sc.	21AG873	MUSHROOM CULTIVATION TECHNOLOGY	0	0	10	20	10
4.	B.Sc.	21AG875	FLORICULTURE AND LANDSCAPING	0	0	10	20	10
5.	B.Sc.	21AG876	FOOD PROCESSING	0	0	10	20	10
6.	B.Sc.	21AG877	AGRICULTURE WASTE MANAGEMENT	0	0	10	20	10
7.	B.Sc.	21AG878	ORGANIC PRODUCTION TECHNOLOGY	0	0	10	20	10
8.	B.Sc.	21AG879	Poultry Production Technology	0	0	10	20	10
9.	B.Sc.	21AG880	Dairy Technology	0	0	10	20	10

Semester 1

Course Code: 21FO123

Course Title: Introduction to Forestry

Pre-requisite: Basic knowledge of Biology and Math.

Rationale:, Agronomical crops are exposed to environmental disaster and subject to climate change impact, therefore thr agro forestry is the right solution of the prevailing situation.By learning this curriculum students as professional can help the farmers ant industry to raise their own crop with suitable agro-forestry models , manage them ,asses the value and sale in market,. This will also support in raising the farmers income.as well in environmental restoration.

Course Outcomes:

CO1.The students will have the ability to apply the knowledge gained in basic terms related to forestry, forest classification, methods of natural regeneration and silent's features of Indian Forest Policies

CO2. The students will have the ability to apply the knowledge gained about afforestation, maintenance and different methods of thinning applied in forest crops

CO3. The students will have the ability to apply the knowledge in field of forest mensuration- diameter, height and volume estimation of trees

CO4. The students will have the ability to apply the knowledge in field of agro forestry, different types and models to be adopted as per the agroclimatic zone

CO5. The students will have the ability to apply the knowledge in field of cultivation practices including nursery and plantation management with reference to Vindhyan region

Scheme of Studies:

Code	Course Code	Course Title	Scheme of studies(Hours/Week)				Total Credits (C)	
			CI	LI	SW	SL		Total Study Hours CI+LI+SW+SL
Program Core (PCC)	21FO123	Introduction to Forestry	1	1	1	1	1+2=3+2=5	1+1

Legend:

CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Code	Course Code	Course Title	Scheme of Assessment (Marks)							End Semester Assessment (ESA)	Total Marks (PRA+ESA)
			Progressive Assessment (PRA)								
	21FO123	Introduction to Forestry	Class/ Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)			
PC C			15	30	-	-	5	50	50	100	

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sectional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

1: The students will have the ability to apply the knowledge gained in basic terms related to forestry, forest classification, methods of natural regeneration and silents's features of Indian Forest Policies

Approximate Hours

Item	Approximate Hours
CI	4
LI	8
SW	1
SL	2
Total	15

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
CO1.The students will have the ability to apply the knowledge gained in 1.1 basic terms related to forestry. Forest classification,and objective of silviculture. 1.2 Silents features of Indian Forest Policies. 1.3 Methods of natural regeneration by seed. 1.4 Methods of vegetative propagation.	1. Identification of tree-species-I. 2. Identification of tree-species-II 3. Diameter measurements using calipers of forked, buttressed-I 4. Diameter measurements using tape of fluted and leaning trees.	Unit-1.1 -Introduction – definitions of basic terms related to forestry objectives of silviculture, forest classification. 1.2 Salient features of Indian Forest Policies. 1.3 Forest regeneration, Natural regeneration - from seed . 1.4 Vegetative parts, coppicing, pollarding, root suckers.	1.Basic knowledge of forest and its role for mankind as well in environmental balance. 2.Requirement of forest produce.

SW-1 Suggested Sessional Work (SW):

- a. Assignments: Salient features of Indian Forest Policies
- b. Mini Project: Nil
- c. Other Activities (Specify): Nil

2: The students will have the ability to apply the knowledge gained about afforestation, maintenance and different methods of thinning applied in forest crops

Approximate Hours

Item	Approximate Hours
CI	4
LI	6
SW	1
SL	1
Total	12

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>2.1 The students will have the ability to apply the knowledge gained about Concept of artificial regeneration and and where to apply.</p> <p>2.2 Layout of nursery ant seedling raising tech. Planting operation.</p> <p>2.3 Different tending operation to be carrid out . Method of thinning.</p> <p>2.4 Basic objective of mensuration and diameter measurement.</p>	<p>1. Height measurement of standing trees by shadow method-I</p> <p>2. Height measurement of standing trees by single pole method.</p> <p>3. Height measurement of standing trees by hypsometer</p>	<p>Unit-2.2.1 Artificial regeneration – objectives, choice between natural and artificial regeneration.</p> <p>2.2 Essential preliminary considerations. Crown classification. Tending operations – weeding, cleaning.</p> <p>2.3 Thinning – mechanical, ordinary, crown and advance thinning.</p> <p>2.4 Forest mensuration – objectives, diameter measurement instruments used in diameter measurement.</p>	<p>1.1 Different method of planting seedling.</p> <p>1.2 Irrigation methods.</p>

SW-2 Suggested Sessional Work (SW):

Assignments: Thinning – mechanical, ordinary, crown and advance thinning.

- a. Mini Project: Nil
- b. Other Activities (Specify): Nil

3: The students will have the ability to apply the knowledge in field of forest mensuration- diameter, height and volume estimation of trees

Item	Approximate Hours
CI	3
LI	6
SW	1
SL	1
Total	13

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>The students will have the ability to apply the knowledge in field of</p> <p>1.1 forest mensuration-, height measurement Different instrument used in height measurement</p> <p>1.2 Principles of height measurement Tree form and form factors,</p> <p>1.3 volume estimation of trees Method of age determination</p>	<p>1. Nursery lay out, seed sowing, vegetative propagation techniques.</p> <p>2. Volume measurement of logs using quarter girth formula</p> <p>3. Volume measurement of logs using Smalian formula</p>	<p>Unit 3 3.1 Non instrumental methods of height measurement - shadow and single pole method.</p> <p>3.2 Instrumental methods of height measurement. Geometric and trigonometric principles.. Tree stem form, form factor, form quotient,</p> <p>3.3 measurement of volume of felled and standing trees. Age determination of trees.</p>	<p>Study about instruments used in measurement</p>

SW-3 Suggested Sessional Work (SW):

- a. **Assignments:** 3 measurement of volume of felled and standing trees. Age determination of trees..
- b. Mini Project: Nil
- c. Other Activities (Specify): Nil

4: The students will have the ability to apply the knowledge in field of agro forestry, different types and models to be adopted as per the agroclimatic zone

Item	Approximate Hours
CI	2
LI	4
SW	2
SL	1
Total	9

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
1. The students will have the ability to apply the knowledge in field of agro forestry 2. different types and models to be adopted as per the agroclimatic zone	1. Study about Forest plantations and their management 2. Study about Forest plantations management	Unit 4. 4.1 Agroforestry – definitions, importance, criteria of selection of trees in agroforestry, different agroforestry systems prevalent in the country. 4.2 Shifting cultivation, taungya, alley cropping, wind breaks and shelter belts, home gardens.	1. Design of shelter belt and wind break

SW-4 Suggested Sessional Work (SW):

Assignments: Shifting cultivation, taungya, alley cropping, wind breaks and shelter belts, home gardens.

- a. **Mini Project: Nil**
- b. **Other Activities (Specify): Nil**

5: The students will have the ability to apply the knowledge in field of cultivation practices including nursery and plantation management with reference to Vindhyan region

Item	Approximate Hours
CI	2
LI	4
SW	2
SL	2
Total	10

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
The students will have the ability to apply the knowledge in field of 1. cultivation practices including nursery of teak and plantation management 2. cultivation practices including nursery of Eucalyptus and plantation management	1. Visits of nearby forest based industries-I 2. Visits of nearby forest based industries-II	Unit-5. 5.1 Cultivation practices of Teak 5.2 Cultivation practices of Eucalyptus	Study of plantation of Teak by Stump planting method

SW-5 Suggested Sessional Work (SW):

Assignments: Cultivation practices of Teak

Cultivation practices of Eucalyptus

- a. Mini Project: Nil
- c. Other Activities (Specify): Nil

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	LI	Sessional Work (SW)	Self Learning (Sl)	Total hour (Cl+SW+Sl)
CO1. The students will have the ability to apply the knowledge gained in basic terms related to forestry, forest classification, methods of natural regeneration and silents features of Indian Forest Policies	4	8	1	2	15
CO2. The students will have the ability to apply the knowledge gained about afforestation, maintenance and different methods of thinning applied in forest crops	4	6	1	1	12
CO3. The students will have the ability to apply the knowledge in field of forest mensuration- diameter, height and volume estimation of trees	3	6	1	1	11
CO4. The students will have the ability to apply the knowledge in field of agro forestry, different types and models to be adopted as per the agroclimatic zone	2	4	2	1	9
CO5. The students will have the ability to apply the knowledge in field of cultivation practices including nursery and plantation management with reference to Vindhyan region	2	4	2	2	10
Total	15	28	7	7	57

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO 1	<p>Unit-1.1 -Introduction – definitions of basic terms related to forestry objectives of silviculture, forest classification.</p> <p>1.2 Salient features of Indian Forest Policies.</p> <p>1.3 Forest regeneration, Natural regeneration - from seed .</p> <p>1.4 Vegetative parts, coppicing, pollarding, root suckers.</p>	5	3	2	10
CO 2	<p>Unit-2.2.1 Artificial regeneration – objectives, choice between natural and artificial regeneration.</p> <p>2.2 Essential preliminary considerations. Crown classification. Tending operations – weeding, cleaning.</p> <p>2.3 Thinning – mechanical, ordinary, crown and advance thinning.</p> <p>2.4 Forest mensuration – objectives, diameter measurement instruments used in diameter measurement.</p>	4	2	4	10
CO 3	<p>Unit 3 3.1 Non instrumental methods of height measurement - shadow and single pole method.</p> <p>3.2 Instrumental methods of height measurement. Geometric and trigonometric principles..</p> <p>Tree stem form, form factor, form quotient,</p> <p>3.3 measurement of volume of felled and standing trees. Age determination of trees.</p>	3	3	4	10
CO 4	<p>Unit 4. 4.1 Agroforestry – definitions, importance, criteria of selection of trees in agroforestry, different</p>	5	3	2	10

	<p>agroforestry systems prevalent in the country.</p> <p>4.2 Shifting cultivation, taungya, alley cropping, wind breaks and shelter belts, home gardens.</p>				
CO 5	Unit-5. 5.1 Cultivation practices of Teak 5.2 Cultivation practices of Eucalyptus	2	4	4	10

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for **Introduction to Forestry** will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Demonstration
7. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, Whatsapp, Mobile, Online sources)
8. Brainstorming

Suggested Learning Resources:**(a) Books:**

S. No.	Title	Author	Publisher	Edition & Year
1	Agro forestry Principle and Practices	A.P.Dwivedi	Oxford & IBH Publishing co. PVT. LTD.	1 st Edition 2016
2	Indian Forestry	K.Manikand and S.Prabhu	Jain Brothers (New Delhi)	Six Revised Edition 2016
3	Introductory to Forestry	Dr. Vijay Kumar Umrao and Kamal Jain	Rama Publishing, Meruth	1 st Edition 2018

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Cos, Pos and PSOs Mapping

Course Code: 21SC122

Course Title: Introduction to Forestry

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprises with different scales in area of agricultural production, process and	Hold a post on supply in administration and policy	Analyze and control commercial and economical process in the field of agriculture.	Teach how to control and manage agricultural production	Introduce general production technologies	Teach how to teach and manage production technology	Preparation of managerial and social responsibility	Student will identify different underutilized crops	Student will practice different reeding techniques used in crop production.	Student will recognize different insect pest and diseases and their symptoms of crops	Student will apply different recent techniques in crop production
21FO123 The students will have the ability to apply the knowledge gained in basic terms related to forestry, forest classification, methods of natural regeneration and silents features of Indian Forest Policies	2	1	3	2	2	3	2	3	1	2	1
21FO123 The students will have the ability to apply the knowledge gained about	1	1	1	2	3	2	2	1	2	1	2

afforestation, maintenance and different methods of thinning applied in forest crops											
21FO123 The students will have the ability to apply the knowledge in field of forest mensuration- diameter, height and volume estimation of trees	1	2	3	1	1	3		2	1	4	2
21FO123 The students will have the ability to apply the knowledge in field of agro forestry, different types and models to be adopted as per the agroclimatic zone	2	1	2	3	2	2	3	1	1	2	1
21FO123 The students will have the ability to apply the knowledge in field of cultivation practices	1	3	1	1	2	3	4	2	1	2	1

including nursery and plantation management with reference to Vindhyan region												
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Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map: Introduction to Forestry

Pos & PSOs	Cos No. & Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
PO1,2,3,4,5,6,7 PSO 1,2,3,4	CO1.The students will have the ability to apply the knowledge gained in basic terms related to forestry, forest classification, methods of natural regeneration and silent's features of Indian Forest Policies	SO 1.1 SO 1.2 SO 1.3 SO 1.4	1. Nursery lay out, seed sowing, vegetative propagation techniques. 2. Volume measurement of logs using quarter girth formula 3. Volume measurement of logs using smalian formula	Introduction – definitions of basic terms related to forestry objectives of silviculture, forest classification.Salien t features of Indian Forest Policies. Forest regeneration, Natural regeneration - from seed. Vegetative parts, coppicing, pollarding, root suckers.	1.Basic knowledge of forest and its role for mankind as well in environmental balence. 2. Requirement of forest produce.
PO1,2,3,4,5,6,7 PSO 1,2,3,4	CO2. The students will have the ability to apply the knowledge gained about afforestation, maintenance and different methods of thinning applied	SO 1.1 SO 1.2 SO 1.3 SO 1.4	1.Height measurement of standing trees by shadow method-I 2.Height measurement of standing trees by single pole	Artificial regeneration – objectives, choice between natural and artificial regeneration. Essential preliminary considerations. Crown classification. Tending operations –	1.Different method of planting seedling. 2.Irrigation methods.

	in forest crops		method. 3.Height measurement of standing trees by hypsoneter	weeding, cleaning. Thinning – mechanical, ordinary, crown and advance thinning. Forest mensuration – objectives, diameter measurement instruments used in diameter measurement.	
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PO1,2,3,4,5,6,7 PSO 1,2,3,4	CO3. The students will have the ability to apply the knowledge in field of forest mensuration- diameter, height and volume estimation of trees	SO 1.1 SO 1.2 SO 1.3	<ol style="list-style-type: none"> 1. Nursery lay out, seed sowing, vegetative propagation techniques. 2. Volume measurement of logs using quarter girth formula 3. Volume measurement of logs using smalian formula 	<p>Non instrumental methods of height measurement - shadow and single pole method.</p> <p>Instrumental methods of height measurement. Geometric and trigonometric principles..</p> <p>Tree stem form, form factor, form quotient, measurement of volume of felled and standing trees. Age determination of trees.</p>	Study about instruments used in measurement
PO1,2,3,4,5,6,7 PSO 1,2,3,4	CO4. The students will have the ability to apply the knowledge in field of agro forestry, different types and models to be adopted as per the agroclimatic zone	SO 1.1 SO 1.2	<ol style="list-style-type: none"> 1. Study about Forest plantations and their management 2. Study about Forest plantations management 	Agroforestry – definitions, importance, criteria of selection of trees in agroforestry, different agroforestry systems prevalent in the country. Shifting cultivation, taungya, alley cropping, wind breaks and shelter belts, home gardens.	1. Design of selter belt and wind break
PO1,2,3,4,5,6,7	CO5. The students will have the ability	SO 1.1 SO 1.2	1. Visits of nearby forest based	Cultivation practices of Teak, Cultivation	Study of plantation of Teak by Stump

PSO 1,2,3,4	to apply the knowledge in field of cultivation practices including nursery and plantation management with reference to Vindhyan region		industries-I 2.Visits of nearby forest based industries-II	practices of Eucalyptus	planting method
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Course Code: 21SD124

Course Title: Comprehension and Communication Skills In English

Pre- requisite: Students will understand about in English lessons there are three main types of learning outcomes which students will understand about: language outcomes (grammar, vocabulary and functions); skills outcomes (reading/viewing, writing/representing, listening, speaking).

Rationale: Communicative English as a course offers the students to work on their communication skills and provides the students sufficient information about the General Phonology and the Phonology of English. The course allows the students to explore the various ways in which language functions while communicating. Along with theoretical learning of the language, the course also includes various practical session allowing the students to develop their skills such as listening, speaking, reading, and writing in standard, academic English.

Course Outcomes:

CO1 Students will be able to use the grammar and frame the sentences effectively.

CO2 Students will be able to read and listen effectively and attentively.

CO3 Vocabulary of students will be enhanced as well as they will learn the use of modals.

CO4 Students will become Professional in writing skills which will further help them in building their curriculum vitae, job application and many more.

CO5 Students will become aware of Indian writings.

Scheme of Studies:

Code	Course Code	Course Title	Scheme of studies(Hours/Week)				Total Credits (C)	
			CI	LI	SW	SL		Total Study Hours (CI+LI+SW+SL)
Program Core (PCC).	21SD124	Comprehension and communication skills in english	1	1	1	1	4	2

Legend:

CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) And others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop,field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

Code	Course Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks
			Class/ Home Assignment 5 number of 3 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 mark each (CT)	Seminar one (SA)	Class Activity one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
Program Core (PCC).	21SD124	Comprehension and communication skills in English	15	30	0	0	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

21SD124 B -01: To teach students to frame sentences with the appropriate use of grammar.

Approximate Hours

Item	Approx Hrs.
CI	3
LI	4
SW	1
SL	1
Total	8

Session Outcomes(SOs)	Laboratory Instruction(LI)	Class room Instruction(CI)	Self Learning(SL)
SO.1 Students Understand about Articles, Prepositions, SO.2 Learned about Tenses (Present, Past and Future), SO.3 Students learned about Vocabulary: Idioms and Phrases, Voice (Active and Passive) SO.4 Student Understand Oral communication skills	LII Oral Communication: Phonetics, Stress LI 2 Intonation, Conversation practice.	1.0 FUNCTIONAL ENGLISH 1.1 Articles, Prepositions, Subject-Verb Agreement, 1.2 Tenses (Present, Past and Future), 1.3 Vocabulary: Idioms and Phrases, Voice (Active and Passive)	Improve learning skill by applying Prepositions, Subject- Verb Agreement, Tenses (Present, Past and Future), Vocabulary: Idioms and Phrases, Voice (Active and Passive) in your daily talk

SW-1 Suggested Sessional Work (SW):

Assignments: Tenses

Other activities (specify): Phrases, Voice (Active and Passive)

21SD124 B.2: To improve the Reading and Listening skills of students.

Approximate Hours

Item	Approx Hrs.
CI	3
LI	6
SW	1
SL	1
Total	09

Session Outcomes(SOs)	Laboratory Instruction(LI)	Class room Instruction(CI)	Self Learning(SL)
SO.1 Students understand Meaning of Reading. SO 1.2 Learned about Meaning of Comprehension, Reading Strategies, Unseen Passage. SO 1.3: understand Meaning of Listening, Listening Process, Listening types. SO.4 Student learned about learning skills	LI 1 Listening Comprehension LI.2 Listening to short talk LI.3 Listening to lectures, Speeches	Unit 2 Reading and listening Comprehension 2.1: Meaning of Reading, 2.2 :Meaning of Comprehension, Reading Strategies, Unseen Passage, 2.3:Meaning of Listening, Listening Process, Listening types.	Meaning of Comprehension, Reading Strategies, Unseen Passage,

SW-1 Suggested Sessional Work (SW):

Assignments: Meaning of Comprehension, Reading Strategies, Unseen Passage,

Mini Project: Write Unseen Passage,

Other activities (specify)

21SD124 B.3: To make students aware of modals and their uses.

Approximate Hours

Item	Approx Hrs.
CI	3
LI	8
SW	1
SL	1
Total	08

Session Outcomes(SOs)	Laboratory Instruction(LI)	Class room Instruction(CI)	Self Learning(SL)
SO.1 Learned about Antonyms, Synonyms. 1.2: Understand Homophones, Homonyms, Homographs. SO.3 Student learned About Rate of speech, Clarity of voice, Speaking and Listening, Politeness.	LI.1 Reading Skills: LI.2 Reading Comprehension LI.3 Reading dialogues, LI.4 Rapid reading,	Unit 3 Vocabulary 1.0: Antonyms, Synonyms, 1.2: Homophones, Homonyms, Homographs, 1.3: Introduction to Modal Auxiliaries (Can, Could, May, Might, Should, Must, Need, Ought to, Would, Could have, Should have, Have to, had to, Used to, Dare to).	Antonyms, Synonyms,

SW-1 Suggested Sessional Work (SW):

Assignments: Introduction to Modal Auxiliaries

Mini Project: made sentence by using (Can, Could, May, Might, Should, Must, Need, Ought to, Would, Could have, Should have, Have to, had to, Used to, Dare to).

Other activities (specify)

21SD124 B.4: To improve the writing skills of students.

Approximate Hours

Item	Approx Hrs.
CI	3
LI	8
SW	1
SL	1
Total	10

Session Outcomes(SOs)	Laboratory Instruction(LI)	Class room Instruction(CI)	Self Learning(SL)
<p>SO.1: Students Learned about Precise writing, Paragraph writing, Report writing,</p> <p>SO.2 Students understand about preparation of Curriculum vitae and Job applications</p> <p>SO.3 Learned about Interviews: Kinds, Importance and Process.</p> <p>SO.4 Learned about Reading dialogues, Rapid reading, Improving reading skills.</p>	<p>LI1 Practice on Conversation.</p> <p>LI.2 Rate of speech,</p> <p>LI.3 Clarity of voice,</p> <p>LI .4 Listening and Speaking Politely.</p>	<p>Unit 4 Writing skills</p> <p>1.0: Precise writing, Paragraph writing, Report writing,</p> <p>1.2:The Style: Importance of Professional writing,</p> <p>1.3: Curriculum vitae and Job applications, Interviews: Kinds, Importance and Process.</p>	<p>1. Precise writing, Paragraph writing, Report writing, The Style: Importance of Professional writing,</p>

SW-1 Suggested Sessional Work (SW):

Assignments: Interviews: Kinds, Importance and Process.

Other activities (specify): Write important agriculture note with Professional writing,

21SD124 B.5: To inspire students to read the fiction.

Approximate Hours

Item	Approx Hrs.
CI	3
LI	4
SW	1
SL	1
Total	05

Session Outcomes(SOs)	Laboratory Instruction(LI)	Class room Instruction(CI)	Self Learning(SL)
SO.1: Students learned about authors SO.2: Students learned about stories SO.3: Students learned about poems	LI1 Improving literary writing . LI.2 Practicing on framing curriculum vitae.	UNIT 5 Indian Literary writing 1.0 Premchand: The Shroud. 1.2: Nissim Ezekiel: Night of the scorpion. 1.3: George Orwell: Animal farm.	Read about Nissim Ezekiel: Night of the scorpion.

SW-1 Suggested Sessional Work (SW):

Assignments: Premchand: The Shroud.

Other activities (specify): Write abstract about George Orwell: Animal farm.

Brief of Hours suggested for the Course Outcome.

Course Outcomes	Class Lectue (CI)	SessionalWork (SW)	Self Learning (SI)	Total hour(CI+SW+SI +LI))
CO-1: Students will be able to use the grammar and frame the sentences effectively.	03+4	1	1	09
CO-2: Students will be able to read and listen effectively and attentively.	03+6	1	1	11
CO-3: Vocabulary of students will be enhanced as well as they will learn the use of modals.	03+8	1	1	13
CO-4: Students will become Professional in writing skills which will further help them in building their curriculum vitae, job application and many more.	03+8	1	1	13
CO-5: Students will become aware of Indian writings.	03+4	1	1	09
Total Hours	15+30	05	5	55

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	FUNCTIONAL ENGLISH	03	04	3	10
CO-2	READING AND LISTENING COMPREHNSION	02	05	3	10
CO-3	VOCABULARY	03	04	3	10
CO-4	WRITING SKILLS	03	03	4	10
CO-5	INDIAN LITERARY WRITING	03	04	3	10
Total		14	20	16	50

Legend: R: Remember, U: Understand, A: Apply

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks.

Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

Improved Lecture

Tutorial

Group Discussion

ICT Based Teaching Learning (Video Demonstration/Tutorials CBT,Blog, Facebook,Twitter, Whatsapp, Mobile, Online sources)

Brainstorming

Suggested Learning Resources:

(a) Books :

S. No.	Title	Author	Publisher	Edition & Year
1	A Practical English Grammar	A.J Thomas:	Oxford University Press	
2	Communication Skills,	Dr P.K. Oberoi:	Shree Sai Prakashan.	
3	The process of communication	Berlo, David k	New York	

- 1 <https://www.sparknotes.com/lit/animalfarm/summary/>
- 2 https://nios.ac.in/media/documents/srsec302new/LG/302_LG_eng_CH_18.pdf
- 3 <https://www.encyclopedia.com/arts/encyclopedias-almanacs-transcripts-and-maps/shroud-kafan-premcand-1936>

Cos, Pos and PSOs Mapping

Course Code: 21SD124

Course Title: Comprehension And Communication Skills In English

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprises with different scales in area of agricultural production, process and	Hold a post on supply in administration and policy	Analyze and control commercial and economical process in the field of agriculture	Teach how to control and manage agricultural production	Introduce general production technologies	Teach how to teach and manage production technology	Preparation of managerial and social responsibility	Student will identify different underutilized crops	Student will practice different reeding techniques used in crop production.	Student will recognize different insect pest and diseases and their symptoms of crops	Student will apply different recent techniques in crop production
CO1 Students will be able to use the grammar and frame the sentences effectively.	2	1	1	1	3	3	1	3	1	2	1
CO2 Students will be able to read and listen effectively and attentively.	1	1	2	1	2	2	1	1	3	1	2
CO3 Vocabulary	1	2	1	1	1	1		1	1	1	2

of students will be enhanced as well as they will learn the use of modals.											
CO4 Students will become Professional in writing skills which will further help them in building their curriculum vitae, job application and many more.	2	1	2	3	1	3	3	1	1	2	1
CO5 Students will become aware of Indian writings	1	2	1	1	1	3	1	2	1	3	1

Course Curriculum Map: Comprehension and Communication Skills in English

Pos & PSOs	Cos No. & Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
PO1,2,3,4,5,6,7 PSO 1,2,3,4	CO1 Students will be able to use the grammar and frame the sentences effectively.	SO 1.1 SO 1.2 SO 1.3 SO 1.4	1 Oral Communication: Phonetics, Stress 2 Intonation, Conversation practice.	FUNCTIONAL ENGLISH Articles, Prepositions, Subject-Verb Agreement, Tenses (Present, Past and Future), Vocabulary: Idioms and Phrases, Voice (Active and Passive)	Improve learning skill by applying Prepositions, Subject-Verb Agreement, Tenses (Present, Past and Future), Vocabulary: Idioms and Phrases, Voice (Active and Passive) in your daily talk
PO1,2,3,4,5,6,7 PSO 1,2,3,4	CO2 Students will be able to read and listen effectively and attentively.	SO 1.1 SO 1.2 SO 1.3 SO 1.4	1 Listening Comprehension 2 Listening to short talk 3 Listening to lectures, Speeches	Meaning of Reading, Meaning of Comprehension, Reading Strategies, Unseen Passage, Meaning of Listening, Listening Process, Listening types.	Meaning of Comprehension, Reading Strategies, Unseen Passage,
PO1,2,3,4,5,6,7 PSO 1,2,3,4	CO3 Vocabulary of students will be enhanced as well as they will learn the use of modals.	SO 1.1 SO 1.2 SO 1.3	1 Reading Skills: 2 Reading Comprehension 3 Reading dialogues, 4 Rapid reading,	Antonyms, Synonyms, Homophones, Homonyms, Homographs, Introduction to Modal Auxiliaries (Can, Could, May, Might, Should, Must, Need, Ought to, Would, Could have, Should have, Have to, had to, Used to, Dare to).	Antonyms, Synonyms,

<p>PO1,2,3,4,5,6,7 PSO 1,2,3,4</p>	<p>CO4 Students will become Professional in writing skills which will further help them in building their curriculum vitae, job application and many more.</p>	<p>SO 1.1 SO 1.2 SO 1.3 SO 1.4</p>	<p>1 Practice on Conversation. 2 Rate of speech, 3 Clarity of voice, 4 Listening and Speaking Politely.</p>	<p>Precise writing, Paragraph writing, Report writing, The Style: Importance of Professional writing, Curriculum vitae and Job applications, Interviews: Kinds, Importance and Process.</p>	<p>Precise writing, Paragraph writing, Report writing, The Style: Importance of Professional writing,</p>
<p>PO1,2,3,4,5,6,7 PSO 1,2,3,4</p>	<p>CO5 Students will become aware of Indian writings</p>	<p>SO 1.1 SO 1.2 SO 1.3</p>	<p>1 Improving literary writing . 2 Practicing on framing curriculum vitae</p>	<p>Premchand: The Shroud. Nissim Ezekiel: Night of the scorpion. George Orwell: Animal farm.</p>	<p>Read about Nissim Ezekiel: Night of the scorpion.</p>

Course Code: 21EV125

Course Title: Fundamentals of Agronomy

Pre-requisite: Student should have basic knowledge of Agronomy, Crop geometry, crop nutrition, Irrigation and weed and its management and about the allelopathy, growth and development and crop adaptation.

Rationale: The students should be acquainted with the knowledge of Agronomy its scope and importance and also know about the seed and method of sowing. They are involve in know about the crop nutrition to get the maximum yield without damaging the soil. The students should be acquainted with the knowledge of weed and its management and herbicide. student also get the knowledge about the crop growth and development and crop adaptation. This field of study and practice is driven by several key factors and considerations: Safety, Sustainability, Innovation and technology, Economic efficiency.

Course Outcomes:

21EV125.1 Students acquaint will familiar with the knowledge of Agronomy and its scope and importance and know the seed and importance of plant population in the field and nutrient use efficiency.

21EV125.2 students will able to acquaints knowledge about Water resources in india and water relationship with soil and plant and irrigation and its method and importance of irrigation.

21EV125.3 Students will able to identify the weed and agronomical problem create by thw weed and its management and allelopathic effects of weeds on crop.

21EV125.4 Students will able to acquaint knowledge to crop growth and development of crop and factors affecting the growth and development plant ideotypes and its concept crop rotation and its principles.

21EV125.5 Students will able to acquaint knowledge to Adaptation and distribution of crops crop management technologies of crop in problematic areas harvesting and threshing of crops

Scheme of Studies:

Code	Course Code	Course Title	Scheme of studies(Hours/Week)				Total StudyHours(CI+LI+SW+SL)	Total Credits (C)
			CI	LI	SW	SL		
Program Core (PCC)	21EV125	Fundamentals of Agronomy	3	1	1	1	6	4

Legend: **CI:**Classroom Instruction(Includes different instructional strategies i.e.Lecture(L) and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

Code	Course Code	Course Title	Scheme of Assessment (Marks)							End Semester Assessment (ESA)	Total Marks (PRA+ESA)
			Progressive Assessment (PRA)						Total Marks		
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)				
Program Core (PCC)	21EV125	Fundamentals of Agronomy	15	30	0	0	5	50	50	100	

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

21EV125.1 Students acquaint will familiar with the knowledge of Agronomy and its scope and importance and know the seed and importance of plant population in the field and nutrient use efficiency.

Approximate Hours

Item	Appx Hrs.
CI	9
LI	06
SW	01
SL	0
Total	16

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO1.1 Understand the agronomy and importance of agronomy in present scenario.</p> <p>SO1.2 Understand the seed and importance of good seed and method of sowing.</p> <p>SO1.3 Understand the tillage and its types and importance of tillage and tilth and also understand crop density and geometry Crop and its types.</p> <p>SO1.4 Understand the Crop nutrition and know the criteria of essentiality manures and fertilizers and its types and importance of manure and fertilizers.</p> <p>SO1.5 Understand the nutrient use efficiency</p>	<p>1. Identification of crops, seeds, fertilizers, pesticides and tillage implements</p> <p>2. Effect of sowing depth on germination and seedling vigour</p> <p>3. Use of tillage implements-reversible plough, one way plough, harrow, leveler, seed drill</p>	<p>Unit-1. Agronomy and its scope, seeds and sowing, tillage and tilth, crop density and geometry, Crop nutrition, manures and fertilizers, nutrient use efficiency</p> <p>1.1 Introduction to Agronomy and its scope and importance.</p> <p>1.2 Introduction to seed and methods of sowing</p> <p>1.3 Introduction to tillage and tilth and importance of tillage and its types.</p> <p>1.4 Explain the crop density and geometry. know the different types of crop geometry.</p> <p>1.5 . Introduction to the different types of crop geometry</p> <p>1.6 Introduction to Crop nutrition and know the essential plant nutrient for the plants</p> <p>1.7. Introduction to</p>	

		manure and fertilizers 1.8 Introduction to types of manure and fertilizers 1.9 Introduction to nutrient use efficiency.	
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SW-1 Suggested Sessional Work (SW):

Assignments:

What is Agronomy ? definition, scope and its importance and crop density and geometry and its types

Other Activities Specify):

21EV125.2 students will be able to acquaints knowledge about Water resources in India and water relationship with soil and plant and irrigation and irrigation its method and importance.

Approximate Hours

Item	Appx Hrs.
CI	09
LI	04
SW	1
SL	1
Total	15

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO1.1 Understand the soil plant water relationship and mechanism of soil plant water relationship and present status water resources in India</p> <p>SO1.2 Understand the crop water requirement and its estimation and water use efficiency of the different crops</p> <p>SO1.3 Understand the irrigation and different methods of irrigation and its importance.</p> <p>SO1.4. Understand the the scheduling of irrigation.</p> <p>SO1.5 Understand the quality of irrigation water and water logging.</p>	<p>1.Measurement of irrigation water.</p> <p>2.Study of soil moisture measuring devices</p>	<p>Unit-2 Water resources, soil plant water relationship, crop water requirement, water use efficiency, irrigation- scheduling criteria and methods, quality of irrigation water, water logging.</p> <p>1.1Introduction to water resources and water resources in india in present scenario.</p> <p>1.2 Introduction to soil plant water relationship.</p> <p>1.3 Explain the mechanism of soil plant water relation ship.</p> <p>1.4. Introduction to crop water requirement.</p> <p>1.5 Explain the estimation of crop water requirement for the crop.</p> <p>1.6 Explain the water use efficiency.</p> <p>1.7. Introduction to irrigation methods of irrigation and importance of irrigation for the crop.</p> <p>1.8 Explain the scheduling of irrigation.</p> <p>1.9 Explain the quality of irrigation water and water logging.</p>	<p>1. Measurement of irrigation water in AKS Field.</p>

SW-1 Suggested Sessional Work (SW):

Assignments:

Explain the irrigation- scheduling criteria and methods, quality of irrigation water, water logging.

a. Other Activities (Specify):

Estimation of water requirement of rice crop in kharif season.

21EV125.3 Students will able to identify the weed and agronomical problem created by the weed and its management and allelopathic effects of weeds on crop.

Approximate Hours	
Item	Appx Hrs.
CI	09
LI	04
SW	01
SL	01
Total	15

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO1.1 Understand the Weeds importance classification of weed on the basis of morphology, seed types and its life</p> <p>SO1.2 Understand the crop weed competition and principles of weed management and methods pf weed management</p> <p>SO1.3 Understand the Herbicides-classification of herbicide on the basis of Mode of action, on the basis of time.</p> <p>SO1.4. Understand the Herbicide selectivity.</p> <p>SO1.5 Understand the allelopathic effects of weed on crop, weed on crop and crop on weed</p>	<p>1. Identification of weeds in crops, Methods of herbicide and fertilizer application</p> <p>2. Numerical exercises on fertilizer requirement, plant population, herbicides and water requirement</p>	<p>Unit-3 Weeds- importance, classification, crop weed competition, concepts of weed management-principles and methods. Herbicides-classification, selectivity and resistance, allelopathy</p> <p>1.1Introduction to Weeds and characteristics of weed and its importance. .</p> <p>1.2 Introduction to classification of weeds and crop weed competition and its effect on crop production.</p> <p>1.3. Introduction to concepts of weed management and principles of weed management.</p> <p>1.4. Explain the methods of weed management</p> <p>1.5 Introduction to Herbicides and its mode of action of herbicides.</p> <p>1.6 Explain the classification of herbicide on the basis of Mode of action, on the basis of time.</p> <p>1.7 Introduction to Herbicide selectivity.</p>	<p>1.Study on allelopathic effect of weed on crop and crop on weeds.</p>

		<p>1.8 Introduction to Herbicide resistance and its management.</p> <p>1.9 Introduction to allelopathy and its types.</p>	
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SW-1 Suggested Sessional Work (SW):

Assignments:

Explain the principles and methods. Herbicides- classification, selectivity and resistance, allelopathy

b. Other Activities(Specify):

21EV125.4 Students will able to acquaint knowledge to crop growth and development of crop and factors affecting the growth and development plant ideotypes and its concept crop rotation and its principles.

Approximate Hours

Item	Appx Hrs.
CI	07
LI	02
SW	1
SL	1
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO1.1 Understand the Growth and development of crop</p> <p>SO1.2 Understand the Factors affecting growth and development</p> <p>SO1.3 Understand the plant ideotypes and concept of plant for ideotypes different situation and crops.</p> <p>SO1.4. Understand the crop rotation and its importance.</p> <p>SO1.5 Understand the principles of crop rotation</p>	<p>1. Study of yield contributing characters and yield estimation</p>	<p>Unit-4 Growth and development of crops. Factors affecting growth and development, plant ideotypes, crop rotation and its principles</p> <p>1.1Introduction to Crop Growth and development.</p> <p>1.2. Explain to Factors affecting growth</p> <p>1.3. Explain to Factors affecting Development.</p> <p>1.4 Introduction to plant ideotypes.</p> <p>1.5 . Explain the concept of plant for ideotypes different situation and crops</p> <p>1.6 Introduction to crop rotation and its importance .</p> <p>1.7 Explain the principles of crop rotation</p>	<p>1.Study on plant ideotypes, crop rotation and its principles.</p>

SW-1 Suggested Sessional Work (SW):

Assignments:

Growth and development of crops. Factors affecting growth and developmen

c. Other Activities(Specify):

21EV125.5 Students will able to acquaint knowledge to Adaptation and distribution of crops crop management technologies of crop in problematic areas harvesting and threshing of crops

Approximate Hours

Item	Appx Hrs.
CI	05
LI	04
SW	1
SL	1
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO1.1 Understand the crop adaptation and distribution of crops</p> <p>SO1.2 Understand the distribution of crops</p> <p>SO1.3 Understand the crop management technologies in problematic areas</p> <p>SO1.4. Understand the harvesting and threshing of crops.</p>	<p>1. Measurement of field capacity</p> <p>2. bulk density and infiltration rate</p>	<p>Unit-5 Adaptation and distribution of crops, crop management technologies in problematic areas, harvesting and threshing of crops.</p> <p>1.1 Introduction crop adaptation.</p> <p>1.2. Introduction to distribution of crops</p> <p>1.3. Introduction to crop management technologies in problematic areas</p> <p>1.4 Introduction to harvesting of crop</p> <p>1.5 Introduction to threshing of crop</p>	<p>1.Study on crop management technologies in problematic areas.</p>

SW-1 Suggested Sessional Work (SW):

Assignments:

Explain Adaptation and distribution of crops and harvesting and threshing of crops

d. Other Activities(Specify):

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Laboratory Instruction (LI)	Sessional Work (SW)	Self Learning (Sl)	Total hour (Cl+LI+SW+Sl)
21EV125.1 Students acquaint will familiar with the knowledge of Agronomy and its scope and importance and know the seed and importance of plant population in the field and nutrient use efficiency.	9	6	01	0	16
21EV125.2 students will able to acquaints knowledge about Water resources in india and water relationship with soil and plant and irrigation and its method and importance of irrigation.	9	4	01	01	15
21EV125.3 Students will able to identify the weed and agronomical problem create by thw weed and its management and allelopathic effects of weeds on crop.	9	4	01	01	15
21EV125.4 Students will able to acquaint knowledge to crop growth and development of crop and factors affecting the growth and development plant ideotypes and its concept crop rotation and its principles.	7	2	01	01	11
21EV125.5 Students will able to acquaint knowledge to Adaptation and distribution of crops crop management technologies of crop in problematic areas harvesting and threshing of crops	5	4	01	01	11
Total Hours	39	20	05	04	68

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Agronomy and its scope, seeds and sowing, tillage crop density and geometry and Crop nutrition.	03	01	01	05
CO-2	Water resources, soil plant water relationship, crop water requirement, water use efficiency, irrigation- scheduling c and methods quality of irrigation water	02	06	02	10
CO-3	Weed crop weed competition, concepts of weed management-principles and methods. Herbicides, selectivity and resistance and allelopathy	03	07	05	15
CO-4	Growth and development of crops. Factors affecting growth and development plant ideotypes crop rotation and its principles	-	10	05	15
CO-5	Adaptation and distribution of crops, crop management technologies in problematic areas, harvesting and threshing of crops	03	02	-	05
Total		11	26	13	50

Legend: R:Remember, U:Understand, A:Apply

The end of semester assessment for fundamentals of Agronomy will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above asks. Teachers can also design different task sasper requirement, for end semester assessment.

Suggested Instructional/ Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Demonstration

7. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, Whatsapp, Mobile, Online sources)
8. Brain storming.

Suggested Learning Resources:*(a)Books:*

S. No.	Title	Author	Publisher	Edition & Year
1	. Handbook of Agriculture (6th edition), Indian Council of Agricultural Research, New Delhi.	ICAR. 2010	Indian Council of Agricultural Research, New Delhi	(6th edition), 2010
2	Modern Concepts and Advance Principles in Crop Production.	Panda, S.C.	Agrobios (India), Jodhpur	2012
3	Principles of Agronomy	Reddy, T.Yellamanda and Reddy, G.H. Sankara	Kalyani Publishers, Ludhiana	2nd edition 2016
4	Principles of Crop Production	Reddy, S.R	Kalyani Publishers, Ludhiana	(4th edition) 2012

CurriculumDevelopmentTeam

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Cos, Pos and PSOs Mapping

Course Code:21AN125

Course Title: Fundamentals of Agronomy

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprises with different scales in area of agricultural production, process and	Hold a post on supply in administration and policy	Analyze and control commercial and economical process in the field of agriculture.	Teach how to control and manage agricultural production	Introduce general production technologies	Teach how to teach and manage production technology	Preparation of managerial and social responsibility	Student will identify different underutilized crops	Student will practice different reeding techniques used in crop production.	Student will recognize different insect pest and diseases and their symptoms of crops	Student will apply different recent techniques in crop production
21EV125.1 Students acquaint will familiar with the knowledge of Agronomy and its scope and importance and know the seed and importance of plant	2	2	1	1	1	3	1	3	1	3	1

population in the field and nutrient use efficiency.											
21EV125.2 students will able to acquaints knowledge about Water resources in india and water relationship with soil and plant and irrigation and its method and importance of irrigation.	1	1	3	1	3	2	1	1	2	1	2
21EV125.3 Students will able to identify the weed and agronomical problem create by thw weed	1	2	1	3	1	1		3	1	1	2

and its management and allelopathic effects of weeds on crop.											
21EV125.4 Students will be able to acquire knowledge of crop growth and development of crop and factors affecting the growth and development of plant types and its concept of crop rotation and its principles.	2	1	3	3	1	2	3	1	1	2	1
21EV125.5 Students will be able to acquire knowledge to	3	2	1	2	1	3	1	2	2	3	1

Adaptation and distribution of crops crop managemen t technologies of crop in problematic areas harvesting and threshing of crops											
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Legend: 1 – Low, 2 – Medium, 3 – High

Curriculum Map: Fundamentals of Agronomy

Pos & PSOs	Cos No. & Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
PO1,2,3,4,5,6,7 PSO 1,2,3,4	Students acquaint will familiar with the knowledge of Agronomy and its scope and importance and know the seed and importance of plant population in the field and nutrient use efficiency.	SO 1.1 SO 1.2 SO 1.3 SO 1.4 SO 1.5	4. Identification of crops, seeds, fertilizers, pesticides and tillage implements 5. Effect of sowing depth on germination and seedling vigour 6. Use of tillage implements-reversible plough, one way plough, harrow, leveler, seed drill	Agronomy and its scope, seeds and sowing, tillage and tilth, crop density and geometry, Crop nutrition, manures and fertilizers, nutrient use efficiency 1.1, 1.2, 1.3,1.4,1.5,1.6,1.7,1.8,1.9	.
PO1,2,3,4,5,6,7 PSO 1,2,3,4	students will able to acquaints knowledge about Water resources in India and water relationship with soil and plant and irrigation and irrigation its method and importance.	SO 1.1 SO 1.2 SO 1.3 SO 1.4 SO 1.5	1.Measurement of irrigation water. 2.Study of soil moisture measuring devices.	Water resources, soil plant water relationship, crop water requirement, water use efficiency, irrigation-scheduling criteria and methods, quality of irrigation water, water logging. 1.1, 1.2, 1.3,1.4,1.5,1.6,1.7,1.8,1.9	Measurement of irrigation water in AKS Field.

PO1,2,3,4,5,6,7 PSO 1,2,3,4	Students will able to identify the weed and agronomical problem created by the weed and its management and allelopathic effects of weeds on crop.	SO 1.1 SO 1.2 SO 1.3 SO 1.4 SO 1.5	3. Identification of weeds in crops, Methods of herbicide and fertilizer application 4. Numerical exercises on fertilizer requirement, plant population, herbicides and water requirement	Weeds- importance, classification, crop weed competition, concepts of weed management-principles and methods. Herbicides- classification, selectivity and resistance, allelopathy 1.1, 1.2, 1.3,1.4,1.5,1.6,1.7,1.8,1.9	Study on allelopathic effect of weed on crop and crop on weeds
PO1,2,3,4,5,6,7 PSO 1,2,3,4	Students will able to acquaint knowledge to crop growth and development of crop and factors affecting the growth and development plant ideotypes and its concept crop rotation and its principles.	SO 4.1 SO 4.2 SO 4.3 SO 4.4 SO 4.5	Study of yield contributing characters and yield estimation	Growth and development of crops. Factors affecting growth and development, plant ideotypes, crop rotation and its principles. 1.1, 1.2, 1.3,1.4,1.5,1.6,1.7	Study on plant ideotypes, crop rotation and its principles.
PO1,2,3,4,5,6,7 PSO 1,2,3,4	Students will able to acquaint knowledge to Adaptation and distribution of crops crop management	SO 5.1 SO 5.2 SO 5.3 SO 5.4	3. Measurement of field capacity 4. bulk density and infiltration rate	Adaptation and distribution of crops, crop management technologies in problematic areas, harvesting and threshing of crops. 1.1, 1.2, 1.3,1.4,1.5	Study on crop management technologies in problematic areas

	technologies of crop in problematic areas harvesting and threshing of crops				
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Course Code: 21BI126-A

Course Title: Introductory Biology

Pre-requisite:

Rationale:

Course Outcomes:

- 1: Students will be able to understand the fundamental concept of biology.
- 2: Understand the diversity and evolution of living organisms.
- 3: Students will be able to understand the morphology of flowering plants and able to describe the plants in Botanical language.
- 4: Student understand different types of plants, classification, identification, and nomenclature
- 5: It gives an Accounts of Role of animals in agriculture.

Scheme of Studies:

Code	Course Code	Course Title	Scheme of studies(Hours/Week)				Total Credits (C)	
			CI	LI	SW	SL		Total Study Hours CI+LI+SW+SL
Program Core (PCC)	21BI126A	Introductory Biology	1	2	0	0	1+2+0+0	1+1

Legend:

CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Code	Course Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ESA)
			Class/Home Assignment 5 number each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
PC C	21BI26A	Introductory Biology	15	30	0	0	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

1: Students will be able to understand the fundamental concept of biology

Approximate Hours

Item	Approximate Hours
CI	3
LI	8
SW	1
SL	1
Total	13

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SOS1 Under stand the characteristics and basic needs of living organism. SOS2 Under stand specific characteristics of various animal phylum. SOS3 Under stand life and their origin.	1.Study of slides phylum protozoa 2. Study of specimens of phylum (Protozoa, Porifera, Coelentrata, 3.Platyhelminthes, Annelida, 4. Arthropoda, Mollusca, Echinodermata, Chordata),	Unit-1 Living word 1.1 Characters of living non living classification of living beings 1.2 characters of phylum (Protozoa, Porifera, Coelentrata, Platyhelminthes, Annelida, Arthropoda, Mollusca, Echinodermata, Chordata), origin of life (Miller concept) 1.3 origin of life (Miller concept)	Differentiate living and non living

SW-1 Suggested Sessional Work (SW):

a. Assignments: Comparative study of different animal phylum

b. Mini project: Make specimen and chart related to different animal phylum

c. Other Activities (Specify):

2: Understand the diversity and evolution of living organisms.

Approximate Hours

Item	Approximate Hours
CI	3
LI	6
SW	1
SL	2
Total	12

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SOS1 Under stand steps of evolution, natural selection constructs phylogentic tree. SOS2 Under stand structure of chromosome, identifying different stages of cell division, SOS3 Under stand importance of cell division in plant and animals.	1. structure of cell 2.cell division(mitosis) 3. meosis cell division	Unit-2. Evolution 2.1 history (Micro-Macro evolution), eugenics techniques, 2.2 binomial system, natural classification, 2.3 cell-mitosis and meiosis cell divisions.	Origin of life Comparative Study of mitosis and meiosis cell division

SW-2 Suggested Sessional Work (SW):

a. Assignments: A. makes a chart of mitosis and meiosis cell division

b. Mini Project: models of structure of cell

c. Other Activities (Specify):

3: Students will be able to understand the morphology of flowering plants and able to describe the plants in Botanical language.

Item	Approximate Hours
CI	3
LI	6
SW	1
SL	2
Total	12

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SOS1 Under stand morphology of flowering plants (root, stem, leaf, flower, fruit, seed etc.) in botanical language SOS2 Under stand parts of flower SOS3 Understand different types of germination and structure of seed	1. modification of root ,stem, leaf etc 2. structure of flower 3. structure of seed	Unit 3 Morphology of flowering plan 3.1 Parts of plants and types of root, leaf, stem; types of venation 3.2 Flower (Description of a flower parts) 3.3 structure of seed, types, germination.	Definition of parts of plant Taxonomic term

SW-3 Suggested Sessional Work (SW):

a. **Assignments:** Make herbarium and study their morphology (leaf flower)

b. **Mini Project:** Make chart related to structure of flower/seed, flow chart of different types of germination

Other Activities (Specify):

4: Student understand different types of plants, classification, identification, and nomenclature

Item	Approximate Hours
CI	3
LI	6
SW	1
SL	1
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SOS1 Under stand basic fundamental terms related to taxonomy of plants. SOS2 Under stand economic importance of plants and identifying features, floral formula, floral diagram SOS3 economic importance of plants related Brassicaceae, Solanaceae, Fabaceae, Poaceae	1.description of plants Brassicaceae, Solanaceae 2. description of plants Poaceae 3.Description of plants Solanaceae	Unit 4. Plant systemics 4.1 Brassicaceae, Solanaceae, 4.2 Fabaceae, 4.3 Poaceae	Economic importance of plants related to families

SW-4 Suggested Sessional Work (SW):

- a. **Assignments:** Describe various plant in botanical language related to families
- b. **Mini Project:** make chart of floral diagram and floral of different families
- c. **Other Activities (Specify):**

5: It gives an Accounts of Role of animals in agriculture.

Item	Approximate Hours
CI	3
LI	4
SW	1
SL	2
Total	10

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SOS1 Under stand role of earth worm, honey bee in agriculture field. SOS2 Under stand the role of birds & cattles in agriculture field. SOS3 Under stand lac insect silk moth	1. study morphology , reproductive system of earthworm 2. life cycle of silk moth	Unit-5. Role of Animals in Agriculture 5.1 Earth worm, honey bee, 5.2, snail slugh, birds & cattles. 5.3 lac insect silk moth	Role of earthworm agriculture Role of birds,cattles agriculture

SW-5 Suggested Sessional Work (SW):

- a. **Assignments:** study morphology of earthworm and collect various sp.
- b. **Mini Project:**
- c. **Other Activities (Specify):**

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (CI)	Sessional Work (SW)	Self Learning (SI)	Total hour (CI+SW+SI)
1: Students will be able to understand the fundamental concept of biology.	3+8(LI)=11	1	1	11+1+1=13
2: Understand the diversity and evolution of living organisms.	3+6(LI)=9	1	2	9+1+2=12
3: Students will be able to understand the morphology of flowering plants and able to describe the plants in Botanical language.	3+6(LI)=9	1	2	9+1+2=12
4: Student understand different types of plants, classification, identification, and nomenclature	3+6(LI)=9	1	1	9+1+1=11
5: It gives an Accounts of Role of animals in agriculture.	3+4(LI)=7	1	2	7+1+2=10

**Suggestion for End Semester Assessment
Suggested Specification Table (For ESA)**

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO 1	1: Students will be able to understand the fundamental concept of biology.	03	01	01	05
CO 2	2: Understand the diversity and evolution of living organisms.	02	06	02	10
CO 3	3: Students will be able to understand the morphology of flowering plants and able to describe the plants in Botanical language.	03	07	05	15
CO 4	4: Student understand different types of plants, classification, identification, and nomenclature	-	10	05	15
CO 5	5: It gives an Accounts of Role of animals in agriculture.	03	02	-	05
	Total	11	26	13	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Demonstration
7. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, Whatsapp, Mobile, Online sources)
8. Brain stormin

Suggested Learning Resources:**(a) Books:**

S. No.	Title	Author	Publisher	Edition & Year
1	A Text book of zoology	Parker and Haswell.		
2	Vertebrate zoology-	R.L.Kotpal.		
3	Unified zoology-	Dr.V.K.Tiwari& Dr. V.K. Singh.		
4	Elementary Botany-	Bendra& Kumar		
5	College Botany-	Ganguli &kar,S B Agarwal		
6	Animal Physiology-	H.R.Singh, Vander.		
7	Comparative Anatomy of Vertebrate Zoology-	Kent.		
8	A Dictionary of Entomology-	leftwich.		
9	Invertebrates-	R.L.Kotpal, Nigam, Jordan.		

Cos, Pos and PSOs Mapping

Course Code: 21BI126-A

Course Title: Introductory Biology

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprises with different scales in area of agricultural production, process and	Hold a post on supply in administration and policy	Analyze and control commercial and economical process in the field of agriculture.	Teach how to control and manage agricultural production	Introduce general production technologies	Teach how to teach and manage production technology	Preparation of managerial and social responsibility	Student will identify different underutilized crops	Student will practice different reeding techniques used in crop production.	Student will recognize different insect pest and diseases and their symptoms of crops	Student will apply different recent techniques in crop production
1:21BI126 A Students will be able to understand the fundamental concept of biology.	2	2	1	1	1	3	1	2	1	3	2
21BI126A Students will be able to understand the morphology of flowering plants and	1	1	2	1	3	2	1	1	3	1	2

able to describe the plants in Botanical language.											
21BI126A Students understand different types of plants, classification, identification and nomenclature	1	3	1	1	1	1		2	1	1	2
21BI126A It gives an Accounts of Role of animals in agriculture.	2	1	3	2	1	2	3	1	3	2	1
21BI126A Understand the diversity and evolution of living organisms.	3	2	1	3	1	3	1	2	1	3	1

Legend: 1 – Low, 2 – Medium, 3 – High

Pos & PSOs	Cos No. & Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
PO1,2,3,4,5,6,7 PSO 1,2,3,4	1: Students will be able to understand the fundamental concept of biology.	SO1.1 SO1.2 SO1.3	1.Study of slides phylum protozoa 2. Study of specimens of phylum (Protozoa, Porifera, Coelentrata, 3.Platyhelminthes, Annelida, 4. Arthropoda, Mollusca, Echinodermata, Chordata),	1.1 Characters of living non living classification of living beings 1.2 characters of phylum (Protozoa, Porifera, Coelentrata, Platyhelminthes, Annelida, Arthropoda, Mollusca, Echinodermata, Chordata), origin of life (Miller concept) 1.3 origin of life (Miller concept) 1.1, 1.2, 1.3	Differentiate living and non living
PO1,2,3,4,5,6,7 PSO 1,2,3,4	2: Understand the diversity and evolution of living organisms.	SO2.1 SO2.2 SO2.3	1. structure of cell 2.cell division(mitosis) 3. meosis cell division	2.1 history (Micro-Macro evolution), eugenics techniques, 2.2 binomial system, natural classification, 2.3 cell-mitosis and meiosis cell divisions. 2.1, 2.2, 2.3	Origin of life Comparative Study of mitosis and meiosis cell division
PO1,2,3,4,5,6,7 PSO 1,2,3,4	3: Students will be able to understand the morphology of flowering plants and able to describe the plants in Botanical language.	SO3.1 SO3.2 SO3.3	1. modification of root ,stem, leaf etc 2. structure of flower 3. structure of seed	3.1 Parts of plants and types of root, leaf, stem; types of venation 3.2 Flower (Description of a flower parts) 3.3 structure of seed, types, germination. 3.1, 3.2, 3.3	Definition of parts of plant Taxonomic term
PO1,2,3,4,5,6,7 PSO 1,2,3,4	4: Student understand different types of plants, classification, identification, and nomenclature	SO4.1 SO4.2 SO4.3	1.description of plants Brassicaceae, Solanaceae 2. description of plants Poaceae 3.Description of plants Solanaceae	4.1 Brassicaceae, Solanaceae, 4.2 Fabaceae, 4.3 Poaceae	Economic importance of plants related to families

		SO4.3		4.1, 4.2, 4.3	
PO1,2,3,4,5,6,7 PSO 1,2,3,4	5: It gives an Accounts of Role of animals in agriculture.	SO 5.1 SO5.2 SO5.3	1. study morphology , reproductive system of earthworm 2. life cycle of silk moth	Earth worm, honey bee, snail slugh, birds & cattles. lac insect silk moth 5.1, 5.2, 5.3	Role of earthworm agriculture Role of birds,cattles agriculture

Course Code: 21MS126-B

Course Title: Elementary Mathematics

Pre-requisite: Student should have basic knowledge of Straight line, Circle, Differentiation and Matrix.

Rationale: The mathematics curriculum in elementary mathematics basically includes conceptual understanding, procedural fluency, and strategic competence in terms of mathematical proficiency. First, conceptual understanding refers to students' comprehension of mathematical concepts and the relationships between concepts.

Course Outcomes: CO1 Recognize to drive a linear relationship from a straight-line graph.

CO2- Illustrate circle can even be a valuable tool when gardening, as they help determine how much space plants need to grow around them.

CO3- Demonstrate algebraic facility with algebraic topics including linear, quadratic, exponential, logarithmic, and trigonometric functions.

CO4- Determine the continuity and differentiability of a function at a point and on a set; Solve problems in a range of mathematical applications using the derivative or the integral.

CO5- Assess matrices are used for taking seismic surveys.

Scheme of Studies:

Code	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Study Hours (CI+LI+SW+SL)	Total Credits (C)
			CI	LI	SW	SL			
Program Core (PCC)	21MS126-B	Elementary Mathematics	2	00	02	01	5	2	

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

Code	Course Code	Course Title	Scheme of Assessment (Marks)						
			Progressive Assessment (PRA)					End Semester Assessment	Total Marks
			Class/Home Assignment 1 number 5 marks each (CA)	Class Test 2 (2 best out) 20 marks each (CT)	Practical Exam (PA)	Class Attendance (AT)	Total Marks (CA+CT+PA+AT)		
PCC	21MS126-B	EM	5	40	-	5	50	(ESA)	(PRA+ESA)
								50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

21MS126-B CO-1 Recognize to drive a linear relationship from a straight-line graph.

Approximate Hours

Item	Appx. Hrs.
CI	6
LI	0
SW	1
SL	2
Total	9

Session Out Comes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO1.1 Student will come to familiar with technology currently used in the mathematics, Be able to assess student learning in mathematics.</p> <p>SO1.2 Student will be able to analyze teaching ideas and textbook presentations of said content in light of the found research.</p> <p>SO1.3 Student will be able to find research on the teaching and learning of content in the secondary mathematics curriculum.</p>		<p>Unit-1. Straight lines : Distance formula, section formula (internal and external division), Change of axes (only origin changed), Equation of co-ordinate axes, Equation of lines parallel to axes, Slope-intercept form of equation of line, Slope-point form of equation of line, Two point form of equation of line, Intercept form of equation of line, Normal form of equation of line, General form of equation of line, Point of intersection of two Straight lines, Angles between two straight lines, Parallel lines, Perpendicular lines, Angle of bisectors between two lines, Area of triangle and quadrilateral.</p> <p>1.1. Distance formula</p> <p>1.2 Section formula (internal and external division)</p> <p>1.3 Change of axes (only origin changed)</p> <p>1.4 Equation of lines parallel to axes</p> <p>1.5. Slope-intercept form of equation of line</p> <p>1.6 Slope-point form of equation of line</p>	<p>1. Prepare the assignment on</p> <p>Angles between two straight lines,</p> <p>General form of equation of line, Angle of bisectors between two lines.</p>

		<p>1.7 Two-point form of equation of line</p> <p>1.8 Normal form of equation of line</p> <p>1.9 Point of intersection of two Straight lines,</p> <p>1.10 Parallel lines, Perpendicular lines</p> <p>1.11 Area of triangle and quadrilateral.</p>	
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SW-1 Suggested Sessional Work (SW):

a. Assignments: Prepare the assignment on Angles between two straight lines

b. Mini Project: -

c. Other Activities (Specify):-

21MS126-B CO-2 Illustrate circle can even be a valuable tool when gardening, as they help determine how much space plants need to grow around them.

Approximate Hours

Item	Appx. Hrs.
CI	6
LI	0
SW	1
SL	2
Total	9

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO2.1 Demonstrate the ability to understand and write mathematical proofs.</p> <p>SO2.2 Create and solve sophisticated multi-step problems in various topics from the secondary curriculum.</p> <p>SO2.3 Circle can even be a valuable tool when gardening, as they help determine how much space plants need to grow around them.</p>		<p>Unit-2 Equation of circle whose Centre and radius is known, General equation of a circle, Equation of circle passing through three given points, Equation of circle whose diameters is line joining two points (x_1, y_1) & (x_2, y_2), Tangent and Normal to a given circle at given point (Simple problems), Condition of tangency of a line $y = mx + c$ to the given circle $x^2 + y^2 = a^2$.</p> <p>1.1 Equation of circle whose Centre and radius is known</p> <p>1.2 General equation of a circle</p> <p>1.3. Equation of circle passing through three given points</p> <p>1.4 Equation of circle whose diameters is line joining two points (x_1, y_1) & (x_2, y_2)</p> <p>1.5 Tangent and Normal to a given circle at given point (Simple problems)</p> <p>1.6 Condition of tangency of a line $y = mx + c$ to the given circle $x^2 + y^2 = a^2$</p>	<p>1. Prepare the assignment on</p> <p>General equation of a circle, Equation of circle whose diameters is line joining two points (x_1, y_1) & (x_2, y_2)</p>

SW-1 Suggested Sessional Work (SW):

Assignments: Equation of circle passing through three given points

a. Other Activities (Specify):

21MS126-B CO-3 Demonstrate algebraic facility with algebraic topics including linear, quadratic, exponential, logarithmic, and trigonometric functions.

Approximate Hours

Item	Appx. Hrs.
CI	6
LI	0
SW	1
SL	2
Total	9

Session Out Comes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO3.1 Be able to use appropriate technologies to solve mathematical problems.</p> <p>SO3.2 Demonstrate algebraic facility with algebraic topics including linear, quadratic, exponential, logarithmic, and trigonometric functions.</p> <p>SO3.3 Calculus is used in pure and applied mathematics, the biological and medical sciences, computer science, Statistics, economics and many other areas.</p>		<p>Unit-3 Differential Calculus: Definition of function, limit and continuity, Simple problems on limit, Differentiation of x^n, e^x, $\sin x$ & $\cos x$ from first principle, Derivatives of sum, difference, product and quotient of two functions, Differentiation of functions of functions (Simple problem based on it), Logarithmic differentiation (Simple problem based on it), Differentiation by substitution method and simple problems based on it, Differentiation of Inverse Trigonometric functions. Maxima and Minima of the functions of the form $y=f(x)$</p> <p>1.1. Differential Calculus: Definition of function</p> <p>1.2. limit and continuity</p> <p>1.3. Simple problems on limit, Differentiation of x^n, e^x, $\sin x$ & $\cos x$ from first principle</p> <p>1.4. Derivatives of sum, difference, product</p> <p>1.5. quotient of two functions</p>	<p>1. Prepare the assignment on</p> <p>Differentiation of x^n, e^x, $\sin x$ & $\cos x$ from first principle,</p> <p>Differentiation of functions of functions (Simple problem based on it), Logarithmic differentiation (Simple problem based on it), Differentiation by substitution method and simple problems based on it</p>

		<p>1.6. Differentiation of functions of functions (Simple problem based on it)</p> <p>1.7. Logarithmic differentiation (Simple problem based on it)</p> <p>1.8. Differentiation by substitution method and simple problems based on it</p> <p>1.9. Differentiation of Inverse Trigonometric functions. Maxima and Minima of the functions of the form $y=f(x)$</p>	
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SW-1 Suggested Sessional Work (SW):

Assignments: Differentiation of x^n , e^x , $\sin x$ & $\cos x$ from first principle,

Differentiation of functions of functions (Simple problem based on it), Logarithmic differentiation (Simple problem based on it), Differentiation by substitution method and simple problems based on it

b. Other Activities (Specify):

21MS126-B CO-4 Determine the continuity and differentiability of a function at a point and on a set.

Approximate Hours

Item	Appx Hrs.
CI	6
LI	0
SW	1
SL	2
Total	9

Session Out Comes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO4.1 Be able to construct appropriate mathematical models to solve a variety of problems.</p> <p>SO4.2 The need to find local maxima and minima arise in many situations.</p> <p>SO4.3 Determine the continuity and differentiability of a function at a point and on a set; Solve problems in a range of mathematical applications using the derivative or the integral.</p>		<p>Unit-4 Integral Calculus: Integration of simple functions, Integration of Product of two functions, Integration by substitution method, Definite Integral (simple problems based on it), Area under simple well-known curves.</p> <p>1.1 Integration of simple functions, Integration of Product of two functions</p> <p>1.2 Integration by substitution method</p> <p>1.3 Definite Integral (simple problems based on it)</p> <p>1.4 Area under simple well-known curves.</p>	<p>1. Prepare the assignment on Integration of simple functions, Integration of Product of two functions, Definite Integral (simple problems based on it)</p>

SW-1 Suggested Sessional Work (SW):

Assignments: Integration of simple functions, Integration of Product of two functions, Definite Integral (simple problems based on it)

c. Other Activities (Specify)

21MS126-B CO-5 Assess matrices are used for taking seismic surveys.

Approximate Hours

Item	Appx Hrs.
CI	6
LI	0
SW	1
SL	2
Total	9

Session Out Comes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO5.1 It can help make animations more precise and accurate.</p> <p>SO5.2 Obtain a full-time position in a related field or placement. Explain why mathematical thinking is valuable in daily life.</p>		<p>Unit-5 Matrices and Determinants: Definition of Matrices, Addition, Subtraction, Multiplication, Transpose and Inverse up to 3rd order, Properties of determinants up to 3rd order and their evaluation.</p> <p>1.1 Definition of Matrices</p> <p>1.2. Addition, Subtraction</p> <p>1.3. Multiplication, Transpose and Inverse up to 3rd order</p> <p>1.4 Properties of determinants up to 3rd order and their evaluation</p>	<p>1. Prepare the assignment Multiplication, Transpose and Inverse up to 3rd order and their evaluation.</p>

SW-1 Suggested Sessional Work (SW):

Assignments: Multiplication, Transpose and Inverse up to 3rd order and their evaluation.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (C I)	Laboratory Lecture (L I)	Sessional Work (SW)	Self-Learning (S I)	Total hour (C I + LI + SW + S I)
01: Recognize to drive a linear relationship from a straight-line graph.	06	-	01	02	09
02: Illustrate circle can even be a valuable tool when gardening, as they help determine how much space plants need to grow around them.	06	-	01	02	09
03: Demonstrate algebraic facility with algebraic topics including linear, quadratic, exponential, logarithmic, and trigonometric functions.	06	-	01	02	09
04: Determine the continuity and differentiability of a function at a point and on a set; Solve problems in a range of mathematical applications using the derivative or the integral.	06	-	01	02	09
05: Assess matrices are used for taking seismic surveys.	06	-	01	02	09
Total Hours	30	-	05	10	45

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit title	Marks Distribution			Total Marks
		R	U	A	
CO-1	Recognize to drive a linear relationship from a straight-line graph.	02	02	02	06
CO-2	Illustrate circle can even be a valuable tool when gardening, as they help determine how much space plants need to grow around them.	02	03	03	08

CO-3	Demonstrate algebraic facility with algebraic topics including linear, quadratic, exponential, logarithmic, and trigonometric functions.	02	04	04	10
CO-4	Determine the continuity and differentiability of a function at a point and on a set; Solve problems in a range of mathematical applications using the derivative or the integral.	03	04	05	12
CO-5	Assess matrices are used for taking seismic surveys.	04	05	05	14
	Total	13	18	19	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Agricultural Marketing, Trade and Prices will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Demonstration
7. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, WhatsApp, Mobile, Online sources)
8. Brainstorming

Suggested Learning Resources:

S. No.	Title	Author	Publisher	Edition & Year
01	Agriculture Mathematics	Vimal Saraswat	HIMANSHU PUBLICATIONS, Udaipur (Rajasthan) & New Delhi	2021 1 st edition
02	Mathematics in Agriculture	Rajeev K. Sharma	Scientific International Pvt. Ltd New Delhi – 110002	2016. First edition
03	Test Book of Basic Mathematics	S.K. Sheel	Daya Publishing House	2015 1 st edition

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Cos, Pos and PSOs Mapping

Course Code:21MS126-B

Course Title: Elementary Mathematics

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprises with different scales in area of agricultural production,process and	Hold a post on supply in administration and policy	Analyze and control commercial and economical process in the field of agriculture.	Teach how to control and manage agricultural production	Introduce general production technologies	Teach how to teach and manage production technology	Preparation of managerial and social responsibility	Student will identify different underutilized crops	Student will practice different reeding techniques used in crop production.	Student will recognize different insect pest and diseases and their symptoms of crops	Student will apply different recent techniques in crop production
CO1 Recognize to drive a linear relationship from a straight-line graph.	2	1	3	1	2	3	1	3	1	2	1
CO2- Illustrate circle can even	1	1	3	2	2	3	1	1	3	1	2

be a valuable tool when gardening, as they help determine how much space plants need to grow around them.											
CO3- Demonstrate algebraic facility with algebraic topics including linear, quadratic, exponential, logarithmic, and trigonometric functions.	1	2	1	3	1	3		2	1	3	2
CO4- Determine the continuity and differentiability of a function at a point and	2	1	2	3	1	1	3	1	3	2	1

on a set; Solve problems in a range of mathematical applications using the derivative or the integral.											
CO5- Assess matrices are used for taking seismic surveys.	1	2	1	3	2	3	1	2	1	3	1

Legend: 1 – Low, 2 – Medium, 3 – High

Curriculum Map: Elementary Mathematics

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
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<p>PO1,2,3,4,5,6,7 PSO 1,2,3,4</p>	<p>21MS126-B.1: Recognize to drive a linear relationship from a straight-line graph.</p>	<p>SO1.1 SO1.2 SO1.3 SO1.4</p>		<p>Unit-1.0 Straight lines : Distance formula, section formula (internal and external division), Change of axes (only origin changed), Equation of co-ordinate axes, Equation of lines parallel to axes, Slope-intercept form of equation of line, Slope-point form of equation of line, Two point form of equation of line, Intercept form of equation of line, Normal form of equation of line, General form of equation of line, Point of intersection of two Straight lines, Angles between two straight lines, Parallel lines, Perpendicular lines, Angle of bisectors between two lines, Area of triangle and quadrilateral.</p> <p>1.1,1.2,1.3,1.4,1.5,1.6</p>	<p>1. Prepare the assignment on Angles between two straight lines, General form of equation of line, Angle of bisectors between two lines.</p>
<p>PO1,2,3,4,5,6,7 PSO 1,2,3,4</p>	<p>21MS126-B.2: Illustrate circle can even be a valuable tool when gardening, as they help determine how much space plants need to grow around them.</p>	<p>SO2.1 SO2.2 SO2.3 SO2.4</p>		<p>Unit-2 Equation of circle whose Centre and radius is known, General equation of a circle, Equation of circle passing through three given points, Equation of circle whose diameters is line joining two points (x_1, y_1) & (x_2, y_2), Tangent and Normal to a given circle at given point (Simple problems), Condition of tangency of a line $y = mx + c$ to the given circle $x^2 + y^2 = a^2$.</p> <p>2.1,2.2,2.3,2.4,2.5,2.6</p>	<p>1. Prepare the assignment on General equation of a circle, Equation of circle whose diameters is line joining two points (x_1, y_1) & (x_2, y_2)</p>

<p>PO1,2,3,4,5,6,7 PSO 1,2,3,4</p>	<p>21MS126-B.3: Demonstrate algebraic facility with algebraic topics including linear, quadratic, exponential, logarithmic, and trigonometric functions.</p>	<p>SO3.1 SO3.2 SO3.3 SO3.4</p>		<p>Unit-3: Differential Calculus: Definition of function, limit and continuity, Simple problems on limit, Differentiation of x^n, e^x, $\sin x$ & $\cos x$ from first principle, Derivatives of sum, difference, product and quotient of two functions, Differentiation of functions of functions (Simple problem based on it), Logarithmic differentiation (Simple problem based on it), Differentiation by substitution method and simple problems based on it, Differentiation of Inverse Trigonometric functions. Maxima and Minima of the functions of the form $y=f(x)$</p> <p>3.1, 3.2, 3.3,3.4,3.5,3.6</p>	<p>1. Prepare the assignment on Differentiation of x^n, e^x, $\sin x$ & $\cos x$ from first principle, Differentiation of functions of functions (Simple problem based on it), Logarithmic differentiation (Simple problem based on it), Differentiation by substitution method and simple problems based on it</p>
<p>PO1,2,3,4,5,6,7 PSO 1,2,3,4</p>	<p>21MS126-B.4: Determine the continuity and differentiability of a function at a point and on a set.</p>	<p>SO4.1 SO4.2 SO4.3 SO4.4</p>		<p>Unit-4.0: Integral Calculus: Integration of simple functions, Integration of Product of two functions, Integration by substitution method, Definite Integral (simple problems based on it), Area under simple well-known curves.</p> <p>4.1, 4.2, 4.3, 4.4,4.5,4.6</p>	<p>1. Prepare the assignment on Integration of simple functions, Integration of Product of two functions, Definite Integral (simple problems based on it).</p>

<p>PO1,2,3,4,5,6,7 PSO 1,2,3,4</p>	<p>21MS126-B.5: Assess matrices are used for taking seismic surveys.</p>	<p>SO5.1 SO5.2 SO5.3 SO5.4</p>		<p>Unit 5: Matrices and Determinants: Definition of Matrices, Addition, Subtraction, Multiplication, Transpose and Inverse up to 3rd order, Properties of determinants up to 3rd order and their evaluation.</p> <p>5.1, 5.2, 5.3,5.4,5.5,5.6</p>	<p>1. Prepare the assignment Multiplication, Transpose and Inverse up to 3rd order and their evaluation.</p>
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Course Code: 21EX128

Course Title : Rural Sociology & Educational Psychology

Pre- requisite: Rural sociology studies the relations of the people who live in the villages. It is just like a mirror of the rural social life. It provides a detailed study of knowledge about different aspects of rural life, its problems, its culture, its religion, its economic and political scenario.

Rationale: The students studying about Social groups, social stratification, culture, social values, social control, social change and their relevance to Agricultural Extension Understand Educational Psychology, Intelligence, Personality, Perception, Emotion, Frustration, Motivation, Teaching, Learning Understanding how human action and consciousness both shape and are shaped by surrounding cultural and social structures.

Course Outcomes:

CO-1: Agriculture extension activity is a transfer of technology for rural and urban peoples both, rural sociology & Educational Psychology one of major aspect of extension course in which students will understand about rural sociology, society, and the importance of society in agriculture extension.

CO-2: How rural and urban society differs from each other and how its work, students will analyze about social group, social stratification, class and cost system and their role in agriculture extension. in rural context

CO-3: Students also need to understand about rural concept, social value, attitude; concepts are importance in agriculture extension. Students need to know about all these, students also will learn about social change and institution.

CO -4: Psychology is a major aspect of learning activity so in this course students also will understand about educational psychology.

CO -5: students learn about Intelligence, Personality these are a major factor in agriculture extension and all though come from extension teaching which students will learn in this particular course.

Scheme of Studies:

Code	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits(C)
			CI	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Program Core (PCC)	21EX128	Rural Sociology & Educational Psychology	2	0	1	1	4	2

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial

(T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C:Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

Code	Course Code	Course Title	Scheme of Assessment (Marks)						End Semester Assessment (ESA)	Total Marks (PRA+ESA)
			Progressive Assessment (PRA)							
			Class/ Home Assignment number 5 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
Program Core (PCC)		Rural Sociology & Educational Psychology	-	40	-	10	-	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

21EX128 1: To understand the basic concept of Rural Sociology, Importance of rural sociology in Agricultural Extension

Approximate Hours

Item	Approx Hrs.
CI	03
LI	0
SW	2
SL	1
Total	06

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO1.2 Understand Sociology and Rural Sociology -</p> <p>SO1.2 Scope of sociology and rural sociology</p> <p>SO1.3 Importance of rural sociology in agricultural extension</p> <p>SO1.4 interrelationship with agricultural extension</p>		<p>CI 1.1 Sociology and Rural Sociology -& interrelationship with agricultural extension</p> <p>CI 1.2 meaning and definition scope of rural sociology importance of rural sociology in agriculture extension</p> <p>CI 1.3 Interrelation with agriculture extension.</p>	Find out the difference between rural sociology & agricultural extension

SW-1 Suggested Sessional Work (SW):

- a. **Assignments:**
Interrelation of rural sociology with agricultural extension.
- b. **Mini Project:**
 - i. Model of village structure

21EX128 2. To understand that how rural and urban society differs from each other and how its work, students will analyze about social group, social stratification, class and cost system and their role in agriculture extension in rural context

Approximate Hours

Item	Approx Hrs.
CI	04
LI	0
SW	2
SL	1
Total	7

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO2.1 Understand Social groups, social stratification, culture, social values, social control, social change and their relevance to Agricultural Extension</p> <p>SO2.2 social stratification,</p> <p>SO2.3 Understand, social values, social control, and their relevance to Agricultural Extension</p> <p>SO2.4 Find out the difference between rural & urban situation.</p> <p>SO2.5 difference between class and caste system</p>		<p>CI 2.1 Indian rural society</p> <p>CI 2.2 social group meaning and definition Classification of Social Group and formation and organization of group</p> <p>CI 2.3 meaning definition and function of social stratification forms of stratification</p> <p>CI 2.4 difference between class and caste system difference the relationship between rural and urban societies</p>	<p>1. Find out the difference between rural & urban situation</p>

SW-1 Suggested Sessional Work (SW):

- c. Assignments:**
 - social group meaning and definition
- d. Mini Project:**
 - i. Structure of different type of social group.

21EX128 3. Understand about rural concept, social value, attitude; concepts are importance in agriculture extension and also learn about social change and institution.

Approximate Hours

Item	Approx Hrs.
CI	08
LI	0
SW	2
SL	1
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO3.1 Students learn and understand about cultural concept, social value, attitude; concepts are importance in agriculture extension.</p> <p>SO3.2 student understand Role of cultural concept in agriculture extension</p> <p>SO3.3 learn meaning and definition of social institution, social change ,dimension and factor of social change</p>		<p>CI 3.1 cultural concept social institute and social and social change</p> <p>CI 3.2 meaning and definition of culture concept</p> <p>CI 3.3 role of cultural concept in agriculture extension</p> <p>CI 3.4 meaning and definition of social values and attitudes</p> <p>CI 3.5 types and roles of social values and attitudes in agriculture extension</p> <p>CI 3.6 meaning and definition of social institution</p> <p>CI 3.7 major institution in rural society function and role of these institution</p> <p>CI 3.8 meaning and definition of social change dimension and factor of social change</p>	<p>2. Find out the difference between different cultural concepts</p>

SW-1 Suggested Sessional Work (SW):

e. *Assignments:*

Write about social change, institution, and cultural concept.

f. Mini Project:

- i. Flow chart of social change .

21EX128 4: Understand about educational psychology and importance of educational psychology in agricultural extension

Approximate Hours

Item	Approx Hrs.
CI	04
LI	0
SW	1
SL	1
Total	06

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO4.1 Psychology is a major aspect of learning activity so in this course students also will understand about educational psychology</p> <p>SO4.2 learn about scope and importance of Psychology and educational Psychology</p>		<p>CI4.1 Psychology and educational Psychology</p> <p>CI 4.2 meaning and definition</p> <p>CI4.3scope of Educational Psychology</p> <p>CI4.4 importance of Educational Psychology in agriculture extension</p>	<p>What are the importance of Educational Psychology in agriculture extension</p>

SW-1 Suggested Sessional Work (SW):

g. Assignments:
Importance of Educational Psychology in agriculture extension.

h. Mini Project:

Ext.101.5: Understand about Intelligence, personality, Extension teaching, learning situation, and its role in agricultural extension.

Approximate Hours

Item	Approx Hrs.
CI	8
LI	0
SW	1
SL	1
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO5.1 Intelligence, Personality these are a major factor in agriculture extension</p> <p>SO5.2 Understand how human action and consciousness both shape and are shaped by surrounding cultural and social structures</p> <p>SO5.3 learn about learning situation and extension teaching</p> <p>SO5.4 how to use intelligence to identify personality of farmers</p>		<p>CI 5.1 meaning and definition and types of intelligence</p> <p>CI 5.2 Factors affecting intelligence</p> <p>CI 5.3 importance of intelligence in agricultural</p> <p>CI 5.4 meaning and definition and types of personality Factors affecting personality</p> <p>CI 5.5 importance of personality in agricultural extension</p> <p>CI 5.6 meaning and definition and steps of extension teaching</p> <p>CI 5.7 meaning and definition of learning and learning experience</p> <p>CI 5.8 meaning and definition of learning situation elements and characters tics of learning situation</p>	Types of intelligence and personality

SW-1 Suggested Sessional Work (SW):

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self Learning (Sl)	Total hour (Cl+SW+Sl)
CO-1: Agriculture extension activity is a transfer of technology for rural and urban peoples both, rural sociology & Educational Psychology one of major aspect of extension course in which students will understand about rural sociology, society, and the importance of society in agriculture extension.	03	2	1	06
CO-2: How rural and urban society differs from each other and how its work, students will analyze about social group, social stratification, class and cost system and their role in agriculture extension. in rural context	04	2	1	07
CO-3: Students also need to understand about rural concept, social value, attitude; concepts are importance in agriculture extension. Students need to know about all these, students also will learn about social change and institution.	08	2	1	11
CO -4: Psychology is a major aspect of learning activity so in this course students also will understand about educational psychology.	04	1	1	06
CO -5: students learn about Intelligence, Personality these are a major factor in agriculture extension and all though come from extension teaching which students will learn in this particular course.	8	1	1	10
Total Hours	27	08	5	40

a) Assignments:

Learning and learning experience, *learning situation*, *Factors affecting intelligence*, *types of personality*

b) Mini Project:No

c) Other Activities (Specify):No

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Sociology and Rural Sociology and interrelationship with agricultural extension	04	04	02	10
CO-2	Indian rural sociology	03	03	04	10
CO-3	Cultural concept social institute and social and social change	03	06	01	10
CO-4	Psychology and educational Psychology	03	06	01	10
CO-5	Intelligence, Personality, Extension teaching and Learning situation	03	04	03	10
Total		16	23	11	50

Legend: R: Remember, U: Understand, A: Apply

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Group Discussion
4. Role Play
5. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT,Blog, Facebook,Twitter, Whatsapp, Mobile, Online sources)
6. Brain storming

Suggested Learning Resources:

(a) Books :

S. No.	Title	Author	Publisher	Edition & Year
1	Rural sociology	S. L, Doshi	Rawat Publishers, Delhi.	2007
2	Introductory rural sociology	J.B. Chitambar,	New York, John Wiley and Sons.	1973
3	Rural sociology and educational Psychology	O. P. Dhama and Bhatnagar	Oxford and IBH publishing CO.PVT. LTD	2 nd Edition 2019

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Cos, Pos and PSOs Mapping

Course Code: 21EX128

Course Title: Rural Sociology & Educational Psychology

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprises with different scales in area of agricultural production, process and	Hold a post on supply in administration and policy	Analyze and control commercial and economical process in the field of agriculture.	Teach how to control and manage agricultural production	Introduce general production technologies	Teach how to teach and manage production technology	Preparation of managerial and social responsibility	Student will identify different underutilized crops	Student will practice different reeding techniques used in crop production.	Student will recognize different insect pest and diseases and their symptoms of crops	Student will apply different recent techniques in crop production
CO-1: Agriculture extension activity is a transfer of technology for rural and urban peoples both, rural sociology & Educational Psychology one of major aspect of extension	2	1	3	1	2	3	1	3	1	2	1

course in which students will understand about rural sociology, society, and the importance of society in agriculture extension.											
CO-2: How rural and urban society differs from each other and how its work, students will analyze about social group, social stratification, class and cost system and their role in agriculture extension. in rural context	1	1	3	2	2	2	1	1	3	1	2
CO-3: Students also need to understand about rural concept, social value, attitude; concepts are importance in agriculture	1	2	1	1	1	3		2	1	3	2

extension. Students need to know about all these, students also will learn about social change and institution.											
CO -4: Psychology is a major aspect of learning activity so in this course students also will understand about educational psychology.	2	1	2	3	1	1	2	1	3	2	1
CO -5: students learn about Intelligence, Personality these are a major factor in agriculture extension and all though come from extension teaching which students will learn in this particular course.	1	2		3	2	3	1	3	1	3	1

Legend: 1 – Low, 2 – Medium, 3 – High

Curriculum Map: Rural Sociology & Educational Psychology

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO 1,2,3,4 PSO 1,2, 3, 4,	21EX128 C-1: Agriculture extension activity is a transfer of technology for rural and urban peoples both, rural sociology & Educational Psychology one of major aspect of extension course in which students will understand about rural sociology, society, and the importance of society in agriculture extension.	SO1.1 SO1.2 SO1.3 SO1.4		Unit-1. Sociology and Rural Sociology -& interrelationship with agricultural extension. meaning and definition scope of rural sociology importance of rural sociology in agriculture extension Interrelation with agriculture extension. 1.1, 1.2, 1.3.	1. Find out the difference between rural sociology & agricultural extension
PO 1,2,3,4 PSO 1,2, 3, 4,	21EX128-C.2: How rural and urban society differs from each other and how its work, students will analyze about social group, social stratification, class and cost system and their role in agriculture extension. in rural context	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5		Unit-2 Indian rural society social group meaning and definition Classification of Social Group and formation and organization of group. meaning definition and function of social stratification forms of stratification difference between class and caste system. difference the relationship between rural and urban societies 2.1, 2.2, 2.3. 2.4,	1. Find out the difference between rural & urban situation

<p>PO 1,2,3,4 PSO 1,2, 3,4,</p>	<p>21EX128-C-3: Students also need to understand about rural concept, social value, attitude; concepts are importance in agriculture extension. Students need to know about all these, students also will learn about social change and institution.</p>	<p>SO3.1 SO3.2 SO3.3</p>		<p>Unit-3.0 cultural concept social institute and social and social change meaning and definition of culture concept. role of cultural concept in agriculture extension meaning and definition of social values and attitudes types and roles of social values and attitudes in agriculture extension. meaning and definition of social institution major institution in rural society function and role of these institution meaning and definition of social change dimension and factor of social change</p> <p>3.1, 3.2, 3.3, 3.4, 3.5, 3.6,3.7,3.8,</p>	<p>1 What are the importance of Educational Psychology in agriculture extension.</p>
<p>PO 1,2,3,4 PSO 1,2, 3,4,</p>	<p>21EX128-C.4: Psychology is a major aspect of learning activity so in this course students also will understand about educational psychology</p>	<p>SO4.1 SO4.2</p>		<p>Unit-4.0 Psychology and educational Psychology meaning and definition. scope of Educational Psychology. importance of Educational Psychology in agriculture extension</p> <p>4.1, 4.2, 4.3. 4.4</p>	<p>1. What is the importance of Educational Psychology in agriculture extension</p>
<p>PO 1,2,3,4 PSO 1,2, 3,4,</p>	<p>21EX128 C.5: students learn about Intelligence, Personality these are a major factor in agriculture extension and all though come from extension teaching which students will learn in this particular course</p>	<p>SO5.1 SO5.2 SO5.3 SO5.4</p>		<p>Unit-5. Intelligence, Personality, Extension teaching and Learning situation. meaning and definition and types of intelligence. Factors affecting intelligence. importance of intelligence in agricultural. meaning and definition and types of personality Factors affecting personality. importance of personality in agricultural extension. meaning</p>	<p>1. Identify Types of intelligence 2. Identify the personality</p>

				<p>and definition and steps of extension teaching. meaning and definition of learning and learning experience. meaning and definition of learning situation. elements and characteristics of learning situation</p> <p>5.1, 5.2, 5.3. 5.4, 5.5, 5.6,5.7,5.8,</p>	
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Course Code: 21AN127

Course Title: Agriculture Heritage

Pre-requisite: Student should have basic knowledge of Indian agricultural heritage and Relevance of heritage to present day agriculture.

Rationale: The students should be acquainted with the knowledge of the history of agriculture and civilization go hand in hand as the food production made it possible for primitive man to settle down in selected areas leading to formation of society and initiation of civilization. The development of civilization and agriculture had passed through several stages. Archeologist initially classified the stages as Stone Age, Bronze and Iron Age. Subsequently the scholars spilt up the Stone Age into Paleolithic period (Old Stone Age), Neolithic age (New Stone Age) and Mesolithic age (Middle stone age). Each of three ages, saw distinct improvements. The man fashioned and improved tools out of stones, bones, woods etc. to help them in day-to-day life. They started growing food crops and domesticated animals like cow, sheep, goat, dog etc.

Course Outcomes:

21AN127.1 Students acquaint will familiar with the knowledge of basics of agricultural heritage.

21AN127.2 Students will able to acquaints about Concept of Importing knowledge of sustainable agriculture for boosting agriculture production.

21AN127.3 Students will able to introduce the students with ancient Indian agriculture.

21AN127.4 Students will able to acquaint knowledge on green revolution

21AN127.5 Acquainting with knowledge on modern agriculture technology for boosting production

Scheme of Studies:

Code	Course Code		Course Title	Scheme of studies(Hours/Week)					Total Credits (C)
				CI	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Program Core (PCC)	21AN127		agriculture heritage	1	0	1	1	3	1

- Legend:** **CI:**Classroom Instruction (Includesdifferentinstructionalstrategiesi.e.Lecture(L)andTutorial (T) and others),
LI:Laboratory Instruction (Includes Practical performance sinlaboratory workshop, field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

Code	Course Code	Course Title	Scheme of Assessment (Marks)							End Semester Assessment	Total Marks
			Progressive Assessment (PRA)						Total Marks		
			Class/ Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	(CA+CT+SA+CAT+AT)			
Program Core (PCC)	21AN127	Agriculture heritage	0	40	0	10	0	50	50	100	

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

21AN127.1 Students acquaint will familiar with the knowledge of basics of agricultural heritage.

Approximate Hours

Item	Appx Hrs.
CI	02
LI	0
SW	1
SL	1
Total	04

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO1.1 Understand the Indian agricultural heritage.</p> <p>SO1.2 Understand the status of farmers in society.</p> <p>SO1.3 Understand the relevance of heritage to present day agriculture.</p> <p>SO1.4 Understand the Development of human culture.</p>		<p>Unit-1. Introduction of Indian agricultural heritage, status of farmers in society; advice by sages to kings on their duties towards farmers</p> <p>1.1 Introduction to Indian agricultural heritage.</p> <p>1.2 Indices and its importance farmers society.</p>	<p>1. The history of agriculture and civilization go hand in hand as the food production made it possible for primitive man to settle down in selected areas leading to formation of society and initiation of civilization.</p> <p>2. The assessment of land use according to the crop</p>

SW-1 Suggested Sessional Work (SW):

Assignments:

What is agricultural heritage? definition, indices and its importance and status of farmers society in agriculture heritage.

Other Activities (Specify):

Research on most suitable agricultural heritage for the Satna Region

21AN127.2 students will be able to acquaint about Concept of Importing knowledge of sustainable agriculture for boosting agriculture production.

Approximate Hours

Item	Appx Hrs.
CI	04
LI	0
SW	2
SL	1
Total	7

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO1.1 Understand the Concept of Globally Important Agricultural Heritage Systems.</p> <p>SO1.2 Understand the scope and Objectives Agricultural Heritage Systems.</p> <p>SO1.3 Understand the production potential under medieval & pre-modern India and its relevance in modern day.</p> <p>SO1.4. Understand the sustainable agriculture, cropping, sequential cropping and intercropping.</p> <p>SO1.5 Understand the soil and water management in ancient period.</p>		<p>Unit-2 soil management in ancient, medieval & pre-modern India and its relevance in modern day sustainable agriculture, heritage of crop & water management</p> <p>1.1 Introduction to Concept of sustainability Globally Important Agricultural Heritage Systems.</p> <p>1.2 Scope and Objectives of cropping systems and farming systems.</p> <p>1.3. production potential under monoculture cropping, multiple cropping.</p> <p>1.4 production potential under multiple cropping.</p>	<p>1. Concept of sustainability in cropping systems and farming systems in satna region.</p> <p>2. the soil and water management in ancient period.</p>

SW-1 Suggested Sessional Work (SW):

Assignments:

Concept of sustainability in cropping systems and farming systems, scope and Objectives production potential under different period in agriculture heritage.

a. Other Activities (Specify):

Research on most suitable Agriculture heritage for the Satna Region.

21AN127.3 Students will be able to introduce the students with ancient Indian agriculture.

Approximate Hours

Item	Appx Hrs.
CI	04
LI	0
SW	1
SL	1
Total	6

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO1.1 Understand the plant growth and development.</p> <p>SO1.2 Understand the vrikshayurveda on crop production and protection.</p> <p>SO1.3 Understand the competition relations between plants and Multi storied cropping and yield stability in intercropping</p> <p>SO1.4. Understand the role traditional knowledge and low-cost technologies.</p> <p>SO1.5 Understand the research need on sustainable agriculture.</p>		<p>Unit-3 plant growth and development & plant protection through vrikshayurveda and traditional knowledge</p> <p>1.1Introduction to plant growth and development. 1.2 Introduction to vrikshayurveda and its effects on crop growth. 1.3.Introduction to traditional knowledge in Indian agriculture heritage. 1.4.Multi-storied cropping and yield stability in intercropping.</p>	<p>1. Study on allelopathic effect on crop and new research on sustainable agriculture.</p>

SW-1 Suggested Sessional Work (SW):

Assignments:

Rol of development & plant protection through vrikshayurveda and low cost technologies; research need on sustainable agriculture.

b. Other Activities (Specify):

New Research on sustainable agriculture.

21AN127.4 Students will able to acquaint knowledge on green revolution

Approximate Hours

Item	Appx Hrs.
CI	06
LI	0
SW	1
SL	1
Total	8

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO1.1 Understand the Crop diversification for sustainability.</p> <p>SO1.2 Understand the heritage of medicinal plants and their relevance today.</p> <p>SO1.3 Understand the seed health in ancient & medieval history and its relevance to present day agriculture.</p> <p>SO1.4. Understand the medicinal</p> <p>SO1.5 Understand the description of Indian civilization and agriculture by travelers from China, Europe and United States.</p>		<p>Unit-4 Heritage of medicinal plants and their relevance today, seed health in ancient & medieval history and its relevance to present day agriculture, description of Indian civilization and agriculture by travelers from China, Europe and United States,</p> <p>1.1Introduction to Crop diversification.</p> <p>1.2. Introduction of medicinal plants and its importance for sustainability.</p> <p>1.3. Introduction to ancient & medieval history and its relevance to present day agriculture in medicinal plants.</p> <p>1.4 Introduction to medicinal pant and its advantages.</p> <p>1.5 The fertilizer Use in intensive cropping system.</p> <p>1.6 description of Indian civilization and agriculture.</p>	<p>1. Study on crop diversification and importance of organic farming for the sustainable agriculture.</p>

21AN127.5 Acquainting with knowledge on modern agriculture technology for boosting production.

Approximate Hours

Item	Appx Hrs.
CI	02
LI	0
SW	1
SL	1
Total	4

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO1.1 Understand journey in agriculture.</p> <p>SO1.2 Understand the green revolution.</p> <p>SO1.3 Understand the impact and concerns of green revolution.</p> <p>SO1.4. Understand the vision for the future of green revolution.</p>		<p>Unit-5 our journey in agriculture, green revolution and its impact and concerns, vision for the future.</p> <p>1.1 Introduction to journey Indian agriculture.</p> <p>1.2. Introduction the green revolution.</p>	<p>1.Study on journey in agriculture, green revolution.</p>

SW-1 Suggested Sessional Work (SW):

Assignments: Study on journey in agriculture, green revolution.

c. Other Activities (Specify):

Study of journey in agriculture, green revolution in sustainable.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (C I)	Laboratory Lecture (L I)	Sessional Work (SW)	Self Learning (S I)	Total hour (C I + LI+ SW +S I)
01: Students acquaint will familiar with the knowledge of basics of agricultural heritage	02	00	01	01	04
02: Students will able to acquaints about Concept of Importing knowledge of sustainable agriculture for boosting agriculture production.	04	00	02	01	07
03: Students will able to introduce the students with ancient Indian agriculture.	03	00	01	01	05
04: Students will able to acquaint knowledge on green revolution	04	00	01	01	06
05: Acquainting with knowledge on modern agriculture technology for boosting production	02	00	01	01	04
Total Hours	15	00	06	05	26

Suggestion for End Semester Assessment
Suggested Specification Table (For ESA)

CO	Unit title	Marks Distribution			Total Marks
		R	U	A	
CO-1	Define the importance of agribusiness in agriculture.	02	02	02	06
CO-2	Elaborate the procedures to set up agro based industries.	02	03	03	08
CO-3	Apply the fundamentals of Ordering, leading, supervision, communications, control and its analysis	02	04	04	10
CO-4	Apply the capital management and their importance in agribusiness.	03	04	05	12
CO-5	Evaluate the Project Appraisal and evaluation techniques policy	04	05	05	14
	Total	13	18	19	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Agricultural Marketing, Trade and Prices will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Demonstration
7. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, Whatsapp, Mobile, Online sources)
8. Brainstorming

Suggested Learning Resources:

S. No.	Title	Author	Publisher	Edition & Year
01	Handbook of agriculture	ICAR	IARI, New Delhi	2017 1st Addition
02	Textbook on Ancient History of Indian Agriculture	Nena Y L, Saxena R.C.	Munshiram Manoharial Publishers	2017 First edition
03	Text book on agricultural Heritage of India	D Kumari, Manimuthu Veeral	AgroTech	06 th Edition 2005

Curriculum Development Team:

1. Mr. Atul Kumar Singh, Assistant Professor Department of Agricultural Science, FAST

Cos, Pos and PSOs Mapping

Course Code: 21AN127

Course Title: Agriculture Heritage

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprises with different scales in area of agricultural production, process and	Hold a post on supply in administration and policy	Analyze and control commercial and economical process in the field of agriculture.	Teach how to control and manage agricultural production	Introduce general production technologies	Teach how to teach and manage production technology	Preparation of managerial and social responsibility	Student will identify different underutilized crops	Student will practice different reeding techniques used in crop production.	Student will recognize different insect pest and diseases and their symptoms of crops	Student will apply different recent techniques in crop production
21AN127.1 Students acquaint will familiar with the knowledge of basics of agricultural heritage.	2	1	1	1	2	3	1	2	1	2	2
21AN127.2 Students will able to acquaints about Concept of Importing	1	1	1	2	2	2	1	1	2	1	2

knowledge of sustainable agriculture for boosting agriculture production.											
21AN127.3 Students will able to introduce the students with ancient Indian agriculture.	1	2	1	2	1	3		2	1	2	2
21AN127.4 Students will able to acquaint knowledge on green revolution	2	1	2	3	2	1	2	1	3	2	3
21AN127.5 Acquainting with knowledge on modern agriculture technology for boosting production	1	2	2	3	2	3	1	2	1	3	1

Legend: 1 – Low, 2 – Medium, 3 – High

Curriculum Map: Agriculture Heritage

Pos & PSOs	Cos No. & Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
PO1,2,3,4 PSO 1,2,3,4	Introduction of Indian agricultural heritage, status of farmers in society; advice by sages to kings on their duties towards farmers	SO 1.1 SO 1.2 SO 1.3 SO 1.4		Introduction to Indian agricultural heritage. Indices and its importance farmers society. Introduction agriculture heritage to present day agriculture. Explain the soil Development of human culture. Introduction to assessment of land use. 1.1, 1.2, 1.3,1.4,1.5,	1. The history of agriculture and civilization go hand in hand as the food production made it possible for primitive man to settle down in selected areas leading to formation of society and initiation of civilization. 2.The assessment of land use according to the crop
PO1,2,3,4 PSO 1,2,3,4	Soil management in ancient, medieval & pre-modern India and its relevance in modern day sustainable agriculture, heritage of crop & water management	SO 2.1 SO 2.2 SO 2.3 SO 2.4 SO 2.5		Introduction to Concept of sustainability Globally Important Agricultural Heritage Systems. Scope and Objectives of cropping systems and farming systems. Production potential under monoculture cropping, multiple cropping. Production potential under multiple cropping. Production potential under sequential cropping. period.2.1,2.2,2.3,2.4,2.5,2.6	1. Concept of sustainability in cropping systems and farming systems in satna region. 2. The soil and Water management in ancient period
PO1,2,3,4 PSO 1,2,3,4	Plant growth and development & plant protection through vrikshayurveda and traditional knowledge	SO 3.1 SO 3.2 SO 3.3 SO 3.4		Introduction to plant growth and development. Introduction to vrikshayurveda and its effects on crop growth.	Study on crop

		SO 3.5		Introduction to traditional knowledge in Indian agriculture heritage. Multi-storied cropping and yield stability in intercropping. Research need on sustainable agriculture and new innovation on sustainable agriculture 3.1,3.2,3.3,3.4,3.5,	
PO1,2,3,4 PSO 1,2,3,4	Heritage of medicinal plants and their relevance today, seed health in ancient & medieval history and its relevance to present day agriculture, description of Indian civilization and Agriculture by travelers from China Europe.	SO 4.1 SO 4.2 SO 4.3 SO 4.4 SO 4.5		.1Introduction to Crop diversification. 1.2. Introduction of medicinal plants and its importance for sustainability. Introduction to ancient & medieval history and its relevance to present agriculture in medicinal plants. Introduction to medicinal pant and its advantages. The fertilizer Use in intensive cropping system. Description of Indian 4.1,4.2,4.3,.4.4,4.5,4.6	Study on crop diversification and importance of organic farming for the sustainable agriculture
PO1,2,3,4 PSO 1,2,3,4	Our journey in agriculture, green revolution and its impact and concerns, vision for the future	SO 5.1 SO 5.2 SO 5.3 SO 5.4		Introduction to journey Indian agriculture. Introduction the green revolution. Impact and concerns of green revolution. 5.1,5.2,5.3,5.4,	1.Study on journey in agriculture, green revolution

Course Code: 21GP121
Course Title: Fundamentals of Genetics
Pre- requisite: Student should have basic knowledge of principles of heredity, Mendelian population, Organization of DNA and RNA and Protein synthesis.

Rationale: Genes are the backbone of all crop improvement activities. Their chemical structure and physical inheritance are pivotal for any breeding program. This course is aimed at understanding the basic concepts of inheritance of genetic traits, helping students to develop their analytical, quantitative and problem-solving skills from classical to molecular genetics.

Course Outcomes:

- 21GP121.1.** Students are able to explain the basic principles of heredity, variation, and cell division and their significance in plant breeding.
- 21GP121.2.** Students are able to understand on sex determination and sex linkage, linkage, crossing over with their role in plant breeding.
- 21GP121.3.** Students are able to explain mutation, mutation induction and mutation detection with their benefits in crop improvement.
- 21GP121.4.** Students are able to explain qualitative and quantitative traits, Polygenes and continuous variations and multiple factor hypothesis.
- 21GP121.5.** Students are gain knowledge about the fundamental concept of cytoplasmic inheritance, Genetic disorders, Nature, structure and replication of genetic material with their role in crop breeding.

Scheme of Studies:

Code	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Study Hours CI+LI+SW+SL	Total Credits (C)
			CI	LI	SW	SL			
Program Core (PCC)	21GP121	Fundamentals of Genetics	2	2	0	0	2+2 = 4	(2+1) = 3	

Legend:

CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others), **LI:** Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies) **SW:** Sessional Work (includes assignment, seminar, mini project etc.), **SL:** Self Learning, **C:** Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Code	Course Code	Course Title	Scheme of Assessment (Marks)							Total Marks (PRA + ESA)
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
PCC	21GP121	Fundamentals of Genetics	15	30	0	0	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

21GP121.1. Students are able to explain the basic principles of heredity, variation, and cell division and their significance in plant breeding.

Approximate Hours

Item	Approximate Hours
CI	7
LI	18
SW	2
SL	1
Total	28

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO1.1. Student will be able to understand pre and post mendelian concepts of heredity.</p> <p>SO1.2. Student are able to understand the applications of Mendel’s principles.</p> <p>SO1.3. Students are able to explain the process of mitosis or somatic cell division.</p> <p>SO1.4. Students are able to explain the process of meiosis or gametic cell division.</p> <p>SO1.5. Students are able to identify the F₂ segregating ration and they are also able to predict some event through probability analysis.</p> <p>SO1.6. Students are able to explain the process of dominance relationships.</p> <p>SO1.7. Students are able to explain the various types of gene interactions and their role in crop improvements.</p>	<p>1. Study of microscope.</p> <p>2. Study of cell structure.</p> <p>3. Experiments on monohybrid test cross and back cross.</p> <p>4. Experiments on dihybrid test cross and back cross.</p> <p>5. Experiments on trihybrid test cross and back cross.</p> <p>6. Practice on mitotic cell division.</p> <p>7. Practice on meiotic cell division.</p> <p>8. Experiments on probability.</p> <p>9. Experiments on Chi-square test.</p>	<p>Unit-1. Beginning of genetics, Mendel’s laws, Cell division and Gene interaction.</p> <p>1.Pre and Post Mendelian concepts of heredity.</p> <p>2.Mendelian principles of heredity.</p> <p>3.Cell division – mitosis.</p> <p>4.Cell division – meiosis.</p> <p>5. Probability and Chi-square.</p> <p>6.Dominance relationships.</p> <p>7.Gene interaction.</p>	<p>1. Mendel’s laws of inheritance.</p> <p>2. Cell division, types and their significance in crop improvement.</p>

SW-1 Suggested Sessional Work (SW):

a. Assignments:

- i. Cell division – mitosis and meiosis.

b. Mini Project:

- i. Monohybrid and Dihybrid and Trihybrid Test cross and Back cross with suitable example.

c. Other Activities (Specify):

Note on the gene interaction its types and their significance in crop improvment.

21GP121.2. Students are able to understand on sex determination and sex linkage, linkage, crossing over with their role in plant breeding.

Approximate Hours

Item	Approximate Hours
CI	7
LI	4
SW	2
SL	1
Total	14

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO2.1. Students are able to explain the multiple alleles, pleiotropism and pseudoalleles.</p> <p>SO2.2. Student will be able to understand mechanisms of sex determination and sex linkage.</p> <p>SO2.3. Students are able to differentiate between sex limited and sex influenced traits.</p> <p>SO2.4. Students are able to explain the Blood group genetics.</p> <p>SO2.5. Students are able to identify linkage, their estimation and role in plant breeding experiments.</p> <p>SO2.6. Student will be able to understand the crossing over mechanisms and role in crop improvement.</p> <p>SO2.7. Student will be able to draw a map of chromosome with distance between two or more genes.</p>	<p>1. Determination of linkage and cross over analysis</p> <p>2. Study on sex linked inheritance in Drosophila.</p>	<p>Unit-2. Alleles, Sex determination, Linkage and Crossing over.</p> <p>1. Multiple alleles, pleiotropism and pseudoalleles.</p> <p>2. Sex determination and sex linkage</p> <p>3. Sex limited and sex influenced traits.</p> <p>4. Blood group genetics.</p> <p>5. Linkage and its estimation.</p> <p>6. Crossing over mechanisms</p> <p>7. Chromosome mapping.</p>	<p>1. Sex determination and mechanisms in different organisms.</p> <p>2. Linkage and cross over analysis through two and three point test cross.</p>

SW-2 Suggested Sessional Work (SW):

a. Assignments:

2. Sex determination mechanisms and sex linkage.

a. Mini Project:

1. Linkage, its types and estimation of linkage.

c. Other Activities (Specify):

21GP121.3. Students are able to explain mutation, mutation induction and mutation detection with their benefits in crop improvement.

Item	Approximate Hours
CI	4
LI	0
SW	2
SL	1
Total	7

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO3.1. Understand the structural changes in chromosome.</p> <p>SO3.2. Students are able to explain the Mutation and their classifications.</p> <p>SO3.3. Student will be able to understand the role mutation in crop improvement</p> <p>SO3.4. Student will be able to understand about mutagenic agents, their functions and induction of mutation.</p>		<p>Unit 3 Chromosomal changes, Mutation, induction of mutation.</p> <p>1. Structural changes in chromosome.</p> <p>2. Mutation, classification.</p> <p>3. Methods of inducing mutation & CIB technique.</p> <p>4. Mutagenic agents and induction of mutation.</p>	<p>1. Chromosome aberrations.</p> <p>2. Mutation, its types, Mutagenic agents and induction of mutation.</p>

SW-3 Suggested Sessional Work (SW):

a. Assignments:

- i. Structural and numerical changes in chromosome.

b. Mini Project:

- i. Methods of inducing mutation & CIB technique.

j. Other Activities (Specify):

21GP121.4. Students are able to explain qualitative and quantitative traits, Polygenes and continuous variations and multiple factor hypothesis.

Item	Approximate Hours
CI	4
LI	4
SW	2
SL	1
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO4.1. Student will be able to understand qualitative & quantitative traits.</p> <p>SO4.2. Student will be able to understand about polygenes and continuous variations.</p> <p>SO4.3. Students are able to explain the multiple factor hypothesis.</p> <p>SO4.4. Students are able to explain the epistatic interactions with examples.</p>	<p>1. Experiments on epistatic interactions including test cross.</p> <p>2. Experiments on epistatic interactions including back cross.</p>	<p>Unit 4 Traits, Polygenes and continuous variations and gene interactions</p> <p>1. Qualitative & Quantitative traits.</p> <p>2. Polygenes and continuous variations.</p> <p>3. Multiple factor hypothesis.</p> <p>4. Epistatic interactions with examples.</p>	<p>1. Polygenes and their variations.</p> <p>2. Epistatic interactions and their types with suitable example.</p>

SW-4 Suggested Sessional Work (SW):

a. Assignments:

- i. Multiple factor hypothesis with suitable example.

b. Mini Project:

- i. Epistatic interactions types with examples.

c. Other Activities (Specify):

21GP121.5. Students are gain knowledge about the fundamental concept of cytoplasmic inheritance, Genetic disorders, Nature, structure and replication of genetic material with their role in crop breeding.

Item	Approximate Hours
CI	8
LI	4
SW	2
SL	1
Total	15

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO5.1. Student will be able to understand the concept of cytoplasmic inheritance.</p> <p>SO5.2. Student will be able to understand and explain about the genetic disorders</p> <p>SO5.3. Students are able to explain the Nature, structure & process of replication of genetic material.</p> <p>SO5.4. To know process of protein synthesis.</p> <p>SO5.5. Students are able to explain the process of Transcription and translational mechanism of genetic material</p> <p>SO5.6. Students are able to understand and draw fine and ultra structure of genes.</p> <p>SO5.7. Students are able to understand function and regulation of genes.</p> <p>SO5.8. Students are able to explain the process of Lac and Trp operons</p>	<p>1. Study of models on DNA structure.</p> <p>2. Study of models on RNA structure.</p>	<p>Unit-5. Cytoplasmic inheritance, genetic material, Protein synthesis and Gene concept.</p> <p>1. Cytoplasmic inheritance.</p> <p>2. Genetic disorders.</p> <p>3. Nature, structure & replication of genetic material.</p> <p>4. Protein synthesis.</p> <p>5. Transcription and translational mechanism of genetic material.</p> <p>6. Gene concept: Gene structure.</p> <p>7. Gene function and regulation.</p> <p>8. Lac and Trp operons.</p>	<p>1. Genetic material: Types, nature and modes of replication.</p> <p>2. Gene concept: structure, function and regulation.</p>

SW-5 Suggested Sessional Work (SW):

- a. Assignments:**
 - i. Cytoplasmic inheritance and their features.
- b. Mini Project:**
 - ii. Genetic disorders and their types.
- c. Other Activities (Specify):**

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Laboratory Instruction (LI)	Sessional Work (SW)	Self Learning (Sl)	Total hour (Cl+LI+SW +Sl)
21GP121.1. Students are able to explain the basic principles of heredity, variation, and cell division and their significance in plant breeding.	7	18	2	1	28
21GP121.2. Students are able to understand on sex determination and sex linkage, linkage, crossing over with their role in plant breeding.	7	4	2	1	14
21GP121.3. Students are able to explain mutation, mutation induction and mutation detection with their benefits in crop improvement.	4	0	2	1	7
21GP121.4. Students are able to explain qualitative and quantitative traits, Polygenes and continuous variations and multiple factor hypothesis.	4	4	2	1	11
21GP121.5. Students are gain knowledge about the fundamental concept of cytoplasmic inheritance, Genetic disorders, Nature, structure and replication of genetic material with their role in crop breeding.	8	4	2	1	15
Total	30	30	10	5	75

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO 1	Beginning of genetics, Mendel's laws, Cell division and Gene interaction.	3	4	3	10
CO 2	Alleles, Sex determination, Linkage and Crossing over.	2	4	4	10
CO 3	Chromosomal changes, Mutation, induction of mutation.	4	3	3	10
CO 4	Traits, Polygenes and continuous variations and gene interactions.	3	2	5	10
CO 5	Cytoplasmic inheritance, genetic material, Protein synthesis and Gene concept.	5	3	2	10
	Total	17	16	17	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Principle of Genetics will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Group Discussion
3. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, Whatsapp, Mobile, Online sources)
4. Brainstorming
5. Power point presentation
6. Chalk and Board
7. Smart board
8. Assignments, quiz
9. Group tasks, student's presentations

Suggested Learning Resources:**(a) Books:**

S. No.	Title	Author	Publisher	Edition & Year
1	Genetics: "Analysis of Genes and Genomes"	Daniel L.H. and Maryellen R.	Laxmi Publications	2011
2	Principles of Genetics.	Gardner E.J. and Snustad D.P.	John Wiley and Sons. 8th ed.	2006
3	Concepts of Genetics.	Klug W.W. and Cummings M.R.	Peterson Edu. Pearson Education India; Tenth edition	2005
4	Genes XII.	Lewin B.	Jones and Bartlett Publ. (International Edition) Paperback,	2008, 2018
5	Cytology, Genetics and Evolution	Gupta P.K.	Rastogi Publications, Meerut. (Hindi Edition)	2004
6	Genetics.	Singh B.D.	Kalyani Publishers (2nd Revised Edition)	2009
7	Genetics.	Snustad D.P. and Simmons M.J.	4th Ed. John Wiley and Sons. 6th Edition International Student Version edition	2006
8	Crop Improvement and Mutagenesis.	Sharma, A.K. and Sharma, R.A.	Scientific Publishers, Jodhpur.	2013
9	Genetics (III Ed).	Strickberger M.W.	Prentice Hall, New Delhi, India; 3rd ed.,	2005, 2015
10	Principles of Genetics.	Tamarin R.H.	Wm. C. Brown Pubs., McGraw Hill Education; 7 edition	1999
11	Practical Manual on Basic and Applied Genetics.	Uppal S, Yadav R, Singh S and Saharan R.P.	Dept. of Genetics, CCS HAU Hisar.	2005

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Cos, POs and PSOs Mapping
Course Code:
Course Title: - Fundamentals of Genetics

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprises with different scales in area of agricultural production, process and	Hold a post on supply in administration and policy	Analyze and control commercial and economical process in the field of agriculture.	Teach how to control and manage agricultural production	Introduce general production technologies	Teach how to teach and manage production technology	Preparation of managerial and social responsibility	Student will identify different underutilized crops	Student will practice different breeding techniques used in crop production.	Student will recognize different insect pest and diseases and their symptoms of crops	Student will apply different recent techniques in crop production
21GP121.1. Students are able to explain the basic principles of heredity, variation, and cell division and their significance in plant breeding.	2	1	1	3	2	3	1	2	3	2	2
21GP121.2. Students are able to understand on sex determination and sex linkage, linkage, crossing over with their role in plant	1	1	1	3	2	2	1	3	2	1	1

breeding.											
21GP121.3. Students are able to explain mutation, mutation induction and mutation detection with their benefits in crop improvement.	1	2	1	2	1	3	3	2	1	1	2
21GP121.4. Students are able to explain qualitative and quantitative traits, Polygenes and continuous variations and multiple factor hypothesis.	2	1	3	1	2	1	2	1	3	1	2
21GP121.5. Students are gain knowledge about the fundamental concept of cytoplasmic inheritance, Genetic disorders, Nature, structure and replication of genetic material with their role in crop breeding.	1	2	1	3	2	3	1	3	1	2	2

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map: Fundamentals of Genetics

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4	21GP121.1. Students are able to explain the basic principles of heredity, variation, and cell division and their significance in plant breeding.	SO1.1 SO1.2 SO1.3	Study about Microscopes	Beginning of genetics, Mendel's laws, Cell division and Gene interaction.	As mentioned in page number
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4	21GP121.2. Students are able to understand on sex determination and sex linkage, linkage, crossing over with their role in plant breeding.	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5	Study of models on DNA structure.	Alleles, Sex determination, Linkage and Crossing over.	As mentioned in page number
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4	21GP121.3. Students are able to explain mutation, mutation induction and mutation detection with their benefits in crop improvement.	SO3.1 SO3.2 SO3.3	Study of models on RNA structure.	Chromosomal changes, Mutation, induction of mutation.	As mentioned in page number
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4	21GP121.4. Students are able to explain qualitative and quantitative traits, Polygenes and continuous variations and multiple factor hypothesis.	SO4.1 SO4.2	Study of models on DNA structure.	Traits, Polygenes and continuous variations and gene interactions.	As mentioned in page number
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4	21GP121.5. Students are gain knowledge about the fundamental concept of cytoplasmic inheritance, Genetic disorders, Nature,	SO5.1 SO5.2	Study about ultra structure of cell	Cytoplasmic inheritance, genetic material, Protein synthesis and Gene concept.	As mentioned in page number

	structure and replication of genetic material with their role in crop breeding.				
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Course Code: 21SC122
Course Title : Fundamental of Soil Science
Pre- requisite: Student should have basic knowledge of Rocks, Minerals, different types of plant essential nutrients.

Rationale: The students studying the difference between soil and land. Formation and distribution of soil on basis of ago-climatic zones of India. The various physical chemical and biological properties of soil in surface and subsurface of soil. Factors affection soil formation and nutrient availability. Role of various nutrients present in soil for growth and development of crop.

Course Outcomes:

- 21SC122.1: To learn the general introduction of soil, classification, components, rocks, formation and weathering and its profile.
- 21SC122.2: To understand the major factors affecting the process of weathering. Soil physical properties of different soil types of various locations of India, there colour variations, nutrient content and physical, chemical and biological variation.
- 21SC122.3: To interpret the soil-water plant relationship and factors affecting them. Soil Air, its distribution with respect to soil and earth. Soil temperature, availability of different types of microbes in different temperature.
- 21SC122.4: To identify various soil cations, anions, Silicate clay structures, and colloids. To be able to classify the different microbes present in soil.
- 21SC122.5: To recollect the role of Organic matter in maintaining the soil fertility and health, components of organic matter, its importance, and factors responsible in reducing it .

Scheme of Studies:

Code	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Study Hours (CI+LI+SW+SL)	Total Credits (C)
			CL	LI	SW	SL			
Program Core (PCC)	21SC122	Fundamental of Soil Science	2	1	1	1	5	3	

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C:Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure

outcome of Learning.

Scheme of Assessment:

Theory

Code	Course Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment	Total Marks
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one	Class Attendance	Total Marks (CA+CT+SA+CAT+AT)		
PCC	21SC122	Fundamental of Soil Science	15	30	0	0	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

21SC122.1: Formation of soil and soil profile from various types of rocks and minerals.

Approximate Hours

Item	AppX Hrs
CI	06
LI	6
SW	2
SL	2
Total	16

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO1.1: To develop the general Introduction of soil, its Components and classification of soil</p> <p>SO1.2: To distinguish various types of rocks and composition of minerals in it.</p> <p>SO1.3: To understand the weathering processes involved in formation of soil and factors affecting it.</p> <p>SO1.4: To discuss the Soil profile and its formation.</p>	<p>1. To study the soil profile In field</p> <p>2. To study the soil sampling tools, Processing and collection representative samples.</p> <p>3. To study about the soil forming rocks and minerals</p>	<p>Unit-1.0 Soil forming process from rocks</p> <p>1.1 To discuss about the Soil, its classification</p> <p>1.2 To identify the various components of soil and its distribution in India</p> <p>1.3 To identify the various components of soil and its distribution in world.</p> <p>1.4 To identify the various process involved in formation of various horizons of soil profile.</p> <p>1.5 To understand the various process involved in formation of soil from Rocks and Minerals.</p> <p>1.6 Distribution of soil on basis of availability of Rocks and minerals in India</p>	<p>1. Composition of earth and various horizons of soil profile</p> <p>2. Types of rock and composition of minerals in it</p>

SW-1 Suggested Sessional Work (SW):

a. Assignments:

- Classification and Types of rocks and minerals
- Soil its components and Soil profile with various horizons ,
- Enlist the various factors affecting Soil formation,
- Enlist various types of weathering.

b. Other Activities(Specify):

Identification and Collection of various types of rocks

21SC122.2: Classification, distribution and physical properties of soil taxonomy in India and world

Approximate Hours

Item	AppX Hrs
CI	6
LI	6
SW	2
SL	1
Total	15

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO2.1: To understand the general information about Soil physical properties of different soil of India</p> <p>SO2.2 To identify the different colours of soil on basis of abundant nutrient present and climatic condition of India and world.</p> <p>SO2.3 To learn the contribution of sand, silt, and clay in different types of soil of India.</p>	<p>1. To determination of bulk density, Particle density and moisture content of a given soil.</p> <p>2. To estimate the porosity of a given soil.</p> <p>3. Determination of soil texture by feel and Bouycous hydrometer method</p>	<p>Unit-2 Classification of soil taxonomy and important physical properties of soil</p> <p>2.1 To study of various soil physical properties , soil texture and structure</p> <p>2.2 To know the different colours of soil due to presence of different nutrients in soil of India.</p> <p>2.3 To learn the classification of India soil taxonomy.</p> <p>2.4 To assess the bulk density porosity and particle density of soil.</p> <p>2.5 To assess the particle density of soil</p> <p>2.6 Evaluation of soil texture</p>	<p>i.State wise map of India and its climatic condition.</p>

SW-2 Suggested Sessional Work(SW):

a. Assignments:

- The various Physical properties of soil
- Taxonomic classification and distribution of soil of India

b. Other Activities(Specify):

21SC122.3: Availability and interaction of various types of water with crop for its growth and Development of crop

Approximate Hours

Item	AppX Hrs
CI	6
LI	4
SW	2
SL	1
Total	13

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO3.1 To understand the soil-water plant relationship its transformation and factors affecting it.</p> <p>SO3.2 To learn major component of soil as Soil Air, distribution of soil air in soil and earth.</p> <p>SO3.3 To assess the Soil temperature classification on basis of availability of microbes.</p> <p>SO3.4 To relate the role of their soil components in maintaining the soil fertility, and health.</p>	<p>1. Determination of moisture content in soil</p> <p>2. Studies of capillary rise phenomenon of water in soil column and water movement in soil.</p>	<p>Unit-3 : Soil water relationship, classification, types and movement</p> <p>3.1 Classification of Soil water for better growth and development of crops.</p> <p>3.2 Movement and availability of Soil water for better growth and development of crops</p> <p>3.3 Soil air its composition and availability of gasses in air.</p> <p>3.4 Soil temperature its classification, flow of heat in soil for plant growth of various crops.</p> <p>3.5 Flow of heat in soil for plant growth of various crops.</p> <p>3.6 Relationship between Soil water on crop growth</p>	<p>i. Basic concept of movement of water , thermodynamics law, transfer of heat and its forms</p>

SW-3 Suggested Sessional Work (SW):

a. Assignments:

- Classification of soil water retention for growth and development of plants

b. Other Activities (Specify):

21SC122.4: Distribution and availability of ions in different soils of India

Approximate Hours

Item	AppX Hrs
CI	7
LI	12
SW	2
SL	1
Total	22

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO4.1 To learn the various soil chemical properties of soil.</p> <p>SO4.2. To understand the formation of clay structures, chemical reaction and ionic availability in various soil of India for maintaining fertility of soil</p> <p>SO4.3 Transportation of ionic nutrients in soil and exchange of nutrients in plants</p> <p>SO4.4 Classification of nutrients available in soil and plant</p>	<ol style="list-style-type: none"> Determination of pH, 2. Determination of soil Ec. To know the available N in soil To know the available P in soil. To know the available K in soil. To know the available secondary nutrient content in soil. To know the available micro nutrient content in soil 	<p>Unit-4: Chemical properties of a soil</p> <p>4.1 To learn about the pH , electrical conductivity, buffering capacity of soil. Role of pH on nutrient availability for crops</p> <p>4.2 Ionic availability of nutrients in soil. Study various types of silicate clay structure</p> <p>4.3 To study the movement of ions in soil and plant, and know about various charges present in soil</p> <p>4.4 To understand the cation exchange capacity, base saturation.</p> <p>4.5 To understand the anion exchange capacity, base saturation.</p> <p>4.6 To learn the various organic form ionic nutrients present in soil and adsorbed by the plants.</p> <p>4.7 To learn the various inorganic form ionic nutrients present in soil and adsorbed by the plants.</p>	<ol style="list-style-type: none"> To study the Periodic table in detail

SW-4 Suggested Sessional Work (SW):

a. Assignments:

- Transportation and availability of nutrients I different types of soil
- Study the various silicate clay structure present in soil

b. Other Activities (Specify):

Power Point Presentation of various types of silicate clay structure present in soil.

21SC122.5: Role, importance , composition and properties of soil organic matter in maintaining the sustainability of soil.

Approximate Hours

Item	AppX Hrs
CI	5
LI	2
SW	2
SL	1
Total	10

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO5.1 To understand the classification of different microbes present in soil, its importance, their role in maintaining the soil fertility and health.</p> <p>SO5.2 To underline the various components of organic matter, its importance, and factors responsible in reducing the toxicity.</p> <p>SO5.3 To interrelate the various soil pollutants, its behavior and controlling techniques for maintaining the ecofriendly nature in soil.</p> <p>SO5.4 Role of biological pests and techniques used in reducing the soil pollution</p>	<p>1. Estimation of organic matter content of soil.</p>	<p>Unit5: Application of organic matter in soil to increase the fertility and productivity of soil there by reducing the soil pollution</p> <p>5.1 To learn about various composition, properties and importance of SOM in soil.</p> <p>5.2 Formation, Classification and Properties of humus.</p> <p>5.3 Availability of Soil organisms in different types of soils. its classification and role in maintaining the sustainability of soil.</p> <p>5.4 Nature of synthetic pesticides, herbicides and</p> <p>5.5 Mitigation techniques in decreasing the soil pollution by increasing the use of biological pest in reducing synthetic harmful chemical compounds</p>	<p>1.List of various harmful pesticides and herbicides banned by ministry of environment, Govt of India.</p>

SW-5 Suggested Sessional Work (SW):

a. Assignments:

- Formation of humus and its classification and composition

- Available soil micro organisms present in soil
- Factors affecting soil pollution and its management techniques

b. Other Activities (Specify):

List of state cultivation totally converted to organic farming given by ministry of environment, Govt of India.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Laboratory Instruction (LI)	Sessional Work (SW)	Self Learning (Sl)	Total hour (Cl+SW+Sl)
21SC122.1: Formation of soil and soil profile from various types of rocks and minerals.	6	6	2	1	15
21SC122.2: Classification, distribution and physical properties of soil taxonomy in India and world.	6	6	2	1	15
21SC122 .3: Availability and interaction of various types of water with crop for its growth and development	6	4	2	1	13
21SC122 .4: Distribution and availability of ions in different soils of India	7	12	2	2	23
21SC122 .5: Application of organic matter in soil to increase the fertility and productivity of soil there by reducing the soil pollution	5	2	2	1	10
Total Hours	30	30	10	6	76

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Soil forming process from rocks	03	01	01	05
CO-2	Classification of soil taxonomy and important physical properties of soil	02	06	02	10
CO-3	Soil water relationship, classification, types and movement	03	07	05	15
CO-4	Distribution and availability of ions in different soils of India	-	10	05	15
CO-5	Role, importance , composition and properties of soil organic matter in maintaining the sustainability of soil.	02	02	01	05
Total		11	26	13	50

Legend: R:Remember, U:Understand, A: Apply

The end of semester assessment for Fundamental of Soil Science will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks.

Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Demonstration
7. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, Whatsapp, Mobile, Online sources)
8. Brainstorming

Suggested Learning Resources:**(a) Books :**

S. No.	Title	Author	Publisher	Edition & Year
1	Classification of soil taxonomy and important physical properties of soil	Boul S.W., Hole R.D., McCracken and Southard R.J.	Panima Publishing corporation, New Delhi	Revised edition Fourth Ed 1998
2	Soil Physics	W. H Duda Baver, L.D. Gardener, W.H. and gardener W.R.	Wiley Eastern Ltd, New Delhi	1976
3	Text book of soil science	Biswas, T.D. and Mukherjee, S.K.	Tata McGraw Hill publishing Co. Ltd, New Delhi	2006
4	The nature and properties of soils	Brady, N.C. and Weil, R.R	Prentice hall of India Pvt. Ltd, M-97, Connaught Circus, New Delhi	2002
5	Introductory Soil Science	Das, D.K.	Kalyani publisher, New Delhi	(2002)

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Cos, Pos and PSOs Mapping

Course Code: 21SC122

Course Title: Fundamentals of Soil Science

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprises with different scales in area of agricultural	Hold a post on supply in	Analyze and control commercial and economical	Teach how to control and	Introduce general production technologies	Teach how to teach and manage production technology	Preparation of managerial and social responsibility	Student will identify different underutilized crops	Student will practice different breeding techniques used in crop	Student will recognize different insect pest and diseases and their	Student will apply different recent techniques in crop
21SC122.1: Formation of soil and soil profile from various types of rocks and minerals.	2	1	1	3	2	3	1	2	3	2	2
21SC122.2: Classification, distribution and physical properties of soil taxonomy in India and world.	1	1	1	3	2	2	1	3	2	1	1
21SC122 .3: Availability and interaction of various types of water with crop for its growth and development	1	2	1	2	1	3	3	2	1	1	2

21SC122 .4: Distribution and availability of ions in different soils of India	2	1	3	1	2	1	2	1	3	1	2
21SC122 .5: Application of organic matter in soil to increase the fertility and productivity of soil there by reducing the soil pollution	1	2	1	3	2	3	1	3	1	2	2

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map: 21SC122 : Fundamental of Soil Science

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self Learning(SL)
PO 1,2,3,4 PSO 1,2, 3, 4	21SC122.1: Formation of soil and soil profile from various types of rocks and minerals.	SOs: 1.1, SOs:1.2, SOs:1.3 SOs:1.4	LI: 1.1, LI: 1.2, LI: 1.3	Unit .1. Soil forming process from rocks 1.1,1.2,1.3,1.4,1.5,1.6	As mentioned in page number 2 to 6
PO 1,2 PO 1,2,3,4 PSO 1,2, 3, 4	21SC122.2: Classification, distribution and physical properties of soil taxonomy in India and world.	SOs: 2.1, SOs:2.2, SOs:2.3	LI: 2.1, LI: 2.2, LI:2.3,	Unit. 2 . Classification of soil taxonomy and important physical properties of soil 2.1,2.2,2.3,2.4,2.5,2.6	
PO 1,2,3,4 PSO 1,2, 3, 4	221SC122 .3: Availability and interaction of various types of water with crop for its growth and development	SOs: 3.1, SOs:3.2, SOs:3.3, SOs:3.4	LI: 3.1, LI:3.2, LI:3.3, LI:3.4, LI:3.5, LI:3.6	Unit.3. Soil water relationship, classification, types and movement 3.1,3.2,3.3,3.4,3.5,3.6,3.7	
PO 1,2,3,4 PSO 1,2, 3, 4	21SC122 .4: Distribution and availability of ions in different soils of India	SOs: 4.1, SOs:4.2, SOs:4.3 SOs:4.4	LI: 4.1,LI:4.2, LI:4.3,LI:4.4, LI:4.5, LI:4.6	Unit.4. Distribution and availability of ions in different soils of India 4.1,4.2,4.3,4.4,4.5,4.6,4.7	
PO 1,2,3,4 PSO 1,2, 3, 4	21SC122 .5: Application of organic matter in soil to increase the fertility and productivity of soil there by reducing the soil pollution	SOs: 5.1, SOs:5.2, SOs:5.3 SOs:5.4	LI: 5.1,	Unit.5. Role, importance , composition and properties of soil organic matter in maintaining the sustainability of soil 5.1,5.2,5.3,5.4,5.5	

Course Code: 21NC129
Course Title : Human Values & Ethics
Pre- requisite: Student should have basic knowledge of Human Values & Ethics and its concepts

Rationale: Students of Yoga should have a legal understanding of Yoga and its original text Yoga. At the same time, they should also have adequate knowledge Human Values Ethics in which they should have knowledge of its basic principles and elements.

Course Outcomes:

- CO 201.1:** A student will be able to interpret the Human Values & Ethics.
- CO 201.2:** A student will be able to describe the self Exploration ,Awareness &self satisfaction.
- CO 201.3** A student will be able to explain the Decision making ,motivation ,sensitivity.
- CO 201.4** A student will be able to discuss the success, self service & Ethical lives .
- CO 201.5** A student will be able to describe the Positive spirit , attachment and detachment .

Scheme of Studies:

Code	Course Code	Course Title	Scheme of studies(Hours/Week)				Total Study Hours (CI+LI+SW+SL)	Total Credits(C)
			CI	LI	SW	SL		
Program Core (PCC)	21NC129	Human Values & Ethics	1	0	1	1	3	1

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop,field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C:Credits. 2

Theory

Code	Course Code	Course Title	Scheme of Assessment (Marks)							End Semester Assessment	Total Marks
			Progressive Assessment (PRA)						Total Marks		
			Class/Home Assignment number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	(CA+CT+SA+CAT+AT)			
Program Core (PCC)	21NC129	Human Values & Ethics	5	5	0	0	0	10	40	50	

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

CO. 1: A student will be able to interpret the Human Values & Ethics.

Approximate Hours

Item	AppX Hrs
CI	05
LI	0
SW	1
SL	1
Total	7

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO1.1 Student will able to Understand Values and ethics</p> <p>SO1.2 Student will able to Understand the Goal and mission & vision of life</p> <p>SO1.3 Student will able to Describe Principal and Philosophy</p> <p>SO1.4 Student will able to Describe Introduction of gita and quran</p>	.	<p>Unit-1. Values and ethics –</p> <p>1.1 Values and ethics An introduction .</p> <p>1.2 Goal and mission of life. Vision of life</p> <p>1.3Principal and Philosophy</p> <p>1.4 Introduction of gita .</p> <p>1.5 Introduction of quran</p>	<p>1. Goal and mission of life. Vision of life</p> <p>2. Introduction of gita and quran</p>

CO. 2:A student will be able to describe the self-Exploration ,Awareness &self satisfaction.

Approximate Hours

Item	AppX Hrs
CI	02
LI	0
SW	1
SL	1
Total	4

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO2.1 Student will able to Understand self-Exploration Self-awareness</p> <p>SO2.2Student will able to Understand the Self-Satisfaction</p>		<p>Unit-2. self</p> <p>2.1 self-Exploration Self-awareness</p> <p>2.2 Self-Satisfaction</p>	<p>1. self-Exploration Self-awareness</p> <p>2- Self-Satisfaction</p>

CO. 3: A student will be able to explain the Decision making ,motivation ,sensitivity.

Approximate Hours

Item	AppX Hrs
CI	02
LI	0
SW	1
SL	1
Total	4

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO3.1 Student will able to Understand Decision making</p> <p>SO3.2 Student will able to Understand the Motivation ,Sensitivity</p>		<p>Unit-3. Decision making</p> <p>3.1 Decision making</p> <p>3.2 Motivation ,Sensitivity</p>	<p>1. Decision making</p> <p>2- Motivation ,Sensitivity</p>

CO. 4: A student will be able to discuss the success, self service & Ethical lives .

Approximate Hours

Item	AppX Hrs
CI	02
LI	0
SW	1
SL	1
Total	4

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO4.1 Student will able to Understand success , Selfless Service</p> <p>SO4.2 Student will able to Understand the Case Study of Ethical Lives</p>	.	<p>Unit-4.</p> <p>4. 1 success ,Selfless Service</p> <p>4.2 Case Study of Ethical Lives</p>	<p>1. success , Selfless Service</p> <p>2- Case Study of Ethical Lives</p>

CO. 5: A student will be able to describe the Positive spirit , attachment and detachment

Approximate Hours

Item	AppX Hrs
CI	04
LI	0
SW	1
SL	1
Total	6

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO5.1 Student will able to Understand Positive spirit ,Mind,Body ,Soul</p> <p>SO5.2 Student will able to Understand the Attachment And Detachment</p> <p>SO5.3 Student will able to Describe Spirituality quotient</p> <p>SO5.4 Student will able to Describe Examination</p>		<p>Unit-5.</p> <p>5.1 Positive spirit,Mind,Body Soul</p> <p>5.2 Attachment And Detachment</p> <p>5.3 Spirituality quotient</p> <p>5.4 Examination</p>	<p>1. Attachment And Detachment</p> <p>2- Positive spirit Mind ,Body,Soul</p>

SW-4 Suggested Sessional Work (SW):

a. Assignments:

- i. Positive spirit,Mind,Body ,Soul
- ii. Attachment And Detachment

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self Learning (Sl)	Total hour (Cl+SW+Sl)
CO 101.1: A student will be able to interpret the Human Values & Ethics.	05	1	1	7
CO 101.2: A student will be able to describe the self Exploration ,Awareness &self satisfaction.	02	1	1	4
CO 101.3: A student will be able to explain the Decision making ,motivation ,sensitivity.	02	1	1	4
CO 101.4: A student will be able to discuss the success, self service & Ethical lives .	02	1	1	4
CO 201.5 A student will be able to describe the Positive spirit , attachment and detachment	04	1	1	6
Total Hours	15	5	5	25

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Human Values & Ethics	02	08	00	10
CO-2	Decision making	02	08	00	10
CO-3	Decision making	02	08	00	10
CO-4	success	02	08	00	10
CO-5	Positive spirit	02	08	00	10
Total		10	40	00	100

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Introduction to Portland cement will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks.

Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Demonstration
7. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT,Blog, Facebook,Twitter, Whatsapp, Mobile, Online sources)
8. Brain storming

Cos, Pos and PSOs Mapping

Course Code: 21NC129

Course Title: Human Value & Ethics

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprises with different scales in area of agricultural production, process and	Hold a post on supply in administration and policy	Analyze and control commercial and economical process in the field of agriculture.	Teach how to control and manage agricultural production	Introduce general production technologies	Teach how to teach and manage production technology	Preparation of managerial and social responsibility	Student will identify different underutilized crops	Student will practice different reeding techniques used in crop production.	Student will recognize different insect pest and diseases and their symptoms of crops	Student will apply different recent techniques in crop production
C0 101.1: A student will be able to interpret the Human Values & Ethics.	2	1	1	1	2	3	1	2	1	2	2
C0 101.2: A student will be able to describe the self Exploration, Awareness & self satisfactio	1	1	1	2	2	2	1	1	2	1	2

n.											
C0 101.3: A student will be able to explain the Decision making ,motivation ,sensitivity.	1	2	1	2	1	3		2	1	2	2
C0 101.4: A student will be able to discuss the success, self service & Ethical lives .	2	1	2	3	2	1	2	1	3	2	3
CO 201.5 A student will be able to describe the Positive spirit , attachment and detachment	1	2	2	3	2	3	1	2	1	3	1

Legend: 1 – Low, 2 – Medium, 3 – High

Curriculum Map: Human Values & Ethics

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4	C0 101.1: A student will be able to interpret the Human Values & Ethics.	SO1.1 SO1.2 SO1.3 SO1.4		Values and ethics, Values and ethics An introduction, Goal and mission of life, Vision of life, Principal and Philosophy, Introduction of gita, Introduction of quran	1. Goal and mission of life. Vision of life 2. Introduction of gita and quran
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4	C0 101.2: A student will be able to describe the self Exploration ,Awareness &self satisfaction	SO2.1 SO2.2		Self, self-Exploration Self-awareness, Self-Satisfaction	1. self-Exploration Self-awareness 2- Self-Satisfaction
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4	C0 101.3: A student will be able to explain the Decision making ,motivation ,sensitivity.	SO3.1 SO3.2		Decision making, Motivation ,Sensitivity	1. Decision making 2- Motivation ,Sensitivity
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4	C0 101.4: A student will be able to discuss the success, self service & Ethical lives.	SO4.1 SO4.2		Success ,Selfless Service, Case Study of Ethical Lives	1. success , Selfless Service 2- Case Study of Ethical Lives
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4	CO 201.5 A student will be able to describe the Positive spirit , attachment and detachment	SO5.1 SO5.2 SO5.3 SO5.4		Positive spirit, Mind, Body Soul,Attachment And Detachment, Spirituality quotient, Examination	1. Attachment And Detachment 2- Positive spirit Mind ,Body,Soul

Course Code: 21NC177

Course Title : Physical Education & Yoga practice

Pre- requisite: Student should have basic knowledge of Physical Education & Yoga practice and its concepts

Rationale: Students of Yoga should have a legal understanding of Yoga and its original text Yoga. At the same time, they should also have adequate knowledge Physical Education & Yoga practice in which they should have knowledge of its basic principles and elements.

Course Outcomes:

CO 201.1: A student will able to interpret about the introduction of Physical Education and its Features and of factors in Physical Education with the Knowledge of Teaching of skills of Football , Badminton.

CO 201.2: A student will able to discuss about the Components of physical fitness and strength with the knowledge of Teaching of skills of Basketball, Kabaddi,

CO 201.3 A student will able to discuss about the Components of physical fitness and strength with the knowledge of Teaching of skills of Badminton.

CO 201.4 A student will able to discuss about the Components of physical fitness and strength with the knowledge of Teaching of skills of Tennis.

CO 201.5 A student will able to differentiate about the Teaching and learning-relationship of sports and physical education and student will able to measure about the Construction and laying out of the track and field

Scheme of Studies:

Code	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits(C)
			CI	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Program Core (PCC)	21NC177	Physical Education & Yoga practice	2	0	1	1	4	2

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial

(T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop,field or other locations using different

instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C:Credits. 2

Theory

Code	Course Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA + ESA)
			Class/Home Assignment number 5 each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CA T)	Class Attendance (AT)	Total Marks (CA+CT+SA+ CAT+AT)		
Program Core (PCC)	21NC 177	Physical Education & Yoga practice	10	10	0	0	0	20	80	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

CO. 1: A student will able to interpret about the introduction of Physical Education and its Features and of factors in Physical Education with the Knowledge of Teaching of skills of Football

Approximate Hours

Item	AppX Hrs
CI	3
LI	3
SW	1
SL	1
Total	8

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO1.1 Student will able to Understand Teaching of skills of Football,</p> <p>SO1.2 Student will able to Understand the Teaching of skills of involvement in game situation (For girls teaching of Tennikoit)</p> <p>SO1.3 Student will able to Describe Teaching of skills of Basketball</p>	.	<p>Unit-1. Teaching of skills of Football</p> <p>1.1 Teaching of skills of Football – demonstration, practice of the skills, correction, involvement in game situation (For girls teaching of Tennikoit)</p> <p>1.2. Teaching of different skills of Football – demonstration, practice of the skills, correction, involvement in game situation (For girls teaching of Tennikoit)</p> <p>1.3. Teaching of advance skills of Football – involvement of all the skills in game situation with teaching of rules of the game</p>	<p>1. Teaching of skills of Football,</p> <p>2. Teaching of skills of Basketball</p> <p>3. Teaching of skills of Tennikoit</p>

CO. 2.: : A student will able to discuss about the Components of physical fitness and strength with the knowledge of Teaching of skills of Basketball, Kabaddi,

Approximate Hours

Item	AppX Hrs
CI	3
LI	3
SW	1
SL	1
Total	8

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO2.1 Student will able to Understand Teaching of skills of Basketball</p> <p>SO2.2 Student will able to Understand the Teaching of skills of Kabaddi</p>	.	<p>Unit-2. Teaching of skills games</p> <p>2.1. Teaching of skills of Basketball – demonstration, practice of the skills, involvement in game situation</p> <p>2.2 Teaching of skills of Basketball – involvement of all the skills in game situation with teaching of rule of the game</p> <p>2.3 Teaching of skills of Kabaddi – demonstration, practice of the skills, correction of skills, involvement in game situation</p>	<p>1. Teaching of skills of Kabaddi</p> <p>2. Teaching of skills of Basketball</p>

CO. 3: A student will able to discuss about the Components of physical fitness and strength with the knowledge of Teaching of skills of Badminton.

Approximate Hours

Item	AppX Hrs
CI	3
LI	3
SW	1
SL	1
Total	8

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO3.1 Student will able to Understand Teaching of advance skills of Kabaddi</p> <p>SO3.2 Student will able to Understand the Teaching of skills of Ball Badminton.</p> <p>SO3.3 Student will able to Describe Teaching – Teaching of some of Asanas</p>		<p>Unit-3. Teaching of skills -</p> <p>3.1 Teaching of advance skills of Kabaddi – involvement of all the skills in game situation with teaching of rule of the game</p> <p>3.2 Teaching of skills of Ball Badminton – demonstration, practice of the skills, correction of skills, involvement in game situation</p> <p>3.3 Teaching of skills of Ball Badminton – involvement of all the skills in game situation with teaching of rule of the game</p>	<p>1. Teaching of skills of Table Kabaddi</p> <p>2. Teaching of some of Asanas</p>

CO. 4: A student will able to discuss about the Components of physical fitness and strength with the knowledge of Teaching of skills of Tennis.

Approximate Hours

Item	AppX Hrs
CI	3
LI	3
SW	1
SL	1
Total	8

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO4.1 Student will able to Understand Teaching of some more of Asanas</p> <p>SO4.2 Student will able to Understand the Teaching of skills of Table Tennis</p>		<p>Unit-4. Teaching of skills -</p> <p>4.1 Teaching of some more of Asanas – demonstration, practice, correction and practice</p> <p>4.2 Teaching of skills of Table Tennis – demonstration, practice of skills, correction and practice and involvement in game situation</p> <p>4.3 Teaching of skills of Table Tennis – demonstration, practice of skills, correction and practice and involvement in game situation</p>	<p>1. Teaching of skills of Table Tennis</p>

CO. 5: A student will able to differentiate about the Teaching and learning-relationship of sports and physical education and student will able to measure about the Construction and laying out of the track and field

Approximate Hours

Item	AppX Hrs
CI	3
LI	3
SW	1
SL	1
Total	8

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO5.1 Student will able to Understand Teaching</p> <p>SO5.2 Student will able to Understand the Teaching.</p> <p>SO5.3 Student will able to Describe Teaching – Physical Fitness and Health</p> <p>SO5.4 Student will able to Describe Construction and laying out of the track and field</p>		<p>Unit-5. Teaching of skills -</p> <p>5.1. Teaching – Meaning, Scope and importance of Physical Education</p> <p>5.2 Teaching – Definition, Type of Tournaments</p> <p>5.3 Teaching – Physical Fitness and Health Education</p>	<p>1. Teaching of skills of Table Tennis</p> <p>2. Teaching.</p> <p>3. Teaching – Physical Fitness and Health</p>

Cos, Pos and PSOs Mapping

Course Code: 21NC177

Course Title: NSS/NCC/Physical Education & Yoga Practices

	Programme Outcomes				Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PSO 1	PSO 2	PSO-3	PSO-4
Course Outcomes	Students will demonstrate a strong understanding of core principles and theories in agriculture including plant science, soil science, animal science, agricultural economics, and agricultural engineering	Students will be proficient in applying scientific principles and techniques to solve realworld problems in agriculture, including crop management, livestock production, and natural resource management	Students will be competent in using modern agricultural technologies and tools, such as precision farming equipment, GIS (Geographic Information Systems), remote sensing, and biotechnology, to optimize agricultural productivity and sustainability.	Students will be able to communicate effectively in written, oral, and visual formats to convey agricultural concepts, research findings, and recommendations to diverse stakeholders including farmers, policymakers, and the public.	Student will identify different underutilized crops	Student will practice different breeding techniques used in crop production.	Student will recognize different insect pest and diseases and their symptoms of crops	Student will apply different recent techniques in crop production
21NC177 A student will be able to interpret about the introduction of Physical Education and its Features and of factors in Physical	1	1	2	1	1	2	1	1

Education with the Knowledge of Teaching of skills of Football , Badminton.								
21NC177 A student will able to discuss about the Components of physical fitness and strength with the knowledge of Teaching of skills of Basketball, Kabaddi,	1	1	1	1	2	1	1	1
21NC177 A student will able to discuss about the Components of physical fitness and strength with the knowledge of Teaching of skills of Badminton.	2	1	1	3	1	1	2	1
21NC177 A student will able to discuss about the Components of physical fitness and strength	1	2	1	1	2	2	1	2

with the knowledge of Teaching of skills of Tennis.								
21NC177 A student will be able to differentiate about the Teaching and learning-relationship of sports and physical education and student will be able to measure about the Construction and laying out of the track and field	1	1	2	1	2	1	1	2

Legend: 1 – Low, 2 – Medium, 3 – High

Cos, Pos and PSOs Mapping

Course Code: 21NC129

Course Title: Human Value & Ethics

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprises with different scales in area of agricultural production,process and trade	Hold a post on supply in administration and policy	Analyze and control commercial and economical process in the field of agriculture	Teach how to control and manage agricultural production	Introduce general production technologies	Teach how to teach and manage production technology	Preparation of managerial and social responsibility	Student will identify different underutilized crops	Student will practice different reeding techniques used in crop production.	Student will recognize different insect pest and diseases and their symptoms of crops	Student will apply different recent techniques in crop production
21NC177 A student will be able to interpret about the introduction of Physical Education and its Features and of factors in Physical Education with the Knowledge of Teaching of skills of Football , Badminton.	2	1	2	1	2	2	1	2	1	2	3
21NC177 A student will be able to discuss about the Components of physical fitness and strength	1	1	1	3	2	2	1	1	2	1	3

with the knowledge of Teaching skills of Basketball, Kabaddi,												
21NC177 A student will be able to discuss about the Components of physical fitness and strength with the knowledge of Teaching of skills of Badminton.	1	3	1	2	1	3		2	1	3	2	
21NC177 A student will be able to discuss about the Components of physical fitness and strength with the knowledge of Teaching of skills of Tennis.	2	1	3	3	2	1	2	1	3	2	3	
21NC177 A student will be able to differentiate about the Teaching and learning-relationship of sports and	1	2	2	2	2	3	1	2	3	3	1	

physical education and student will be able to measure about the Construction and laying out of the track and field											
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Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map: Physical Education & Yoga practice

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
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PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4	21NC177 A student will able to interpret about the introduction of Physical Education and its Features and of factors in Physical Education with the Knowledge of Teaching of skills of Football , Badminton.	SO1.1 SO1.2 SO1.3	Physical Education and its Features	Teaching of skills of Football – demonstration, practice of the skills, correction, involvement in game situation (For girls teaching of Tennikoit)	1. Teaching of skills of Football 2. Teaching of skills of Basketball 3. Teaching of skills of Tennikoit
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4	21NC177 A student will able to discuss about the Components of physical fitness and strength with the knowledge of Teaching of skills of Basketball, Kabaddi	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5	of physical fitness and strength.	Teaching of skills of Basketball – demonstration, practice of the skills, involvement in game situation	1. Teaching of skills of Kabaddi 2. Teaching of skills of Basketball
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4	21NC177 A student will able to discuss about the Components of physical fitness and strength with the knowledge of Teaching of skills of Badminton.	SO3.1 SO3.2 SO3.3	Teaching of skills of Badminton.	Teaching of skills of Basketball – demonstration, practice of the skills, involvement in game situation	1. Teaching of skills of Table Kabaddi 2. Teaching of some of Asanas
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4	21NC177 A student will able to discuss about the Components of physical fitness and strength with the knowledge of Teaching of skills of Tennis.	SO4.1 SO4.2	Teaching of skills of Tennis.	Teaching of advance skills of Kabaddi – involvement of all the skills in game situation with teaching of rule of the game	1. Teaching of skills of Table Tennis
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4	21NC177 A student will able to differentiate about the Teaching and learning-relationship of sports and physical education and student will able to measure about the Construction and laying out of the track and field	SO5.1 SO5.2	Construction and laying out of the track and field	1 Teaching of some more of Asanas – demonstration, practice, correction and practice	1. Teaching of skills of Table Tennis 2. Teaching. 3. Teaching – Physical Fitness and Health

Semester- 2

Course Code: 21EC229

Course Title: Fundamentals of Agricultural Economics

Pre requisite: - Student should have basic knowledge of principle and method of economics. Also students learned to the application of economics principle in agriculture.

Rationale: - Fundamentals of Agricultural Economics is the express through the concept and provide the information of Economics principles and method to professionals in accurate manners. It should develop skill in the students with apply the basic knowledge of Agricultural Economics

Course Outcomes:

1. Identify the concept and meaning of economics, basic concept of economics and agricultural economics
2. Express the various economic principles economics and basic theories with their application
3. Apply of cost concepts and laws of returns principles in agricultural economics.
4. Analyze about the national income, current policies and programmers on population control.
5. Asses the money and banking, types of banks and credit creation policy with their functions.

Scheme of studies

Code	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			CI	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Program Core (PCC)	21EC229	Fundamentals of Agricultural Economics	02	00	02	01	05	02

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Code	Course Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ESA)
			Class/ Home Assignment 5 number 3 marks each (CA)	Classes Test 2 (2 best out of 3) 10 marks each (CT)	Semin ar one (SA)	Class Activit y any one (CAT)	Class Attende nce (AT)	Total Marks (CA+CT+SA+CAT+AT)		
(Program Core (PCC)	21EC 229	Fundamentals of Agricultural Economics	15	30	00	00	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

21EC229 CO-1: Identify the concept and meaning of economics, basic concept of economics and agricultural economics

Approximate Hours

Item	AppX Hrs
C 1	8
LI	0
SW	2
SL	1
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO1.1- Introduce to <i>Economics</i>: Meaning, scope and subject matter, definitions, activities, approaches to economic analysis; micro and macro economics, positive and normative analysis. Nature of economic.</p> <p>SO1.2 - Introduce about rationality assumption, concept of equilibrium, economic laws as generalization of human behavior. SO1.3 - Discussion about the basic concepts: Goods and services, desire, want, demand, utility, cost and price, wealth, capital, income and welfare</p> <p>SO1.4- Describes the agricultural economics: meaning, definition, characteristics of agriculture, importance and its role in economic development.</p> <p>SO1.5 - Discuss about agricultural planning and development in the country..</p>		<p>Unit-1</p> <p><i>Economics</i>: Meaning, scope and subject matter, definitions, activities, approaches to economic analysis; micro and macro economics, positive and normative analysis. Nature of economic theory; rationality assumption, concept of equilibrium, economic laws as generalization of human behavior. Basic concepts: Goods and services, desire, want, demand, utility, cost and price, wealth, capital, income and welfare. Agricultural economics: meaning, definition, characteristics of agriculture, importance and its role in economic development. Agricultural planning and development in the country.</p> <p>1.1-<i>Economics</i>: Meaning, scope and subject matter,</p>	<p>1.1- Prepare the assignment on Meaning and definition of economics & agricultural economics, nature scope and importance of economics</p>

		<p>definitions</p> <p>1.2-Economics activities, approaches to economic analysis.</p> <p>1.3- Micro and Macro economics, positive and normative analysis. Nature of economic theory.</p> <p>1.4-Rationality assumption, concept of equilibrium.</p> <p>1.5- Economic laws as generalization of human behavior</p> <p>1.6- Basic concepts: Goods and services, desire, want, demand, utility, cost and price, wealth, capital, income and welfare.</p> <p>1.7-Agricultural economics: meaning, definition, characteristics of agriculture, importance and its role in economic development.</p> <p>1.8-Agricultural planning and development in the country.</p>	
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SW-1 Suggested Sessional Work (SW):

a. Assignments: Prepare the assignment on Meaning and definition of economics & agricultural economics, nature scope and importance of economics

b. Mini Project: -

c. Other Activities (Specify):

21EC229 CO-2: Express the various economic principles economics and basic theories with their application

Approximate Hours

Item	AppX Hrs
C 1	05
LI	00
SW	02
SL	01
Total	08

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO2.1 – Introduce to <i>Demand</i>: meaning, law of demand, demand schedule and demand curve, determinants</p> <p>SO2.2- Introduce to utility theory; law of diminishing marginal utility, equi-marginal utility principle</p> <p>SO2.3- Consumer’s equilibrium and derivation of demand curve, concept of consumer surplus.</p> <p>SO2.4- Elasticity of demand: concept and measurement of price elasticity, income elasticity and cross</p> <p>SO2.5- Elasticity. Supply: Stock v/s supply, law of supply, supply schedule, supply curve, determinants of supply, elasticity of supply</p>		<p>Unit-2.0 –</p> <p><i>Demand</i>: meaning, law of demand, demand schedule and demand curve, determinants, utility theory; law of diminishing marginal utility, equi-marginal utility principle. Consumer’s equilibrium and derivation of demand curve, concept of consumer surplus. Elasticity of demand: concept and measurement of price elasticity, income elasticity and cross elasticity. Supply: Stock v/s supply, law of supply, supply schedule, supply curve, determinants of supply, elasticity of supply</p> <p>2.1 - Demand: meaning, law of demand, demand schedule and demand curve, determinants</p> <p>2.2- utility theory; law of diminishing marginal utility, equi-marginal utility principle.</p> <p>2.3- Consumer’s equilibrium</p>	<p>2.1 – Prepare the assignment on demand, demand schedule and demand curve importance of economics.</p>

		<p>and derivation of demand curve, concept of consumer surplus.</p> <p>2.4- Elasticity of demand: concept and measurement of price elasticity, income elasticity and cross.</p> <p>2.5- Elasticity. Supply: Stock v/s supply, law of supply, supply schedule, supply curve, determinants of supply, elasticity of supply.</p>	
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SW-1 Suggested Sessional Work (SW):

a. Assignments: Prepare the assignment on demand, demand schedule and demand curve importance of economics .

b. Mini Project:

c. Other Activities (Specify):

21EC229 CO -3: Apply of cost concepts and laws of returns principles in agricultural economics.

Approximate Hours

Item	AppX Hrs
C 1	06
LI	00
SW	02
SL	01
Total	09

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO3.1 – Identify to the Production: process, creation of utility, factors of production, input output relationship</p> <p>SO3.2 – Discuss to the laws of returns: Law of variable proportions and law of returns to scale.</p> <p>SO3.3- Identify to the <i>cost</i>: cost concepts, short run and long run cost curves.</p> <p>SO3.4- Discuss to market structure: meaning and types of market, basic features of perfectly competitive and imperfect markets.</p> <p>SO3.5- Price determination under perfect competition; short run and long run equilibrium of firm and industry, shut down and break even points. Distribution theory: meaning, factor market and pricing of factors of production. Concept of rent, wage, interest and profit.</p>		<p>Unit-3.0</p> <p>Production: process, creation of utility, factors of production, input output relationship. <i>Laws of returns</i>: Law of variable proportions and law of returns to scale. <i>Cost</i>: Cost concepts, short run and long run cost curves. Market structure: meaning and types of market, basic features of perfectly competitive and imperfect markets. Price determination under perfect competition; short run and long run equilibrium of firm and industry, shut down and break even points. Distribution theory: meaning, factor market and pricing of factors of production. Concept of rent, wage, interest and profit.</p> <p>3.1- Production: process, creation of utility, factors of production, input output relationship.</p> <p>3.2- laws of returns: Law</p>	<p>3.1 Prepare the assignment on market structure meaning, & Scope importance of economics.</p>

		<p>of variable proportions and law of returns to scale.</p> <p>3.3-Cost: cost concepts, short run and long run cost curves.</p> <p>3.4- Market structure: meaning and types of market, basic features of perfectly competitive and imperfect markets.</p> <p>3.5-Price determination under perfect competition; short run and long run equilibrium of firm and industry, shut down and break even points.</p> <p>3.6- Distribution theory: meaning, factor market and pricing of factors of production. Concept of rent, wage, interest and profit.</p>	
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SW-1 Suggested Sessional Work (SW):

- a. Assignments:** Prepare the assignment on market structure meaning, & Scope importance of economics.
- b. Mini Project:**
- c. Other Activities (Specify):**

21EC229 CO -4: Analyze about the national income, current policies and programmers on population control

Approximate Hours

Item	App X Hrs
CI	05
LI	00
SW	02
SL	01
Total	08

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO1.1– Identify the <i>National income</i>: Meaning and importance, circular flow.</p> <p>SO1.2 - The concepts of national income accounting and approaches.</p> <p>SO1.3- Measurement, national income difficulties in measurement.</p> <p>SO1.4- Describes the population: Importance, Malthusian and Optimum population theories.</p> <p>SO1.5– Natural and socio-economic determinants, current policies and programs on population control.</p>		<p>Unit-4.0:</p> <p><i>National income</i>: Meaning and importance, circular flow, concepts of national income accounting and approaches to measurement, difficulties in measurement.</p> <p>Population: Importance, Malthusian and Optimum population theories, natural and socio-economic determinants, current policies and programs on population control.</p> <p>4.1- Discusses to <i>national income</i>: Meaning and importance,</p> <p>4.2- The concepts of national income accounting and approaches.</p> <p>4.3- Measurement, national income difficulties in measurement.</p> <p>4.4- Population: Importance, Malthusian and Optimum population theories.</p> <p>4.5- Natural and socio-economic determinants, current policies and</p>	<p>1.1- Prepare the assignment on <i>national income</i> accounting and approaches to measurement.</p>

		programs on population control	
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a. Assignments: Prepare the assignment on *national income* accounting and approaches to measurement

b. Mini Project:

c. Other Activities (Specify)

21EC229 CO -5: Asses the money and banking, types of banks and credit creation policy with their functions.

Approximate Hours.

Item	App X Hrs
CI	06
LI	00
SW	01
SL	02
Total	09

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO1.1–Identify money: Barter system of exchange and its problems, evolution, meaning and functions of money.</p> <p>SO1.2- Classification of money, money supply, general price index, inflation and deflation.</p> <p>SO1.3- Discuss the, Banking: Role in modern economy, types of banks, functions of commercial and central bank, credit creation policy.</p> <p>SO1.4 - Public finance: meaning, micro v/s macro finance, need for agricultural finance, public revenue and public expenditure.</p> <p>SO1.5- <i>Tax</i>: meaning, direct and indirect taxes, agricultural taxation, VAT.</p>		<p>Unit-5.0</p> <p>Money: Barter system of exchange and its problems, evolution, meaning and functions of money, classification of money, money supply, general price index, inflation and deflation. Banking: Role in modern economy, types of banks, functions of commercial and central bank, credit creation policy. Public finance: meaning, micro v/s macro finance, need for agricultural finance, public revenue and public expenditure. <i>Tax</i>: meaning, direct and indirect taxes, agricultural taxation, VAT.</p> <p>5.1- Discuss concepts of money Barter system of exchange and its problems, evolution, meaning and functions of money.</p> <p>5.2- Describes the Classification of money, money supply, general price index, inflation and deflation.</p> <p>5.3- Discuss the, Banking: Role in modern</p>	<p>1.1 - Prepare the assignment on Concepts of money, classification of money.</p> <p>1.2 differences between micro v/s macro finance in agricultural economics.</p>

		<p>economy, types of banks, functions of commercial and central bank, credit creation policy.</p> <p>5.4- Public finance: meaning, micro v/s macro finance.</p> <p>5.5- Importance of agricultural finance, public revenue and public expenditure.</p> <p>5.6- <i>Tax</i>: meaning, direct and indirect taxes, agricultural taxation, VAT.</p>	
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SW-1 Suggested Sessional Work (SW):

- a. Assignments:**
- 1. Prepare the assignment on Concepts of money, classification of money.
 2. Differences between micro v/s macro finance in agricultural economics.
- b. Mini Project:**
- c. Other Activities (Specify):**

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (C I)	Laboratory Lecture (L I)	Sessional Work (SW)	Self Learning (S I)	Total hour (C I + L I + SW + S I)
21EC229 CO-01 Identify the concept and meaning of economics, basic concept of economics and agricultural economics.	08	00	02	01	11
21EC229 CO -02: Express the various economic principles economics and basic theories with their application.	05	00	02	01	08
21EC229 CO -03: Apply of cost concepts and laws of returns principles in agricultural economics.	06	00	02	01	09
21EC229 CO -04: Analyze about the national income, current policies and programmers on population control.	05	00	02	01	08
21EC229 CO -05: Asses the money and banking, types of banks and credit creation policy with their functions.	06	00	01	02	09
Total Hours	30	00	09	06	45

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit title	Marks Distribution			Total Marks
		R	U	A	
CO-1	Identify the concept and meaning of economics, basic concept of economics and agricultural economics.	02	03	00	05
CO-2	Express the various economic principles economics and basic theories with their application.	02	05	03	10
CO-3	Apply of cost concepts and laws of returns principles in agricultural economics.	00	08	07	15
CO-4	Analyze about the national income, current policies and programmers on population control.	02	05	08	15
CO-5	Asses the money and banking, types of banks and credit creation policy with their functions.	00	03	02	05
	Total	06	24	20	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Introduction to Portland cement will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks.

Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Visit to Industry
7. Demonstration
8. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Face book, Twitter, Whatsapp, Mobile, Online sources)
9. Brainstorming

Suggested Learning Resources:

S. No.	Title	Author	Publisher	Edition & Year
01	Agricultural economics	Bhavani Devi,P. Raghu Ram,S. Subba Reddy,T.V. Neelakanta Sastry	Oxford and IBH Co. Pvt. Ltd., , New Delhi.	2009
02	<i>Elementary Economic Theory</i>	K. K. Dewett and J. D. Varma	S. Chand & Company, New Delhi.	1986
03	Principles of agricultural economics	Latika Sharma <i>et al.</i>	Agrotech publishers, Udaipur	2014
04	Micro Economic Theory	M.L. Jhingan	Vikas Publishing House Pvt. Ltd., New Delhi.	2004
05	Outline of Micro economics	Dominick Salvatore	Schaum's Outline Series.	2011

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Cos, Pos and PSOs Mapping

Course Code: 21EC229

Course Title: Fundamentals of Agriculture Economics

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprises with different scales in area of agricultural production, process and	Hold a post on supply in administration and policy	Analyze and control commercial and economical process in the field of agriculture.	Teach how to control and manage agricultural production	Introduce general production technologies	Teach how to teach and manage production technology	Preparation of managerial and social responsibility	Student will identify different underutilized crops	Student will practice different breeding techniques used in crop production.	Student will recognize different insect pest and diseases and their symptoms of crops	Student will apply different recent techniques in crop production
21EC229 CO-01 Identify the concept and meaning of economics, basic concept of economics and agricultural	2	1	1	3	2	3	1	2	3	2	2

economics.											
21EC229 CO -02: Express the various economic principles economics and basic theories with their application.	1	1	2	3	2	2	1	3	1	1	1
21EC229 CO -03: Apply of cost concepts and laws of returns principles in agricultural economics.	1	2	1	2	1	3	3	2	1	1	3
21EC229 CO -04: Analyze about the national income, current policies and	2	1	3	1	2	1	2	1	3	1	1

programmers on population control.											
21EC229 CO -05: Asses the money and banking, types of banks and credit creation policy with their functions.	1	2	3	3	2	3	1	3	1	3	2

Legend: 1 – Low, 2 – Medium, 3 – High

Curriculum Map

Pos & PSOs	Cos No. & Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
PO1,2,3,4,5,6,7 PSO 1,2,3,4	21EC229 CO-01 Identify the concept and meaning of economics, basic concept of economics and agricultural economics.	SO1.1 SO1.2 SO1.3 SO 1.4 SO 1.5		<i>Economics:</i> Meaning, scope and subject matter, definitions, activities, approaches to economic analysis; micro and macro economics, positive and normative analysis. Nature of economic theory; rationality assumption, concept of equilibrium, economic laws as generalization of human behavior. Basic concepts: Goods and services, desire, want, demand, utility, cost and price, wealth, capital, income and welfare. Agricultural economics: meaning, definition, characteristics of agriculture, importance and its role in economic development. Agricultural planning and development in the country. 1.1, 1.2, 1.3,1.4,1.5,1.6,1.7,1.8	1.1- Prepare the assignment on Meaning and definition of economics & agricultural economics, nature scope and importance of economics
PO1,2,3,4,5,6,7 PSO 1,2,3,4	21EC229 CO -02: Express the various economic principles economics and basic theories with their application.	SO2.1 SO2.2 SO2.3 SO 2.4 SO 2.5		<i>Demand:</i> meaning, law of demand, demand schedule and demand curve, determinants, utility theory; law of diminishing marginal utility, equi-marginal utility principle. Consumer's equilibrium and derivation of demand curve, concept of consumer surplus. Elasticity of demand: concept and measurement of price elasticity, income elasticity and cross elasticity. Supply: Stock v/s supply, law of supply, supply schedule,	2.1 – Prepare the assignment on demand, demand schedule and demand curve importance of economics.

				supply curve, determinants of supply, elasticity of supply 2.1, 2.2, 2.3,2.4,2.5	
PO1,2,3,4,5,6,7 PSO 1,2,3,4	21EC229 CO -03: Apply of cost concepts and laws of returns principles in agricultural economics.	SO3.1 SO3.2 SO3.3 SO 3.4 SO 3.5		Production: process, creation of utility, factors of production, input output relationship. <i>Laws of returns</i> : Law of variable proportions and law of returns to scale. <i>Cost</i> : Cost concepts, short run and long run cost curves. Market structure: meaning and types of market, basic features of perfectly competitive and imperfect markets. Price determination under perfect competition; short run and long run equilibrium of firm and industry, shut down and break even points. Distribution theory: meaning, factor market and pricing of factors of production. Concept of rent, wage, interest and profit. 3.1, 3.2, 3.3,3.4,3.5,3.6	3.1 Prepare the assignment on market structure meaning, & Scope importance of economics.
PO1,2,3,4,5,6,7 PSO 1,2,3,4	21EC229 CO -04: Analyze about the national income, current policies and programmers on population control.	SO4.1 SO4.2 SO4.3 SO4.3		<i>National income</i> : Meaning and importance, circular flow, concepts of national income accounting and approaches to measurement, difficulties in measurement. Population: Importance, Malthusian and Optimum population theories, natural and socio-economic determinants, current policies and programs on population control.	1.1- Prepare the assignment on <i>national income</i> accounting and approaches to measurement.

		SO 4.4 SO 4.5		4.1, 4.2, 4.3,4.4,4.5	
PO1,2,3,4,5,6,7 PSO 1,2,3,4	21EC229 CO -05: Asses the money and banking, types of banks and credit creation policy with their functions.	SO 5.1 SO5.2 SO5.3 SO 5.4 SO 5.5		Money: Barter system of exchange and its problems, evolution, meaning and functions of money, classification of money, money supply, general price index, inflation and deflation. Banking: Role in modern economy, types of banks, functions of commercial and central bank, credit creation policy. Public finance: meaning, micro v/s macro finance, need for agricultural finance, public revenue and public expenditure. <i>Tax</i> : meaning, direct and indirect taxes, agricultural taxation, VAT. 5.1, 5.2, 5.3,5.4,5.5,5.6	1.1 - Prepare the assignment on Concepts of money, classification of money. 1.2 differences between micro v/s macro finance in agricultural economics.

Course Code: 21HO221

Course Title : Fundamental of Horticulture

Pre- requisite: Student should have basic knowledge of all the basic fundamental aspects of horticulture.

Rationale: The students studying cement fundamentals of horticulture possess sound understanding about the concepts of horticulture employed in boosting up the proper package and practices required for horticultural crops. In addition to this students will understand about all the related advanced techniques of horticulture in a very precious way.

Course Outcomes:

- 21HO221.1:** Apply the knowledge of horticulture in terms of its definition branches, importance/scope and classification.
- 21HO221.2:** Ability to understand about plant vegetative propagation/structure including different Principles of Horticulture
- 21HO221.3:** Understand the major causes of unfruitfulness, role of pollinators and pollinizers in pollination , usefulness of fertilization and parthenocarpy in horticultural crops.
- 21HO221.4:** Understand the concept of garden type and parts lawn making practices along with medicinal aromatic , spices and condiments plants.
- 21HO221.5:** Understand the concept of plants bio-regulators as advancement and different irrigation and fertilizers application methods.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits(C)
			CI	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Program Core (PCC)	21HO221	Fundamental of Horticulture	1	1	1	1	4	2

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

Board of Study	Course Code	Course Title	Scheme of Assessment (Marks)							End Semester Assessment (ESA)	Total Marks (PRA+ESA)
			Progressive Assessment (PRA)						Total Marks (CA+CT+SA+CAT+A)		
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)				
Program Core 21 (PCC)	21HO21	FOH	15	30	0	0	5	50	50	100	

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

21HO221.1: Apply the knowledge of horticulture in terms of its definition branches, importance/scope and classification.

Approximate Hours

Item	AppX Hrs
CI	03
LI	04
SW	02
SL	01
Total	10

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
<p>SO1.1 Understand scope of horticulture in India</p> <p>SO1.2 Ability to understand the botany of different horticultural crops</p> <p>SO1.3 Understand about the different climate and soil for growing horticultural crops successfully</p>	<p>1.1 Identification of garden tools.</p> <p>1.2 Identification of Horticulture crops.</p>	<p>Unit-1.0 Horticulture-Its definition and branches, importance and scope; horticultural and botanical classification; climate and soil for horticultural crops.</p> <p>1.1 Definition, branches, importance and scope of horticulture</p> <p>1.2 Horticultural and botanical classification</p> <p>1.3 Climate and soil for horticultural crops</p>	<p>1. Branches of horticultural crops</p> <p>2. Different horticultural climatic zones</p>

SW-1 Suggested Sessional Work (SW):

a. Assignments:

i. Preparation of herbarium (Using seeds and leaves of fruits, vegetables, flowers, spices, medicinal and aromatic plants)

b. Mini Project:

i. Prepare chart of botanical classification of horticultural crops

21HO221.2: Ability to understand about plant vegetative propagation/structure including different Principles of Horticulture

Approximate Hours

Item	AppX Hrs
CI	03
LI	08
SW	02
SL	01
Total	14

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO2.1 Understand the propagation methods in horticulture crops.</p> <p>SO2.2 Types of different propagation structures.</p> <p>SO2.3 Understand the principle and methods of training and pruning.</p> <p>SO2.4 Understand about the orchard establishment.</p>	<p>2.1 Practices of sexual and asexual propagation methods.</p> <p>2.2 Layout and planting of orchard.</p> <p>2.3 Practices of training and pruning in horticulture crops.</p> <p>2.4 Preparation of seed beds.</p>	<p>Unit-2 Plant propagation-methods and propagating structures; principles of orchard establishment; Principles and methods of training and pruning, juvenility and flower bud differentiation.</p> <p>2.1 Learn the propagation methods and different propagation structures.</p> <p>2.2 Orchard establishment, juvenility and flower bud differentiation.</p> <p>2.3 Principle and methods of training and pruning.</p>	<p>1.Methods of training and pruning in different fruit crops.</p> <p>2.Flower bud differentiation.</p>

SW-2 Suggested Seasonal Work (SW):

a. Assignments:

- i. Propagation structure, Propagation methods, principles and methods of training, principles and methods of Pruning, orchard establishment.

21HO221.3: Understand the major causes of unfruitfulness, role of pollinators and pollinizers in pollination , usefulness of fertilization and parthenocarpy in horticultural crops.

Approximate Hours

Item	AppX Hrs
CI	03
LI	0
SW	02
SL	01
Total	6

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO3.1 Understand major causes of unfruitfulness.</p> <p>SO3.2 Determine the importance of pollination, pollinizers, pollinators and fertilization.</p> <p>SO3.3 Application parthenocarpy induction methods and its importance in vegetable production</p>		<p>Unit-3 : unfruitfulness; pollination, pollinizers and pollinators; fertilization and parthenocarpy.</p> <p>3.1 Different causes of unfruitfulness in vegetable</p> <p>3.2 Importance of pollination, pollinizers and pollinators</p> <p>3.3 Importance of fertilization and parthenocarpy induction in vegetable crops.</p>	<p>Common crops susceptible to unfruitfulness and methods use to overcome</p> <p>Major pollinators and pollinizers and there species in vegetables</p>

SW-3 Suggested Sessional Work (SW):

a. Assignments:

- i. Major chemicals used in parthenocarpy induction

21HO221.4: Understand the concept of garden type and parts lawn making practices along with medicinal aromatic , spices and condiments plants.

Approximate Hours

Item	AppX Hrs
CI	03
LI	06
SW	02
SL	01
Total	12

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO4.1 Understand about kitchen gardening.</p> <p>SO4.2 Type of garden and its parts.</p> <p>SO4.3 Understand about lawn establishment method.</p> <p>SO4.4 Introduction about medicinal , Aromatic plants and their used.</p> <p>SO4.5 Introduction about Spices and condiments and their used.</p>	<p>4.1 Practices of transplanting and care of vegetable seedlings.</p> <p>4.2 Practices of making herbaceous & shrubby borders in orchard and kitchen gardening.</p> <p>4.3 Preparation of potting mixture, potting and repotting.</p>	<p>Unit-4.0 :Kitchen gardening garden type and parts; lawn making; medicinal and Aromatic plants; Spices and condiments</p> <p>4.1 Introduction about kitchen garden and practices of kitchen garden as per session schedule.</p> <p>4.2 Different garden types and its parts.</p> <p>4.3 lawn establishment practices and its management.</p> <p>4.4 Introduction about medicinal and aromatic plants.</p> <p>4.5 Introduction about Spices and condiments.</p>	<p>1.Preparation of well labeled diagram of kitchen gardening.</p> <p>2.Making a chart of medicinal and aromatic plants with their botanical discription</p>

SW-4 Suggested Sessional Work (SW):

- a. Assignments:**
 - i. Kitchen garden different type of vegetable garden lawn making practices Enlist different medicinal and aromatic plant with their importance
- b. Mini Projects:**
 - i. Preparation of chart of medicinal, aromatic Spices and condiments
- e. Other Activities (Specify):**
 - i. Visit to Commercial Nursery and orchard.

21HO221.5: Understand the concept of plants bio-regulators as advancement and different irrigation and fertilizers application methods.

Approximate Hours

Item	AppX Hrs
CI	03
LI	02
SW	02
SL	01
Total	08

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO5.1 Understand the bio-regulators used in horticultural crops</p> <p>SO5.2 Methods of irrigation used in horticultural crops</p> <p>SO5.3 Understand the calculation of fertilizer doses</p>	<p>5.1 Practices of Fertilizer application in different Horticulture cops.</p>	<p>Unit 5: use of plant bio-regulators in horticulture. Irrigation & fertilizers application-method and quantity</p> <p>1. Use of plant bioregulators in horticulture crops</p> <p>2. Irrigation methods applied in horticultural crops</p> <p>3. Different fertilizer application methods of horticultural crops</p>	<p>1. Identify the different plant bio regulators</p> <p>2. Types of irrigation and fertilizer application methods</p>

SW-5 Suggested Sessional Work (SW):

Assignments:

- a. Collect the samples of different plant bio-regulators
- b. Collect the samples of different fertilize

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (CI)	Sessional Work (SW)	Self Learning (SI)	Total hour (CI+SW+SI)
21HO221.1: Apply the knowledge of horticulture in terms of its definition branches, importance/scope and classification.	3	2	2	7
21HO221.2: Ability to understand about plant vegetative propagation/structure including different Principles of Horticulture	3	1	2	6
21HO221.3: Understand the major causes of unfruitfulness, role of pollinators and pollinizers in pollination , usefulness of fertilization and parthenocarpy in horticultural crops.	3	1	2	6
21HO221.4: Understand the concept of garden type and parts lawn making practices along with medicinal aromatic , spices and condiments plants.	5	2	2	9
21HO221.5: Understand the concept of plants bio-regulators as advancement and different irrigation and fertilizers application methods.	3	1	2	6
Total Hours	17	7	10	34

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Apply the knowledge of horticulture in terms of its definition branches, importance/scope and classification.	03	01	01	05
CO-2	Ability to understand about plant vegetative propagation/structure including different Principles of Horticulture.	02	03	05	10
CO-3	Understand the major causes of unfruitfulness, role of pollinators and pollinizers in pollination , usefulness of fertilization and parthenocarpy in horticultural crops.	04	06	05	15
CO-4	Understand the concept of garden type and parts lawn making practices along with medicinal aromatic , spices and condiments plants	5	5	05	15
CO-5	Understand the concept of plants bio-regulators as advancement and different irrigation and fertilizers application methods	01`	`	2	05
Total		11	26	13	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Fundamental of Horticulture will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Demonstration
7. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, Whatsapp, Mobile, Online sources)
8. Brainstorming

Suggested Learning Resources

Sl. No.	Title	Author	Publisher	Edition & Year
1	Handbook of Horticulture	Chadha, K.L.	ICAR, NewDelhi	2002
2	A handbook of Fruit Science and Technology	D.K. Salunkhe and S.S. Kadam	CRC Press	2013
3	Basic Horticulture	Jitendra Singh	Kalyani Publications, New Delhi	2011
4	Basics Horticulture	K.V. Peter	New India Publishing Agency	2009
5	Fundamentals of Horticulture	Kausal Kumar Misra and Rajesh Kumar	Biotech Books	2014

Cos, POs and PSOs Mapping
Course Title: Fundamental of Horticulture
Course Code: 21HO221-C

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprises with different scales in area of agricultural production, process and	Hold a post on supply in administration and policy	Analyze and control commercial and economical process in the field of agriculture.	Teach how to control and manage agricultural production	Introduce general production technologies	Teach how to teach and manage production technology	Preparation of managerial and social responsibility	Student will identify different underutilized crops	Student will practice different reeding techniques used in crop production.	Student will recognize different insect pest and diseases and their symptoms of crops	Student will apply different recent techniques in crop production
1. Apply the knowledge of horticulture in terms of its definition branches, importance/scope and classification.	1	1	1	3	2	3	2	2	3	1	2
2. Ability to understand about plant vegetative propagation/structure including	1	1	3	3	1	2	1	3	1	2	1

different Principles of Horticulture.											
3. Understand the major causes of unfruitfulness, role of pollinators and pollinizers in pollination , usefulness of fertilization and parthenocarpy in horticultural crops.	1	3	1	2	1	3	1	2	1	3	3
4. Understand the concept of garden type and parts lawn making practices along with medicinal aromatic , spices and condiments plants	2	1	2	1	2	3	2	1	3	2	1
5. Understand the concept of plants bio-regulators as advancement and different irrigation and fertilizers application	2	2	3	3	2	3	1	3	1	1	2

methods										
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Legend: 1 – Low, 2 – Medium, 3 – High

Curriculum Map: Fundamental of Horticulture

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
PO 1,2,3,4,5,6,7 PSO 1,2, 3,4	21HO221.1: Apply the knowledge of horticulture in terms of its definition branches, importance/scope and classification.	SO1.1 SO1.2 SO1.3	1.1 Identification of garden tools. 1.2 Identification of Horticulture crops.	Unit-1.0 Horticulture-Its definition and branches, importance and scope; horticultural and botanical classification; climate and soil for horticultural crops. 1.1, 1.2, 1.3	1. Branches of horticultural crops 2. Different horticultural climatic zones
PO 1,2,3,4,5,6,7 PSO 1,2, 3,4	21HO221.2: Ability to understand about plant vegetative propagation/structure including different Principles of Horticulture	SO2.1 SO2.2 SO2.3 SO2.4	2.1 Practices of sexual and asexual propagation methods. 2.2 Layout and planting of orchard. 2.3 Practices of training and pruning in horticulture crops. 2.4 Preparation of seed beds.	Unit-2 Plant propagation-methods and propagating structures; principles of orchard establishment; Principles and methods of training and pruning, juvenility and flower bud differentiation.	Methods of training and pruning in different fruit crops. Flower bud differentiation.

PO 1,2,3,4,5,6,7 PSO 1,2, 3,4	21HO221.3: Understand the major causes of unfruitfulness, role of pollinators and pollinizers in pollination , usefulness of fertilization and parthenocarpy in horticultural crops.	SO3.1 SO3.2 SO3.2		Unit-3 : unfruitfulness; pollination, pollinizers and pollinators; fertilization and parthenocarpy. 3.1, 3.2, 3.3	Common crops susceptible to unfruitfulness and methods use to overcome Major pollinators and pollinizers and there species in vegetables
PO 1,2,3,4,5,6,7 PSO 1,2, 3,4	21HO221.4: Understand the concept of garden type and parts lawn making practices along with medicinal aromatic , spices and condiments plants.	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5	4.1 Practices of transplanting and care of vegetable seedlings. 4.2 Practices of making herbaceous & shrubby borders in orchard and kitchen gardening. 4.3 Preparation of potting mixture, potting and repotting.	Unit-4.0 : Kitchen gardening garden type and parts; lawn making; medicinal and Aromatic plants; Spices and condiments 4.1 Introduction about kitchen garden and practices of kitchen garden as per session schedule. 4.1, 4.2, 4.3, 4.4, 4.5	1.Preparation of well labeled diagam of kitchen gardening. 2.Making a chart of medicinal and aromatic plants with their botanical discription
PO 1,2,3,4,5,6,7 PSO 1,2, 3,4	21HO221.5: Understand the concept of plants bio-regulators as advancement and different irrigation and fertilizers application methods.	SO5.1	5.1 Practices of Fertilizer application in different Horticulture cops.	Unit 5: use of plant bio-regulators in horticulture. Irrigation & fertilizers application-method and quantity 5.1, 5.2, 5.3	1. Identify the different plant bio regulators 2. Types of irrigation and fertilizer application methods

Course Code: 21HO222

Course Title: Fundamentals of Crop Physiology

Pre-requisite:

Rationale:

Course Outcomes:

- 1: Students will be able to understand the fundamental concept of crop physiology.
- 2: Students will be able to understand the structure of plant cell, cell organelles and their function and internal activities of plant.
- 3: Students will be able to understand the general process of photosynthesis and respiration.
- 4: It gives an account of the plant hormone and their role in plant growth and development.
- 5: It gives an account of physiological aspects of growth and development.

Scheme of Studies:

Code	Course Code	Course Title	Scheme of studies(Hours/Week)				Total Study Hours CI+LI+SW+SL	Total Credits (C)
			CI	LI	SW	SL		
Program Core (PCC)	21HO222	Fundamentals of Crop Physiology	1	1			1 + 2 = 3	1 + 1

Legend:

CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Code	Course Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
Program Core (PCC)	21HO22	Fundamentals of Crop Physiology	15	30	0	0	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

1: Students will be able to understand the fundamental concept of crop physiology.

Approximate Hours

Item	Aprox. Hours
CI	3
LI	10
SW	0
SL	2
Total	15

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SOs 1. Understand the basic features of physiology of plants. SOs 2. Understand physiological activities and their impact in plant. SOs 3. Understand the structure of stomata and measured rate of transpiration with the help of potometer.	1. Study of plant cells. 2. Structure and distribution of stomata, imbibitions, osmosis 3. Plasmolysis. 4. Measurement of rate of transpiration by farmer potometer. 5. Measurement of rate of transpiration by ganongs potometer.	Unit-1 Introduction of crop physiology 1. Introduction to crop physiology and its importance in Agriculture 2. Plant cell: an Overview 3. Diffusion and osmosis; Absorption of water, transpiration and Stomatal Physiology; Mineral nutrition of Plants.	Differentiate osmosis and diffusion. Structure of plant cell.

SW-1 Suggested Sessional Work (SW):

- a. Assignments:
- b. Mini Project:
- c. Other Activities (Specify):

2: Students will be able to understand the structure of plant cell, cell organelles and their function and internal activities of plant.

Approximate Hours

Item	Approximate Hours
CI	3
LI	4
SW	0
SL	1
Total	8

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SOs 1. Understand the role of macro and micro nutrients in plants symptoms caused by deficiency/ excess of these nutrients. SOs 2. Understand the transport of nutrients. SOS3 Understand the uptake of nutrients	1. Tissue test for mineral nutrients, estimation of relative water content (Micro). 2. Tissue test for mineral nutrients, estimation of relative water content (Macro).	Unit-2. Nutrio-physiology 1. Functions and deficiency symptoms of nutrients (micro) 2. Functions and deficiency symptoms of nutrients (macro) 3. Nutrient uptake mechanisms.	Role of nutrients in plant.

SW-2 Suggested Sessional Work (SW):

- a. Assignments:**
- b. Mini Project:**
- c. Other Activities (Specify):**

3: Students will be able to understand the general process of photosynthesis and respiration.

Item	Approximate Hours
CI	3
LI	10
SW	0
SL	1
Total	14

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SOs 1. Understand the process of photosynthesis in higher plants with particular emphasis on light and dark reaction</p> <p>SOS2 Understand C₃, C₄, CAM pathway.</p> <p>SOs 3. Understand the process of respiration in plants with particular emphasis on aerobic and an aerobic respiration, structure mitochondria, ATP synthesis.</p>	<p>1. Separation of photosynthetic pigments through paper chromatography.</p> <p>2. Rate of photosynthesis (effect of different light qualities).</p> <p>3. Rate of photosynthesis (effect of different light qualities).</p> <p>4. Rate of respiration.</p> <p>5. Measurement of photosynthetic CO₂ assimilation by Infra Red Gas Analyser (IRGA).</p>	<p>Unit 3 Photosynthesis, Respiration.</p> <p>1. Light and Dark reactions.</p> <p>2. C₃, C₄ and CAM plants. Respiration: Glycolysis, TCA cycle and electron transport chain.</p> <p>3. Fat Metabolism: Fatty acid synthesis and Breakdown.</p>	<p>Structure of chloroplast.</p>

SW-3 Suggested Sessional Work (SW):

- a. Assignments:.
- b. Mini Project:
- c. Other Activities (Specify):

4: It gives an account of the plant hormone and their role in plant growth and development.

Item	Approximate Hours
CI	3
LI	4
SW	0
SL	1
Total	8

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SOs 1. Understand the plant hormone and their role in plant development. SOs 2. Understand the biosynthesis, of plant hormone SOS3 structure and properties of each plant hormone.	1. Role of plant hormones (Auxin, Cytokinin) 2. Role of plant hormone.	Unit 4. Plant Growth 1. Physiological roles and agricultural uses of auxin, cytokinin. 2. Physiological roles and agricultural uses of ethylene, ABA, gibberellins etc. 3. Physiological roles and agricultural uses of gibberellins etc.	Functions of plant hormones

SW-4 Suggested Sessional Work (SW):

- a. Assignments:
- b. Mini Project:
- c. Other Activities (Specify):

5: It gives an accounts of physiological aspects of growth and development.

Item	Approximate Hours
CI	3
LI	2
SW	0
SL	0
Total	5

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SOs 1. Understand the growth, their different stages, SOS2 Understand S-graph, factors affecting it. SOs 3. Understand the Role of physiological growth parameters in crop productivity.	1. Measurement of growth with help of arch auxanometer.	Unit-5. Growth and Development 1. Physiological aspects of growth and development of major crops 2. Growth analysis 3. Role of Physiological growth parameters in crop productivity.	

SW-5 Suggested Sessional Work (SW):

- a. Assignments:**
- b. Mini Project:**
- c. Other Activities (Specify):**

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (CI)	Sessional Work (SW)	Self Learning (SI)	Total hour (CI+SW+SI)
1: Students will be able to understand the fundamental concept of crop physiology.	3+10(LI)=13	0	2	13+0+2=15
2: Students will be able to understand the structure of plant cell, cell organelles and their function and internal activities of plant.	3+4(LI)=7	0	1	7+0+1=8
3: Students will be able to understand the general process of photosynthesis and respiration.	3+10(LI)=13	0	1	13+0+1=14
4: It gives an account of the plant hormone and their role in plant growth and development.	3+4(LI)=7	0	1	7+0+1=8
5: It gives an account of physiological aspects of growth and development.	3+2(LI)=5	0	0	5+0+0=5

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO 1	1: 21HO222				
CO 2	Students will be able to understand the fundamental concept of crop physiology.				
CO 3	2:21HO222 Students will be able to understand the structure of plant cell, cell organelles and their function and internal activities of plant.				
CO 4	3:21HO222 Students will be able to understand the general process of photosynthesis and respiration.				
CO 5	4:21HO222 It gives an account of the plant hormone and their role in plant growth and development.				

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for ... will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Demonstration
7. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, Whatsapp, Mobile, Online sources)
8. Brainstormin

Suggested Learning Resources:**(a) Books:**

S. No.	Title	Author	Publisher	Edition & Year
1	Plant Physiology.	1. N. K. Gupta & Sunita Gupta	Oxford and IBH publication, New Delhi	2004
2	Plant Physiology.	2. S. N. Pandey and B. K. Sinha	Vikas Publishing House Pvt. Ltd., new Delhi	(1995).
3	Plant Physiology,	J. B. Salisbury and C.W. Ross	Wadswar Publishing Company, Belmont, California	(1992).
4	Plant Physiology.	4. L. Taiz and E. Zieger	4th Ed. Sinauer Associates.	(2006).

Curriculum Development Team:

- 1.
- 2.
- 3.
- 4.

Cos, Pos and PSOs Mapping

Course Code: 21HO222

Course Title: Fundamentals of Crop Physiology

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprises with different scales in area of agricultural production,process and trade	Hold a post on supply in administration and policy	Analyze and control commercial and economical process in the field of agriculture	Teach how to control and manage agricultural production	Introduce general production technologies	Teach how to teach and manage production technology	Preparation of managerial and social responsibility	Student will identify different underutilized crops	Student will practice different breeding techniques used in crop production.	Student will recognize different insect pest and diseases and their symptoms of crops	Student will apply different recent techniques in crop production
1: 21HO222 Students will be able to understand the fundamental concept of crop physiology.	1	2	1	3	1	3	2	2	3	3	2
2:21HO222 Students will be able to understand the structure of plant cell, cell organelles	1	2	3	3	1	2	1	3	3	2	1

and their function and internal activities of plant.											
3:21HO222 Students will be able to understand the general process of photosynthesis and respiration.	1	3	1	2	3	3	1	3	1	3	3
4:21HO222 It gives an account of the plant hormone and their role in plant growth and development.	2	1	2	1	1	3	2	1	3	2	2
5:21HO222 It gives an account of physiological aspects of growth and development	2	2	3	1	2	3	1	3	1	3	2

Legend: 1 – Low, 2 – Medium, 3 – High

Pos & PSOs	Cos No. & Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
PO1,2,3,4,5,6,7 PSO 1,2,3,4	Students will be able to understand the fundamental concept of crop physiology.	SO1.1 SO1.2 SO1.3	Study of plant cells. Structure and distribution of stomata, imbibitions, osmosis Plasmolysis. Measurement of rate of transpiration by farmer potometer. Measurement of rate of transpiration by ganongs potometer.	Introduction to crop physiology and its importance in Agriculture Plant cell: an Overview Diffusion and osmosis; Absorption of water, transpiration and Stomatal Physiology; Mineral nutrition of Plants. 1.1, 1.2, 1.3	Differentiate osmosis and diffusion. Structure of plant cell.
PO1,2,3,4,5,6,7 PSO 1,2,3,4	Students will be able to understand the structure of plant cell, cell organelles and their function and internal activities of plant.	SO2.1 SO2.2 SO2.3	Tissue test for mineral nutrients, estimation of relative water content (Micro). Tissue test for mineral nutrients, estimation of relative water content (Macro).	Functions and deficiency symptoms of nutrients (micro) Functions and deficiency symptoms of nutrients (macro) Nutrient uptake mechanisms. 2.1, 2.2, 2.3	Role of nutrients in plant.
PO1,2,3,4,5,6,7 PSO 1,2,3,4	Students will be able to understand the general process of photosynthesis and respiration.	SO3.1 SO3.2 SO3.3	Separation of photosynthetic pigments through paper chromatography. Rate of photosynthesis (effect of different light qualities). Rate of photosynthesis (effect of different light qualities). Rate of respiration. Measurement of photosynthetic CO ₂ assimilation by Infra Red	Light and Dark reactions. C3, C4 and CAM plants. Respiration: Glycolysis, TCA cycle and electron transport chain. Fat Metabolism: Fatty acid synthesis and Breakdown. 3.1, 3.2, 3.3	Structure of chloroplast.

			Gas Analyser (IRGA).		
PO1,2,3,4,5,6,7 PSO 1,2,3,4	It gives an account of the plant hormone and their role in plant growth and development.	SO4.1 SO4.2 SO4.3 SO4.4	Role of plant hormones (Auxin, Cytokinin) Role of plant hormone.	Physiological roles and agricultural uses of auxin, cytokinin, Physiological roles and agricultural uses of ethylene, ABA, gibberellins etc. Physiological roles and agricultural uses of gibberellins etc. 4.1, 4.2, 4.3	Functions of plant hormones
PO1,2,3,4,5,6,7 PSO 1,2,3,4	It gives an account of physiological aspects of growth and development.	SO 5.1 SO5.2 SO5.3	Measurement of growth with help of arch auxanometer.	Physiological aspects of growth and development of major crops, Growth analysis, Role of Physiological growth parameters in crop productivity. 5.1, 5.2, 5.3	

Course Code: 21PP223

Course Title: Fundamentals of Plant Pathology

Pre- requisite: Student should have basic knowledge of living, non-living and environmental causes of plant diseases.

Rationale: Maximum production to fulfill the requirement of present and future generation and healthy crop production, it is necessary to protect the crops against diseases. Therefore, to know the fundamentals of the course is mandatory.

Course Outcomes:

CO1 Know the history, importance, concepts and cause of (living, non-living and environmental) cause of plant diseases.

CO2 Understand the fungi, bacteria, viruses, nematodes and phanerogamic plant parasites.

CO3 Discuss about Bacteria, Mollicutes and Viruses with their microscopic characters

CO4 Acquaintance with nematodes and phanerogamic plant parasites and loss caused by them.

CO5 Isolation/diagnosis of plant pathogenic microorganisms and methods of their management.

Scheme of Studies:

Code	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			CI	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Program Core (PCC)	21PP223	Fundamentals of Plant Pathology	3	1	1	1	7	4

Legend:

CI: Classroom Instruction (Includes different instructional strategies i.e., Lecture (L) and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning, C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Theory + Practical

Code	Course Code	Course Title	Scheme of Assessment (Marks)						
			Progressive Assessment (PRA)					End Semester Assessment (ESA)	Total Marks (PRA + ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2, 15 marks each (CT)	Seminar one (SA)	Activity any one (CAT)	Class Attendance (AT)		
Program Core (PCC)	21PP223	Fundamentals of Plant Pathology		30	-	-		50	100

Course-Curriculum Detailing: This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

21PP223.1: Know the history, importance, concepts and cause of (living, non-living and environmental) cause of plant diseases.

Approximate Hours

Item	Appx. Hrs
CI	10
LI	6
SW	1
SL	1
Total	18

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
<p>SO1.1 Understand the importance of plant diseases</p> <p>SO1.2 Invention of different diseases</p> <p>SO1.3 Terminology used in plant pathology</p> <p>SO1.4 Type of causes of diseases</p>	<ul style="list-style-type: none"> • Acquaintance with various laboratory equipment and microscopy. • Preparation of media, isolation and Koch's postulates. 	<p>Unit-1 Introduction: Importance of plant diseases, scope and objectives of Plant Pathology. History of Plant Pathology with special reference to Indian work. Terms and concepts in Plant Pathology. Pathogenesis. Cause and classification of plant diseases. Important plant pathogenic organisms, different groups: fungi, bacteria, fastidious vesicular bacteria, phytoplasmas, spiroplasma, viruses, viroids, algae, protozoa, phanerogamic parasites and nematodes with examples of diseases caused by them. Diseases and symptoms due to abiotic causes.</p> <p>1.1 Importance of plant diseases. 1.2 scope and objectives of Plant Pathology 1.3 History of Plant Pathology with special reference to world work 1.4 History of Plant Pathology with special reference to Indian work 1.5 Terms and concepts in Plant Pathology 1.6 Pathogenesis 1.7 Cause and classification of plant diseases 1.8 Important plant pathogenic organisms, different groups: fungi, bacteria, fastidious vesicular bacteria, phytoplasmas, spiroplasma, with examples of diseases caused by them 1.9 Important plant pathogenic organisms, different groups: viruses, viroids, algae, protozoa, phanerogamic parasites and nematodes with examples of diseases caused by them 1.10 Diseases and symptoms due to abiotic causes</p>	<p>1. Diseases caused by biotic and abiotic causes</p>

SW-1 Suggested Sessional Work (SW):

a. Assignments:

- i) World history of Plant Pathology, Plant disease epiphytotics, objectives of plant pathology

21PP223.2: Understand the fungi, bacteria, viruses, nematodes and phanerogamic plant parasites.

Approximate Hours

Item	Appx Hrs
CI	08
LI	6
SW	1
SL	1
Total	16

Session outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
<p>SO2.1 Understand the fungal cell & its organelles</p> <p>SO2.2 Define the terms used in fungal study</p> <p>SO2.3 Illustrate fungal characters in diagnosis of fungi</p>	<ul style="list-style-type: none"> • General study of different structures of fungi. • Study of symptoms of various plant diseases. • Study of representative fungal genera. 	<p>Unit-2 Fungi: general characters, definition of fungus, somatic structures, types of fungal thalli, fungal tissues, modifications of thallus, reproduction (asexual and sexual). Nomenclature, Binomial system of nomenclature, rules of nomenclature, classification of fungi. Key to divisions, sub-divisions, orders and classes.</p> <p>2.1 General characters of fungi; definition and somatic structure</p> <p>2.2 General characters of fungi; types of fungal thalli, fungal tissues</p> <p>2.3 Modifications of fungal thallus</p> <p>2.4 Reproduction; Asexual</p> <p>2.5 Reproduction; Sexual</p> <p>2.6 Nomenclature, Binomial system of nomenclature, rules of nomenclature</p> <p>2.7 Classification of fungi.</p> <p>2.8 Key to divisions, sub-divisions, orders and classes</p>	<p>1 Microscopic diagram of fungal cell</p>

SW-2 Suggested Sessional Work (SW):

a) Assignments:

- i) Key to divisions, sub-divisions, orders of fungi

21PP223.3: Discuss about Bacteria, Mollicutes and Viruses with their microscopic characters

Approximate Hours

Item	Appx. Hrs
CI	09
LI	6
SW	1
SL	1
Total	17

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
<p>SO3.1 Differentiate the fungal and bacterial cell</p> <p>SO3.2 Review the mollicutes and their morphology</p> <p>SO3.3 Corelate viruses with living and non-living</p> <p>SO3.4 Identify the transmission of viruses</p>	<ul style="list-style-type: none"> Staining and identification of plant pathogenic bacteria. Transmission of plant viruses. 	<p>Unit-3 Bacteria and mollicutes: general morphological characters. Basic methods of classification and reproduction. Viruses: nature, architecture, multiplication and transmission</p> <p>3.1 General morphological of bacteria</p> <p>3.2 Characters of bacteria</p> <p>3.3 Basic methods of classification of bacteria; On the basis of aggregation and staining</p> <p>3.4 Basic methods of classification of bacteria; On the basis of pathogenic ability</p> <p>3.5 Reproduction of bacteria; Asexual reproduction</p> <p>3.6 Sexual reproduction of bacteria</p> <p>3.7 Nature, architecture of virus</p> <p>3.8 Multiplication of Viruses</p> <p>3.9 Transmission</p>	<p>1 Microscopic diagram of bacterial cell</p>

SW-3 Suggested Sessional Work (SW):

b. Assignments:

- i) Architecture of virus

21PP223.4: Acquaintance with nematodes and phanerogamic plant parasites and losses caused by them

Approximate Hours

Item	Appx Hrs
CI	09
LI	6
SW	1
SL	1
Total	17

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
<p>SO4.1 Identify different phanerogamic plant parasites.</p> <p>SO4.2 Demonstrate the morphology of different nematodes</p> <p>SO4.3 Evaluate the damage caused by nematodes</p>	<ul style="list-style-type: none"> Study of phanerogamic plant parasites. Study of morphological features and identification of plant parasitic nematodes. Extraction of nematodes from soil. 	<p>Unit-4 Study of phanerogamic plant parasites. Nematodes: General morphology and reproduction, classification, symptoms and nature of damage caused by plant nematodes (<i>Heterodera</i>, <i>Meloidogyne</i>, <i>Anguina</i> etc).</p> <p>4.1 Study of phanerogamic plant parasites</p> <p>4.2 General morphology of nematode; anterior</p> <p>4.3 General morphology of nematode; posterior</p> <p>4.4 Male reproductive system of nematodes</p> <p>4.5 Female reproductive system of nematodes</p> <p>4.6 Classification of nematodes</p> <p>4.7 Symptoms caused by nematodes</p> <p>4.8 Nature of damage caused by <i>Heterodera</i>, <i>Meloidogyne</i></p> <p>4.9 Nature of damage caused by <i>Anguina</i> etc</p>	<p>1 Different structures of nematodes</p>

SW-4 Suggested Sessional Work (SW):

c. Assignments:

- i) Phanerogamic plants and their classification with their hosts

21PP223.5: Isolation/diagnosis of plant pathogenic microorganisms and methods of their management.

Approximate Hours

Item	Appx Hrs
CI	09
LI	6
SW	1
SL	1
Total	17

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
<p>SO5.1 Recognize the principles of disease management</p> <p>SO5.2 Demonstrate the methods of plant disease management</p> <p>SO5.3 Identify different fungicides and antibiotics and their active ingredients</p>	<ul style="list-style-type: none"> • Study of fungicides and their formulations. • Methods of pesticide application and their safe use. • Calculation of fungicide sprays concentrations. 	<p>Unit-5 Principles and methods of plant disease management. Nature, chemical combination, classification, mode of action and formulations of fungicides and antibiotics.</p> <p>5.1 Principles and methods of plant disease management</p> <p>5.2 Cultural methods of plant disease management</p> <p>5.3 Biological methods of plant disease management</p> <p>5.4 Physical methods methods of plant disease management</p> <p>5.5 Host resistance and quarantine</p> <p>5.6 Nature and chemical combination of fungicides</p> <p>5.7 Classification of fungicides</p> <p>5.8 Mode of action and formulations of fungicides</p> <p>5.9 Antibiotics.</p>	<p>1 Types of fungicides and their chemical composition</p>

SW-5 Suggested Sessional Work (SW):

d. Assignments:

- i) Classification of fungicides and antibiotics, principles of plant disease management

Brief of Hours suggested for the Course Outcome

ii)

Course Outcomes	Class Lecture (C)	Lab instruction (LI)	Sessional Work (SW)	Self Learning (Sl)	Total hour (Cl+SW+Sl)
21PP223.1: Know the history, importance, concepts and cause of (living, non-living and environmental) cause of plant diseases.	10	6	1	2	19
21PP223.2: Understand the fungi, bacteria, viruses, nematodes and phanerogamic plant parasites.	8	6	1	2	17
21PP223.3: Minimize the losses caused by different pathogens through different management practices	9	6	1	2	18
21PP223.4: Acquaintance with nematodes and phanerogamic plant parasites and losses caused by them	9	6	1	2	18
21PP223.5: Isolation/diagnosis of plant pathogenic microorganisms and methods of their management	9	6	1	2	18
Total Hours	45	30	05	10	90

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

C O	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Introduction	03	02	01	10
CO-2	Fungi: general characters, Nomenclature & classification	02	06	02	10
CO-3	Bacteria, mollicutes and Viruses	03	07	05	10
CO-4	Phanerogamic plant parasites & Nematodes		10	05	10
CO-5	Principles and methods of plant disease management classification of fungicides	03	02		10
Total		11	26	13	50

Legend:

R: Remember,

U: Understand,

A: Apply

The end of semester assessment for Fundamentals of Plant Pathology will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Case study
3. Group Discussion
4. Role Play
5. Demonstration
6. Brainstorming

Suggested Learning Resources:**(a) Books:**

S. No.	Title	Author	Publisher	Edition & Year
1	Plant Pathology	Agrios GN.	Academic Press, New York. (Indian Ed.)	2005 5th Ed.
2	Plant Pathology	Mehrotra R S and Aggarwal A.	Tata McGraw-Hill Publishing Co Ltd. ND.	2012. 12th ed.
3	Introductory Mycology	Alexopoulos CJ, Mims CW and Blackwell M	John Wiley & Sons, New York.	2000. 5th Ed.
4	Mathew's Plant Virology.	Hull R.	Academic Press, New York.	2002. 4th Ed.
5	Fundamentals of Plant Bacteriology.	Jayaraman J and Verma JP.	Kalyani Publishers, Ludhiana.	2002.
6.	Text Book on Introductory Plant Nematology.	Walia RK and Bajaj HK	ICAR, New Delhi.	2003.
7.	Principles of Plant Pathology (Hindi)	B. P. Singh		

Curriculum Development Team

1. Associate Professor & Head, Dr. Doomar Singh, Department of Plant Pathology, AKS University

Cos, POs and PSOs Mapping

Course Title: Fundamentals of Plant Pathology

Course Code: 21PP223

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprises with different scales in area of agricultural production, process and trade	Hold a post on supply in administration and policy	Analyze and control commercial and economical process in the field of agriculture	Teach how to control and manage agricultural production	Introduce general production technologies	Teach how to teach and manage production technology	Preparation of managerial and social responsibility	Student will identify different underutilized crops	Student will practice different breeding techniques used in crop production.	Student will recognize different insect pest and diseases and their symptoms of crops	Student will apply different recent techniques in crop production
1.Know the history, importance, concepts and cause of (living, non-living and environmental) cause of plant diseases.	1	2	1	3	1	3	2	2	3	1	2
2.Understand the fungi, bacteria, viruses,	1	2	0	3	1	2	1	3	1	2	1

nematodes and phanerogamic plant parasites.											
3.Minimize the losses caused by different pathogens through different management practices	1	3	2	2	3	3	1	3	1	2	3
4.Acquaintance with nematodes and phanerogamic plant parasites and losses caused by them	1	1	2	1	1	3	2	1	3	2	1
5.Isolation/diagnosis of plant pathogenic microorganisms and methods of their management	1	2	3	1	3	3	1	2	1	3	1

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map: Fundamentals of Plant Pathology

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self- Learning (SL)
POs 1,2,3,4,5,6,7 PSOs 1,2,3,4	1: Know the history, importance, concepts and cause of (living, non-living and environmental) cause of plant diseases.	SO 1.1 SO 1.2 SO 1.3 SO 1.4	<ul style="list-style-type: none"> • Acquaintance with various laboratory equipment and microscopy. • Preparation of media, isolation and Koch's postulates 	<p>Unit-1 Introduction: Importance of plant diseases, scope and objectives of Plant Pathology. History of Plant Pathology with special reference to Indian work. Terms and concepts in Plant Pathology. Pathogenesis. Cause and classification of plant diseases. Important plant pathogenic organisms, different groups: fungi, bacteria, fastidious vesicular bacteria, phytoplasmas, spiroplasma, viruses, viroids, algae, protozoa, phanerogamic parasites and nematodes with examples of diseases caused by them. Diseases and symptoms due to abiotic causes.</p> <p>1.1,1.2,1.3,1.4,1.5,1.6, 1.7,1.8,1.9,1.10</p>	2. Diseases caused by biotic and abiotic causes
POs 1,2,3,4,5,6,7 PSOs 1,2,3,4	2: Understand the fungi, bacteria, viruses, nematodes and phanerogamic plant parasites.	SO 2.1 SO 2.2 SO 2.3	<ul style="list-style-type: none"> • General study of different structures of fungi. • Study of symptoms of various plant diseases. • Study of representative fungal genera. 	<p>Fungi: general characters, definition of fungus, somatic structures, types of fungal thalli, fungal tissues, modifications of thallus, reproduction (asexual and sexual). Nomenclature, Binomial system of nomenclature, rules of nomenclature, classification of fungi. Key to divisions, subdivisions, orders and classes.</p> <p>2.1,2.2,2.3,2.4,2.5,2.6,2.7,2.8</p>	1. Microscopic diagram of fungal cell

POs 1,2,3,4,5,6,7 PSOs 1,2,3,4	3: Minimize the losses caused by different pathogens through different management practices	SO 3.1 SO 3.2 SO 3.3 SO 3.4	<ul style="list-style-type: none"> • Staining and identification of plant pathogenic bacteria. • Transmission of plant viruses. 	Bacteria and mollicutes: general morphological characters. Basic methods of classification and reproduction. Viruses: nature, architecture, multiplication and transmission. 3.1,3.2,3.3,3.4,3.5,3.6,3.7	2 Microscopic diagram of bacterial cell
POs 1,2,3,4,5,6,7 PSOs 1,2,3,4	4: Acquaintance with nematodes and phanerogamic plant parasites and losses caused by them	SO 4.1 SO 4.2 SO 4.3	<ul style="list-style-type: none"> • Study of phanerogamic plant parasites. • Study of morphological features and identification of plant parasitic nematodes. • Extraction of nematodes from soil. 	Study of phanerogamic plant parasites. Nematodes: General morphology and reproduction, classification, symptoms and nature of damage caused by plant nematodes (<i>Heterodera, Meloidogyne, Anguina</i> etc). 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9	2 Different structures of nematodes
POs 1,2,3,4,5,6,7 PSOs 1,2,3,4	5: Isolation/ diagnosis of plant pathogenic microorganisms and methods of their management	SO 5.1 SO 5.2 SO 5.3	<ul style="list-style-type: none"> • Study of fungicides and their formulations. • Methods of pesticide application and their safe use. • Calculation of fungicide sprays concentrations. 	Principles and methods of plant disease management. Nature, chemical combination, classification, mode of action and formulations of fungicides and antibiotics. 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9	2 Types of fungicides and their chemical composition

Course Code: 21SD225

Course Title : Communication Skills and personality Development

Pre-requisite: This course aims at the promotion of the strategies for the personality development of the students. It also aims to build the communicative competence and confidence of the students.

Rationale: Rational Personality development is an indispensable tool that helps an individual to flourish personal and professional skills. An extraordinary personality is sophisticated, well dressed and groomed, exuding confidence in speech and interpersonal skills..

Course Outcomes:

Course outcomes

21SD225 1. Analyze basic communication skills.

21SD225 2. Students will know about intercultural communication skills.

21SD225 3. Interpersonal communication skills that will improve knowledge and personality.

21SD225 4. Students will analyze public speaking communication skills.

Scheme of Studies:

Code	Course Code	Course Title	Scheme of studies(Hours/Week)				Total Study Hours (CI+LI+SW+SL)	Total Credits(C)
			CI	LI	SW	SL		
Program Core (PCC)	Program Core (PCC)	Program Core (PCC)	1	0	1	1	3	2

Legend:

CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

**Scheme of Assessment:
Theory**

Code	Course Code	Course Title	Scheme of Assessment (Marks)							End Semester Assessment	Total Marks
			Progressive Assessment (PRA)						Total Marks		
			Class/ Home Assignment number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	(CA+CT+SA+CAT+AT)			
Program Core (PCC)	21SD 225	Communication Skills and personality Development	15	30	0	0	5	50	50	100	

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

21SD225. 1.Students will understand about communication skills.

Item	Approx Hrs.
CI	3
LI	4
SW	1
SL	1
Total	09

Session Outcomes(SOs)	Laboratory Instruction(LI)	Class room Instruction(CI)	Self Learning(SL)
SO.1. Students will be able to learn about structural and functional grammar; SO.2 Meaning and process of communication, SO.3. Verbal and Non Verbal communication.	1.1Process of listening. 1.2Note taking.	UNIT1.0 Communication Skills: 1.1 Structural and functional grammar; 1.2 Meaning and Process of Communication, Verbal and Non-Verbal Communication, 1.3 Objective of Communication, Listening and note taking, Process of listening.	Take part in TV/Radio talk and build communication skill

SW-1 Suggested Sessional Work (SW):

- a. Assignments: Write a particular script of agriculture for speech.
- b. Mini Project:

Other activities (specify) : Students will take part in agriculture events to know about perfect speech as verbal communication.

21SD225. 2. Structural and Functional Grammar

Approximate Hours

Item	Approx Hrs.
CI	4
LI	12
SW	1
SL	1
Total	18

Session Outcomes(SOs)	Laboratory Instruction(LI)	Class room Instruction(CI)	Self Learning(SL)
SO.1. Students will be able to listen effectively. SO.2. note taking, writing skills, SO.3. oral presentation skills; field diary and lab record; indexing, footnote and bibliographic procedures.	2.1 Writing skill introduction. 2.2 Oral presentation skills. 2.3 Field diary and Lab record. 2.4 Indexing 2.5 Footnote 2.6 Bibliographic Procedure.	UNIT2.0 Writing skills 2.1 Oral presentation Skills, field diary and lab record,. 2.2 indexing, footnote and Bibliographic procedure, 2.3 Barriers to communication, How to overcome barriers to Communication. 2.4 Indian writing in English: R K Narayan An Astrologers Day Mahesh Dattani Tara	Practice to write verb and discuss about sentence writing.

SW-1 Suggested Sessional Work (SW):

c. Assignments: Write at least 100 verbs and submit.

d. Mini Project: make a note on any assigned topic as note-making

Other activities (specify)

21SD225.3. Writing Skills, Communication Skills and personality Development

Approximate Hours

Item	Approx Hrs.
CI	4
LI	8
SW	1
SL	1
Total	14

Session Outcomes(SOs)	Laboratory Instruction(LI)	Class room Instruction(CI)	Self Learning(SL)
SO.1 Students will also be able to understand reading and comprehension of general and technical articles, SO.2 Students will be able to Precise the given passage SO.3 Students will be able to summarize passage SO.4 Abstracting.	3.1 Reading and comprehension of general articles. 3.2 Reading and comprehension of technical articles. 3.3 Precise writing, 3.4 summarizing, and abstracting.	UNIT 3.0 - Reading and Comprehension of general and technical articles, 3.1 precise writing, 3.2 Summarizing, abstracting, 3.3 Conjunction and its types 3.4 Coordinating and Subordinating	With the help of concern faculty look and learn about writing and mentioned record to build the skill.

SW
-1

Suggested Sessional Work (SW):

- e. **Assignments:** Collect the different short of letter and write it on own form.
- f. **Mini Project:** make 5 indexes on subjects and letters of orders.

Other activities (specify): 1.0 Read different type Letter Writing format in library

21SD225. 4 To know about importance of Presentation Skills. Communication Skills and personality Development.

Approximate Hours

Item	Approx Hrs.
CI	2
LI	6
SW	1
SL	1
Total	10

Session Outcomes(SOs)	Laboratory Instruction(LI)	Class room Instruction(CI)	Self Learning(SL)
SO.1 Students will be able to analyze interpersonal communication skills public speaking communication skills. SO.2 Students will be able to write letters and applications effectively	4.1 , individual presentation 4.2 group presentation 4.3 Practice on Letter writing	UNIT 4.0 Individual and group presentations, 4.1 impromptu presentation, Public speaking. 4.2 Letter writing: Enquiry, Order, Complaint and Tender Notice.	Practice of presentation to build the confidence.

SW-1 Suggested Sessional Work (SW):

g. Assignments: Prepare presentation for new agriculture extension approach.

h. Mini Project: find the solution of rigid topic of agriculture via group discussion and make a report on it.

Other activities (specify):1.0 Practice in Oral Presentation Skills.

21AG431B.5 Indian Writing in English Communication Skills and personality Development

Approximate Hours

Item	Approx Hrs.
CI	2
LI	0
SW	1
SL	1
Total	4

Session Outcomes(SOs)	Laboratory Instruction(LI)	Class room Instruction(CI)	Self Learning(SL)
<p>SO.1 . Students will be able to analyze interpersonal communication skills and public speaking communication skills.</p> <p>SO.2 Differentiate GD and debate.</p>		<p>UNIT 5.0 Group discussion, Do's and Don'ts of GD.</p> <p>5.1 Debate, Organizing seminars and conferences, speech, advertising.</p>	<p>Read about R.K. Narayan and Mahesh Dattani.</p>

SW-1 Suggested Sessional Work (SW):

- i. Assignments: Write a single chapters of concern author to learn their writing skill.
- j. Mini Project:
 - Other activities (specify):** Write short writing on any agriculture topic by own way.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lectue (CI)	Labora tory Instruc tion (LI)	Sessiona l Work(S W)	Self Learnin g (SI)	Total hour (CI+SW +SI +LI)
CO-1: Analyze basic communication skills.	3	4	1	1	09
CO-2: Students will know about intercultural communication skills.	4	12	1	1	18
CO-3: Interpersonal communication skills that will improve knowledge and personality.	4	8	1	1	14
CO-4: Students will analyze public speaking communication skills.	2	6	1	1	10
CO-5: To train the students and make them comprehend various aspects of Interview skills.	2	0	1	1	04
Total Hours	15	30	05	05	55

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Communication Skills	04	03	03	10
CO-2	Writing skills	03	04	03	10
CO-3	Reading and Comprehension of general and technical articles,	04	03	03	10
CO-4	Individual and group presentations,	03	02	05	10
CO-5	Group discussion, Do's and Don'ts of GD.	03	04	03	10
Total		17	16	17	50

Legend: R: Remember, U: Understand, A: Apply

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks.

Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Group Discussion
4. ICT Based Teaching Learning (Video /,Blog, Facebook, Twitter, Whatsapp, Mobile, Online sources)
5. Brainstorming

Cos, POs and PSOs Mapping

Course Title: Communication Skills and personality Development

Course Code: 21SD225

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprises with different scales in area of agricultural production process	Hold a post on supply in administration and	Analyze and control commercial and economical process in the field of agricultural production	Teach how to control and manage agricultural production	Introduce general production technologies	Teach how to teach and manage production technology	Preparation of managerial and social responsibility	Student will identify different underutilized crops	Student will practice different breeding techniques used in crop production.	Student will recognize different insect pest and diseases and their symptoms of crops	Student will apply different recent techniques in crop production
21SD225 1. Analyze basic communication skills.	1	2	1	3	1	3	2	2	3	1	2
21SD225 2. Students will know about intercultural communication skills.	1	2	0	3	1	2	1	3	1	2	1
21SD225 3.	1	3	2	2	3	3	1	3	1	2	3

Interpersonal communication skills that will improve knowledge and personality.											
21SD225 4. Students will analyze public speaking communication skills.	1	1	2	1	1	3	2	1	3	2	1
21SD225 1. Analyze basic communication skills.	1	2	3	1	3	3	1	2	1	3	1

Course Curriculum Map: Communication Skills and Personality Development

Pos & PSOs	Cos No. & Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
PO1,2,3,4,5,6,7 PSO 1,2,3,4	CO1 Students will understand about communication skills.	SO 1.1 SO 1.2 SO 1.3	1 Process of listening. 2 Note taking.	Structural and functional grammar; Meaning and Process of Communication, Verbal and Non-Verbal Communication, Objective of Communication, Listening and note taking, Process of listening	Take part in TV/Radio talk and build communication skill
PO1,2,3,4,5,6,7 PSO 1,2,3,4	CO2 Students will be able to Structure sentences and Functional Grammar will be improved	SO 1.1 SO 1.2 SO 1.3	1. Writing skill introduction. 2. Oral presentation skills. 3. Field dairy and Lab record. 4. Indexing 5. Footnote 6. Bibliographic Procedure.	Oral presentation Skills, field diary and lab record,. indexing, footnote and Bibliographic procedure, Barriers to communication, How to overcome barriers to Communication. Indian writing in English: R K Narayan An Astrologers Day Mahesh Dattani Tara	Practice to write verb and discuss about sentence writing.
PO1,2,3,4,5,6,7 PSO 1,2,3,4	CO3 Students will be able to Write effectively, improved Communication Skills and enhanced personality Development	SO 1.1 SO 1.2 SO 1.3 SO 1.4	1. Reading and comprehension of general articles. 2. Reading and comprehension of technical articles. 3. Precise writing, 4. Summarizing, and abstracting.	Reading and Comprehension of general and technical articles, precise writing, Summarizing, abstracting, Conjunction and its types, Coordinating and Subordinating	With the help of concern faculty look and learn about writing and mentioned record to build the skill.
PO1,2,3,4,5,6,7 PSO 1,2,3,4	CO4 Students will know the	SO 1.1 SO 1.2	1. , individual presentation	Impromptu presentation, Public speaking. Letter writing: Enquiry,	Practice of presentation to

	importance of Presentation Skills, Communication Skills and personality Development.		2. group presentation 3. Practice on Letter writing	Order, Complaint and Tender Notice.	build the confidence.
PO1,2,3,4,5,6,7 PSO 1,2,3,4	CO5 Indian Writing in English Communication Skills and personality Development	SO 1.1 SO 1.2		Group discussion, Do's and Don'ts of GD, Debate, Organizing seminars and conferences, speech, advertising.	Read about R.K. Narayan and Mahesh Dattani.

Course Code: 21 EV227

Course Title Environmental Studies & Disaster management

Pre-requisite: Students should have the basic knowledge of Biology, Chemistry and Sociology.

Rationale: Honable supreme court of India has issue the direction that Environmental studies should be part of curriculum in each discipline at U G level. Environment is concern of every one. The pollutants source may be local but its impact is far reaching, Every one should be made aware regarding conservation of natural resources, their wise use and using appropriate technology for achieving sustainable development goal. Study should also address the society need and mitigating them. Impact of climate change should also be addressed. Sources of disaster and their prompt management is also essential to save the life and property. This course will be helpful in developing the understanding of environmental issues and measures to combat them.

Course Outcomes:

CO1. Student will have ability to apply the gained knowledge about the basic concept of environmental science, different types of natural resources, their utilization and impact on environment, causes of degradation and depletion and methods of their conservation.

CO2. Student will have ability to apply the knowledge of structural and functional components of different types of ecosystems and ecological succession. different levels of biodiversity, values, hotspots, threats of biodiversity and their measures of conservation.

CO3. Student will have ability to apply the knowledge of different types of pollution, their sources, impact on environment and basics of their control measures. different sources of solid wastes and their management specifically to urban areas.

CO4. Student will have ability to learn about the basic concept of sustainable development, different methods of water conservation. He will also learn about the different acts related to environmental conservation and different social issues.

CO5 Student will have ability to learn different types of disasters, their sources, impacts and also will apply the gained knowledge in disaster management with coordination to government bodies and NGOs.

Scheme of Studies:

Code	Course Code	Course Title	Scheme of studies(Hours/Week)				Total Study Hours CI+LI+SW+SL	Total Credits (C)
			CI	LI	SW	SL		
Program Core (PCC)	21EV227	Environmental Studies & Disaster management	2	1	2	2	2 +2=4 +4=8	2+1

Legend:

CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Code	Course Code	Course Title	Scheme of Assessment (Marks)							
	21E V22 7	Environmental Studies & Disaster management	Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ESA)
			Class/Home Assignment 5 number each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
Program Core (PCC)			15	30	-	-	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

CO-1 Student will have ability to apply the gained knowledge about the basic concept of environmental science, different types of natural resources, their utilization and impact on environment, causes of degradation and depletion and methods of their conservation.

Approximate Hours

Item	Approximate Hours
CI	6
LI	6
SW	4
SL	4
Total	20

Session Outcomes (SOs)	Laboratory Instruction (LI) 2 hr	Class room Instruction (CI)	Self Learning (SL)
<p>CO-1. Student will have ability to apply the gained knowledge about the basic concept of</p> <p>1-1 Multidisciplinary nature of Environmental science,</p> <p>1.2 Different types of natural resources, Forest resource their utilization depletion and methods of their conservation.</p> <p>1.3 Water-resource type, uses, methods of their conservation.</p> <p>1.4 Food resource- food problem, modern Ag practices and its impact,</p> <p>1.5 Land resources , causes of degradation, utilization practices</p> <p>1.6 Energy resources - type, regeneration methods, conservation practices</p>	<ul style="list-style-type: none"> • 1- Visit to local polluted sites and collection of water/soil sample. • 2 Determination of total dissolved solids (TDS) • Determination of total dissolved solid (TS) in effluents/water 	<p>Unit-1.1 --Natural Resources</p> <p>Multidisciplinary nature of environmental science,</p> <p>1.2 Natural resources Definition, Type Forest resource</p> <p>1.3 Water resource, Mineral resource</p> <p>1.4 Food, resource</p> <p>1.5 Land resource</p> <p>1.6 Energy resources</p>	<p>1. Forest resource impact and role,</p> <p>2. Problem of excessive water uses,</p> <p>3. Impact of modern Ag practices.</p> <p>4. Concept of Green energy</p>

SW-1 Suggested Sessional Work (SW):

- a. **Assignments:**
 1. Write the contribution of eminent environmentalist in Environmental conservation
 2. Problems related to big dams
- b. **Mini Project:** Nil
- c. **Other Activities (Specify):** Nil

CO 2: Student will have ability to apply the knowledge of structural and functional components of different types of ecosystems and ecological succession. different levels of biodiversity, values, hotspots, threats of biodiversity and their measures of conservation.

Approximate Hours

Item	Approximate Hours
CI	6
LI	6
SW	4
SL	4
Total	20

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<ul style="list-style-type: none"> • Student will have ability to apply the knowledge of • 2.1 Different type of Ecosystem and structure 2.2 Functions of different types of ecosystems • 2.3 Ecological succession.in pond 2.4 Different levels of biodiversity, hotspots 2.5 Values, , threats of biodiversity 2.6 Measures of conservation 	1.Determination of dissolved oxygen (DO) in given water sample. 2.Identification of plant species in university campus-I 3.Identification of plant species in university campus-II	Unit-2. 2.1 Ecosystem- Definition,Types& components, 2.2 Food chain, food web, energy flow 2.3 Ecological succession .2.4 Biodiversity-Definition, types, Biodiversity Hotspots ,2.5 Values, threats 2.6 Conservation of biodiversity.	1.1.Biodiversity heritage in MP 2. Important medicinal plants 3.Red data book

SW-2 Suggested Sessional Work (SW):

a.Assignments: 1.Prepare a mind map on structure and function of ecosystem.

2.Prepare a map of Biodiversity Hotspots in India.

b.Mini Project: Nil

Other Activities (Specify): Nil

Co-3: Student will have ability to apply the knowledge of different types of pollution, their sources, impact on environment and basics of their control measures. different sources of solid wastes and their management specifically to urban areas.

Item	Approximate Hours
CI	6
LI	6
SW	4
SL	4
Total	20

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<ul style="list-style-type: none"> Student will have ability to apply the knowledge of different types of 1. Air, pollution, their sources, impact and control measures. 2. water pollution, their sources, impact and control measures. 3. soil noise & thermal pollution, their sources, impact and control measures. 4. waste management-concep, types, sources 5. municipal solid waste management. 6. MSWM strategies in practice. 	<ul style="list-style-type: none"> Determination of hardness in given water sample. Determination of alkalinity in given water sample. Determination of acidity in given water sample. 	Unit:3- Environmental Pollution. 3.1 Air, Pollution. 3.2 water, Pollution. 3.3 soil, noise & thermal pollution. 3.4 Solid waste management- definition, types, sources. 3.5 municipal solid waste management. 3.6 MSWM strategies.	Study of impact of Air pollution due to industrial discharge. Recycling of water after treatment

SW-3 Suggested Sessional Work (SW):

Assignments: Observation of nearby polluted site and river and make a note

Study about different sources of Municipal solid waste and its management.

a. Mini Project: Nil

b. Other Activities (Specify): Nil

CO-4 Student will have ability to learn about the basic concept of sustainable development, different methods of water conservation. He will also learn about the different acts related to environmental conservation and different social issues.

Item	Approximate Hours
CI	6
LI	6
SW	4
SL	4
Total	20

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>Student will have ability to learn about the</p> <ol style="list-style-type: none"> 1. Basic concept of sustainable development, 2. Different methods of water conservation. 3. He will also learn about the different acts related to environmental conservation 4. different social issues.like population structure, 5. Basic knowledge of HIV\AIDS and programe related to women and child welfare, 	<ol style="list-style-type: none"> 1. Collection of soil sample 2.Determination of soil moisture content in given soil sample. 3.Determination of carbonate content in given soil sample 	<p>Unit:4- 4.1 Sustainable development (SD) Concept & issues of SD</p> <p>4.2 Urban problem related to energy,</p> <p>4.3 water conservation, rain water harvesting watershed management,</p> <p>4.4 Environment Protection acts,</p> <p>4.5 Human population & Family Welfare Programme,</p> <p>4.6 HIV/AIDS, Women & Child welfare.</p>	<p>National sustainable development goal</p> <p>Water shed management practices</p>

SW-4 Suggested Sessional Work (SW):

a. Assignments: Write the concept of sustainable development

Write the population dynamics in India.

b. Mini Project: Nil

c. Other Activities (Specify): Nil

CO-5: Student will have ability to learn different types of disasters, their sources, impacts and also will apply the gained knowledge in disaster management with coordination to government bodies and NGOs.

Item	Approximate Hours
CI	6
LI	6
SW	4
SL	4
Total	20

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>Student will have ability to learn</p> <ol style="list-style-type: none"> 1. Types of disaster .2 Floods, cyclone disasters, their sources, impact 3. Earthquakes, drought etc disasters, their sources, impact 4. Understanding the Physical sources of disaster 5. Disaster management with coordination to government bodies 6. NGOs and Armed forces in NDMA 	<ol style="list-style-type: none"> 1. Determination of nitrate content in given soil sample. 2. Study of rain water harvesting system and its importance-I 3. Study of rain water harvesting system and its importance-II 	<p>Unit:5 5.1 Disaster Management Definition, types of disaster,</p> <p>5.2 Floods, cyclone 5.3 Earthquakes, drought etc. 5.4 Forest fires, oil fires, pollutions. Rail, air & sea accidents. 5.5 Disaster Management-international Strategy, National Disaster Management Frame work, 5.6 Role of NGOs, Armed forces in Disaster response.</p>	<ol style="list-style-type: none"> 1.: Study of national disaster management act 2005 2. Study of Role of local NGO in disaster responce

SW-5 Suggested Sessional Work (SW):

a. Assignments: Prepare a flow chart related to type of disaster.

Prepare a flow chart of disaster management

b. Mini Project: Nil

c. Other Activities (Specify): Nil

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (CI)	LI	Sessional Work (SW)	Self Learning (SI)	Total hour (CI+SW+SI)
CO1. Student will have ability to apply the gained knowledge about the basic concept of environmental science, different types of natural resources, their utilization and impact on environment, causes of degradation and depletion and methods of their conservation.	6	6	4	4	20
CO2. Student will have ability to apply the knowledge of structural and functional components of different types of ecosystems and ecological succession. different levels of biodiversity, values, hotspots, threats of biodiversity and their measures of conservation.	6	6	4	4	20
CO3. Student will have ability to apply the knowledge of different types of pollution, their sources, impact on environment and basics of their control measures. different sources of solid wastes and their management specifically to urban areas.	6	6	4	4	20
CO4. Student will have ability to learn about the basic concept of sustainable development, different methods of water conservation. He will also learn about the different acts related to environmental conservation and different social issues.	6	6	4	4	20
CO5 Student will have ability to learn different types of disasters, their sources, impacts and also will apply the gained knowledge in disaster management with coordination to government bodies and NGOs.	6	6	4	4	20
Total	30	30	20	20	100

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO 1	Unit-1.1 --Natural Resources Multidisciplinary nature of environmental science, 1.2 Natural resources Definition, Type Forest resource 1.3 Water resource, Mineral resource 1.4 Food, resource 1.5 Land resource 1.6 Energy resources	5	3	2	10
CO 2	Unit-2. 2.1 Ecosystem- Definition, Types & components, 2.2 Food chain, food web, energy flow 2.3Ecological succession .2.4 Biodiversity-Definition, types, Biodiversity Hotspots ,2.5 Values, threats 2.6 Conservation of biodiversity.	5	4	1	10
CO 3	Unit:3- Environmental Pollution. 3.1 Air, Pollution. 3.2 water, Pollution. 3.3 soil, noise & thermal pollution. 3.4 Solid waste management- definition, types, sources. 3.5 municipal solid waste management. 3.6 MSWM strategies.	4	3	3	10
CO 4	Unit:4- 4.1 Sustainable development (SD) Concept & issues of SD 4.2 Urban problem related to energy, 4.3 water conservation, rain water harvesting watershed management, 4.4 Environment Protection acts, 4.5 Human population & Family Welfare Programme, 4.6 HIV/AIDS, Women & Child welfare.	4	4	2	10
CO 5	Unit:5 5.1 Disaster Management Definition, types of disaster, 5.2 Floods, cyclone 5.3 Earthquakes, drought etc. 5.4 Forest fires, oil fires, pollutions. Rail, air & sea accidents. 5.5 Disaster Management- international Strategy, National Disaster Management Frame work,	5	1	3	10

	5.6 Role of NGOs. Armed forces in Disaster response.				
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Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for **Environmental Studies & Disaster management** will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Demonstration
7. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, Whatsapp, Mobile, Online sources)
8. Brainstorming

Suggested Learning Resources:**(a) Books:**

S. No.	Title	Author	Publisher	Edition & Year
1	Ecology and Environment	P D Sharma, Rastogi	Publication, Meerut- New Delhi	2010
2	Environmental Science A New Approach	Pushpa Dahiya, Manisha Ahlawat,	Alpha Science	201 3,
3	Fundamentals of environmental Sciences	Bamanayha B. R. Verma L. N. and Verma A.,	Yash publishing house, Bikaner	2005,
4	Disaster Management and Risk Reduction: <i>Role of Environmental Knowledge,</i>	Editor(s): Anil K. Gupta, Sreeja S. Nair, Florian Bemmerlein-Lux, Sandhya	Chatterji, Alpha Science	2013,
5	Environmental Biology,	Agarwal K C,	Agro Botanica, Bikaner	1999,
6	Perspectives in Environmental studies	Anubha Kaushik and CP Kaushik	New Age International Publishers	Six Addition 2018

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Cos, Pos and PSOs Mapping

Course Code: 21EV227

Course Title: Environmental Studies and Disaster Management

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprises with different scales in area of agricultural production process	Hold a post on supply in administration and	Analyze and control commercial and economical process in the field of agricultural production	Teach how to control and manage agricultural production	Introduce general production technologies	Teach how to teach and manage production technology	Preparation of managerial and social responsibility	Student will identify different underutilized crops	Student will practice different breeding techniques used in crop production.	Student will recognize different insect pest and diseases and their symptoms of crops	Student will apply different recent techniques in crop production
21EV227 Student will have ability to apply the gained knowledge about the basic concept of environmental science, different types of natural resources, their	1	1	1	3	1	3	1	2	3	2	2

utilization and impact on environment, causes of degradation and depletion and methods of their conservation.											
21EV227 Student will have ability to apply the knowledge of structural and functional components of different types of ecosystems and ecological succession. different levels of biodiversity, values, hotspots, threats of biodiversity and their measures of conservation.	1	2	2	3	1	2	1	1	1	2	1
21EV227 Student will have ability to apply the knowledge of	1	3	2	2	1	3	1	3	1	2	3

different types of pollution, their sources, impact on environment and basics of their control measures. different sources of solid wastes and their management specifically to urban areas.											
21EV227 student will have ability to learn about the basic concept of sustainable development, different methods of water conservation. He will also learn about the different acts related to environmental conservation and different social issues.	1	2	2	1	3	1	2	1	3	1	2
21EV227	1	1	3	1	1	3	1	2	2	3	1

<p>Student will have ability to learn different types of disasters, their sources, impacts and also will apply the gained knowledge in disaster management with coordination to government bodies and NGOs</p>											
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Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map: Environmental Studies & Disaster management

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4	21EV227 Student will have ability to apply the gained knowledge about the basic concept of environmental science, different types of natural resources, their utilization and impact on environment, causes of degradation and depletion and methods of their conservation.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5 SO1.6	1- Visit to local polluted sites and collection of water/soil sample. 2-Determination of total dissolved solids (TDS) Determination of total dissolved total solid (TS) in effluents/water	Multidisciplinary nature of environmental science, Natural resources, Definition, Type Forest resource, Water resource, Mineral resource, Food, Land Energy resources 1.1,1.2,1.3,1.4,1.4,1.5, 1.6	1.Forest resource impact and role 2.Problem of excessive water uses, 3.Impact of modern Ag practices. 4.Concept of Green energy
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4	21EV227 Student will have ability to apply the knowledge of structural and functional components of different types of ecosystems and ecological succession. different levels of biodiversity, values, hotspots, threats of biodiversity and their measures of conservation.	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5 SO2.6	1.Determination of dissolved oxygen (DO) in given water sample. 2.Identification of plant species in university campus-I 3.Identification of plant species in university campus-II	Ecosystem- Definition, Types & components, Food chain, food web, energy flow, Ecological succession, Biodiversity- Definition, types, Biodiversity Hotspots, Values, threats, onservation of biodiversity 2.1,2.2,2.3,2.4,2.4,2.5,	1.1.Biodiversity heritage in MP 2. Important medicinal plants 3.Red data book

				2.6	
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4	21EV227 Student will have ability to apply the knowledge of different types of pollution, their sources, impact on environment and basics of their control measures. different sources of solid wastes and their management specifically to urban areas.	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5 SO3.6	<ul style="list-style-type: none"> • Determination of hardness in given water sample. • Determination of alkalinity in given water sample. • Determination of acidity in given water sample. 	Environmental Pollution. Air, Pollution,water, Pollution, soil, noise & thermal pollution, Solid waste management-definition, types, sources, municipal solid waste management, MSWM strategies. 3.1,3.2,3.3,3.4,3.4.3.5,3.6	Study of impact of Air pollution due to industrial discharge. Recycling of water after treatment
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4	21EV227 student will have ability to learn about the basic concept of sustainable development, different methods of water conservation. He will also learn about the different acts related to environmental conservation and different social issues.	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5	<ol style="list-style-type: none"> 1. Collection of soil sample 2.Determination of soil moisture content in given soil sample. 3.Determination of carbonate content in given soil sample 	Sustainable development (SD), Concept & issues of SD, Urban problem related to energy, water conservation, rain water harvesting watershed management,Environment Protection acts, Human population & Family Welfare Programme, HIV/AIDS, Women &	National sustainable development goal Water shed management practices

				Child welfare 4.1,4.2,4.3,4.4,4.4,4.5	
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4	21EV227 Student will have ability to learn different types of disasters, their sources, impacts and also will apply the gained knowledge in disaster management with coordination to government bodies and NGOs	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5 SO5.6	1. Determination of nitrate content in given soil sample. 2. Study of rain water harvesting system and its importance-I 3. Study of rain water harvesting system and its importance-II	Disaster Management, Definition, types of disaster, Floods, cyclone, Earthquakes, drought etc.Forest fires, oil fires, pollutions. Rail, air & sea accidents. Disaster Management- international Strategy, National Disaster Management Framework, Role of NGOs, Armed forces in Disaster response 5.1,5.2,5.3,5.4,5.5,5.6	1.: Study of national disaster management act 2005 2. Study of Role of local NGO in disaster response

Course Code: 21MS228

Course Title: Statistical Methods

Pre-requisite: Student should have basic knowledge of Statistics, Probability, Correlation and Regression.

Rationale: The Statistics curriculum in Statistical Methods basically includes conceptual understanding, procedural fluency, and strategic competence in terms of Statistics. First, conceptual understanding refers to students' comprehension of Statistics concepts and the relationships between concepts.

Course Outcomes: CO1 Students to know the applications of Statistics and learn and apply these techniques in the agriculture field of their study.

CO2 A probability distribution is a statistical model that shows the possible outcomes of a particular event or course of action as well as the statistical likelihood of each event.

CO3 Students should be able to understand and compute various statistical measures of correlation, fitting of curve and regression.

CO4 Analysis of data pertaining to attributes and to interpret the results. Compare the pairs of treatment means using different methods when null hypothesis is rejected in ANOVA.

CO5 Sampling provides the tools/ techniques for selecting a sample of elements from a target population keeping in mind the objectives and nature of population.

Scheme of Studies:

Code	Course Code	Course Title	Scheme of studies (Hours/Week)				Total Study Hours (CI+LI+SW+SL)	Total Credits (C)
			CI	LI	SW	SL		
Program Core (PCC)	21MS228	Statistical Methods	2	01	02	01	6	3

Legend: CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

Code	Course Code	Course Title	Scheme of Assessment (Marks)						
			Progressive Assessment (PRA)					End Semester Assessment (ESA)	Total Marks (PRA+ESA)
			Class/Home Assignment 1 number 5 marks each (CA)	Class Test 2 (2 best out) 15 marks each (CT)	Practical Exam (PA)	Class Attendance (AT)	Total Marks (CA+CT+PA+AT)		
Program Core (PCC)	21MS228	SM	5	30	10	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

21MS228 CO-1 Students to know the applications of Statistics and learn and apply these techniques in the agriculture field of their study.

Approximate Hours

Item	Appx. Hrs.
CI	6
LI	1
SW	1
SL	2
Total	10

Session Out Comes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO1.1 Making familiar with some elementary statistical methods of analysis of data viz. Measures of Central Tendency, Dispersion, Moments, Skewness, and Kurtosis and to interpret them.</p> <p>SO1.2 Students to know the applications of Statistics and learn and apply these techniques in the agriculture field of their study.</p>	<p>1) To impart knowledge on Statistical concepts like Data Collection, Measures of Central Tendency.</p> <p>2) Students should be able to understand and compute various statistical measures of Dispersion.</p>	<p>Unit-1. Introduction to Statistics and its Applications in Agriculture, Graphical Representation of Data, Measures of Central Tendency & Dispersion.</p> <p>1.1. Introduction to Statistics and its Applications in Agriculture</p> <p>1.2 Graphical Representation of Data</p> <p>1.3 Measures of Central Tendency</p> <p>1.4 Measures of Dispersion</p>	<p>1. Prepare the assignment on Graphical Representation of Data, Measures of Central Tendency & Dispersion.</p>

SW-1 Suggested Sessional Work (SW):

a. Assignments: Prepare the assignment on Graphical Representation of Data, Measures of Central Tendency & Dispersion

b. Mini Project: -

c. Other Activities (Specify):-

21MS228 CO-2 Probability distribution is a statistical model that shows the possible outcomes of a particular event or course of action as well as the statistical likelihood of each event.

Approximate Hours

Item	Appx. Hrs.
CI	6
LI	1
SW	1
SL	2
Total	10

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO2.1 A probability distribution is a statistical model that shows the possible outcomes of a particular event or course of action as well as the statistical likelihood of each event.</p> <p>SO2.2 Probability distribution functions are quite important and widely used in Agriculture science.</p>	<p>1- Measures of Dispersion (Ungrouped Data). Measures of Dispersion (Grouped Data).</p> <p>2- Moments, Measures of Skewness & Kurtosis (Ungrouped Data).</p>	<p>Unit-2 Definition of Probability, Addition and Multiplication Theorem (without proof). Simple Problems Based on Probability. Binomial & Poisson Distributions.</p> <p>1.1 Definition of Probability</p> <p>1.2 Addition and Multiplication Theorem (without proof)</p> <p>1.3. Simple Problems Based on Probability</p> <p>1.4 Binomial & Poisson Distributions.</p>	<p>1. Prepare the assignment on Simple Problems Based on Probability. Binomial & Poisson Distributions.</p>

SW-1 Suggested Sessional Work (SW):

Assignments: Prepare the assignment on Simple Problems Based on Probability. Binomial & Poisson Distributions.

d. Other Activities (Specify):

21MS228 CO-3 Students should be able to understand and compute various statistical measures of correlation, fitting of curve and regression.

Approximate Hours

Item	Appx. Hrs.
CI	6
LI	1
SW	1
SL	2
Total	10

Session Out Comes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO3.1 Students should be able to understand and compute various statistical measures of correlation, fitting of curve and regression.</p> <p>SO3.2 To understand the process of hypothesis testing and its significance.</p>	3- Correlation & Regression Analysis.	<p>Unit-3 Definition of Correlation, Scatter Diagram. Karl Pearson's Coefficient of Correlation. Linear Regression Equations.</p> <p>1.1. Definition of Correlation</p> <p>1.2. Scatter Diagram</p> <p>1.3. Karl Pearson's Coefficient of Correlation</p> <p>1.4. Linear Regression Equations</p>	<p>1. Prepare the assignment on Karl Pearson's Coefficient of Correlation. Linear Regression Equations.</p>

SW-1 Suggested Sessional Work (SW):

Assignments: Prepare the assignment on Karl Pearson's Coefficient of Correlation. Linear Regression Equations.

d. Other Activities (Specify):

21MS228 CO-4 Analysis of data pertaining to attributes and to interpret the results. Compare the pairs of treatment means using different methods when null hypothesis is rejected in ANOVA.

Approximate Hours

Item	Appx Hrs.
CI	6
LI	1
SW	1
SL	2
Total	10

Session Out Comes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO4.1 Analysis of data pertaining to attributes and to interpret the results.</p> <p>SO4.2 Compare the pairs of treatment means using different methods when null hypothesis is rejected in ANOVA.</p>	<p>4- Application of One Sample t-test. Application of Two Sample Fisher's t-test.</p>	<p>Unit-4 Introduction to Test of Significance, One sample & two sample test t for Means, Chi-Square Test of Independence of Attributes in 2 ×2 Contingency Table.</p> <p>1.1 Introduction to Test of Significance</p> <p>1.2 One sample & two sample test t for Means,</p> <p>1.3 Chi-Square Test of Independence of Attributes in 2 ×2 Contingency Table</p>	<p>1. Prepare the assignment on Chi-Square Test of Independence of Attributes in 2 ×2 Contingency Table.</p>

SW-1 Suggested Sessional Work (SW):

Assignments: Prepare the assignment on Chi-Square Test of Independence of Attributes in 2 ×2 Contingency Table

d. Other Activities (Specify):

21MS228 CO-5 Sampling provides the tolls/ techniques for selecting a sample of elements from a target population keeping in mind the objectives and nature of population.

Approximate Hours

Item	Appx Hrs.
CI	6
LI	1
SW	1
SL	2
Total	10

Session Out Comes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO1.1 Sampling provides the tolls/ techniques for selecting a sample of elements from a target population keeping in mind the objectives and nature of population.</p> <p>SO1.2 Most of the research work is done through Sample Survey.</p>	<p>5- Chi-Square test of Goodness of Fit. Chi-Square test of Independence of Attributes for 2×2 contingency table.</p> <p>6- Analysis of Variance One Way Classification. Analysis of Variance Two Way Classification.</p>	<p>Unit-5 Introduction to Analysis of Variance, Analysis of One-Way Classification. Introduction to Sampling Methods, Sampling versus Complete Enumeration, Simple Random Sampling with and without replacement, Use of Random Number Tables for selection of Simple Random Sample.</p> <p>1.1 Introduction to Analysis of Variance</p> <p>1.2. Analysis of One-Way Classification</p> <p>1.3. Introduction to Sampling Methods</p> <p>1.4 Sampling versus Complete Enumeration</p> <p>1.5 Simple Random Sampling with and without replacement</p> <p>1.6 Use of Random Number Tables for selection of Simple Random Sample.</p>	<p>1. Prepare the assignment on Introduction to Analysis of Variance, Analysis of One-Way Classification. Introduction to Sampling Methods, Sampling versus Complete Enumeration.</p>

SW-1 Suggested Sessional Work (SW):

Assignments: Prepare the assignment on Introduction to Analysis of Variance, Analysis of One-Way Classification. Introduction to Sampling Methods, Sampling versus Complete Enumeration.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (C I)	Laboratory Lecture (L I)	Sessional Work (SW)	Self-Learning (S I)	Total hour (C I + LI+ SW +S I)
01: Students to know the applications of Statistics and learn and apply these techniques in the agriculture field of their study.	06	10	01	02	19
02: A probability distribution is a statistical model that shows the possible outcomes of a particular event or course of action as well as the statistical likelihood of each event.	06	06	01	02	15
03: Students should be able to understand and compute various statistical measures of correlation, fitting of curve and regression.	06	04	01	02	13
04: Analysis of data pertaining to attributes and to interpret the results. Compare the pairs of treatment means using different methods when null hypothesis is rejected in ANOVA.	06	04	01	02	13
05: Sampling provides the tolls/ techniques for selecting a sample of elements from a target population keeping in mind the objectives and nature of population.	06	06	01	02	15
Total Hours	30	30	05	10	75

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit title	Marks Distribution			Total Marks
		R	U	A	
CO-1	Students to know the applications of Statistics and learn and apply these techniques in the agriculture field of their study.	02	02	02	06
CO-2	A probability distribution is a statistical model that shows the possible outcomes of a particular event or course of action as well as the statistical likelihood of each event.	02	03	03	08
CO-3	Students should be able to understand and compute various statistical measures of correlation, fitting of curve and regression.	02	03	05	10
CO-4	Analysis of data pertaining to attributes and to interpret the results. Compare the pairs of treatment means using different methods when null hypothesis is rejected in ANOVA.	04	03	05	12
CO-5	Sampling provides the tolls/ techniques for selecting a sample of elements from a target population keeping in mind the objectives and nature of population.	04	05	05	14
	Total	14	16	20	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for statistical methods will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Demonstration
7. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Face book, Twitter, Whats app, Mobile, Online sources)
8. Brainstorming

Suggested Learning Resources:

S. No.	Title	Author	Publisher	Edition & Year
01	Sampling Techniques	W.G. Cochran.	Oxford and IBH Publishing Co	1989
02	Statistical Tables for Biological	R.A. Fisher and Yates	Agricultural and Medical Research. Oliver & Boyd, Edinburg.	1948
03	Biostatistical Analysis	Ferrol H. Zar	Pearson Education, India	2005 Fourth Edition
04	Handbook of Agril. Statistics	S.R.S. Chandel	Achal Prakashan Mandir, Kanpur.	1998
05	Statistical Methods	S.P. Gupta	Sultan Chand & Sons, New Delhi	2002
06	Basic Statistics	B.L. Agarwal	Wiley Eastern, New Delhi	1991

Curriculum Development Team:

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Cos, Pos and PSOs Mapping

Course Code: 21MS228

Course Title: Statistical Methods

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprises with different scales in area of agricultural production, process and trade	Hold a post on supply in administration and policy	Analyze and control commercial and economical process in the field of agriculture	Teach how to control and manage agricultural production	Introduce general production technologies	Teach how to teach and manage production technology	Preparation of managerial and social responsibility	Student will identify different underutilized crops	Student will practice different breeding techniques used in crop production.	Student will recognize different insect pest and diseases and their symptoms of crops	Student will apply different recent techniques in crop production
21EN224.1: Relate & recall basic terms, facts & concepts of insect's external morphology important insect-pest.	1	2	1	3	1	2	1	2	3	1	2

21EN 224.2: Emphasize the concepts and analytical approaches in anatomy, physiology and biology of insect.	3	2	1	3	1	2	1	3	1	2	1
21EN 224.3: Acquired the knowledge of ability to categorize insects based on basic ecological, behavioral, morphological, physiological, or developmental attributes.	2	3	1	2	3	2	1	3	1	2	1
21EN 224.4: Gain knowledge to examine insects deeply	2	2	3	1	1	1	2	1	3	2	3

within a biological level of analysis and make strategies for successful pest management strategy.												
21EN 224.5: Understand about different families and orders of class Insecta which cause economic losses or benefits for mankind.	1	2	1	1	3	1	2	2	1	1	2	

Legend: 1 – Low, 2 – Medium, 3 – High

Curriculum Map: Statistical Methods

POs &	COs No.& Titles	SOs	Laboratory Instruction	Classroom Instruction (CI)	Self-Learning (SL)
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PSOs No.		No.	(LI)		
PO 1,2,3,4,5,6,7 PSO 1,2, 3,4	21MS228.1: Students to know the applications of Statistics and learn and apply these techniques in the agriculture field of their study.	SO1.1 SO1.2	1.1 To impart knowledge on Statistical concepts like Data Collection, Measures of Central Tendency. 1.2 Students should be able to understand and compute various statistical measures of Dispersion.	Unit-1.0 Introduction to Statistics and its Applications in Agriculture, Graphical Representation of Data, Measures of Central Tendency & Dispersion. 1.1, 1.2, 1.3	1. Prepare the assignment on Graphical Representation of Data, Measures of Central Tendency & Dispersion.
PO 1,2,3,4,5,6,7 PSO 1,2, 3,4	21MS228.2: Probability distribution is a statistical model that shows the possible outcomes of a particular event or course of action as well as the statistical likelihood of each event.	SO2.1 SO2.2	2.1 Measures of Dispersion (Ungrouped Data). Measures of Dispersion (Grouped Data). 2.2 Moments, Measures of Skewness & Kurtosis (Ungrouped Data).	Unit-2 Definition of Probability, Addition and Multiplication Theorem (without proof). Simple Problems Based on Probability. Binomial & Poisson Distributions. 2.1, 2.2, 2.3	1. Prepare the assignment on Simple Problems Based on Probability. Binomial & Poisson Distributions.
PO 1,2,3,4,5,6,7 PSO 1,2, 3,4	Students should be able to understand and compute various statistical measures of correlation, fitting of curve and regression.	SO3.1 SO3.2	3.1 Correlation & Regression Analysis.	Unit-3: Definition of Correlation, Scatter Diagram. Karl Pearson's Coefficient of Correlation. Linear Regression Equations. 3.1, 3.2, 3.3	1. Prepare the assignment on Karl Pearson's Coefficient of Correlation. Linear Regression Equations.
PO 1,2,3,4,5,6,7 PSO 1,2, 3,4	21MS228.4: Analysis of data pertaining to attributes and to interpret the results. Compare the pairs of treatment means using	SO4.1 SO4.2	4.1 Application of One Sample t-test. Application of Two Sample Fisher's t-test.	Unit-4.0: Introduction to Test of Significance, One sample & two sample test t for Means, Chi-Square Test of Independence of Attributes in	Prepare the assignment on Chi-Square Test of Independence of Attributes in 2 x 2 Contingency Table.

	different methods when null hypothesis is rejected in ANOVA.			2 ×2 Contingency Table. 4.1, 4.2, 4.3	
PO 1,2,3,4,5,6,7 PSO 1,2, 3,4	21MS228.5: Sampling provides the tolls/ techniques for selecting a sample of elements from a target population keeping in mind the objectives and nature of population.	SO5.1 SO5.2	5.1 Chi-Square test of Goodness of Fit. Chi-Square test of Independence of Attributes for 2 ×2 contingency table. 5.2 Analysis of Variance One Way Classification. Analysis of Variance Two Way Classification.	Unit 5: Introduction to Analysis of Variance, Analysis of One-Way Classification. Introduction to Sampling Methods, Sampling versus Complete Enumeration, Simple Random Sampling with and without replacement, Use of Random Number Tables for selection of Simple Random Sample. 5.1, 5.2, 5.3	1. Prepare the assignment on Introduction to Analysis of Variance, Analysis of One-Way Classification. Introduction to Sampling Methods, Sampling versus Complete Enumeration.

Course Code: 21EN224

Course Title: Fundamentals of Entomology

Pre- requisite: Student should have basic knowledge of insects their structure, function, behavior, evolution, diversity, and effect on agricultural production, as well as on people and animals.

Rationale: Student studying external and internal morphology, anatomy, Physiology, pest outbreaks, ecology of insects in agroecosystem, HPR, IPM strategies and classification of insects upto orders and family.

Course Outcomes:

21EN224.1: Relate & recall basic terms, facts & concepts of insect's external morphology important insect-pest.

21EN224.2: Emphasize the concepts and analytical approaches in anatomy, physiology and biology of insects.

21EN224.3: Acquired the knowledge of ability to categorize insects based on basic ecological, behavioral, morphological, physiological, or developmental attributes.

21EN224.4: Gain knowledge to examine insects deeply within a biological level of analysis and make strategies for successful pest management strategy.

21EN224.5: Understand about different families and orders of class Insecta which cause economic losses or benefits for mankind.

Scheme of Studies:

Code	Course Code	Course Title	Scheme of studies (Hours/Week)				Total Study Hours (CI+LI+SW+SL)	Total Credits (C)
			CI	LI	SW	SL		
Program Core (PCC)	Course code: 21EN224	Fundamentals of Entomology	3	2	1	1	7	4

Legend: CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

Code	Course Code	Course Title	Scheme of Assessment (Marks)							End Semester Assessment (ESA)	Total Marks (PRA+ESA)
			Progressive Assessment (PRA)								
			Class/Homework Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)			
Program Core (PCC)	21EN224	Fundamentals of Entomology	30	15	0	5	0	50	50	100	

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

21EN224.1.: Relate & recall basic terms, facts & concepts of insect's external morphology important insect-pest.

Approximate Hours

Item	AppX Hrs
CI	09
LI	12
SW	1
SL	1
Total	23

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO1.1 Understand historical scenario of entomology and concept of animal kingdom.</p> <p>SO1.2 structure and functions of different external organs</p> <p>SO1.3 modifications of different organs of insect</p> <p>SO1.4 Anatomy and physiology of internal organs of insect</p> <p>SO1.5 Different types of legs, mouthparts, wings, larvae, pupae with example</p>	<p>LI 1.1 Types of wings, wing coupling apparatus and Wing venation.</p> <p>LI 1.2 Types of insect larvae and pupae.</p> <p>LI 1.3 Types of insect antennae.</p> <p>LI 1.4. Types of mouthparts.</p> <p>LI 1.5. Types of legs.</p> <p>LI 1.6 Methods of collection and preservation of insects including immature stages and external features of grasshopper.</p>	<p>Unit-1.0:History of Insects and Insect Morphology-</p> <p>1.1 History of Entomology in India.</p> <p>1.2 Major points related to dominance of Insecta in Animal kingdom.</p> <p>1.3 Classification of phylum Arthropoda upto classes.</p> <p>1.4 Relationship of class Insecta with other classes of Arthropoda.</p> <p>1.5 Morphology: Structure and functions of insect cuticle and molting. Body segmentation.</p> <p>1.6 Structure of Head, thorax and abdomen.</p> <p>1.7 Structure and modifications of insect antennae, mouth parts, legs, Wing venation, modifications and wing coupling apparatus.</p> <p>1.8 Structure of male and female genital organ. Metamorphosis and diapause in insects.</p> <p>1.9 Types of larvae and pupae.</p>	<p>Morphology and anatomy of insects.</p> <p>Types of antennae, mouth parts, legs wigs etc. of insects.</p>

SW-1 Suggested Sessional Work (SW):

Assignments: Classification of phylum Arthropoda upto classes. Relationship of class Insecta with other classes of Arthropoda. Morphology: Structure and functions of insect cuticle and molting. Body segmentation.

Mini Project:

Flow diagram of insect classification upto their orders.

Other Activities(Specify): Note on Status of entomological societies, research institutes and innovative works which are established in India

21EN224.2.: Emphasize the concepts and analytical approaches in anatomy, physiology and biology of insects

Approximate Hours

Item	AppX Hrs
CI	09
LI	4
SW	1
SL	1
Total	15

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO2.1 Understand parts of Alimentary canal and process of digestion.</p> <p>SO2.2 Understand parts and process of Circulatory system and excretory system.</p> <p>SO2.3 Understand parts and process of Respiratory system and nervous system</p> <p>SO2.4 Understand parts and process of Endocrine system and Reproductive system</p> <p>SO2.5. Different types of Reproduction in insect.</p>	<p>LI2.1 Dissection of digestive system in insects (Grasshopper)</p> <p>LI2.2 Dissection of male and female reproductive systems in insects (Grasshopper)</p>	<p>Unit-2.0: Insect Anatomy & Physiology-</p> <p>2.1 Structure and functions of digestive system.</p> <p>2.2 Structure and functions of circulatory system.</p> <p>2.3 Structure and functions of excretory system.</p> <p>2.4 Structure and functions of Respiratory system.</p> <p>2.5 Structure and functions of nervous system.</p> <p>2.6 Structure and functions of endocrine system.</p> <p>2.7 Structure and functions of male Reproductive system</p> <p>2.8 Structure and functions of female Reproductive system</p> <p>2.9 Types of Reproduction.</p>	<p>Systemic knowledge of insects for anatomical study and for further appropriate management practice.</p>

Suggested Sessional Work (SW):

Assignments: Structure and functions of digestive, circulatory, excretory, respiratory, nervous, secretary (Endocrine) and reproductive system, in insects. Types of reproduction in insects.

Mini Project: Labelled diagram of insect organ system.

Other Activities (Specify): Making models of various organ systems and submitting them to the department.

21EN224.3.: Acquired the knowledge of ability to categorize insects based on basic ecological, behavioral, morphological, physiological, or developmental attributes.

Approximate Hours

Item	AppX Hrs
CI	09
LI	0
SW	1
SL	1
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO3.1 Understand definition and components of environment .</p> <p>SO3.2 Understand effects of abiotic factors on insect population and in their biology.</p> <p>SO3.3 Understand effects of biotic factors on insect population and in their biology.</p> <p>SO3.4 Understand factors of environmental resistance of insect</p> <p>SO3.5. Understand factors effecting pest outbreak.</p>		<p>Unit-3.0: Insect Ecology -</p> <p>3.1 Introduction, Environment and its components.</p> <p>3.2 Abiotic and biotic factors</p> <p>3.3 Effect of abiotic factors-temperature, moisture.</p> <p>3.4 Effect of humidity, rainfall, light,</p> <p>3.5 Atmospheric pressure and air currents.</p> <p>3.6 Effect of biotic actors – food competition,</p> <p>3.7 Natural and environmental resistance.</p> <p>3.8 Causes for outbreak of pests in agro-ecosystem.</p> <p>3.9 Impact of components in agro-ecosystem.</p>	<p>Ecological factors and their responses in agroecosystem regarding insects’ population.</p>

SW-1 Suggested Sessional Work (SW):

Assignments: Classification of phylum Arthropoda upto classes. Relationship of class Insecta with other classes of Arthropoda. Morphology: Structure and functions of insect cuticle and molting. Body segmentation.

Mini Project:

Flow diagram of insect classification upto their orders.

Other Activities (Specify):

Note on Status of entomological societies and entomological research institutes which are established in India

21EN224.4.: Gain knowledge to examine insects deeply within a biological level of analysis and make strategies for successful pest management strategy.

Approximate Hours

Item	AppX Hrs
CI	09
LI	0
SW	1
SL	1
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO4.1 Understand definition and categories of pest and their surveillance tools .</p> <p>SO4.2 Application process of IPM practices</p> <p>SO4.3 Formulation and Toxicity impacts of insecticides.</p> <p>SO4.4 Innovative and advance methods of plant protection</p> <p>SO4.5. Application techniques and safety measures of insecticides</p>		<p>Unit-4.0: Pest and IPM:</p> <p>4.1 Pest surveillance and pest forecasting and Categories of pests.</p> <p>4.2 Cultural, Mechanical, Physical. Legislative. Biological (parasites, predators & transgenic plant pathogens such as bacteria, fungi and viruses) methods of control.</p> <p>4.3 Chemical control-importance, hazards and limitations.</p> <p>4.4 Classification of insecticides, toxicity of insecticides and formulations of insecticides.</p> <p>4.5 Recent methods of pest control, repellents, antifeedants, hormones, attractants, gamma radiation and genetic control.</p> <p>4.6 Practices, scope and limitations of IPM.</p> <p>4.7 Application techniques of spray fluids.</p> <p>4.8 Important species of pollinators, weed killers and scavengers, their importance.</p> <p>4.9 Phytotoxicity of insecticides. Symptoms of poisoning, first aid and antidotes.</p>	<p>Pest surveillance tools, categories and management practices pf IPM.</p> <p>Insecticide classification.</p> <p>Intensity of toxicity and their formulation.</p> <p>Advance methods of pest control .</p>

SW-1 Suggested Sessional Work (SW):

Assignments:

Pest categories, Control practices, Insecticide classification, Pollinator, Weedkiller and Scavengers etc.

Mini Project:

Flow chart of IPM strategies.

Other Activities (Specify):

Field visit and demonstration of control practices in concern agriculture field.

21EN224.5.: Understand about different families and orders of class Insecta which cause economic losses or benefits for mankind.

Approximate Hours

Item	AppX Hrs
CI	09
LI	2
SW	1
SL	1
Total	13

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO5.1 Taxonomical key and nomenclature System of animal kingdom.</p> <p>SO5.2 Agricultural importance of orthoptera and Dictyoptera orders and their families</p> <p>SO5.3 Agricultural importance of Odonata ,Hemiptera, Isoptera and Thysanoptera orders and their families</p> <p>SO5.4 Agricultural importance of Neuroptera and Lepidoptera orders and their families</p> <p>SO5.5. Agricultural importance of coleoptera ,Hymenoptera and Diptera orders and their families</p>	<p>LI5.1 Study of characters of orders Orthoptera, Dictyoptera, Odonata, Isoptera, Thysanoptera, Hemiptera, Lepidoptera, Neuroptera, Coleoptera, Hymenoptera, Diptera and their families of agricultural importance.</p>	<p>Unit-5.0: Insect Taxonomy:</p> <p>5.1 Systematics: Taxonomy – importance, history and development and binomial nomenclature.</p> <p>5.2 Classification of class Insecta upto Orders, basic groups of present-day insects with special emphasis to orders and families of Agricultural importance like Orthoptera, Acrididae, Gryllidae,</p> <p>5.3 Dictyoptera, Manidae, Blattidae.</p> <p>5.4 Odonata; Isoptera: Termitidae; Thysanoptera: Thripidae;</p> <p>5.5 Hemiptera: Pentatomidae, Coreidae, Pyrrhocoridae, Aphididae, Coccidae.</p> <p>5.6 Neuroptera: Chrysopidae; Lepidoptera, Papiloinidae, Noctuidae, Pyralidae, Gelechiidae, Arctiidae, Bombycidae.</p> <p>5.7 Coleoptera, Chrysomelidae, Curculionidae, Bruchidae, Scarabaeidae.</p> <p>5.8 Hymenoptera:</p>	<p>1. Systematic position characters of various orders class insecta with their example.</p>

		<p>Tenthredinidae, Apidae. 5.9 Diptera: Cecidomyiidae, Tachinidae, Agromyziidae, Tephritidae.</p>	
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SW-1 Suggested Sessional Work (SW):

Assignments:

Characters of various orders and their Families of class insecta

Mini Project:

Flow chart of insect classification upto their orders, Family and Examples.

Other Activities (Specify):

Note the location and establishment years of important Entomological Museums of India.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Laboratory instruction (LI)	Sessional Work (SW)	Self Learning (SI)	Total hour (Cl+LI+SW+SI)
21EN 224.1: Relate & recall basic terms, facts & concepts of insect's external morphology important insect-pest.	9	12	1	1	23
21EN 224.2: Emphasize the concepts and analytical approaches in anatomy ,physiology and biology of insect.	9	4	1	1	15
21EN 224.3: Acquired the knowledge of ability to categorize insects based on basic ecological, behavioral, morphological, physiological, or developmental attributes.	9	0	1	1	11
21EN 224.4: Gain knowledge to examine insects deeply within a biological level of analysis and make strategies for successful pest management strategy.	9	0	1	1	11
21EN 224.5: Understand about different families and orders of class Insecta which cause economic losses or benefits for mankind.	9	2	1	1	13
Total Hours	45	12	5	5	73

Suggestion for End Semester Assessment

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	History of Insects and Insect Morphology	03	03	04	10
CO-2	Insect Anatomy & Physiology	02	06	02	10
CO-3	Insect Ecology	03	02	05	10
CO-4	Pest and IPM	5	1	04	10
CO-5	Insect Taxonomy	05	05	-	10
Total		18	17	15	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Introduction to Portland cement will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks.
Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Case Method
3. Group Discussion
4. Role Play
5. Visit to Field
6. Demonstration/Dissection
7. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, Whatsapp, Mobile, Online sources)
8. Brainstorming

Suggested Learning Resources:**(a) Books:**

S.No.	Title	Author	Publisher	Edition & Year
1	Insect Structure and Function	R.F. Chapman	, ELBS Publishers New Delhi	Old edition 1981
2	General and Applied Entomology	B.V David and T.N Ananthkrishnan.	Mc graw Hill publishing Co. Ltd. New Delhi.	, 2nd Ed.2003
3	A Text Book of Entomology	Mathur and Upadhyay	Aman Publishing House, Meerut	2005
4	Insect Physiology and Anatomy	N.C Pant and S. Ghai,	. ICAR, New Delhi.	1981
5	Practical Manual			
6	Lecture note provided by Dept. of Entomology, AKS University, Satna .			

Curriculum Development Team

1. Dr. S.S. Tomar, Dean, FAST, AKS University
2. Associate Professor Dr Rama Sharma, HOD Entomology, AKS University
3. Assistant Professor Dr Vishnoo Omar, Department of Entomology, AKS University

Cos, Pos and PSOs Mapping
Course Code: 21EN224
Course Title: Fundamentals of Entomology

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprises with different scales in area of agricultural production, process and trade	Hold a post on supply in administration and policy	Analyze and control commercial and economical process in the field of agriculture.	Teach how to control and manage agricultural production	Introduce general production technologies	Teach how to teach and manage production technology	Preparation of managerial and social responsibility	Student will identify different underutilized crops	Student will practice different rearing techniques used in crop production.	Student will recognize different insect pest and diseases and their symptoms of crops	Student will apply different recent techniques in crop production
21EN224.1: Relate & recall basic terms, facts & concepts of insect's external morphology important insect-pest.	1	2	1	3	1	2	2	2	3	1	2
21EN 224.2: Emphasize the concepts and analytical approaches in anatomy, physiology and biology of insect.	3	2	1	3	1	2	1	3	1	3	1
21EN 224.3: Acquired the knowledge of ability to categorize insects based	1	3	1	2	3	3	1	3	1	2	1

on basic ecological, behavioral, morphological, physiological, or developmental attributes.											
21EN 224.4: Gain knowledge to examine insects deeply within a biological level of analysis and make strategies for successful pest management strategy.	3	2	3	1	1	1	1	1	3	2	3
21EN 224.5: Understand about different families and orders of class Insecta which cause economic losses or benefits for mankind.	1	2	1	1	3	1	1	2	1	3	2

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map: Fundamentals of Entomology

Pos & PSOs	Cos No. & Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
PO1,2,3,4,5,6,7 PSO 1,2,3,4	21EN 224.1: Relate & recall basic terms, facts & concepts of insect's external morphology important insect-pest.	SO 1.1 SO 1.2 SO 1.3 SO 1.4 SO 1.5	<p>1.1 Types of wings, wing coupling apparatus and Wing venation.</p> <p>1.2 Types of insect larvae and pupae.</p> <p>1.3 Types of insect antennae.</p> <p>1.4. Types of mouthparts.</p> <p>1.5. Types of legs.</p> <p>1.6 Methods of collection and preservation of insects including immature stages and external features of grasshopper.</p>	<p>History of Entomology in India.</p> <p>Major points related to dominance of Insecta in Animal kingdom.</p> <p>Classification of phylum Arthropoda upto classes.</p> <p>Relationship of class Insecta with other classes of Arthropoda.</p> <p>Morphology: Structure and functions of insect cuticle and molting. Body segmentation.</p> <p>Structure of Head, thorax and abdomen.</p> <p>Structure and modifications of insect antennae, mouth parts, legs, Wing venation, modifications and wing coupling apparatus.</p> <p>Structure of male and female genital organ. Metamorphosis and diapause in insects.</p> <p>Types of larvae and pupae.</p> <p>1.1, 1.2, 1.3,1.4,1.5,1.6,1.7,1.8,1.9</p>	<p>Morphology and anatomy of insects.</p> <p>Types of antennae, mouth parts, legs wigs etc. of insects</p>
PO1,2,3,4,5,6,7 PSO 1,2,3,4	2: Emphasize the concepts and analytical approaches in anatomy ,physiology and biology of insect.	SO 2.1 SO 2.2 SO 2.3 SO 2.4 SO 2.5	<p>2.1 Dissection of digestive system in insects (Grasshopper)</p> <p>2.2 Dissection of male and female reproductive systems in insects (Grasshopper)</p>	<p>Structure and functions of digestive system.</p> <p>Structure and functions of circulatory system.</p> <p>Structure and functions of excretory system.</p> <p>Structure and functions of Respiratory system.</p> <p>Structure and functions of nervous system.</p> <p>Structure and functions of endocrine system.</p> <p>Structure and functions of male Reproductive system</p> <p>Structure and functions of female</p>	<p>Systemic knowledge of insects for anatomical study and for further appropriate management practice</p>

				Reproductive system Types of Reproduction. 2.1,2.2,2.3,2.4,2.5,2.6,2.7,2.8,2.9	
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<p>PO1,2,3,4,5,6,7 PSO 1,2,3,4</p>	<p>Acquired the knowledge of ability to categorize insects based on basic ecological, behavioral, morphological, physiological, or developmental attributes</p>	<p>SO 3.1 SO 3.2 SO 3.3 SO 3.4 SO 3.5</p>		<p>3.1 Introduction, Environment and its components. 3.2 Abiotic and biotic factors 3.3 Effect of abiotic factors-temperature, moisture. 3.4 Effect of humidity, rainfall, light, 3.5 Atmospheric pressure and air currents. 3.6 Effect of biotic actors – food competition, 3.7 Natural and environmental resistance. 3.8 Causes for outbreak of pests in agro-ecosystem. 3.9 Impact of components in agro-ecosystem.</p>	<p>Ecological factors and their responses in agroecosystem regarding insects' population.</p>
<p>PO1,2,3,4,5,6,7 PSO 1,2,3,4</p>	<p>Gain knowledge to examine insects deeply within a biological level of analysis and make strategies for successful pest management strategy</p>	<p>SO 4.1 SO 4.2 SO 4.3 SO 4.4 SO 4.5</p>		<p>Unit-4.0: Pest and IPM: 4.1 Pest surveillance and pest forecasting and Categories of pests. 4.2 Cultural, Mechanical, Physical. Legislative. Biological (parasites, predators & transgenic plant pathogens such as bacteria, fungi and viruses) methods of control. 4.3 Chemical control-importance, hazards and limitations. 4.4 Classification of insecticides, toxicity of insecticides and formulations of insecticides. 4.5 Recent methods of pest control, repellents, antifeedants, hormones, attractants, gamma radiation and genetic control. 4.6 Practices, scope and limitations of IPM. 4.7 Application techniques of spray fluids.</p>	<p>4. Pest surveillance tools, categories and management practices of IPM. 5. Insecticide classification. Intensity of toxicity and their formulation. Advance methods of pest control .</p>

				<p>pollinators, weed killers and scavengers, their importance.</p> <p>4.9 Phytotoxicity of insecticides.</p> <p>Symptoms of poisoning, first aid and antidotes.</p>	
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<p>PO1,2,3,4,5,6,7 PSO 1,2,3,4</p>	<p>21EN 224.5: Understand about different families and orders of class Insecta which cause economic losses or benefits for mankind.</p>	<p>SO 5.1 SO52.2 SO 5.3 SO 5.4 SO 5.5</p>		<p>Unit-5.0: Insect Taxonomy: 5.1 Systematics: Taxonomy – importance, history and development and binomial nomenclature. 5.2 Classification of class Insecta upto Orders, basic groups of present-day insects with special emphasis to orders and families of Agricultural importance like Orthoptera, Acrididae, Gryllidae, 5.3 Dictyoptera, Manidae, Blattidae. 5.4 Odonata; Isoptera: Termitidae; Thysanoptera: Thripidae; 5.5 Hemiptera: Pentatomidae, Coreidae, Pyrrhocoridae, Aphididae, Coccidae. 5.6 Neuroptera: Chrysopidae; Lepidoptera, Papilionidae, Noctuidae, Pyralidae, Gelechiidae, Arctiidae, Bombycidae. 5.7 Coleoptera, Chrysomelidae, Curculionidae, Bruchidae, Scarabaeidae. 5.8 Hymenoptera: Tenthredinidae, Apidae. 5.9 Diptera: Cecidomyiidae, Tachinidae, Agromyziidae, Tephritidae.</p>	<p>1.Systematic position characters of various orders class insecta with their example.</p>
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Course Code: 21GP226
Course Title: Fundamentals of plant breeding
Pre- requisite: Student should have basic knowledge of modes of reproduction, Genetic basis and breeding methods self and cross pollinated crops.
Rationale: The students studying breeding concept should possess foundational understanding about mutation, heterosis and hybrids. This course is aimed at understanding to develop high yielding variety.

Course Outcomes:

21GP226.1: Student will be able to understand about plant breeding- introduction, historical concepts, objectives, reproduction, self – incompatibility and male sterility.

21GP226.2: Students will have the ability to apply the knowledge gained about component of Genetic variation, Genetic basis and breeding methods in self- pollinated crops.

21GP226.3: To understand Concepts of population genetics, development of inbred lines and hybrids, composite and synthetic varieties.

21GP226.4: Student will be able to understand Breeding methods in asexually propagated crops, polyploidy in relation to plant breeding and mutation breeding.

21GP226.5: Students will get knowledge on breeding for important biotic and abiotic stresses, DNA markers and Intellectual Property Rights

Scheme of Studies:

Code	Course Code	Course Title	Scheme of studies(Hours/Week)				Total Study Hours CI+LI+SW+SL	Total Credits (C)
			CI	LI	SW	SL		
Program Core (PCC)	21GP226	Fundamentals of Plant Breeding	2	2	0	0	4	(2+1)=3

Legend:

CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others), **LI:** Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies) **SW:** Sessional Work (includes assignment, seminar, mini project etc.), **SL:** Self Learning, **C:** Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Code	Course Code	Course Title	Scheme of Assessment (Marks)							End Semester Assessment (ESA)	Total Marks (PRA + ESA)
			Progressive Assessment (PRA)						Total Marks (CA+CT+SA+CAT+AT)		
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one	Class Activity any one (CAT)	Class Attendance (AT)				
Program Core (PCC)	21GP226	Fundamentals of Plant Breeding	15	30	0	0	5	50	50	100	

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

21GP226.1: Student will be able to understand about plant breeding- introduction, historical concepts, objectives, reproduction, self – incompatibility and male sterility.

Approximate Hours

Item	Approximate Hours
CI	6
LI	10
SW	2
SL	2
Total	20

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO1.1. Understand Historical development and objectives.</p> <p>SO1.2. Students are able to explain the concept, nature and role of plant breeding.</p> <p>SO1.3. Understand Major achievements and future prospects.</p> <p>SO1.4. Students are able to explain the genetics in relation to plant breeding, modes of reproduction and apomixes.</p> <p>SO1.5. Students are able to understand and explain Self – incompatibility.</p> <p>SO1.6. Understand Male sterility- genetic consequences, cultivar options</p>	<p>1. Study of floral structure of self-pollinated crops.</p> <p>2. Study of floral structure of cross pollinated crops.</p> <p>3. Study of germplasm of various crops.</p> <p>4. Consequences of inbreeding on genetic structure of resulting populations. Study of male sterility system.</p> <p>5. To work out the mode of pollination in a given crop and extent of natural out crossing.</p>	<p>Unit-1.Historical development, objectives and concept,</p> <p>1.1. Historical development and objectives.</p> <p>1.2. Concept, nature and role of plant breeding</p> <p>1.3. Major achievements and future prospects</p> <p>1.4 Genetics in relation to plant breeding, modes of reproduction and apomixes.</p> <p>1.5 Self – incompatibility.</p> <p>1.6. Male sterility- genetic consequences, cultivar options</p>	<p>1 Nature and role of plant breeding.</p> <p>2.Modes of reproduction</p>

SW-1 Suggested Sessional Work (SW):

a. Assignments:

Genetics in relation to plant breeding.

b. Mini Project:

Self – incompatibility

Other Activities (Specify):

21GP226.2: Students will have the ability to apply the knowledge gained about component of Genetic variation, Genetic basis and breeding methods in self- pollinated crops.

				Approximate Hours	
				Item	Approximate Hours
				CI	6
				LI	10
				SW	2
				SL	1
				Total	19
Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)		
<p>SO2.1. Students are able to explain domestication, acclimatization and introduction.</p> <p>SO2.2. Understand Centre of origin/diversity, component of Genetic variation;</p> <p>SO2.3. Understand Heritability and genetic advance.</p> <p>SO2.4. Understand Genetic basis and breeding methods in self- pollinated crops-mass and pure line selection.</p> <p>SO2.5 Understand Hybridization techniques.</p> <p>SO2.6. Students are able to maintain and handling of segregating population; Multiline concept.</p>	<p>1.Plant Breeder’s kit</p> <p>2.Emasculation and hybridization techniques in self crops.</p> <p>3.Emasculation and hybridization techniques in cross pollinated crops.</p> <p>4. Handling of segregation populations</p> <p>5. Methods of calculating mean, range, variance, standard deviation, heritability.</p>	<p>Unit-2. Domestication, Acclimatization and introduction.</p> <p>2.1.Domestication, Acclimatization, and introduction.</p> <p>2.2. Centre of origin/diversity, component of Genetic variation;</p> <p>2.3. Heritability and genetic advance.</p> <p>2.4. Genetic basis and breeding methods in self-pollinated crops-mass and pure line selection.</p> <p>2.5. Hybridization techniques.</p> <p>2.6. Handling of segregating population; Multiline concept.</p>	<p>1.Domestication, Acclimatization, and introduction.</p> <p>2. Heritability and genetic advance.</p>		

SW-2 Suggested Sessional Work (SW):

a. Assignments:

Hybridization techniques.

b. Mini Project:

Multiline concept.

Other Activities (Specify):

21GP226.3: To understand Concepts of population genetics, development of inbred lines and hybrids, composite and synthetic varieties.

Item	Approximate Hours
CI	6
LI	4
SW	2
SL	2
Total	14

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO3.1 Students are able to explain concepts of population genetics</p> <p>SO3.2. Understand Hardy-Weinberg Law</p> <p>SO3.3. Understand Genetic basis and methods of breeding cross pollinated crops</p> <p>SO3.4. Understand Modes of selection; Heterosis and inbreeding depression</p> <p>SO3.5 Understand Development of inbred lines and hybrids.</p> <p>SO3.6. Student will be able to understand composite and synthetic varieties.</p>	<p>1.Designs used in plant breeding experiment, analysis of Randomized Block Design.</p> <p>2. Prediction of performance of double cross hybrids.</p>	<p>Unit 3 Concepts of population genetics.</p> <p>3.1. Concepts of population genetics</p> <p>3.2 Hardy-Weinberg Law.</p> <p>3.3 Genetic basis and methods of breeding cross pollinated crops,</p> <p>3.4. Modes of selection; Heterosis and inbreeding depression</p> <p>3.5 Development of inbred lines and hybrids.</p> <p>3.6 composite and synthetic varieties.</p>	<p>1.Hardy-Weinberg Law</p> <p>2. Modes of selection</p>

SW-3 Suggested Sessional Work (SW):

a. Assignments:

Concepts of population genetics

b. Mini Project:

Genetic basis and methods of breeding cross pollinated crops,

Other Activities (Specify):

21GP226.4: Student will be able to understand Breeding methods in asexually propagated crops, polyploidy in relation to plant breeding and mutation breeding.

Item	Approximate Hours
CI	6
LI	0
SW	2
SL	1
Total	9

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO4.1. Students are able to understand breeding methods in asexually propagated crops</p> <p>SO4.2. Understand Clonal selection.</p> <p>SO4.3. Understand Hybridization; Wide hybridization.</p> <p>SO4.4. Understand Pre-breeding.</p> <p>SO4.5. Student will be able to understand Polyploidy in relation to plant breeding.</p> <p>SO4.6. Understand Mutation breeding-methods and uses.</p>		<p>Unit 4. Breeding methods in asexually propagated crops.</p> <p>4.1. Breeding methods in asexually propagated crops.</p> <p>4.2. Clonal selection</p> <p>4.3. Hybridization; Wide hybridization.</p> <p>4.4. Pre-breeding.</p> <p>4.5 Polyploidy in relation to plant breeding.</p> <p>4.6 Mutation breeding-methods and uses.</p>	<p>1. Hybridization; Wide hybridization.</p>

SW-4 Suggested Sessional Work (SW):

a. Assignments:

Mutation breeding-methods and uses

Mini Project:

b. Polyploidy in relation to plant breeding.

Other Activities (Specify):

21GP226.5: Students will get knowledge on breeding for important biotic and abiotic stresses, DNA markers and Intellectual Property Rights

Item	Approximate Hours
CI	6
LI	0
SW	2
SL	1
Total	9

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO5.1. Students are able to understand Breeding for important biotic and abiotic stresses.</p> <p>SO5.2. Understand Biotechnological tools-DNA markers</p> <p>SO5.3. Student will be able to understand Marker assisted selection.</p> <p>SO5.4. Understand Participatory plant breeding.</p> <p>SO5.5. Student will be able to understand Intellectual Property Rights.</p> <p>SO5.6. Understand Patenting, Plant Breeders and & Farmer's Rights</p>		<p>Unit-5. Breeding for important biotic and abiotic stresses.</p> <p>5.1. Breeding for important biotic and abiotic stresses.</p> <p>5.2. Biotechnological tools-DNA markers.</p> <p>5.3. Marker assisted selection.</p> <p>5.4. Participatory plant breeding.</p> <p>5.5. Intellectual Property Rights.</p> <p>5.6. Patenting, Plant Breeders and & Farmer's Rights</p>	<p>1.Marker assisted selection.</p>

SW-5 Suggested Sessional Work (SW):

a. Assignments:

Intellectual Property Rights.

b. Mini Project:

Participatory plant breeding

Other Activities (Specify):

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Laboratory Instruction (LI)	Sessional Work (SW)	Self Learning (Sl)	Total hour (Cl+LI+SW+Sl)
21GP226.1: Student will be able to understand about plant breeding-introduction, historical concepts, objectives, reproduction, self – incompatibility and male sterility.	6	10	2	2	20
21GP226.2: Students will have the ability to apply the knowledge gained about component of Genetic variation, Genetic basis and breeding methods in self- pollinated crops.	6	10	2	1	19
21GP226.3: To understand Concepts of population genetics, development of inbred lines and hybrids, composite and synthetic varieties.	6	4	2	2	14
21GP226.4: Student will be able to understand Breeding methods in asexually propagated crops, polyploidy in relation to plant breeding and mutation breeding.	6	0	2	1	9
21GP226.5: Students will get knowledge on Breeding for important biotic and abiotic stresses, DNA markers and Intellectual Property Rights	6	0	2	1	9
Total	30	30	10	7	77

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO 1	Historical development, objectives and concept.	6	2	2	10
CO 2	Domestication, Acclimatization and introduction.	5	4	2	11
CO 3	Concepts of population genetics.	4	4	1	9
CO 4	Breeding methods in asexually propagated crops	6	2	2	10
CO 5	Breeding for important biotic and abiotic stresses.	5	3	2	10
Total		26	15	9	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Fundamentals of plant breeding will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks.

Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Case Method
3. Group Discussion
4. Demonstration
5. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, Whatsapp, Mobile, Online sources)
6. Brainstorming

Suggested Learning Resources:

(a) Books:

S. No.	Title	Author	Publisher	Edition & Year
1	Principles of Plant Breeding.	Alard, R.W.	John Willey & Sons, New York.	2000
2	Principles and Procedures of Plant Breeding, Biotechnological and Conventional Approaches.	Chahel, G.S. and Ghosal S.S.	Narosa Publishing House, New Delhi.	2002
3	Plant Breeding	Singh, B.D.	Kalyani Publishing House, New Delhi.	2005
4	Essentials of Plant Breeding- Principles and Methods.	Singh, P.	Kalyani Publishing House, New Delhi.	2001.

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PO, PSO, CO Mapping

Course Code: **21GP226**

Course Title: **Fundamentals of plant breeding**

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprises with different scales in area of agricultural production process	Hold a post on supply in administration and	Analyze and control commercial and economical process in	Teach how to control and manage	Introduce general production	Teach how to teach and manage production technology	Preparation of managerial and social responsibility	Student will identify different underutilized crops	Student will practice different breeding techniques used in crop production.	Student will recognize different insect pest and diseases and their symptoms of crops	Student will apply different recent techniques in crop production
21GP226.1: Student will be able to understand about plant breeding- introduction, historical concepts, objectives, reproduction, self – incompatibility and male sterility.	1	2	1	3	1	3	2	2	3	1	2
21GP226.2: Students will have the	1	2	0	3	1	2	1	3	1	2	1

ability to apply the knowledge gained about component of Genetic variation, Genetic basis and breeding methods in self- pollinated crops.											
21GP226.3: To understand Concepts of population genetics, development of inbred lines and hybrids, composite and synthetic varieties.	1	3	2	2	3	3	1	3	1	2	3
21GP226.4: Student will be able to understand Breeding methods in asexually propagated crops, polyploidy in relation to plant breeding and mutation breeding.	1	2	1	1	3	1	2	1	3	1	1

21GP226.5: Students will get knowledge on Breeding for important biotic and abiotic stresses, DNA markers and Intellectual Property Rights	1	1	3	1	1	3	2	2	3	3	3
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Legend: 1- Low, 2 – Medium, 3- High

Course Curriculum Map: Fundamentals of plant breeding

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4	21GP226.1: Student will be able to understand about plant breeding-introduction, historical concepts, objectives, reproduction, self – incompatibility and male sterility.	SO1.1 SO1.2 SO1.3	1.Plant Breeder’s kit	Historical development, objectives and concept.	As mentioned in page number
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4	21GP226.2: Students will have the ability to apply the knowledge gained about component of Genetic variation, Genetic basis and breeding methods in self- pollinated crops.	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5	2.Emasculation and hybridization techniques in self-crops.	Domestication, Acclimatization and introduction.	As mentioned in page number
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4	21GP226.3: To understand Concepts of population genetics, development of inbred lines and hybrids, composite	SO3.1 SO3.2 SO3.3	3.Emasculation and hybridization techniques in cross	Concepts of population genetics.	As mentioned in page

	and synthetic varieties.		pollinated crops.		number
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4	21GP226.4: Student will be able to understand Breeding methods in asexually propagated crops, polyploidy in relation to plant breeding and mutation breeding.	SO4.1 SO4.2	4. Handling of segregation populations	Breeding methods in asexually propagated crops	As mentioned in page number
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4	21GP226.5: Students will get knowledge on Breeding for important biotic and abiotic stresses, DNA markers and Intellectual Property Rights	SO5.1 SO5.2	5. Methods of calculating mean, range, variance, standard deviation, heritability.	Breeding for important biotic and abiotic stresses.	As mentioned in page number

Semester 3

Course Code: 21EX322

Course Title : Fundamental of agriculture extension

Pre- requisite: The fundamental objective of extension education is to raise the standard of living of the rural people by helping them in using their natural resources in the right way and to increase the net income of farmers by more production and proper marketing system.

Rationale: The students studying about Extension, which is fundamentally a system of out-of-school education for adults and youths alike. It is a system where people are motivated through a proper approach to help themselves by applying science in their daily lives, in farming, home making and community living. Students have the knowledge and concept of extension and its importance in agricultural development. Students are exposed towards various rural development programmes aimed at poverty alleviation and to increase employment opportunities and their analysis. Students have knowledge about various types of communication and communication skill.

Course Outcomes:

- CO 1.** Understanding the fundamentals of extension education, extension systems in India.
- CO 2.** Insight in to programme planning and rural development efforts, extension administration.
- CO 3.** Knowledge on different extension methods and approaches used for transfer of agricultural technology.
- CO 4.** Provide an opportunity to visit different organizations involved in extension activities and rural development work.
- CO 5.** Acquaintance on practical skills in preparation of different extension teaching methods.
- CO 6.** Knowledge on the concepts of adoption, diffusion and innovation and understanding the principles involved in agricultural journalism

Scheme of Studies:

Code	Course Code	Course Title	Scheme of studies(Hours/Week)				Total Study Hours (CI+LI+SW+SL)	Total Credits(C)
			CI	LI	SW	SL		
Program Core (PCC)	21EX322	Fundamental of agriculture extension	2	1	2	1	6	3

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial

(T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

Code	Course Code	Course Title	Scheme of Assessment (Marks)						End Semester Assessment (ESA)	Total Marks (PRA+ESA)
			Progressive Assessment (PRA)							
			Class/ Home Assignment number 5 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 mark each (CT)	Seminar one (SA)	Class Activity any one (CA T)	Class Attendance (AT)	Total Marks (CA+CT+SA +CAT+AT)		
Program Core (PCC)	21EX322	Fundamentals of agricultural extension	15	30	-	-	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion

21EX322 unit 1: Understanding the fundamentals of extension education, extension systems in India.

Approximate Hours

Item	Approx Hrs.
CI	06
LI	02
SW	1
SL	1
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
<p>SO1.1 In fundamental of agriculture extension students understand about basic objective and working procedure of agriculture extension</p> <p>SO1.2 meaning and scope of Extension education and agriculture extension.</p> <p>SO1.33 Learned about extension education process.</p> <p>SO1.4 Understand about principles and steps in programme development</p>	<p>LI 1.0 To get acquainted with university extension system.</p>	<p>UNIT 1.1 Extension Education and extension programme planning</p> <p>1.2 meaning and definition and types of education</p> <p>1.3 meaning and definition of extension education</p> <p>1.4 scope and process of extension education</p> <p>1.5 Objective and principles of extension education</p> <p>1.6 meaning and process extension programme planning, principles and steps in programme development</p>	<p>1.Process of extension education</p>

SW-1 Suggested Sessional Work (SW):

a. Assignments: Meaning and definition And types of education, Principles and steps in programme development

b. Mini Project:

c) Other Activities (Specify):

21EX322 unit 2 To Understand the extension system in India, various development programme and new trends in agriculture extension.

Approximate Hours

Item	Approx Hrs.
CI	06
LI	06
SW	2
SL	1
Total	15

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO1.2.1 later students understand about pre- and programme.</p> <p>SO2.2:post-independence extension programme.</p> <p>So2.3 understand about new trends in agriculture extension Rural development an</p> <p>SO2.4 Students Understand the concept of Privatization Extension, Cyber Extension.</p> <p>SO 2.5 Learned about Marked led , Farmer led Extension in agriculture and Expert system.</p>	<p>LI 2.1 A visit to village to understand the problems being encountered by the villagers/ farmers;</p> <p>LI 2.2 to study organization and functioning of DRDA and other departments at district level.</p> <p>LI 2.3 visit to NGO and learning from their experience in rural development.</p>	<p>UNIT 2.1 Extension system in India and new trends in agriculture extension</p> <p>2.2 Pre-independence programme (Shri nketan, Marthandam, firka development Scheme, Gurgaon Experiment etc)</p> <p>2.3 post -independence programme era (Etawah pilot project, Nilokheri)</p> <p>2.4 Various agriculture development programmes launched by Govt. / ICAR(IADP, IAAP, HYVP, KVK, IVLP,ORP, ND, NATP, NAIP, etc)</p> <p>2. 5 Privatization extension, CYBER Extension</p> <p>2.6 Marked led and Farmer led Extension in agriculture, Expert system</p>	<p>Students Understand the concept of Privatization Extension, Cyber Extension, and Market led, Farmer led Extension in agriculture and Expert system.</p>

SW-1 Suggested Sessional Work (SW):

c. Assignments:

Various agriculture development programmes launched by Govt. / ICAR (IADP, IAAP, HYVP, KVK, IVLP, ORP, ND, NATP, NAIP, etc)

d. Mini Project:

21EX322 unit 3. Provide an opportunity to visit different organizations involved in extension activities and rural development work.

Approximate Hours

Item	Approx Hrs.
CI	03
LI	00
SW	2
SL	1
Total	7

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO 3.1 learns various rural development programme of Gov. of India community development.</p> <p>SO 3.2 understands the concept of community development.</p>		<p>UNIT 3.1 Rural Development and Community Development Programme.</p> <p>3.2 meaning and definition of Rural development ,Various rural development programme</p> <p>3.3 meaning and definition of Community development Concept, Principals and Philosophy of CD</p>	Various rural development programme

SW-1 Suggested Sessional Work (SW):

- e. Assignments:*
Concept, Principals and Philosophy of CD.
- f. Mini Project:**

21EX322 unit 4 Insight in to extension administration and ICT application in TOT and acquire skill in leadership in rural development

Approximate Hours

Item	Approx Hrs.
CI	09
LI	14
SW	1
SL	1
Total	25

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO4.1 understand about rural leadership, extension administration,</p> <p>SO4.2 Understand Monitoring and evaluation</p> <p>SO4.3 learn about capacity building of extension personnel</p> <p>SO4.4 Get applied knowledge about extension teaching method</p> <p>SO4.5 learn about several ICT application in transfer of technology in agriculture.</p>	<p>4.1 Group discussion- exercise;</p> <p>4.2 handling and use of audio visual equipment's and</p> <p>4.3 handling digital camera and LCD projector;</p> <p>4.4preparation and use of AV aids,</p> <p>4.5 preparation of extension literature – leaflet, booklet, folder,</p> <p>4.6 pamphlet news stories and success stories</p> <p>4.7 micro teaching exercise.</p>	<p>UNIT 4.1 Rural leadership, Monitoring and evaluation, Extension Teaching method and ICT applications in TOT</p> <p>4.2 Concept, definition and types of Rural leadership</p> <p>4.3 Concept, principals and functions of Extension administration</p> <p>4.4 Monitoring and Evaluation extension programme</p> <p>4.5 Concept and models of transfer of technology</p> <p>4.6 capacity building of extension personal</p> <p>4.7 meaning classification of extension teaching method</p> <p>4.8 Types of extension teaching method (individual, Group and Mass contact method)</p> <p>4.9 ICT application in TOT, Media Mix strategies</p>	<p>ICT applications in transfer of technology in agriculture</p> <p>To learn about different type of extension teaching methods and leadership skills</p>

SW-1 Suggested Sessional Work (SW):

A. Assignments:

Concept and models of transfer of technology , capacity building of extension personal , meaning classification of extension teaching method, Types of extension teaching method (individual, Group and Mass contact method)

B. Mini Project:

C. other activities

21EX322 unit 5. Learn about communication, journalism and diffusion and adoption of innovation in agriculture

Approximate Hours

Item	Approx Hrs.
CI	06
LI	8
SW	1
SL	1
Total	16

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO5.1 Learn about Communication and communication skills</p> <p>SO5.2 Understand that what is the role of journalism in agriculture</p> <p>SO5.3 understand adoption and diffusion of innovation in agriculture</p> <p>SO5.4 gain knowledge of categories of adopters</p>	<p>LI 1.1 Presentation skill</p> <p>LI 1.2 visit to community radio and television studio for understanding the process of programme production.</p> <p>LI 1.3 Script writing, writing for print and electronic media,</p> <p>LI 1.4 Developing script for radio and television.</p>	<p>UNIT 5.1 communication, journalism and diffusion and adoption of innovation in agriculture</p> <p>5.2 meaning and definition and principals of communication</p> <p>5.3 functions and barriers of communication</p> <p>5.4 Different model of Communication</p> <p>5.5 Agriculture Journalism</p> <p>5.6 Concept, Meaning and Process of Diffusion and adoption of innovation, Stages of Adoption and categories of adopters</p>	<p>Different model of Communication, Agriculture Journalism</p>

SW-1 Suggested Sessional Work (SW):

a) Assignments:

Stages of Adoption and categories of adopters ,different model of Communication

b) Mini Project:

No

c) Other Activities (Specify):

No

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Laboratory Instruction (LI)	Sessional Work (SW)	Self Learning (SL)	Total hour (Cl+SW+Sl)
CO 1. Understanding the fundamentals of extension education, extension systems in India.	06	2	01	01	10
CO 2. Insight in to programme planning and rural development efforts, extension administration.	06	06	01	01	14
CO 3. Knowledge on different extension methods and approaches used for transfer of agricultural technology.	03	0	01	01	05
CO 4. Provide an opportunity to visit different organizations involved in extension activities and rural development work.	09	14	01	01	25
CO 5. Acquaintance on practical skills in preparation of different extension teaching methods.	06	8	01	01	16
Total Hours	30	30	05	05	70

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Understanding the fundamentals of extension education, extension systems in India.	04	03	03	10
CO-2	Insight in to programme planning and rural development efforts, extension administration.	03	04	03	10
CO-3	Knowledge on different extension methods and approaches used for transfer of agricultural technology.	04	04	02	10
CO-4	Provide an opportunity to visit different organizations involved in extension activities and rural development work.	03	04	03	10
CO-5	Acquaintance on practical skills in preparation of different extension teaching methods.	03	04	03	10
Total		17	19	14	50

Legend: R: Remember, U: Understand, A: Apply

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Visit to Village NGO, government organization
7. Demonstration
8. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT,Blog, Facebook,Twitter, Whatsapp, Mobile, Online sources)
9. Brainstorming

10.

Suggested Learning Resources:

(a) Books :

S. No.	Title	Author	Publisher	Edition & Year
1	Extension communication and management	G.L. Ray	Kalyani publisher	2016
2	extension education and information system	Jitendra chauhan	Eisha publisher	2013
3	Fundamental of extension education		JNKVV jabalpur communication center	2019

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Cos, Pos and PSOs Mapping

Course Code: 21EX322

Course Title: Fundamentals of Agricultural Extension

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprises with different scales in area of agricultural production, process and trade	Hold a post on supply in administration and policy	Analyze and control commercial and economical process in the field of agriculture.	Teach how to control and manage agricultural production	Introduce general production technologies	Teach how to teach and manage production technology	Preparation of managerial and social responsibility	Student will identify different underutilized crops	Student will practice different breeding techniques used in crop production.	Student will recognize different insect pest and diseases and their symptoms of crops	Student will apply different recent techniques in crop production
21EX322. Understanding the fundamentals of extension education, extension systems in India.	2	2	1	1	1	3	2	1	3	1	2
21EX322. Insight in to programme planning and rural development efforts,	1	2	1	3	1	2	1	3	1	2	1

extension administration.											
21EX322. Knowledge on different extension methods and approaches used for transfer of agricultural technology.	1	3	2	2	3	3	1	3	1	2	3
21EX322. Provide an opportunity to visit different organizations involved in extension activities and rural development work.	1	2	1	2	3	1	2	1	3	1	1
21EX322 Acquaintance on practical skills in preparation of different extension teaching methods.	1	2	3	1	1	3	2	2	3	3	3

Legend: 1 – Low, 2 – Medium, 3 – High

Curriculum Map: Fundamentals of Agricultural Extension

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO 1,2,3,4 PSO 1,2, 3, 4,	21EX322-C.1: Understanding the fundamentals of extension education, extension systems in India.	SO1.1 SO1.2 SO1.3 SO1.4	1.1 To get acquainted with university extension system.	Unit-1.0 Extension Education and extension programme planning meaning and definition and types of education meaning and definition of extension education scope and process of extension education. Objective and principles of extension education. meaning and process extension programme planning. principles and steps in programme development 1.1, 1.2, 1.3. 1.4, 1.5, 1.6,	1 Process of extension education
PO 1,2,3,4 PSO 1,2, 3, 4,	21EX322-C.2: Insight in to programme planning and rural development efforts, extension administration	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5	2.1 A visit to village to understand the problems being encountered by the villagers/ farmers; 2.2 to study organization and functioning of DRDA and other development departments at district level. 2.3 visit to NGO and learning from their experience in rural development.	Unit-2.0 – Extension system in India and new trends in agriculture extension Pre-independence programme (Shri nikan, Marthandam, firka development Scheme, Gurgaon Experiment etc.)post - independence programme era (Etawah pilot project, Nilokheri) Various agriculture development programmes launched by Govt. / ICAR(IADP, IAAP, HYVP, KVK, IVLP,ORP, ND, NATP, NAIP, etc)Privatization extension, CYBER Extension. Marked led	1 Students Understand the concept of Privatization Extension, Cyber Extension, and Market led, Farmer led Extension in agriculture and Expert system.

				and Farmer led Extension in agriculture. Expert system etc 2.1, 2.2, 2.3. 2.4, 2.5,2.6.	
PO 1,2,3,4 PSO 1,2, 3,4,	21EX322-C.3: Knowledge on different extension methods and approaches used for transfer of agricultural technology.	SO3.1 SO3.2		Unit-3.0 Rural Development and Community Development Programme. meaning and definition of Rural development Various rural development programme meaning and definition of Community development Concept, Principals and Philosophy of CD. 3.1, 3.2, 3.3,	1. Various rural development programme
PO 1,2,3,4 PSO 1,2, 3,4,	21EX322-C.4: Provide an opportunity to visit different organizations involved in extension activities and rural development work.	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5	4.1 Group discussion-exercise; 4.2 handling and use of audio visual equipment's and 4.3 handling digital camera and LCD projector; 4.4preparation and use of AV aids, 4.5 preparation of extension literature – leaflet, booklet, folder, 4.6 pamphlet news stories and success stories 4.7 micro teaching exercise.	Unit-4.0 Rural leadership, Monitoring and evaluation, Extension Teaching method and ICT applications in TOT Concept, definition and types of Rural leadership Concept, principals and functions of Extension administration. Monitoring and Evaluation extension programme. Concept and models of transfer of technology. capacity building of extension personal. meaning classification of extension teaching method. Types of extension teaching method (individual, Group and Mass contact method) ICT application in TOT, Media Mix strategies 4.1, 4.2, 4.3. 4.4, 4.5,	1 ICT applications in transfer of technology in agriculture 2.To learn about different type of extension teaching methods and leadership skills

				4.6.4.7.4.8,4.9	
PO 1,2,3,4 PSO 1,2, 3,4,	21EX322 C.5: Acquaintance on practical skills in preparation of different extension teaching methods.	SO5.1 SO5.2 SO5.3 SO5.4	5.1 Presentation skill 5.2 visit to community radio and television studio for understanding the process of programme production. 5.3 Script writing, writing for print and electronic media, 5.4 Developing script for radio and television.	Unit-5.0 communication, journalism and diffusion and adoption of innovation in agriculture. Meaning and definition and principals of communication. Functions and barriers of communication. Different model of Communication. Agriculture Journalism Concept, Meaning and Process of Diffusion and adoption of innovation Stages of Adoption and categories of adopters 5.1, 5.2, 5.3. 5.4, 5.5, 5.6,	1 Different model of Communication, Agriculture Journalism

Course Code: 21AN323

Course Title : Crop Production Technology - (Kharif Crops)

Pre-requisite: practical knowledge of crop production is not only imperative but essential
With a view to Enhance production of particular crop.

Rationale: practical knowledge is the only solution for desired production for any
particular crops.

Course Outcomes: 21AN323.1 The UG students introduce about soil and climatic conditions of vindhya region for crop production.

21AN323.2 Student will become expert to know the crop production technology of kharif cereals crop

21AN323.3 Student acquired knowledge about scientific pulse crops production packages and practices.

21AN323.4 UG students acquainted knowledge about oilseeds crop production and oil extractions process.

21AN323.5 Students of UG classes gain knowledge on fiber and forage crops with the familiar relationship.

Scheme of Studies:

Code	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			CI	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Program Core (PCC)	21AN323	Crop production technology (Kharif Crops)	01	01	01	01	04	02

Legend:

CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:
Theory

Code	Course Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA + ESA)
			Class/ Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CA T)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
Program Core (PCC)	21A N323	Crop production technology – (Kharif Crops)	15	30	0	0	05	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

Course outcome 21AN323.1 The UG students introduce about soil and climatic conditions of Vindhya region for crop production.

Approximate Hours

Item	Appx Hrs.
CI	04
LI	04
SW	01
SL	01
TOTAL	10

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO1.1 To acquaint with modern production of rice crop under the present scenario</p> <p>SO1.2 To familiar with modern production of maize crop under the present scenario</p> <p>SO1.3 To know the recent production technology of sorghum</p> <p>SO1.4 To learn how improved transplanting technique is done under SRI method. To learn how seeds are sown under different depth of sowing?</p>	<p>1. Techniques of transplanting of rice under SRI method</p> <p>2. Effect of sowing depth on germination of kharif crops</p>	<p>Unit-1. Origin, geographical distribution economic importance, soil and climatic requirements varieties cultural practices and yield of kharif crops Rice, Maize, Sorghum</p> <p>1.1. Origin, geographical distribution economic importance, soil and climatic requirements and varieties of Rice</p> <p>1.2 Introduction to cultural practices and yield of rice crop.</p> <p>1.3 Origin, geographical distribution economic importance, soil and climatic requirements varieties cultural practices and yield of Maize crop.</p> <p>1.4 Origin, geographical distribution economic importance, soil and climatic requirements varieties cultural practices and yield of kharif of Sorghum crop.</p>	<p>Study on SRI method of Rice crop</p>

SW-1 Suggested Sessional Work (SW):

Assignments: production technology of maize crop with reference to modern practices.

a. Other Activities (Specify): Identification of different varieties of rice crop

Course outcome 21AN323.2 Student will become expert to know the crop production technology of kharif cereals crop

Approximate Hours

Item	Appx Hrs.
CI	2
LI	2
SW	1
SL	1
TOTAL	6

SessionOutcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO1.1 Student will become expert in improved production technology of pearl millet.</p> <p>SO1.2 Student may familiar with improve pacackages and practices for finger millet crop under the periphery of satna distic.</p>	<p>Effect of seed size on germination and seedling vigour of kharif season crops,</p>	<p>Unit-2 Origin, geographical distribution economic importance, soil and climatic requirements varieties cultural practices and yield of pearl millet and finger millet crops</p> <p>1.1 Origin, geographical distribution economic importance, soil and climatic requirements and varieties of pearl millet.</p> <p>1.2 Origin, geographical distribution economic importance, soil and climatic requirements varieties cultural practices and yield of finger millet crop.</p>	<p>1. To study about Cultivation of major millet crop.</p>

SW-1 Suggested Sessional Work (SW):

Assignments: production technology of pearl millet

b. OtherActivities(Specify): Identification of different varaieties of finger millet crop

Course outcome 21AN323.3 Student acquired knowledge about scientific pulse crops production packages and practices.

Approximate Hours

Item	AppxHrs.
CI	03
LI	02
SW	01
SL	01
TOTAL	07

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO1.1 To acquaint with modern production of pigeonpea crop under the present scenario</p> <p>SO1.2 To know the recent production technology of mungbean.</p> <p>SO1.3 To familiar with modern production of urdbean crop under the present scenario</p>	<p>Sowing of, pigeonpea, mungbean, urdbean,</p>	<p>Unit-3 Origin, geographical distribution economic importance, soil and climatic requirements varieties cultural practices and yield of kharif crops pigeonpea, mungbean and urdbean;</p> <p>1.1. Origin, geographical distribution economic importance of pigeonpea.</p> <p>1.2 . cultural practices and yield of mungbean crop.</p> <p>1.3. Origin, geographical distribution economic importance, soil and climatic requirements varieties cultural practices and yield of urdbean;</p>	<p>Production technology of pigeonpea crop</p>

SW-1 Suggested Sessional Work (SW):

Assignments: modern packages and practices of pigeonpea crop

c. Other Activities (Specify): identification of weed

Course out come 21AN323.4 UG students acquainted knowledge about oilseeds crop production and oil extractions process.

Approximate Hours

Item	AppxHrs.
CI	03
LI	04
SW	01
SL	01
TOTAL	09

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO1.1 Origin, geographical distribution economic importance, soil and climatic requirements varieties cultural practices and yield of kharif crops - groundnut, and soybean</p> <p>SO1.2 Student may familiar with improve pacackages and practices for groundnut crop under the peri-phery of satna distic</p> <p>SO1.3 To acquaint with modern production of soybean crop under the present scenario</p>	<p>1.Study of crop varieties and important agronomic experiments at experimental farm.</p> <p>2.Study of forage experiments, morphological description of kharif season crops</p>	<p>Unit-4 Origin, geographical distribution economic importance, soil and climatic requirements varieties cultural practices and yield of kharif crops groundnut, and soybean.</p> <p>1.1. Origin, geographical distribution economic importance, soil and climatic requirements and varieties of Groundnut.</p> <p>1.2. Introduction to cultural practices and yield of Soybean crop.</p> <p>1.3 Classification of groundnut and soybean crop</p>	<p>1. To study about Cultivation of Groundnut crop.</p>

SW-1 Suggested Sessional Work (SW):

Assignments: production technology of Soybean crop with reference to modern practices.

d. Other Activities (Specify): Packages and practices of Groundnut crop

Course outcome 21AN323.5 Students of UG classes gain knowledge on fiber and forage crops with the familiar relationship.

Approximate Hours

Item	Appx Hrs.
CI	2
LI	6
SW	1
SL	1
TOTAL	10

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO1.1 Student may familiar with improve packages and practices for cotton & jute crop under the periphery of satna district</p> <p>SO1.2 To know the recent production technology of sorghum</p> <p>SO1.3 To acquaint with modern production of cowpea, cluster bean crop under the present scenario</p> <p>SO1.4. Student will become expert in improved production technology of Napier.</p>	<p>1. Study of crop varieties and important agronomic experiments at experimental farm.</p> <p>2. Study of yield contributing characters and yield calculation of kharif season crops</p> <p>3. Identification of weeds in kharif season crops</p>	<p>Unit-5 Origin, geographical distribution economic importance, soil and climatic requirements varieties cultural practices and yield of kharif crops cotton & jute.</p> <p>1.1 Introduction to cultural practices and yield of sorghum, cowpea crop</p> <p>1.2. Origin, geographical distribution economic importance, soil and climatic requirements varieties cultural practices and yield of cluster bean and Napier crop.</p>	<p>1.. Production technology of cotton crop.</p>

SW-1 Suggested Sessional Work (SW):

Assignments: production technology of Jute crop with reference to modern practices.

Other Activities (Specify): Packages and practices of Cotton crop

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Laboratory Instruction (LI)	Sessional Work (SW)	Self Learning (Sl)	Total hour (Cl+LI+SW+Sl)
21EV125.1 Students acquaint will familiar with the knowledge of Agronomy and its scope and importance and know the seed and importance of plant population in the field and nutrient use efficiency.	4	4	1	1	10
21EV125.2 students will able to acquaints knowledge about Water resources in india and water relationship with soil and plant and irrigation and its method and importance of irrigation.	2	2	01	01	06
21EV125.3 Students will able to identify the weed and agronomical problem create by thw weed and its management and allelopathic effects of weeds on crop.	3	2	01	01	7
21EV125.4 Students will able to acquaint knowledge to crop growth and development of crop and factors affecting the growth and development plant ideotypes and its concept crop rotation and its principles.	3	4	01	01	9
21EV125.5 Students will able to acquaint knowledge to Adaptation and distribution of crops crop management technologies of crop in problematic areas harvesting and threshing of crops	2	6	01	01	10
Total Hours	14	18	05	05	42

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution				Total Marks
		R	U	A		
CO 1	Student will able to become expert identify the Rabi crops.	10	5	5		20
CO 2	Students will acquaint with underline the field preparation, seed treatment, seed inoculation, and nursery management etc.	10	5	5		20
CO 3	Student will have knowledge about seed production technology of Rabi crops..	10	5	5		20
CO 4	Students of UG Agronomy will become expert to review the integrated nutrient, insect- pest and disease management technology.	10	5	5		20
CO 5	Student will able to become expert for preparation of balance sheet and estimate the cost of cultivation of Rabi crops..	10	5	5		20
Total						100

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Introduction to Practical Crop Production II (Rabi Crop) will be held with written examination of 100 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks.

Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Visit to Field Work
7. Demonstration
8. ICT Based Teaching Learning
9. Brain storming

Suggested Learning Resources: (a) Books :

S. No.	Title	Author	Publisher	Edition & Year
1.	Manures and Fertilizers	Yawalkar, K.S., Agarwal, J.P. and Bokde, S.	Agri-Horticultural Publishing House, Nagpur.	10th edition 2008
2.	Principles and Practices of Agronomy Agrobios (India), Jodhpur.	Balasubramanian, P. and Palaniappan, S.P.	Agrobios (India), Jodhpur.	2016
3.	Principles of Agronomy	Reddy, S. R.,	Kalyani Publishers, Ludhiana	5 th edition 2016
4.	Principles and Practices of Agronomy	Singh, S.S. and Singh, Rajesh	Kalyani Publishers, New Delhi,	5 th edition 2015

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Cos, Pos and PSOs Mapping

Course Code: 21AN323

Course Title: Crop Production Technology-1 (Kharif)

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprises with different scales in area of agricultural production, process and trade	Hold a post on supply in administration and policy	Analyze and control commercial and economical process in the field of agriculture.	Teach how to control and manage agricultural production	Introduce general production technologies	Teach how to teach and manage production technology	Preparation of managerial and social responsibility	Student will identify different underutilized crops	Student will practice different breeding techniques used in crop production.	Student will recognize different insect pest and diseases and their symptoms of crops	Student will apply different recent techniques in crop production
21AN323.1 The UG students introduce about soil and climatic conditions of vindhya region for crop production.	2	1	1	1	1	3	2	1	2	1	2
21AN323.2 Student will become expert to know the crop	2	2	1	3	1	2	1	3	2	2	1

production technology of kharif cereals crop											
21AN323.3 Student acquired knowledge about scientific pulse crops production packages and practices.	1	3	2	2	1	3	1	3	1	1	3
21AN323.4 UG students acquainted knowledge about oilseeds crop production and oil extractions process.	1	3	1	2	3	1	2	1	3	1	1
21AN323.5 Students of UG classes gain knowledge on fiber and forage crops with the familiar relationship.	1	2	3	2	1	3	2	2	3	1	3

Legend: 1 – Low, 2 – Medium, 3 – High

Curriculum Map: Crop Production Technology-1 (Kharif)

Pos & PSOs	Cos No. & Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
PO1,2,3,4,5,6,7 PSO 1,2,3,4	The UG students introduce about soil and climatic conditions of Vindhya region for crop production.	SO 1.1 SO 1.2 SO 1.3 SO 1.4	1.Techniques of transplanting of rice under SRI method 2.Effect of sowing depth on germination of kharif crops.	Origin, geographical distribution economic importance, soil and climatic requirements varieties cultural practices and yield of kharif crops Rice, Maize, Sorghum 1.1, 1.2, 1.3,1.4	Study on SRI method of Rice crop.
PO1,2,3,4,5,6,7 PSO 1,2,3,4	Student will become expert to know the crop production technology of kharif cereals crop	SO 2.1 SO 2.2	Effect of seed size on germination and seedling vigour of kharif season crops.	Origin, geographical distribution economic importance, soil and climatic requirements varieties cultural practices and yield of pearl millet and finger millet crops 2.1,2.2	To study about Cultivation of major millet crop.
PO1,2,3,4,5,6,7 PSO 1,2,3,4	Student acquired knowledge about scientific pulse crops production packages and practices.	SO 3.1 SO 3.2 SO 3.3	Sowing of, pigeonpea , mungbean, urdbean.	Origin, geographical distribution economic importance, soil and climatic requirements varieties cultural practices and yield of kharif crops pigeonpea, mungbean and urdbean 3.1,3.2,3.3	Production technology of pigeonpea crop.
PO1,2,3,4,5,6,7	UG students acquainted	SO 4.1	1.Study of crop varieties and important agronomic	Origin, geographical distribution economic importance, soil and climatic	To study about Cultivation of

PSO 1,2,3,4	knowledge about oilseeds crop production and oil extractions process.	SO 4.2 SO 4.3 SO 4.4 SO 4.5	experiments at experimental farm. 2.Study of forage experiments, morphological description of kharif season crops	requirements varieties cultural practices and yield of kharif crops groundnut, and soybean. 4.1,4.2,4.3	Groundnut crop.
PO1,2,3,4,5,6,7 PSO 1,2,3,4	Students of UG classes gain knowledge on fiber and forage crops with the familiar relationship.	SO 5.1 SO 5.2 SO 5.3 SO 5.4	1.Study of crop varieties and important agronomic experiments at experimental farm. 2. Study of yield contributing characters and yield calculation of kharif season crops 3.Identification of weeds in kharif season crops	Origin, geographical distribution economic importance, soil and climatic requirements varieties cultural practices and yield of kharif crops cotton & jute. 5.1,5.2	Production technology of cotton crop.

Course Code: 21EC324

Course Title: Agricultural Finance and Co-Operation

Pre requisite: -Students should have advance knowledge of Agricultural Finance and Co-Operation, for developed the ability of financial analysis in agriculture enterprises.

Rationale: - Agricultural Finance and Co-Operation is the express through the concept and provide the information to Agricultural Economist and professionals in accurate manners. Agricultural Economist or scientist should develop skill in the enterprise analysis and farm business with apply the principle of agricultural finance and cooperatin.

Course Outcomes:

CO1: Define the agricultural finance, agricultural credits and credit analysis.

CO 2: Express the sources of agricultural finance and nationalization of commercial banks

CO 3: Interpret higher financing institutions – RBI, NABARD, ADB, IMF, World Bank, Insurance

CO 4: Analyze about the financial statements and preparation of project reports

CO 5: Asses the about the meaning and concept of Agricultural Cooperation.

Scheme of Studies:

Code	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits (C)
			CI	LI	SW	SL	Total Study Hours CI+LI+SW+SL	
Program Core (PCC)	21EC324	Agricultural Finance and Co-Operation	2	2	1	1	06	03

Legend:

CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Code	Course Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ESA)
			Class/ Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
Program Core (PCC)	21EC229	Agricultural Finance and Co-Operation	15	30	00	00	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

21EC324 CO 1: Define the agricultural finance, agricultural credits and credit analysis.

Approximate Hours	
Item	Approximate Hours
CI	06
LI	04
SW	1
SL	1
Total	10

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction(CI)	Self Learning (SL)
<p>SO1.1: Agricultural Finance-meaning. scope and significance</p> <p>SO1.2: Scope and significance of Agricultural Finance</p> <p>SO1.3: Credit needs and its role in Indian agriculture.</p> <p>SO1.4: Agricultural credit: meaning, definition, need, classification</p> <p>SO1.5: Credit analysis: 4 R's, and 3C's of credits.</p>	<p>1. Determination of most profitable level of capital use.</p> <p>2. Optimum allocation of limited amount of capital among different enterprise.</p>	<p>Unit-1- Agricultural Finance-meaning, scope and significance, credit needs and its role in Indian agriculture. Agricultural credit: meaning, definition, need, classification. Credit analysis: 4 R's, and 3C's of credits.</p> <p>1.1 Introduce to agricultural Finance and meaning</p> <p>1.2: Discuss to scope and significance.</p> <p>1.3: Credit needs and its role in Indian agriculture.</p> <p>1.4: Discuss to Agricultural credit: meaning, definition and needs</p> <p>1.5: Describe the classification of credits</p> <p>1.6: Apply the Credit analysis: 4 R's, and 3C's of credits.</p>	<p>Prepare the assignment on Meaning and definition of Agricultural Finance-meaning, scope and significance, credit needs and its role in Indian agriculture</p>

SW-1 Suggested Sessional Work (SW):

a. Assignments: Prepare the assignment on Meaning and definition of Agricultural Finance-meaning, scope and significance, credit needs and its role in Indian agriculture

b. Mini Project:

c. Other Activities (Specify)

21EC324 CO 2: Express the sources of agricultural finance and nationalization of commercial banks

Approximate Hours

Item	Approximate Hours
CI	5
LI	4
SW	1
SL	1
Total	09

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO1.1: Sources of agricultural finance:</p> <p>SO1.2: Institutional and non-institutional sources,</p> <p>SO1.3: Commercial banks, social control and</p> <p>SO1.4: Nationalization of commercial banks,</p> <p>SO1.5: Micro financing including KCC.</p>	<p>1- Analysis of progress and performance of cooperatives using published data.</p> <p>2-Analysis of progress and performance of commercial banks and RRBs using published data.</p>	<p>Unit 2- Sources of agricultural finance: institutional and non-institutional sources, commercial banks, social control and nationalization of commercial banks, Micro financing including KCC.</p> <p>2.1 Sources of agricultural finance:</p> <p>2.2 Institutional and non-institutional sources,</p> <p>2.3 Commercial banks, social control and</p> <p>2.4 nationalization of commercial banks,</p> <p>2.5 Micro financing including KCC.</p>	<p>Prepare the assignment on Meaning and definition of Institutional and non-institutional sources and commercial banks</p>

SW-2 Suggested Sessional Work (SW):

- a. Assignments:** Prepare the assignment on Meaning and definition of Institutional and non-institutional sources, and commercial banks.
- b. Mini Project:**
- c. Other Activities (Specify):**

21EC324 CO 3: Interpret higher financing institutions – RBI, NABARD, ADB, IMF, World Bank, Insurance

Item	Approximate Hours
CI	6
LI	4
SW	1
SL	1
Total	10

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO1: Lead bank scheme.</p> <p>SO2: RRBs, Scale of finance and unit cost.</p> <p>SO3: An introduction to higher financing institutions – RBI, NABARD, ADB, IMF, world bank, Insurance and Credit</p> <p>SO4: Guarantee Corporation of India.</p> <p>SO5: Cost of credit. Recent development in agricultural credit.</p>	<p>1. Visit to a commercial bank, cooperative bank and cooperative society to acquire firsthand knowledge of their management, schemes and procedures</p> <p>2. Estimation of credit requirement of farm business – A case study.</p>	<p>Unit 3- Lead bank scheme, RRBs, Scale of finance and unit cost. An introduction to higher financing institutions – RBI, NABARD, ADB, IMF, world bank, Insurance and Credit Guarantee Corporation of India. Cost of credit. Recent development in agricultural credit.</p> <p>3.1 Lead bank scheme.</p> <p>3.2 RRBs, Scale of finance and unit cost.</p> <p>3.3 An introduction to higher financing institutions – RBI, NABARD, ADB, IMF, world bank.</p> <p>3.4 Insurance and Credit</p> <p>3.5 Guarantee Corporation of India.</p> <p>3.6 Cost of credit. Recent development in agricultural credit.</p>	<p>Prepare the assignment on Meaning and definition of introduction to higher financing institutions – RBI, NABARD, ADB, IMF, world bank.</p>

SW-3 Suggested Sessional Work (SW):

- a. **Assignments:** Prepare the assignment on Meaning and definition of introduction to higher financing institutions – RBI, NABARD, ADB, IMF, world bank
- b. **Mini Project:**
- c. **Other Activities (Specify):**

21EC324 CO 4: Analyze about the financial statements and preparation of project reports

Item	Approximate Hours
CI	6
LI	2
SW	1
SL	1
Total	10

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO1.1: Preparation and analysis of financial statements – SO1.2: Balance Sheet SO1.3: Income Statement. SO1.4: Basic guidelines for preparation of project reports- SO1.5: Bank norms – SWOT analysis.	1. Preparation and analysis of balance sheet – A case study.	Unit 4- Preparation and analysis of financial statements – Balance Sheet and Income Statement. Basic guidelines for preparation of project reports- Bank norms – SWOT analysis. 4.1 Preparation and analysis of financial statements. 4.2 Balance Sheet 4.3Income Statement. 4.4Basic guidelines for preparation of project reports. 4.5 Bank norms – SWOT analysis.	Prepare the assignment on Meaning and definition of Preparation and analysis of financial statements – Balance Sheet and Income Statement.

SW-4 Suggested Sessional Work (SW):

a. Assignments: Prepare the assignment on Meaning and definition of Preparation and analysis of financial statements – Balance Sheet and Income Statement.

b. Mini Project:

c. Other Activities (Specify):

21EC324 CO 5: Asses the about the meaning and concept of Agricultural Cooperation.

Item	Approximate Hours
CI	6
LI	2
SW	1
SL	1
Total	10

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO1.1: Meaning, brief history of cooperative development in India, objectives,</p> <p>SO1.2: principles of cooperation, significance of cooperatives in Indian agriculture.</p> <p>SO1.3: Agricultural Cooperation in India-credit, marketing, consumer and multi-purpose cooperatives,</p> <p>SO1.4: farmers' service cooperative societies, processing cooperatives, farming</p> <p>SO1.5: Cooperatives, cooperative warehousing; role of ICA, NCUI, NCDC, NAFED..</p>	<p>1-Preparation and analysis of income statement – A case study, Appraisal of a loan proposal</p>	<p>Unit 5- Agricultural Cooperation – Meaning, brief history of cooperative development in India, objectives, principles of cooperation, significance of cooperatives in Indian agriculture. Agricultural Cooperation in India- credit, marketing, consumer and multi-purpose cooperatives, farmers' service cooperative societies, processing cooperatives, farming cooperatives, cooperative warehousing; role of ICA, NCUI, NCDC, NAFED.</p> <p>5.1 Agricultural Cooperation.</p> <p>5.2 Meaning, brief history of cooperative development in India, objectives.</p> <p>5.3 principles of cooperation, significance of cooperatives in Indian agriculture.</p> <p>5.4 Agricultural Cooperation in India- credit, marketing, consumer and multi-purpose</p>	<p>Prepare the assignment on Meaning and definition of Agricultural Cooperation in India- credit, marketing, consumer and multi-purpose cooperatives, farmers' service cooperative societies, processing cooperatives, farming cooperatives, cooperative warehousing; role of ICA, NCUI, NCDC, NAFED.</p>

		<p>cooperatives.</p> <p>5.5 Farmers service cooperative societies, processing cooperatives, and farming.</p> <p>5.6 Cooperatives, cooperative warehousing; role of ICA, NCUI, NCDC, NAFED.</p>	
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SW-5 Suggested Sessional Work (SW):**Assignments:** Prepare the assignment on Meaning and definition of

- a. Agricultural Cooperation in India- credit, marketing, consumer and multi-purpose cooperatives, farmers' service cooperative societies, processing cooperatives, farming cooperatives, cooperative warehousing; role of ICA, NCUI, NCDC, NAFED
- b. **Mini Project:**
- c. **Other Activities (Specify):**

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self Learning (Sl)	Total hour (Cl+SW+Sl)
1: Define the agricultural finance, agricultural credits and credit analysis.	06	01	01	08
2: Express the sources of agricultural finance and nationalization of commercial banks	05	01	01	07
3: Interpret higher financing institutions – RBI, NABARD, ADB, IMF, World Bank, Insurance	06	01	01	08
4: Analyze about the financial statements and preparation of project reports	06	01	01	08
5: Asses the about the meaning and concept of Agricultural Cooperation.	06	01	01	08
Total	29	5		

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO 1	1: Define the agricultural finance, agricultural credits and credit analysis.	02	03	00	05
CO 2	2: Express the sources of agricultural finance and nationalization of commercial banks	02	05	03	10
CO 3	3: Interpret higher financing institutions – RBI, NABARD, ADB, IMF, World Bank, Insurance	00	08	07	15
CO 4	4: Analyze about the financial statements and preparation of project reports	02	05	08	15
CO 5	5: Asses the about the meaning and concept of Agricultural Cooperation.	00	03	02	05
	Total	06	24	20	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Demonstration
7. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, Whatsapp, Mobile, Online sources)
8. Brainstorming

Suggested Learning Resources:**(a) Books:**

S. No.	Title	Author	Publisher	Edition & Year
1	Agricultural finance and management	S. Subba Reddy, P. Raghu Ram,	Oxford & IBH Pub. Co, New Delhi	1996
2	New Dimensions of Cooperative Management	Kamat, G.S.,	Himalyan Publishing House, Mumbai.	1978
3	Agricultural Finance.	Nelson and Murray	Kalyani Publishers, New Delhi.	1988.
4	An Introduction to Agricultural Finance	Pandey, U.K	Kalyani Publishers, New Delhi.	1990
5	Agricultural Finance Theory and Practices,	Singh, J.P.	Ashish Publishing House, New Delhi	1988

Curriculum Development Team:

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Cos, Pos and PSOs Mapping

Course Code: 21EC324

Course Title: Agricultural Finance and Cooperation

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprises with different scales in area of agricultural production, process and	Hold a post on supply in administration and policy	Analyze and control commercial and economical process in the field of agriculture.	Teach how to control and manage agricultural production	Introduce general production technologies	Teach how to teach and manage production technology	Preparation of managerial and social responsibility	Student will identify different underutilized crops	Student will practice different breeding techniques used in crop production.	Student will recognize different insect pest and diseases and their symptoms of crops	Student will apply different recent techniques in crop production
21EC324.1: Define the agricultural finance, agricultural credits and credit analysis.	2	1	1	3	1	3	2	1	2	2	1

21EC324.2: Express the sources of agricultural finance and nationalization of commercial banks	1	2	1	3	1	2	1	3	1	2	1
21EC324.3: Interpret higher financing institutions – RBI, NABARD, ADB, IMF, World Bank, Insurance	1	3	2	2	1	2	1	3	1	12	3
21EC324.4: Analyze about the financial statements and preparation of project reports	2	3	1	2	3	1	2	1	3	1	2

21EC324.5: Asses the about the meaning and concept of Agricultural Cooperation.	1	3	3	2	1	3	1	2	2	1	1
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Legend: 1 – Low, 2 – Medium, 3 – High

Curriculum Map: Agricultural Finance and Cooperation

Pos & PSOs	Cos No. & Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
PO1,2,3,4,5,6,7 PSO 1,2,3,4	1: Define the agricultural finance, agricultural credits and credit analysis.	SO 1.1 SO 1.2 SO 1.3 SO 1.4 SO 1.5	1. Determination of most profitable level of capital use. 2. Optimum allocation of limited amount of capital among different enterprise.	Agricultural Finance- meaning, scope and significance, credit needs and its role in Indian agriculture. Agricultural credit: meaning, definition, need, classification. Credit analysis: 4 R's, and 3C's of credits. 1.1,1.2,1.3,1.4,1.5,1.6	Prepare the assignment on Meaning and definition of Agricultural Finance- meaning, scope and significance, credit needs and its role in Indian agriculture
PO1,2,3,4,5,6,7 PSO 1,2,3,4	2: Express the sources of agricultural finance and nationalization of commercial banks	SO 2.1 SO 2.2 SO 2.3 SO 2.4 SO 2.5	1- Analysis of progress and performance of cooperatives using published data. 2-Analysis of progress and performance of commercial banks and RRBs using published data.	Sources of agricultural finance: institutional and non-institutional sources, commercial banks, social control and nationalization of commercial banks, Micro financing including KCC. 2.1,2.2,2.3,2.4,2.5	Prepare the assignment on Meaning and definition of Institutional and non-institutional sources and commercial banks
PO1,2,3,4,5,6,7 PSO 1,2,3,4	3: Interpret higher financing institutions – RBI,	SO 3.1 SO 3.2	1. Visit to a commercial bank, cooperative bank and cooperative society to acquire firsthand	Preparation and analysis of financial statements – Balance Sheet and Income Statement. Basic guidelines for preparation of project reports- Bank norms – SWOT	Prepare the assignment on Meaning and definition of

	NABARD, ADB, IMF, World Bank, Insurance	SO 3.3 SO 3.4 SO 3.5	knowledge of their management, schemes and procedures. 2. Estimation of credit requirement of farm business – A case study.	analysis. 3.1,3.2,3.3,3.4,3.5,3.6	introduction to higher financing institutions – RBI, NABARD, ADB, IMF, world bank.
PO1,2,3,4,5,6,7 PSO 1,2,3,4	4: Analyze about the financial statements and preparation of project reports	SO 4.1 SO 4.2 SO 4.3 SO 4.4 SO 4.5	Preparation and analysis of balance sheet – A case study.	Preparation and analysis of financial statements – Balance Sheet and Income Statement. Basic guidelines for preparation of project reports- Bank norms – SWOT analysis. 4.1,4.2,4.3,4.4,4.5	Prepare the assignment on Meaning and definition of Preparation and analysis of financial statements – Balance Sheet and Income Statement.
PO1,2,3,4,5,6,7 PSO 1,2,3,4	5: Asses the about the meaning and concept of Agricultural Cooperation.	SO 5.1 SO 5.2 SO 5.3 SO 5.4 SO 5.5	1-Preparation and analysis of income statement – A case study, Appraisal of a loan proposal	Agricultural Cooperation – Meaning, brief history of cooperative development in India, objectives, principles of cooperation, significance of cooperatives in Indian agriculture. Agricultural Cooperation in India- credit, marketing, consumer and multi-purpose cooperatives, farmers’ service cooperative societies, processing cooperatives, farming cooperatives, cooperative warehousing; role of ICA,	Prepare the assignment on Meaning and definition of Agricultural Cooperation in India- credit, marketing, consumer and multi-purpose cooperatives, farmers’ service

				<p>NCUI, NCDC, NAFED.</p> <p>5.1,5.2,5.3,5.4</p>	<p>cooperative societies, processing cooperatives, farming cooperatives, cooperative warehousing; role of ICA, NCUI, NCDC, NAFED.</p>
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Course Code:- 21CS325**Course Title:- Agriculture Informatics**

- **Pre-requisite:-** Student should have basic knowledge of computer such as Input devices, central processing unit and output devices. Student should aware of how to power on computer and how to shut down computer.

Rationale: - The subject of Agriculture Informatics Various software applications assists farmers in managing their operations efficiently. These programs help with tasks like crop planning, inventory management, financial tracking, and equipment maintenance scheduling. Computers enable farmers to employ precision agriculture techniques, utilizing data from satellites, drones, and sensors to assess variations in soil characteristics, moisture levels, and crop health. This often leads to improved crop quality, higher yields, and better overall agricultural productivity.

Course Outcomes:

CS325.1: Knowledge and anatomy of computer including Operating Systems and networking.

CS325.2: Able to describe MS Office like MS Word, MS Excel, MS Access and Ms PowerPoint.

CS325.3: Able to describe audio visual aids for smart learning and communication process.

CS325.4: Knowledge of World Wide Web (www) and internet their Concepts and components and use of Information and Communication Technology in Agriculture.

CS325.5: Able to describe preparation of contingent crop-planning using IT tools. Smartphone Apps in Agriculture for farm advises, market price, postharvest management. Agriculture Expert System, Soil Information Systems for supporting Farm decisions

Scheme of Studies:

Code	CourseCode	CourseTitle	Scheme of studies(Hours/Week)				Total StudyHours(CI+LI+SW+SL)	TotalCredits (C)
			CI	LI	SW	SL		
Program Core (PCC)	21CS325	Agriculture Informatics	1	1	1	1	4	2

Legend:CI:ClassroomInstruction(Includesdifferentinstructionalstrategiesi.e.Lecture(L)andTutorial (T)and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sectional Work (include assignment, seminar, mini project etc.),

SL: Self earning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Code	Course Code	Course Title	Scheme of Assessment (Marks)							End Semester Assessment (ESA)	Total Marks (PRA+ESA)
			Progressive Assessment (PRA)						Total Marks (CA+CT+SA+CAT+AT)		
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)				
Program Core (PCC)	21CS 325	Agriculture Informatics	15	30	0	0	5	50	50	100	

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

CO:- 01 Knowledge and anatomy of computers including Operating Systems and networking.

Approximate Hours

Item	Appx Hrs.
CI	5
LI	6
SW	1
SL	0
Total	12

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO1.1 Understanding basic concept of computer and Versions of Windows and their Use</p> <p>SO1.2 Understanding the networking and programming language</p> <p>SO1.3 Understanding the number system</p>	<p>1.1 Practice of important DOS Commands.</p> <p>1.2 demonstrating the Creation of Files & Folders</p> <p>1.3 Describe Number System</p>	<p>Unit-1. Introduction to Computer</p> <p>1.1 Describe the introduction, definition and components of computer , hardware and Software</p> <p>1.2 Describe the Input and output devices.</p> <p>1.3 Describe the Windows and linux operating systems</p> <p>1.4 Understanding the networking and its types</p> <p>1.5 Define programming language and its types.</p>	

SW-1 Suggested Sessional Work(SW):

- a. **Assignments:** Describe input and output devices.
- b. **Mini Project:**
- c. **Other Activities(Specify):**

CO:- 02 Able to describe MS Office like MS Word, MS Excel, MS Access and Ms PowerPoint

Approximate Hours

Item	AppxHrs.
CI	3
LI	8
SW	2
SL	0
Total	13

session outcomes (Sos)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO1.1 Understanding Ms office software</p> <p>SO1.2Importance of office software in agriculture</p>	<p>1.1Demonstrating the Creating, Opening and Saving Document</p> <p>1.2Demonstrating the Creation of presentation file</p> <p>1.3Demonstrating the Creating a spreadsheet, use of statistical tools, writing expressions, creating graphs, analysis of scientific data.</p> <p>1.4Demonstrating the Creating Database, preparing queries and reports in MS Access</p>	<p>Unit-2 Introduction to MS Office</p> <p>1.1Describe the MS Office and creation of document in ms word</p> <p>1.2 Describe the data presentation and Interpretation</p> <p>1.3 Understanding the concept of database and its use in agriculture.</p>	

SW-1 Suggested Sessional Work (SW):

- a. **Assignments:** Explain in details data presentation and data interpretation methods
Class Test1
- b. **Mini Project:**
- c. **Other Activities (Specify)**

CO:- 03 Able to describe audio visual aids for smart learning and communication process.

Approximate Hours

Item	AppxHrs.
CI	2
LI	4
SW	1
SL	0
Total	5

SW-1 Suggested Sessional Work (SW):

- a. Assignments:** Explain about Communication Process
- b. Mini Project:**
- c. Other Activities (Specify)**

CO:- 04 Knowledge of the World Wide Web (www) and Internet their Concepts and components and use of Information and Communication Technology in Agriculture.

Approximate Hours

Item	Appx Hrs.
CI	2
LI	4
SW	2
SL	0
Total	6

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO1.1 Understanding the Audio Visual aids</p> <p>SO1.2 Audio Visual aids use in video conferencing and communication process</p>	<p>1.1 Handling of audio visual equipments</p> <p>1.2 Demonstrating poster and chart presentation</p>	<p>Unit-3 Audio visual aids</p> <p>1.1 Describe Audio visual aids, advantages and classification</p> <p>1.2 Understanding the Video conferencing and Communication process, Berlo's model, feedback and barriers</p>	

SW-1 Suggested Sessional Work (SW):

- a. **Assignments:** Explain about use of ICT in Agriculture
Class Test 2
- b. **Mini Project:**
- c. **Other Activities (Specify):**

CO:- 05 Knowledge of World Wide Web (www) and internet their Concepts and components and use of Information and Communication Technology in Agriculture.

ApproximateHours

Item	AppxHrs.
CI	3
LI	8
SW	2
SL	0
Total	13

SessionOutcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO1.1Understanding It tools and its importance</p> <p>SO1.2Understanding use of smart phone app in agriculture</p>	<p>1.1 Introduction of Geospatial Technology for generating valuable information for Agriculture</p> <p>1.2Hands on Crop Simulation Models (CSM) such as DSSAT/Crop-Info/CropSyst/Wofost</p> <p>1.3 Hands on Decision support system</p> <p>1.4 Understanding e banking market</p>	<p>Unit-5 IT Tools</p> <p>1.1IT and its importance, IT tools, IT-enabled services and their impact on society</p> <p>1.2Smartphone Apps in Agriculture for farm advisory, e-banking markets market price</p> <p>1.3Decision support systems, concepts, and applications in Agriculture, Agriculture Expert System</p>	

SW-1 Suggested Sessional Work (SW):

- a. **Assignments:**Smartphone Apps in Agriculture for farm advisory.

Class Test 3

- b. **Mini Project:**

- c. **OtherActivities(Specify):**

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self Learning (Sl)	Total hour (Cl+SW+Sl)
CS 325.1: Knowledge and anatomy of computer including Operating Systems and networking	5	1	0	6
CS 325.2: Able to describe MS Office like MS Word, MS Excel, MS Access and Ms PowerPoint	3	2	0	5
CS 325.3 Able to describe audio visual aids for smart learning and communication process.	2	1	0	3
CS 325.4: Knowledge of World Wide Web (www) and Internet their Concepts and components and use of Information and Communication Technology in Agriculture.	2	2	0	4
CS 325.5: Able to describe preparation of contingent crop-planning using IT tools. Smartphone Apps in Agriculture for farm advises, market price, postharvest management. Agriculture Expert System, Soil Information Systems for supporting Farm decisions.	3	2	0	5
Total Hours	15	08	00	23

Suggestion for End Semester Assessment

Suggested Specification Table(For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Knowledge and anatomy of computer including Operating Systems and networking.	04	04	00	08
CO-2	Able to describe MS Office like MS Word, MS Excel, MS Access and Ms PowerPoint	02	02	03	07
CO-3	Able to describe audio visual aids for smart learning and communication process.	02	03	04	09
CO-4	Knowledge of World Wide Web (www) and internet their Concepts and components and use of Information and Communication Technology in Agriculture.	03	04	02	09
CO-5	Able to describe preparation of contingent crop-planning using IT tools. Smartphone Apps in Agriculture for farm advises, market price, postharvest management. Agriculture Expert System, Soil Information Systems for supporting Farm decisions.	06	06	05	17
Total		17	19	14	50

Legend: R:Remember, U:Understand, A:Apply

The end of first semester assessment for Computer Application in management will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Brainstorming

Suggested Learning Resources:**(a) Books:**

S. No.	Title	Author	Publisher	Edition&Year
1	Fundamentals of Computer	Balagurusamy	Tata MacGrawHil l	
2	Fundamentals of Computer	P. K. Sinha	BPB Publication	
3	Fundamentals of Information Technology	Deepak Bharihoke		
4	Lecture note provided by Dept. of Management Studies AKS University, Satna .			

Curriculum Development Team:

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Cos, Pos and PSOs Mapping

Course Code: 21CS325

Course Title: Agri-Informatics

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprises with different scales in area of agricultural production, process and trade	Hold a post on supply in administration and policy	Analyze and control commercial and economical process in the field of agriculture.	Teach how to control and manage agricultural production	Introduce general production technologies	Teach how to teach and manage production technology	Preparation of managerial and social responsibility	Student will identify different underutilized crops	Student will practice different breeding techniques used in crop production.	Student will recognize different insect pest and diseases and their symptoms of crops	Student will apply different recent techniques in crop production
21CS325.1: Knowledge and anatomy of computer including Operating Systems and networking	2	1	1	2	1	3	2	1	2	1	1

21CS325.2: Able to describe MS Office like MS Word, MS Excel, MS Access and Ms PowerPoint	2	2	1	2	1	2	1	3	2	1	1
21CS325.3 Able to describe audio visual aids for smart learning and communication process.	1	3	1	2	1	3	1	3	1	1	2
21CS325.4: Knowledge of World Wide Web (www) and internet their Concepts and components and use of Information and Communication	1	3	1	2	3	1	2	1	3	1	1

Technology in Agriculture.											
21CS325.5: Able to describe preparation of contingent crop-planning using IT tools. Smartphone Apps in Agriculture for farm advises, market price, postharvest management. Agriculture Expert System, Soil Information Systems for supporting Farm decisions.	2	2	3	2	1	3	1	2	3	1	2

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction(LI)	Classroom Instruction(CI)	Self Learning (SL)
PO 1,2,3,4,5,6,7 PSO 1,2,3,4	CO1 Knowledge and anatomy of computer including Operating Systems and networking.	SO1.1 SO1.2 SO1.3	1,2,3	Unit-1 Introduction to Computer 1,2,3,4,5	
PO 1,2,3,4,5,6,7 PSO 1,2,3,4	CO-2 Able to describe MS Office like MS Word, MS Excel, MS Access and Ms PowerPoint	SO2.1 SO2.2	1,2,3,4	Unit-2 Introduction to MS Office 1,2,3	
PO 1,2,3,4,5,6,7 PSO 1,2,3,4	CO-3 Able to describe audio visual aids for smart learning and communication process.	SO3.1 SO3.2	1,2	Unit-3 Audio visual aids 1,2	
PSO 1,2,3,4 PSO 1,2,3,4	CO 4 Knowledge of World Wide Web (www) and internet their Concepts and components and use of Information and Communication Technology in Agriculture.	SO4.1 SO4.2	1,2	Unit-4 Internet 1,2	
PO 1,2,3,4,5,6,7 PSO 1,2,3,4	CO 5 Able to describe preparation of contingent crop-planning using IT tools. Smartphone Apps in Agriculture for farm advises, market price, postharvest management. Agriculture Expert System, Soil Information Systems for supporting Farm decisions.	SO5.1 SO5.2	1,2,3,4	Unit 5: IT Tools 1,2,3	

Course Code: 21 HO 327

Course Title : Production Technology for vegetables and spices

Pre- requisite: Student should have basic knowledge of Production technology for cultivation of Different Vegetables and Spices.

Rationale: The students studying Production technology for vegetables and spices should possess foundational understanding about the technology to be employed in proper manner to boosting up the Vegetables and spices by adopting modern Horticultural package and practices. Imparting this Student will enable to understand the concepts of vegetable and Spices production in refined and sound manner.

Course Outcomes:

21 HO 327.1: Recognize the Importance of vegetables & spices in human nutrition and national economy, kitchen gardening, brief about origin, area, climate, soil, improved varieties and cultivation practices such as time of sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation.

21HO327.2: Weed management, harvesting and yield, physiological disorders, of important vegetable and spices (Tomato, Brinjal, Chilli, Capsicum, Cucumber, Melons, Gourds, Pumpkin, French bean

21 HO327.3: Peas; Cole crops such as Cabbage, Cauliflower, Knol-khol.

21 HO327.4: Bulb crops such as Onion, Garlic; Root crops such as Carrot, Raddish, Beetroot; Tuber crops such as Potato.

21 HO327.5: Understand the concept of production technology of Leafy vegetables such as Amaranth, Palak, Perennial vegetables.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits(C)
			CI	LI	SW	SL	Total Study Hours(CI+LI+SW+SL)	
Program Core (PCC)	21 HO 327	Production Technology for vegetables and spices	1	1	1	1	4	2

Legend:

CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial

(T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note:

SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:**Theory**

Board of Study	Course Code	Course Title	Scheme of Assessment (Marks)						End Semester Assessment (ESA)	Total Marks (PRA+ESA)
			Progressive Assessment (PRA)							
			Class/Home Assignment number 5 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+ A)		
Program Core (PCC)	21 HO 327	Production Technology for vegetables and spices	15	30	0	0	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

21 HO 327.1: Recognize the Importance of vegetables & spices in human nutrition and national economy, kitchen gardening, brief about origin, area, climate, soil, improved varieties and cultivation practices such as time of sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation.

Approximate Hours

Item	AppXHrs
CI	03
LI	04
SW	02
SL	01
Total	10

Session Out comes(SOs)	Laboratory Instruction(LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO1.1 Student will understand the Importance of vegetables & spices in human nutrition and national economy</p> <p>SO1.2 Student will recognize the role of kitchen garden and origin, area, climate, soil, improved varieties.</p> <p>SO1.3 Student will apply different cultivation practices such as time of sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation</p>	<p>1. Identification of vegetables and spices with their seed and nursery raising techniques.</p> <p>1.1 identification of vegetables and spices</p> <p>1.2 nursery raising techniques.</p>	<p>Unit-1.0 Importance of vegetables & spices in human nutrition and national economy, kitchen gardening, brief about origin, area, climate, soil, improved varieties and cultivation practices such as time of sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation</p> <p>1.1 Importance of vegetables & spices in human nutrition and national economy</p> <p>1.2 kitchen garden and brief about origin, area, climate, soil, improved varieties.</p> <p>1.3 cultivation practices such as time of sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation.</p>	<p>1. Major vegetables and spices with their botanical description.</p> <p>2. Improved varieties of vegetables and spices.</p>

SW-1 Suggested Sessional Work (SW):

a. Assignments:

- i. Preparation of herbarium (Using seeds and leaves of vegetables and spices)
- ii. Prepare the list of improved varieties of different vegetables and spices with their varietal characteristics

Other Activities (Specify):

Note on Status of vegetable and spices production in India and major vegetable and spices producing states of India

21HO327.2: Weed management, harvesting and yield, physiological disorders, of important vegetable and spices (Tomato, Brinjal, Chilli, Capsicum, Cucumber, Melons, Gourds, Pumpkin, French bean

Approximate Hours

Item	AppX Hrs
CI	03
LI	02
SW	02
SL	01
Total	08

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self -Learning(SL)
<p>SO2.1 Understand the importance of weed management in vegetable and spices crops.</p> <p>SO2.2 Understand the types of different weed management methods.</p> <p>SO2.3 Identify the various physiological disorders of important vegetable and spices.</p>	Practice of Direct seed sowing and Transplanting.	<p>Unit-2weed management, harvesting and yield, physiological disorders, of important vegetable and spices (Tomato, Brinjal, Chilli, Capsicum, Cucumber, Melons, Gourds, Pumpkin, French bean.</p> <p>2.1Importance of weed management in vegetable and spices crops.</p> <p>2.2Types of different weed management methods</p> <p>2.3Physiological disorders of important vegetable and spices.</p>	i.Types of different weed and their classification.

SW-2 Suggested Seasonal Work (SW):

a. Assignments:

- i. Preparation of herbarium of major weeds found in vegetable crop field.

21HO327.3: Peas; Cole crops such as Cabbage, Cauliflower, Knol-khol.

Approximate Hours

Item	AppX Hrs
CI	03
LI	02
SW	02
SL	01
Total	08

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO3.1 Understand the production technologies of Peas; Cole crops, (Cabbage, Cauliflower, Knol-khol)	1 Study of morphological characters of different vegetables and spices	Unit-3: Peas; Cole crops such as Cabbage, Cauliflower, Knol-khol 3.1 Understand the production technologies of Peas. 3.2 Understand the production technologies of Cabbage, Cauliflower. 3.3 Understand the production technologies of knoll- khol.	Classification of vegetables and spices.

SW-3 Suggested Sessional Work(SW):

a. Assignments:

- i. Classification of major vegetables and spices based on season and their climactic requirement

21HO327.4: Bulb crops such as Onion, Garlic; Root crops such as Carrot, Raddish, Beetroot;Tuber crops such as Potato.

Approximate Hours

Item	AppX Hrs
CI	03
LI	04
SW	02
SL	01
Total	10

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO4.1 Understand the production technologies of root crops such as Carrot, radish, Beetroot.</p> <p>SO4.2 Understand the production technologies of tuber crops such as Potato.</p> <p>SO4.2 Understand the production technologies of Bulb crops such as Onion and Garlic.</p>	<p>Study of fertilizer application, Harvesting and preparation for market.</p> <p>4.1 Practices of fertilizer application.</p> <p>4.2 Practices of Harvesting and preparation for market.</p>	<p>Unit-4.0 Bulb crops such as Onion, Garlic; Root crops such as Carrot, radish, Beetroot; Tuber crops such as Potato.</p> <p>4.1 Understand the production technologies of Root crops(Carrot, radish, Beetroot).</p> <p>4.2 Understand the production technologies Bulb crops (Onion and Garlic)</p> <p>4.3 Understand the production technologies Tuber crops (Potato).</p>	<p>i. Classification of vegetables based on their economical parts used.</p> <p>ii. Classification of spices based on their economical parts used.</p>

SW-4 Suggested Sessional Work(SW):

- a. Assignments:**
Physiological disorders and their management of Onion, Garlic, Carrot, radish, Beetroot and Potato.
- b. Mini Projects:**
 - i. Preparation of chart of vegetables and spices available in agriculture research farm.
- e. Other Activities (Specify):**
 - i. Visit to Commercial Nursery.

21HO327.5: Understand the concept of production technology of Leafy vegetables such as Amaranth, Palak, Perennial vegetables

Approximate Hours

Item	AppX Hrs
CI	03
LI	02
SW	02
SL	01
Total	08

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
SO5.1 Understand the production technology of Leafy vegetables.	Estimation of Economics of vegetables and spices cultivation.	<p>Unit5: Leafy vegetables such as Amaranth, Palak. Perennial vegetables).</p> <ol style="list-style-type: none"> 1. Recognition of leafy vegetables. 2. Understand the production technologies Leafy vegetables (Amaranth and Palak) 3. Identification and production technology of perennial vegetables. 	<ol style="list-style-type: none"> 1. Identify the role of Leafy vegetables in human 2. Types of irrigation and fertilizer application methods

SW-5 Suggested Sessional Work (SW):

Assignments:

Note on nutritional values of Leafy vegetables

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self Learning (Sl)	Total hour (Cl+SW+Sl)
21HO221.1: Recognize the Importance of vegetables & spices in human nutrition and national economy, kitchen gardening, brief about origin, area, climate, soil, improved varieties and cultivation practices such as time of sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation.	3	2	2	7
21HO221.2: Weed management, harvesting and yield, physiological disorders, of important vegetable and spices (Tomato, Brinjal, Chilli, Capsicum, Cucumber, Melons, Gourds, Pumpkin, French bean.	3	2	1	6
21HO221.3: Peas; Cole crops such as Cabbage, Cauliflower, Knol-khol	3	2	1	6
21HO221.4: Bulb crops such as Onion, Garlic; Root crops such as Carrot, Raddish, Beetroot; Tuber crops such as Potato	3	3	2	8
21HO221.5: Understand the concept of production technology of Leafy vegetables such as Amaranth, Palak, Perennial vegetables	3	1	2	6
Total Hours	15	10	8	33

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Recognize the Importance of vegetables & spices in human nutrition and national economy, kitchen gardening, brief about origin, area, climate, soil, improved varieties and cultivation practices such as time of sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation	02	02	02	06
CO-2	Weed management, harvesting and yield, physiological disorders, of important vegetable and spices (Tomato, Brinjal, Chilli, Capsicum, Cucumber, Melons, Gourds, Pumpkin, French bean.	02	03	04	9
CO-3	Peas; Cole crops such as Cabbage, Cauliflower, Knol-khol	03	03	05	11
CO-4	Bulb crops such as Onion, Garlic; Root crops such as Carrot, Raddish, Beetroot; Tuber crops such as Potato	2	4	06	12
CO-5	Understand the concept of production technology of Leafy vegetables such as Amaranth, Palak, Perennial vegetables	01	5	6	12
Total		10	18	22	50

Legend: R:Remember, U:Understand, A: Apply

The end of semester assessment for Fundamental of Horticulture will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Demonstration

7. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, Whatsapp, Mobile, Online sources)
8. Brainstorming

Suggested Learning Resources

Sl. No.	Title	Author	Publisher	Edition & Year
1	A Text book on production technology of vegetables	B.R.Choudhary	Kalyani Publishers	2009
2	Vegetable crops in India	K S Yawalkar	Agri-Horticultural Pub. House. Nagpur	2008
3	Vegetable Crop Production	K.V.Kamath	Oxford Book Company	2007
4	Olericulture in India	M.K.Rana	Kalyani Publishers	2008
5	Handbook of Vegetable Crops	M.S.Dhaliwal	Kalyani Publishers	2008

Cos, POs and PSOs Mapping

Course Title: Production Technology for vegetables and spices

Course Code: 21Ho327-C

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprises with different scales in area of agricultural production, process and trade	Hold a post on supply in administration and policy	Analyze and control commercial and economical process in the field of agriculture.	Teach how to control and manage agricultural production	Introduce general production technologies	Teach how to teach and manage production technology	Preparation of managerial and social responsibility	Student will identify different underutilized crops	Student will practice different reeding techniques used in crop production.	Student will recognize different insect pest and diseases and their symptoms of crops	Student will apply different recent techniques in crop production
1. Recognize the Importance of vegetables & spices in human nutrition and national economy, kitchen gardening, brief about origin, area, climate, soil, improved varieties and cultivation practices such as time of	2	1	1	2	1	3	2	1	2	1	3

sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation.											
2. Weed management, harvesting and yield, physiological disorders, of important vegetable and spices (Tomato, Brinjal, Chilli, Capsicum, Cucumber, Melons, Gourds, Pumpkin, French bean.	2	2	2	3	2	2	1	3	2	1	1
3 Peas; Cole crops such as Cabbage, Cauliflower, Knol-khol.	1	1	2	2	1	3	1	2	1	1	1
4. Bulb crops such as Onion, Garlic; Root crops such as Carrot, Raddish, Beetroot;	1	2	1	2	3	1	2	1	2	1	3

Tuber crops such as Potato											
5. Understand the concept of production technology of Leafy vegetables such as Amaranth, Palak, Perennial vegetables	1	2	1	2	1	3	1	2	3	2	3

Legend: 1 – Low, 2 – Medium, 3 – High

Curriculum Map: Production Technology for vegetables and spices

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
PO 1,2,3,4,5,6,7 PSO 1,2, 3,4	21 HO 327.1: Recognize the Importance of vegetables & spices in human nutrition and national economy, kitchen gardening, brief about origin, area, climate, soil, improved varieties and cultivation practices such as time of sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation.	SO1.1 SO1.2 SO1.3	1. Identification of vegetables and spices with their seed and nursery raising techniques. 1.1 identification of vegetables and spices 1.2 nursery raising techniques.	Unit-1.0 Importance of vegetables & spices in human nutrition and national economy, kitchen gardening, brief about origin, area, climate, soil, improved varieties and cultivation practices such as time of sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation 1.1, 1.2, 1.3	1. Major vegetables and spices with their botanical description. 2. Improved varieties of vegetables and spices.
PO 1,2,3,4,5,6,7 PSO 1,2, 3,4	21HO327.2: Weed management, harvesting and yield, physiological disorders, of important vegetable and spices (Tomato, Brinjal, Chilli, Capsicum, Cucumber, Melons, Gourds, Pumpkin, French bean	SO2.1 SO2.2 SO2.3	Practice of Direct seed sowing and Transplanting.	Unit-2 weed management, harvesting and yield, physiological disorders, of important vegetable and spices (Tomato, Brinjal, Chilli, Capsicum, Cucumber, Melons, Gourds, Pumpkin, French bean. 2.1, 2.2, 2.3	1.Types of different weed. and their classification.
PO 1,2,3,4,5,6,7 PSO 1,2, 3,4	21 HO327.3: Peas; Cole crops such as Cabbage, Cauliflower, Knol-khol.	SO3.1	1 Study of morphological characters of different vegetables and spices	Unit-3: Peas; Cole crops such as Cabbage, Cauliflower, Knol-khol 3.1, 3.2, 3.3	Classification of vegetables and spices.

<p>PO 1,2,3,4,5,6,7 PSO 1,2, 3,4</p>	<p>21 HO327.4: Bulb crops such as Onion, Garlic; Root crops such as Carrot, Raddish, Beetroot; Tuber crops such as Potato.</p>	<p>SO4.1 SO4.2 SO4.3</p>	<p>Study of fertilizer application, Harvesting and preparation for market. 4.1 Practices of fertilizer application. 4.2 Practices of Harvesting and preparation for market.</p>	<p>Unit-4.0 Bulb crops such as Onion, Garlic; Root crops such as Carrot, radish, Beetroot; Tuber crops such as Potato. 4.1, 4.2, 4.3</p>	<p>i. Classification of vegetables based on their economical parts used. ii. Classification of spices based on their economical parts used.</p>
<p>PO 1,2,3,4,5,6,7 PSO 1,2, 3,4</p>	<p>21 HO327.5: Understand the concept of production technology of Leafy vegetables such as Amaranth, Palak, Perennial vegetables.</p>	<p>SO5.1</p>	<p>Estimation of Economics of vegetables and spices cultivation.</p>	<p>Unit5:Leafy vegetables such as Amaranth, Palak. Perennial vegetables). 5.1, 5.2, 5.3</p>	<p>1. Identify the role of Leafy vegetables in human 2. Types of irrigation and fertilizer application methods</p>

Course code: 21EN328

Course Title: Principles of Integrated Pest and Disease Management

Pre-requisite: Student should have basic knowledge of insects their structure, function, behavior, evolution, diversity, and effect on agricultural production, as well as on people and animals and different methods of their control.

Rationale: The student studying importance of insect pest and disease, their different Categories, how we control their population and their effect on crops and positive and negative effect of different insect and disease control methods on environment.

Course Outcome:

21EN328.1.: Students knowledgeable about different category of insect pest and diseases. Definition and history of IPM, Their concept and principles and Tools of IPM.

21EN328.2: Students are skilled in determining pest levels and Calculation of ETL and EIL, their importance in IPM, Economic Importance of insect pest and disease and methods of detection and diagnosis of insect pest and disease.

21EN328.3: To be able to address different methods of control of insect pest and disease, their positive and negative impact and Host Plant Resistance and its advantage and disadvantage.

21EN328.4: Gain knowledge to about Ecological management of crop improvement, convention insecticides and surveying and forecasting for insect pest monitoring and make strategies for successful pest management strategy.

21EN328.5: To Understands about Safe use of insecticides, poisoning, first aid and antidotes and their effect on plants, animals and environment. Different IPM module for different Crops. Implications on using IPM.

Scheme of Studies:

Code	Course Code	Course Title	Scheme of studies(Hours/Week)				Total Study Hours (CI+LI+SW+SL)	Total Credits (C)
			CI	LI	SW	SL		
Program Core (PCC)	Course code: 21EN233	Principles of Integrated Pest and Disease Management	2	1	1	1	5	3

Legend: CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

Code	Course Code	Course Title	Scheme of Assessment (Marks)							End Semester Assessment (ESA)	Total Marks (PRA+ESA)
			Progressive Assessment (PRA)						Total Marks (CA+CT+SA+CA T+AT)		
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)				
Program Core (PCC)	21EN328	Principles of Integrated Pest and Disease Management	15	20	5	5	5	50	50	100	

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

21EN328.1.: Students knowledgeable about different category of insect pest and diseases. Definition and history of IPM, Their concept and principles and Tools of IPM.

Approximate Hours

Item	AppX Hrs
CI	06
LI	00
SW	02
SL	01
Total	09

SW-1 Suggested Sessional Work (SW):

Assignments: Categories of insect pests and diseases. IPM Definition and its history.

Mini Project:

Flow diagram of Different Tools of IPM

Other Activities (Specify): Promotion of bio-pesticides and neem based pesticides as alternative to chemical pesticides.

21EN328.2: Students are skilled in determining pest levels and Calculation of ETL and EIL, their importance in IPM, Economic Importance of insect pest and disease and methods of detection and diagnosis of insect pest and disease.

Approximate Hours

Item	AppX Hrs
CI	06
LI	08
SW	01
SL	01
Total	16

SW-1 Suggested Sessional Work (SW)

Assignments: Methods of detection and diagnosis of insect pest and diseases.

Mini Project: Calculation and dynamics of economic injury level.

Other Activities (Specify): Conduction of regular pest surveillance & monitoring to assess pest/disease situation.

21EN328.3: To be able to address different methods of control of insect pest and disease, their positive and negative impact and Host Plant Resistance and its advantage and disadvantage.

Approximate Hours

Item	AppX Hrs
CI	06
LI	04
SW	01
SL	01
Total	12

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning(SL)
<p>SO3.1 Understand definition and types of Host plant resistance.</p> <p>SO3.2 Understand Different methods cultural control and its advantages and disadvantages.</p> <p>SO3.3 Understand Different methods of cultural control and.</p> <p>SO3.4 Understand Different methods of mechanical control</p> <p>SO3.5. Understand Different methods of physical control.</p> <p>SO3.6. Understand about legal method of pest control.</p> <p>SO3.7. Understand about biological control.</p> <p>SO3.8. Understand about chemical control.</p>	<p>LI 3.1 Identification of biocontrol agents, different predators and natural enemies.</p> <p>LI 3.2 Mass multiplication of <i>Trichoderma</i>, <i>Pseudomonas</i>, <i>Trichogramma</i>, NPV etc.</p>	<p>Unit-3.0: Methods of control</p> <p>3.1 Definition and history of Host plant resistance.</p> <p>3.2 Types and mechanisms of Host plant resistance.</p> <p>3.3 Different methods of cultural control and its advantages and disadvantages.</p> <p>3.4 Different methods of mechanical control and its advantages and disadvantages.</p> <p>3.5 Different methods of physical control and its advantages and disadvantages.</p> <p>3.6 Legal method of pest control.</p>	<p>1. Methods of control and its advantages and disadvantages.</p>

SW-1 Suggested Sessional Work (SW):

Assignments: Types and mechanisms of Host plant resistance, biological control, its types and its advantages and disadvantages and chemical control and its advantages and disadvantages.

Mini Project:

Biological control, its types and its advantages

Other Activities (Specify):

Learn rearing biological control agents for their field use and conservation of naturally occurring bio-agents.

21EN328.4: Gain knowledge to about Ecological management of crop improvement, convention insecticides and surveying and forecasting for insect pest monitoring and make strategies for successful pest management strategy.

Approximate Hours

Item	Appx Hrs
CI	06
LI	08
SW	01
SL	01
Total	16

Session Outcomes (SOs)	Laboratory Instruction(LI)	Class room Instruction (CI)	Self-Learning (SL)
<p>SO4.1 Understand ecological management.</p> <p>SO4.2 Understand conventional pesticides.</p> <p>SO4.3 Understand formulation, Toxicity impacts of insecticides.</p> <p>SO4.4 Understand survey, surveillance and forecasting</p> <p>SO4.5. Understand development and validation of IPM module</p>	<p>LI 4.1 Plan & assess preventive strategies (IPM module) and decision making.</p> <p>LI 4.2 Crop monitoring attacked by insect, pest and diseases.</p> <p>LI 4.3 Crop (agroecosystem) dynamics of a selected insect pest and diseases.</p> <p>LI 4.4 Awareness campaign at farmers' fields.</p>	<p>Unit-4.0: Ecological management and validation of IPM module:</p> <p>4.1 Ecological management by using different methods.</p> <p>4.2 Concept of conventional pesticides.</p> <p>4.3 Formulation, Toxicity impacts of conventional pesticides.</p> <p>4.4 Definition and use of survey, surveillance and forecasting in Pest control.</p> <p>4.5 Development and validation of IPM module for different crops in different regions.</p> <p>4.6 Awareness of positive impact of IPM in ecological scenario.</p>	<p>1. Development and validation of IPM module for different crops in different regions</p>

SW-1 Suggested Sessional Work (SW):

Assignments: Definition and use of survey, surveillance and forecasting in Pest control.

Mini Project: List conventional pesticides.

Other Activities (Specify): Field visit and conducting regular pest surveillance & monitoring to assess pest/disease situation.

.21EN3285: To Understands about Safe use of insecticides, poisoning, first aid and antidotes and their effect on plants, animals and environment. Different IPM module for different Crops. Implications on using IPM.

Approximate Hours

Item	AppX Hrs
CI	06
LI	00
SW	02
SL	01
Total	09

Session Outcomes(SOs)	Laboratory Instruction (LI)	Class room Instruction(CI)	Self-Learning (SL)
<p>SO5.1: Understand implementation and impact of IPM Programs.</p> <p>SO5.2 Understand safety issues during pesticide uses.</p> <p>SO5.3 Understand political, social and legal implication of IPM.</p> <p>SO5.4 Understand case histories of important IPM programmes.</p>		<p>Unit-5.0: Impact of IMP Module and Case histories of IPM programs:</p> <p>5.1 Implementation and impact of IPM (IPM module for Insect pest and disease for different crops).</p> <p>5.2 Safety precautions during pesticide uses.</p> <p>5.3 Political, social and legal implication of IPM.</p> <p>5.4 Case histories of important IPM programmes.</p> <p>5.5 Case histories of IPM program in different regions.</p> <p>5.6 Impact of various tools of IPM</p>	<p>1. Safety precautions during pesticide uses.</p> <p>2. Political, social and legal implication of IPM.</p>

SW-1 Suggested Sessional Work (SW):

Assignments: Case histories of important IPM programmes.

Mini Project: Safety issues in pesticide uses

Other Activities (Specify): Popularizing IPM approach among local farming community.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Laboratory instruction (LI)	Sessional Work (SW)	Self Learning (Sl)	Total hour (Cl+LI+SW+Sl)
21EN328.1.: Students knowledgeable about different category of insect pest and diseases. Definition and history of IPM, Their concept and principles and Tools of IPM.	06	00	02	01	09
21EN328.2: Students are skilled in determining pest levels and Calculation of ETL and EIL, their importance in IPM, Economic Importance of insect pest and disease and methods of detection and diagnosis of insect pest and disease.	06	08	01	01	16
21EN328.3: To be able to address different methods of control of insect pest and disease, their positive and negative impact and Host Plant Resistance and its advantage.	06	04	01	01	12
21EN328.4: Gain knowledge to about Ecological management of crop improvement, convention insecticides and surveying and forecasting for insect pest monitoring and make strategies for successful pest management strategy.	06	08	01	01	16
21EN328.5: To Understands about Safe use of insecticides, poisoning, first aid and antidotes and their effect on plants, animals and environment. Different IPM module for different Crops. Implications on using IPM.	06	00	02	01	09
Total Hours	30	20	07	05	62

Suggestion for End Semester Assessment
Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Basic Introduction of IPM	04	03	04	11
CO-2	Determining the injury and population level and importance of insect pest	03	04	03	10
CO-3	Methods of control	04	02	04	10
CO-4	Ecological management and validation of IPM module	04	02	03	09
CO-5	Impact of IMP Module and Case histories of IPM programmes	04	03	03	10
Total		19	14	17	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Introduction to Portland cement will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Case Method
3. Group Discussion
4. Role Play
5. Visit to Field
6. Demonstration/Dissection
7. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, WhatsApp, Mobile, Online sources)
8. Brainstorming

Suggested Learning Resources:**(a) Books:**

S. No.	Title	Author	Publisher	Edition & Year
1	A Text Book of Entomology	DR. MATHUR, DR. UPADHYAY	RAMA PUBLISHING HOUSE	2023
2	An Outline of Entomology	G S Dhaliwal	Kalyani publication, New Delhi	2017
3	Integrated Pest Management Concepts & Approaches	Ramesh Arora Gs Dhaliwal	Kalyani Publisher	2003
4	Applied Entomology	K P Shrivastava	Kalyani publication, New Delhi	2011, 2ndEdition
5	Practical Manual			
6	Lecture note provided by Dept. of Entomology, AKS University, Satna.			

Curriculum Development Team:**Curriculum Development Team**

1. Dr. S.S. Tomar, Dean, FAST, AKS University
2. Associate Professor Dr Rama Sharma, HOD Entomology, AKS University
3. Assistant Professor Dr Vishnoo Omar, Department of Entomology, AKS University

Cos, POs and PSOs Mapping
Course Title: Principles of Integrated Pest and Disease Management
Course Code: 21EN328

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprises with different scales in area of agricultural production, process and trade	Hold a post on supply in administration and policy	Analyze and control commercial and economical process in the field of agriculture.	Teach how to control and manage agricultural production	Introduce general production technologies	Teach how to teach and manage production technology	Preparation of managerial and social responsibility	Student will identify different underutilized crops	Student will practice different reeding techniques used in crop production.	Student will recognize different insect pest and diseases and their symptoms of crops	Student will apply different recent techniques in crop production
CO-1 Students knowledgeable about different category of insect pest and diseases. Definition and history of IPM, Their concept and principles and Tools of IPM	3	1	1	2	1	2	2	1	2	2	3
Co-2 Students are skilled in determining pest levels and Calculation of ETL and EIL, their	2	2	2	3	1	2	1	3	2	1	3

importance in IPM, Economic Importance of insect pest and disease and methods of detection and diagnosis of insect pest and disease.											
Co-3 To be able to address different methods of control of insect pest and disease,their positive and negative impact and Host Plant Resistance and its advantage and disadvantage.	1	3	2	2	1	3	1	2	1	3	1
CO-4. Gain knowledge to about Ecological management of crop improvement, convention insecticides	3	2	3	2	3	1	2	3	2	1	1

and surveying and forecasting for insect pest monitoring and make strategies for successful pest management strategy.											
CO-5. To Understands about Safe use of insecticides, poisoning, first aid and antidotes and their effect on plants, animals and environment. Different IPM module for different Crops. Implications on using IPM.	1	2	1	2	1	3	1	2	3	2	3

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map: Principle of Integrated Pest and Deases Management

Pos & PSOs	Cos No. & Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
PO1,2,3,4,5,6,7 PSO 1,2,3,4	1.Students knowledgeable about different category of insect pest and diseases. Definition and history of IPM, Their concept and principles and Tools of IPM.	SO 1.1 SO 1.2 SO 1.3 SO 1.4 SO 1.5		By the different season different category of insect pest. By level of injury point of view different category of insect pest. By association of host point of view different category of insect pest different category of Diseasonal pest Definition and history of IPM segmentation.Concept and principles IPM. 1.1, 1.2, 1.3,1.4,1.5,1.6	Concept and tools of IPM
PO1,2,3,4,5,6,7 PSO 1,2,3,4	2. Students are skilled in determining pest levels and Calculation of ETL and EIL, their importance in IPM, Economic Importance of insect pest and disease and methods of detection and diagnosis of insect pest and disease.	SO 2.1 SO 2.2 SO 2.3 SO 2.4 SO 2.5	2.1 Methods of diagnosis and detection of various insect pests, and plant diseases. 2.2 Assessment of crop yield losses. 2.3 Methods of insect pests and plant disease measurement. 2.4 Calculations based on economics of IPM.	: Determining the injury and population level and importance of insect pest - By Medicinal use of insect, the importance of insect pests.By manufacture of cosmetic product, importance of insect pests By ecological point of view importance of insect pests. Economic importance of disease.Methods of detection and diagnosis of insect pest and diseases. Calculation and dynamics of economic injury level. 2.1,2.2,2.3,2.4,2.5,2.6	Methods of detection and diagnosis of insect pest and diseases

PO1,2,3,4,5,6,7 PSO 1,2,3,4	3. To be able to address different methods of control of insect pest and disease, their positive and negative impact and Host Plant Resistance and its advantage and disadvantage.	SO 3.1 SO 3.2 SO 3.3 SO 3.4 SO 3.5 SO 3.6 SO 3.7 SO 3.8	3.1 Identification of biocontrol agents, different predators and natural enemies. 3.2 <i>Mass multiplication of Trichoderma, Pseudomonas, Trichogramma, NPV etc.</i>	Definition and history of Host plant resistance. Types and mechanisms of Host plant resistance. Different methods of cultural control and its advantages and disadvantages. Different methods of mechanical control and its advantages and disadvantages. Different methods of physical control and its advantages and disadvantages. Legal method of pest control. 3.1,3.2,3.3,3.4,3.5,3.6	Methods of control and its advantages and disadvantages
PO1,2,3,4,5,6,7 PSO 1,2,3,4	4. Gain knowledge to about Ecological management of crop improvement, convention insecticides and surveying and forecasting for insect pest monitoring and make strategies for successful pest management strategy.	SO 4.1 SO 4.2 SO 4.3 SO 4.4 SO 4.5	4.1 Plan & assess preventive strategies (IPM module) and decision making. 4.2 Crop monitoring attacked by insect, pest and diseases. 4.3 Crop (agroecosystem) dynamics of a selected insect pest and diseases. 4.4 Awareness campaign at farmers' fields.	Ecological management and validation of IPM module: Ecological management by using different methods. Concept of conventional pesticides. Formulation, Toxicity impacts of conventional pesticides. Definition and use of survey, surveillance and forecasting in Pest control. Development and validation of IPM module for different crops in different regions. Awareness of positive impact of IPM in ecological scenario. 4.1,4.2,4.3,4.4,4.5,4.6	Development and validation of IPM module for different crops in different regions
PO1,2,3,4,5,6,7 PSO 1,2,3,4	5. To Understands about Safe use of insecticides, poisoning, first aid and	SO 5.1 SO 5.2	.	Implementation and impact of IPM (IPM module for Insect pest). Safety precautions during pesticide	Safety precautions during

	antidotes and their effect on plants, animals and environment. Different IPM module for different Crops. Implications on using IPM.	SO 5.3 SO 5.4		uses. Political, social and legal implication of IPM. Case histories of important in different regions.Impact of various tools of IPM. 5.1,5.2,5.3,5.4,5.5,5.6	pesticide uses. Political, social and legal implication of IPM
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Course Code:	21AE326
Course Title:	Farm Machinery and Power Engineering
Pre- requisite:	Student should have basic knowledge of mechanics, physics, and mathematics - Familiarity with agricultural principles and practices.
Rationale:	Farm Machinery and Power is a fundamental course in Agricultural Engineering that equips students with the knowledge and skills to design, operate, and manage agricultural machinery and power systems. Farm Machinery and Power is essential for modern agriculture, food security, and sustainability. This course prepares students to design, operate, and manage farm machinery and power systems, meeting industry demands and advancing agricultural engineering.

Course Outcomes:

- AE 105.1:** Students will understand the current status and importance of farm power in India, identify and explain different sources of farm power, describe the working principles of IC engines, and compare two-stroke and four-stroke cycle engines.
- AE 105.2:** Students will be able to identify and explain the functions of various IC engine components, understand IC engine terminology, describe different systems of IC engines, and troubleshoot common issues.
- AE 105.3:** Students will understand power transmission systems in tractors, identify different types of tractors and their applications, analyze the cost-effectiveness of tractor power and attached implements, and optimize tractor performance.
- AE 105.4:** Students will be able to identify and explain primary and secondary tillage implements, understand hill agriculture and suitable implements, describe implements for inter-cultural operations, and select appropriate tillage implements for specific soil and crop conditions.
- AE 105.5:** Students will understand sowing and planting equipment, plant protection equipment, harvesting and threshing equipment, and optimize the use of agricultural equipment for efficient crop management.

Scheme of Studies:

Code	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Study Hours (CI+LI+SW+SL)	Total Credits(C)
			CI	LI	SW	SL			
Program Core (PCC)	21AE326	Farm Machinery and Power	1	1	1	1	4	2	

- Legend:**
- CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),
 - LI:** Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)
 - SW:** Sessional Work (includes assignment, seminar, mini project etc.),
 - SL:** Self Learning,
 - C:** Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Theory & Practical

Code	Course Code	Course Title	Scheme of Assessment (Marks)							End Semester Assessment (ESA)	Total Marks (PRA+ESA)
			Progressive Assessment (PRA)								
			Class/Home Assignment (CA) (For Practical)	Mid Term-1	Mid Term-2	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)			
Program Core (PCC)	21AE326	Farm Machinery and Power (Theory)	0	15	15	0	0	30		50	80
		Farm Machinery and Power (Practical/Lab)	15	0	0	5	0	20		0	20
		Total									100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

AE 105.1: Understand the current status and importance of farm power in India, identify and explain different sources of farm power, describe the working principles of IC engines, and compare two-stroke and four-stroke cycle engines.

Approximate Hours

Item	AppX Hrs
CI	03
LI	04
SW	02
SL	2
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
<p>SO1.1 Explain the current status of farm power in India and its significance in agricultural development.</p> <p>SO1.2 Identify and describe different sources of farm power, including their advantages and limitations.</p> <p>SO1.3 Describe the working principles of IC engines and their applications in agriculture.</p> <p>SO1.4 Compare and contrast two-stroke and four-stroke cycle engines, including their efficiency and emissions.</p>	<p>1- Experiment to measure the power output of a small IC engine and calculate its efficiency.</p> <p>2- Dissect and assemble a small IC engine to understand its components and working principles.</p>	<p>Unit-1.0 Status and Sources of Farm Power</p> <p>1.1- the history and evolution of farm power in India.</p> <p>1.2- Group discussion on the advantages and limitations of different sources of farm power.</p> <p>1.3- Interactive presentation on the working principles of IC engines, using animations and simulations to illustrate key concepts.</p>	<p>1. The latest advancements in farm power technology, including alternative energy sources and sustainable practices.</p> <p>2. Maintenance and repair of IC engines, including troubleshooting common issues and replacement of parts.</p>

SW-1 Suggested Sessional Work (SW):

a. Assignments:

- i. Write the importance of farm power in Indian agriculture.
- ii. Compare and contrast two-stroke and four-stroke cycle engines.

b. Mini Project

- i. Write the best practices for selecting and maintaining farm power equipment.

AE 105.2: Identify and explain the functions of various IC engine components, understand IC engine terminology, describe different systems of IC engines, and troubleshoot common issues.

Approximate Hours

Item	AppX Hrs
CI	03
LI	02
SW	02
SL	02
Total	9

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO2.1 Identify and explain the functions of major IC engine components, including cylinders, pistons, crankshafts, and valves.</p> <p>SO2.2 Understand and apply IC engine terminology, including displacement, compression ratio, and power output.</p> <p>SO2.3 Describe the different systems of IC engines, including air intake, fuel supply, ignition, and exhaust systems.</p> <p>SO2.4 Troubleshoot common issues in IC engines, including misfires, overheating, and low power output.</p>	<p>Dissect and reassemble a small IC engine to identify and understand the functions of various components.</p>	<p>Unit-2: IC Engines</p> <p>2.1 Lecture on IC engine components and their functions, using diagrams and animations to illustrate key concepts.</p> <p>2.2 IC engine terminology and systems, with students presenting on different topics.</p> <p>2.3 Interactive simulation on troubleshooting IC engine issues.</p>	<p>tutorials on IC engine repair and maintenance</p> <p>Read and summarize a technical article on advances in IC engine technology, including new materials, designs, and efficiency improvements.</p>

SW-2 Suggested Sessional Work (SW):

a. Assignments:

- i. Explain the functions and importance of a specific IC engine components.

b. Mini Project:

Illustration of an IC engine system, labelling key components and explaining their functions.

AE 105. 3: Power transmission systems in tractors, identify different types of tractors and their applications, analyze the cost-effectiveness of tractor power and attached implements, and optimize tractor performance.

Approximate Hours

Item	AppX Hrs
CI	3
LI	2
SW	2
SL	2
Total	9

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CL)	Self Learning (SL)
<p>SO3.1 Explain the principles of power transmission systems in tractors, including gear trains and hydraulic systems.</p> <p>SO3.2 Identify and describe different types of tractors, including their applications and limitations.</p> <p>SO3.3 Analyze the cost-effectiveness of tractor power and attached implements, including fuel efficiency and maintenance costs.</p> <p>SO3.4 Optimize tractor performance for various agricultural operations, including tillage, planting, and harvesting.</p>	<p>1. Inspect and maintain a tractor's power transmission system, including gear trains and hydraulic systems.</p>	<p>Unit-3: Power Transmission System</p> <p>3.1 Lecture on tractor power transmission systems, including gear trains and hydraulic systems.</p> <p>3.2 different types of tractors and their applications, with students presenting on specific tractor models.</p> <p>3.3 Interactive simulation on optimizing tractor performance, with students working in teams to adjust parameters for maximum efficiency.</p>	<p>i. Tractor maintenance and repair, including videos on power transmission systems.</p> <p>ii. summarize a technical article on advances in tractor technology, including new power transmission systems and efficiency improvements.</p>

SW-3 Suggested Sessional Work (SW):

a. Assignments:

- Write the advantages and limitations of different types of tractors, including their applications and cost-effectiveness.

b. Mini Project:

- Illustration of a tractor's power transmission system, labelling key components and explaining their functions.

AE 105.4: Identify and explain primary and secondary tillage implements, understand hill agriculture and suitable implements, describe implements for intercultural operations, and select appropriate tillage implements for specific soil and crop conditions.

Approximate Hours

Item	AppX Hrs
CI	3
LI	4
SW	2
SL	2
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO4.1 Identify and explain primary and secondary tillage implements, including their functions and applications.</p> <p>SO4.2 Understand hill agriculture and suitable implements, including terracing and contour farming.</p> <p>SO4.3 Describe implements for intercultural operations, including weeding and pruning.</p> <p>SO4.4 Select appropriate tillage implements for specific soil and crop conditions, including soil type and moisture levels.</p>	<p>1- experiment to compare the performance of different tillage implements, including primary and secondary tillage.</p> <p>2- Inspect and maintain tillage implements, including sharpening and adjusting blades.</p>	<p>Unit-4: Tillage Implements</p> <p>4.1 tillage implements and their applications, including primary and secondary tillage.</p> <p>4.2 Hill agriculture and suitable implements, with students presenting on specific hill farming practices.</p> <p>4.3 selecting appropriate tillage implements, with students working in teams to match implements with soil and crop conditions.</p>	<p>i. tillage implement maintenance and repair, including videos on sharpening and adjusting blades.</p> <p>ii. Read and summarize a technical article on advances in tillage technology, including new implement designs and materials.</p>

SW-4 Suggested Sessional Work (SW):

a. Assignments:

- i. Write the advantages and limitations of different tillage implements, including their applications and cost-effectiveness.
- ii. Create a diagram or illustration of a tillage implement, labelling key components and explaining their functions.

b. Mini Project:

Design and develop a guide for selecting and maintaining tillage implements, including tips on soil type, crop selection, and implement adjustment.

AE 105.5: Understanding of sowing and planting equipment, plant protection equipment, harvesting and threshing equipment, and optimize the use of agricultural equipment for efficient crop management.

Item	AppX Hrs
CI	3
LI	4
SW	2
SL	2
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO5.1 Explain the principles of sowing and planting equipment, including seed drills and planters.</p> <p>SO5.2 Understand plant protection equipment, including sprayers and dusters.</p> <p>SO5.3 Describe harvesting and threshing equipment, including combines and balers.</p> <p>SO5.4 Optimize the use of agricultural equipment for efficient crop management, including timing and spacing.</p>	<p>1. Conduct a experiment to compare the performance of different sowing and planting equipment, including seed drills and planters.</p> <p>2. Inspect and maintain harvesting and threshing equipment, including combines and balers.</p>	<p>Unit 5: Sowing, Harvesting and threshing machineries</p> <p>5.1 Lecture on sowing and planting equipment, including seed drills and planters.</p> <p>5.2 plant protection equipment, with students presenting on specific pest management practices.</p> <p>5.3 Optimization of agricultural equipment use, with students working in teams to schedule equipment operations for maximum efficiency.</p>	<p>1. agricultural equipment maintenance and repair, including videos on sowing and planting equipment.</p> <p>2. advances in agricultural equipment technology, including new equipment designs and automation.</p>

SW-5 Suggested Sessional Work (SW):

a. Assignments:

1. advantages and limitations of different sowing and planting equipment, including their applications and cost-effectiveness.
2. Create a diagram or illustration of a harvesting or threshing equipment, labeling key components and explaining their functions.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (CL)	Session alWork (SW)	Self Learning (SL)	Total hour (CL+ SW+SL)
AE 105.1: Students will understand the current status and importance of farm power in India, identify and explain different sources of farm power, describe the working principles of IC engines, and compare two-stroke and four-stroke cycle engines.	3	2	2	07
AE 105.2: Students will be able to identify and explain the functions of various IC engine components, understand IC engine terminology, describe different systems of IC engines, and troubleshoot common issues.	3	2	2	07
AE 105.3: Students will understand power transmission systems in tractors, identify different types of tractors and their applications, analyze the cost-effectiveness of tractor power and attached implements, and optimize tractor performance.	3	2	2	07
AE 105.4: Students will be able to identify and explain primary and secondary tillage implements, understand hill agriculture and suitable implements, describe implements for intercultural operations, and select appropriate tillage implements for specific soil and crop conditions.	3	2	2	07
AE 105.5: Students will understand sowing and planting equipment, plant protection equipment, harvesting and threshing equipment, and optimize the use of agricultural equipment for efficient crop management.	3	2	2	07
Total Hours	15	10	10	35

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Status and Sources of Farm Power	01	04	04	9
CO-2	IC Engines	02	04	04	10
CO-3	Power Transmission System	2	04	05	11
CO-4	Tillage Implements	02	08	05	15
CO-5	Sowing, Harvesting and threshing machineries	03	02	-	05
Total		10	22	18	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for farm machinery and power will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Visit to Laboratories
7. Demonstration
8. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, Whatsapp, Mobile, Online sources)
9. Brainstorming

Suggested Learning Resources:**(a) Books:**

S. No.	Title	Author	Publisher	Edition & Year
1	Principles of Agricultural Engineering	Michael, A.M. and T.P. Ojha	Jain Brothers, Jodhpur	Vol. I. 2012
2	Farm Tractors, Maintenance and Repair	Rai and Jain	Tata Mc Graw Hill Publ. New Delhi.	1989
3	Elements of Farm Machinery	Srivastava	A.C. Oxford IBH Publ. Company, New Delhi.	1989
4	Elements of Agricultural Engineering	Singhal	O.P. Suraj Prakashan, Allahabad.	Vol. I & III. 1989
5	Element of Agricultural Engineering	Sahay, Jagdishwar	Agro. Book Agency, New Chitragupta Nagar, Patna.	1990

Curriculum Development Team

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Cos, POs and PSOs Mapping

Course Code: 21AE326

Course Title: Farm Machinery and Power Engineering

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprises with different scales in area of agricultural production, process and trade	Hold a post on supply in administration and policy	Analyze and control commercial and economical process in the field of agriculture	Teach how to control and manage agricultural production	Introduce general production technologies	Teach how to teach and manage production technology	Preparation of managerial and social responsibility	Student will identify different underutilized crops	Student will practice different breeding techniques used in crop production.	Student will recognize different insect pest and diseases and their symptoms of crops	Student will apply different recent techniques in crop production
AE 105.1: Students will understand the current status and importance of farm power in India, identify and explain different sources of farm power, describe the working principles of IC engines, and compare two-stroke and four-stroke cycle engines.	2	1	3	2	1	3	1	1	2	3	1

AE 105.2: Students will be able to identify and explain the functions of various IC engine components, understand IC engine terminology, describe different systems of IC engines, and troubleshoot common issues.	2	1	2	3	2	2	1	3	2	1	3
AE 105.3: Understanding of power transmission systems in tractors, identify different types of tractors and their applications, analyze the cost-effectiveness of tractor power and attached implements, and optimize tractor performance .	1	1	3	2	1	3	1	2	1	2	1

AE 105.4: Students will be able to identify and explain primary and secondary tillage implements, understand hill agriculture and suitable implements, describe implements for intercultural operations, and select appropriate tillage implements for specific soil and crop conditions.	1	3	1	2	3	1	2	1	3	1	1
AE 105.5: Students will understand sowing and planting equipment, plant protection equipment, harvesting and threshing equipment, and optimize the use of agricultural equipment	1	2	3	2	1	3	1	2	1	2	1

for efficient crop management .												
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Legend: 1 – Low, 2 – Medium, 3 – High

Curriculum Map: Agricultural Finance and Cooperation

Pos & PSOs	Cos No. & Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
PO1,2,3,4 PSO 1,2,3,4	1: Define the agricultural finance, agricultural credits and credit analysis.	SO 1.1 SO 1.2 SO 1.3 SO 1.4 SO 1.5	1. Determination of most profitable level of capital use. 2. Optimum allocation of limited amount of capital among different enterprise.	Agricultural Finance- meaning, scope and significance, credit needs and its role in Indian agriculture. Agricultural credit: meaning, definition, need, classification. Credit analysis: 4 R's, and 3C's of credits. 1.1,1.2,1.3,1.4,1.5,1.6	Prepare the assignment on Meaning and definition of Agricultural Finance- meaning, scope and significance, credit needs and its role in Indian agriculture
PO1,2,3,4 PSO 1,2,3,4	2: Express the sources of agricultural finance and nationalization of commercial banks	SO 2.1 SO 2.2 SO 2.3 SO 2.4 SO 2.5	1- Analysis of progress and performance of cooperatives using published data. 2-Analysis of progress and performance of commercial banks and RRBs using published data.	Sources of agricultural finance: institutional and non-institutional sources, commercial banks, social control and nationalization of commercial banks, Micro financing including KCC. 2.1,2.2,2.3,2.4,2.5	Prepare the assignment on Meaning and definition of Institutional and non-institutional sources and commercial banks
PO1,2,3,4 PSO 1,2,3,4	3: Interpret higher financing institutions – RBI, NABARD, ADB, IMF, World Bank, Insurance	SO 3.1 SO 3.2 SO 3.3 SO 3.4 SO 3.5	1. Visit to a commercial bank, cooperative bank and cooperative society to acquire firsthand knowledge of their management, schemes and procedures. 2. Estimation of credit requirement of farm business – A case study.	Preparation and analysis of financial statements – Balance Sheet and Income Statement. Basic guidelines for preparation of project reports- Bank norms – SWOT analysis. 3.1,3.2,3.3,3.4,3.5,3.6	Prepare the assignment on Meaning and definition of introduction to higher financing institutions – RBI, NABARD, ADB, IMF, world bank.
PO1,2,3,4 PSO 1,2,3,4	4: Analyze about the financial statements and preparation of project reports	SO 4.1 SO 4.2 SO 4.3 SO 4.4	Preparation and analysis of balance sheet – A case study.	Preparation and analysis of financial statements – Balance Sheet and Income Statement. Basic guidelines for	Prepare the assignment on Meaning and definition of preparation and

		SO 4.5		preparation of project reports- Bank norms – SWOT analysis. 4.1,4.2,4.3,.4.4,4.5	analysis of financial statements – Balance Sheet and Income Statement.
PO1,2,3,4 PSO 1,2,3,4	5: Asses the about the meaning and concept of Agricultural Cooperation.	SO 5.1 SO 5.2 SO 5.3 SO 5.4 SO 5.5	1-Preparation and analysis of income statement – A case study, Appraisal of a loan proposal	Agricultural Cooperation – Meaning, brief history of cooperative development in India, objectives, principles of cooperation, significance of cooperatives in Indian agriculture. Agricultural Cooperation in India- credit, marketing, consumer and multi-purpose cooperatives, farmers’ service cooperative societies, processing cooperatives, farming cooperatives, cooperative warehousing; role of ICA, NCUI, NCDC, NAFED. 5.1,5.2,5.3,5.4	prepare the assignment on Meaning and definition of Agricultural Cooperation in India- credit, marketing, consumer and multi-purpose cooperatives, farmers’ service cooperative societies, processing cooperatives, farming cooperatives, cooperative warehousing; role of ICA, NCUI, NCDC, NAFED.

Course Code: 21GN329

Course Title: Crop Improvement – I (Kharif Crops)

Pre- requisite: To provide insight into recent advances in improvement of kharif cereals, legumes, oilseeds, fiber, sugarcane and vegetative propagated crops using conventional and modern biotechnological approaches.

Rationale: After completing this course, the student will be able to know about important botanical status and reproductive structures of crops and genetics of important kharif field crops.

Course Outcomes:

21GN329.1: Students will have able to learn importance of wild relative to produce new varieties of kharif crops.

21GN329.2: Students will have able to learn Gene preservation method for further use to improve kharif crops.

21GN329.3 Students will have able to learn to applies breeding method to improve kharif crops.

21GN329.4 Students will have able to learns identification of resistance gene relate to kharif crop with high yield potential against Pest and pathogen and utilization genes.

21GN329.5: Students will have able to understand new genetic approaches to achieve a definite ideotype of kharif crop.

Scheme of Studies:

Code	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits (C)
			CI	LI	SW	SL	Total Study Hours CI+LI+SW+SL	
Program Core (PCC)	21GN329	Crop Improvement – I (Kharif Crops)	1	2	0	0	3	(1+1)= 2

Legend:

CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others), **LI:** Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies) **SW:** Sessional Work (includes assignment, seminar, mini project etc.), **SL:** Self Learning, **C:** Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Code	Course Code	Course Title	Scheme of Assessment (Marks)							End Semester Assessment (ESA)	Total Marks (PRA + ESA)
			Progressive Assessment (PRA)						Total Marks (CA+CT+SA+CAT+AT)		
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one	Class Activity any one (CAT)	Class Attendance (AT)	SA			
Program Core (PCC)	21GN329	Crop Improvement – I (Kharif Crops)	15	30	0	0	5	50	50	100	

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

21GN329.1: Students will have able to learn importance of wild relative to produce new varieties of kharif crops.

Approximate Hours

Item	Approximate Hours
CI	3
LI	10
SW	2
SL	1
Total	16

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO1.1. Understand of Centers of origin, distribution of species of different cereals, and pulses.</p> <p>SO1.2. Understand of Centers of origin, distribution of species of different oilseeds, fodders and cash crops.</p> <p>SO1.3. Understand of Centers of origin, distribution of species of different vegetable and horticultural crops.</p>	<p>1. To Study floral biology, emasculation and hybridization techniques in Rice, Jute, Maize, Sorghum, Pearl millet,</p> <p>2. To Study floral biology, emasculation and hybridization techniques in Ragi, Pigeonpea, Urdbean, Mungbean, Soybean,</p> <p>3. To Study floral biology, emasculation and hybridization techniques in Groundnut, Sesame, Caster, Cotton, Cowpea,</p> <p>4. To Study floral biology, emasculation and hybridization techniques in Tobacco, Brinjal, Okra and Cucurbitaceous crops.</p> <p>5. Maintenance breeding of different kharif crops</p>	<p>Unit-1 Centers of origin, distribution of species, wild relatives in different cereals;</p> <p>1.1 Centers of origin, distribution of species Wild relatives in different cereals, and pulses.</p> <p>1.2 Centers of origin, distribution of species Wild relatives in different oilseeds, fodders and cash crops.</p> <p>1.3 Centers of origin, distribution of species Wild relatives in different vegetable and horticultural crops.</p>	<p>1. Wild relatives in fodders and cash crops.</p> <p>2. Wild relatives in different cereals.</p>

SW-1 Suggested Sessional Work (SW):

a. Assignments:

b. Floral biology, emasculation and hybridization techniques in different crop species in cereals.

c. Mini Project:

i. Centers of origin, distribution of species in kharif crops.

d. Other Activities (Specify):

21GN329.2 Students will have able to learn Gene preservation method for further use to improve kharif crops.

Approximate Hours

Item	Approximate Hours
CI	3
LI	6
SW	2
SL	1
Total	12

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO2.1. Students are able to understand the Plant genetic resources, its types and their utilization in crop improvement.</p> <p>SO2.2. Students are able to understand the genetics of qualitative characters.</p> <p>SO2.3. Students are able to understand the genetics of quantitative characters..</p>	<p>1. Handling of germplasm and segregating populations by pedigree method.</p> <p>2. Handling of germplasm and segregating populations by bulk method.</p> <p>3. Handling of germplasm and segregating populations by single seed decent method.</p>	<p>Unit-2. - Plant genetic resources, its utilization and conservation,</p> <p>2.1. Plant genetic resources, utilization and conservation.</p> <p>2.2. Study of genetics of qualitative characters.</p> <p>2.3. Study of genetics of quantitative characters.</p>	<p>1. Learn about qualitative and quantitative characters.</p>

SW-2 Suggested Sessional Work (SW):

a. Assignments:

2. Plant genetic resources, its utilization and conservation.

a. Mini Project:

1. study of genetics, handling of germplasm.

c. Other Activities (Specify):

21GN329.3 Students will have able to learn to applies breeding method to improve kharif crops.

Item	Approximate Hours
CI	3
LI	4
SW	2
SL	1
Total	10

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO3.1. Students are able to understand the concepts of breeding self pollinated crops.</p> <p>SO3.2. Students are able to understand the concepts of breeding cross pollinated crops.</p> <p>SO3.3. Students are able to understand the concepts of breeding vegetatively propagated crops.</p>	<p>1. Study of field techniques for seed production Kharif crops.</p> <p>2. Study of field techniques for hybrid seeds production in Kharif crops.</p>	<p>Unit 3 Important concepts of breeding in different crops.</p> <p>1.Important concepts of breeding self pollinated crops.</p> <p>2.Important concepts of breeding cross pollinated crops.</p> <p>3.Important concepts of breeding vegetatively propagated crops.</p>	<p>1. Concepts of breeding vegetatively propagated crops.</p>

SW-3 Suggested Sessional Work (SW):

a) Assignments:

- i. Important concepts of breeding vegetatively propagated crops.

b) Mini Project:

- ii. Techniques for seed production and hybrid seeds production.

c) Other Activities (Specify):

21GN329.4 Students will have able to learns identification of resistance gene relate to kharif crop with high yield potential against Pest and pathogen and utilization genes.

Item	Approximate Hours
CI	3
LI	6
SW	2
SL	1
Total	12

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO4.1. Students are able to understand the Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for yield, adaptability.</p> <p>SO4.2. Students are able to understand the Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for stability, abiotic and biotic stress tolerance.</p> <p>SO4.3. Students are able to understand the Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for quality (physical, chemical, nutritional). chemical)</p>	<p>1. Estimation of heterosis, inbreeding depression</p> <p>2. Estimation of heritability.</p> <p>3. Layout of field experiments</p>	<p>Unit 4. Major breeding objectives and procedures including conventional and modern innovative approaches.</p> <p>1. Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for yield, adaptability.</p> <p>2. Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for stability, abiotic and biotic stress tolerance.</p> <p>3. Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for quality (physical, chemical, nutritional).</p>	<p>1.varieties for abiotic and biotic stress tolerance.</p> <p>2.procedures including conventional and modern innovative approaches.</p>

SW-4 Suggested Sessional Work (SW):

a. Assignments:

Major breeding objectives and procedures including modern innovative approaches.

b. Mini Project:

quality (physical, chemical), nutritional.

c. Other Activities (Specify):

21GN329.5: Students will have able to explain new genetic approaches to achieve a definite ideotype of kharif crop.

Item	Approximate Hours
CI	3
LI	4
SW	2
SL	1
Total	10

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO5.1. Students are able to understand the process of Hybrid seed production technology in Maize, Rice, Sorghum.</p> <p>SO5.2. Students are able to understand the process of Hybrid seed production technology in Pearl millet and Pigeonpea, etc.</p> <p>SO5.3. Students are able to explain the Ideotype concept and climate resilient crop varieties for future.</p>	<p>1. Study of quality characters.</p> <p>2. Study of donor parents for different characters.</p>	<p>Unit-5. Hybrid seed production technology in various crops Ideotype concept and climate resilient crop varieties for future.</p> <p>1 Hybrid seed production technology in Maize, Rice, Sorghum.</p> <p>2 Hybrid seed production technology in Pearl millet and Pigeonpea, etc.</p> <p>3 Ideotype concept and climate resilient crop varieties for future.</p>	<p>1. Ideotype concept and climate resilient crop varieties for future.</p>

SW-5 Suggested Sessional Work (SW):

a. Assignments:

- I. Hybrid seed production technology in Rice.

b. Mini Project:

- ii. climate resilient crop varieties for future.

c. Other Activities (Specify):

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (CI)	Sessional Work (SW)	Self Learning (SI)	Total hour (CI+SW+SI)
21GN329.1: Students able to explain Centers of origin, distribution of species, wild relatives in different cereals.	13	2	1	16
21GN329.2: Students able to explain Plant genetic resources, its utilization and conservation.	9	2	1	12
21GN329.3: Students able to explain Important concepts of breeding self-pollinated, cross pollinated and vegetatively propagated crops.	7	2	1	10
21GN329.4 Students able to explain Major breeding objectives and procedures including conventional and modern innovative approaches.	9	2	1	12
21GN329.5: Students able to explain Hybrid seed production technology in various crops Ideotype concept and climate resilient crop varieties for future.	7	2	1	10

**Suggestion for End Semester Assessment
Suggested Specification Table (For ESA)**

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO 1	Centers of origin, distribution of species, wild relatives in different cereals	6	2	2	10
CO 2	Plant genetic resources, its utilization and conservation.	5	4	2	11
CO 3	Important concepts of breeding in different crops.	4	4	1	9
CO 4	Major breeding objectives and procedures including conventional and modern innovative approaches.	6	2	2	10
CO 5	Hybrid seed production technology in various crops Ideotype concept and climate resilient crop varieties for future.	5	3	2	10
	Total	26	15	9	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for **Crop Improvement – I (Kharif)** will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Case Method
3. Group Discussion
4. Demonstration
5. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, Whatsapp, Mobile, Online sources)
6. Brainstorming
7. Smart board

Suggested Learning Resources:**(a) Books:**

S. No.	Title	Author	Publisher	Edition & Year
1	Breeding of Field Crops	Chopra, V.L.	Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.	2000
2	Vol. II Medicinal and Aromatic Plant	Chaddha. K.L. and Rajendra Gupta.	Malhotra Publishing House, New Delhi.	1995
3	Advances in Plant Breeding.	Mandal, A. K., P.K. Ganguli and S.P. Banerjee.	CBS Publishers and Distributors, New Delhi	1991
4	Crop Improvement: Challenges in the Twenty-First Century.	Manjit S. Kang	International Book Distributing Co. Lucknow	2004
5	Breeding of Field Crops	Poehlman, J.M.	AVI Publishing Co. INC, East Port, Conneacticut, USA.	1987

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Cos, POs and PSOs Mapping

Course Title: Production Technology for vegetables and spices

Course Code: 21Ho327-C

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprises with different scales in area of agricultural production, process and trade	Hold a post on supply in administration and policy	Analyze and control commercial and economical process in the field of agriculture	Teach how to control and manage agricultural production	Introduce general production technologies	Teach how to teach and manage production technology	Preparation of managerial and social responsibility	Student will identify different underutilized crops	Student will practice different breeding techniques used in crop production.	Student will recognize different insect pest and diseases and their symptoms of crops	Student will apply different recent techniques in crop production
21GN329.1: Students will have able to learn importance of wild relative to produce new varieties of kharif crops.	2	1	3	2	1	3	2	1	2	1	1
21GN329.2: Students will have able to learn Gene preservation method for further use to improve	2	2	1	3	2	2	1	3	2	1	3

kharif crops.											
21GN329.3 Students will have able to learn to applies breeding method to improve kharif crops.	1	2	2	2	1	3	1	2	1	2	1
21GN329.4 Students will have able to learns identification of resistance gene relate to kharif crop with high yield potential against Pest and pathogen and utilization genes.	1	2	1	2	3	1	2	2	2	1	1
21GN329.5: Students will have able to understand new genetic approaches to achieve a definite ideotype of kharif crop.	3	2	1	3	1	3	1	1	3	2	1

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map: Crop Improvement – I (Kharif Crops)

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4,	21GN329.1: Students will have able to learn importance of wild relative to produce new varieties of kharif crops.	SO1.1 SO1.2 SO1.3	Handling of germplasm and segregating populations by pedigree method.	Centers of origin, distribution of species, wild relatives in different cereals	As mentioned in page number
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4,	21GN329.2: Students will have able to learn Gene preservation method for further use to improve kharif crops.	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5	Handling of germplasm and segregating populations by bulk method.	Plant genetic resources, its utilization and conservation.	As mentioned in page number
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4,	21GN329.3 Students will have able to learn to applies breeding method to improve kharif crops.	SO3.1 SO3.2 SO3.3	Handling of germplasm and segregating populations by single seed decent method	Important concepts of breeding in different crops.	As mentioned in page number
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4,	21GN329.4 Students will have able to learns identification of resistance gene relate to kharif crop with high yield potential against Pest and pathogen and utilization genes.	SO4.1 SO4.2	Study of quality characters.	Major breeding objectives and procedures including conventional and modern innovative approaches.	As mentioned in page number
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4,	21GN329.5: Students will have able to understand new genetic approaches to achieve a definite ideotype of kharif crop.	SO5.1 SO5.2	Study of donor parents for different characters.	Hybrid seed production technology in various crops Ideotype concept and climate resilient crop varieties for future.	As mentioned in page number

Course Code: 21BT321

Course Title: Agricultural Microbiology

Pre-requisite: Students must have general idea of cell system and understanding of Whittaker five kingdom classification.

Rationale: Studying agricultural microbiology is essential for understanding the role of microorganisms in soil fertility, plant health, and nutrient cycling. It enables the development of sustainable farming practices, efficient soil management, and disease control, contributing to enhanced crop yields, food security, and environmentally responsible agriculture.

Course Outcomes:

CO1_21BT321.01 Student will understand the basic microbial groups and study characteristics of prokaryotes and eukaryotes. To know the structure and various physical and chemical growth requirements of bacteria.

CO2_21BT321.02 To understand the bacterial genetics and mode of genetic recombination.

CO3_21BT321.03 To highlight the role of soil microorganisms in soil fertility and plant growth promotion by nutrient mobilization of elements through geochemical cycle.

CO4_21BT321.04 To students will understand the concepts of biological nitrogen fixation, free, associative and symbiotic association.

CO5_21BT321.05 Student will understand the agriculture residue degradation or conversion to useful product.

Scheme of Studies

Code	Course Code	Course Title	Scheme of Studies (Hours/Week)					Total Credit (C)
			CI	LI	SW	SL	Total Study Hours	
Program Core (PCC)	21BT321	Agricultural Microbiology	01	01	01	01	4	02

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment

Code	Course Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA + ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Classes Test 2 (2 best out of 3) 10 marks each (CT)	Seminars	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
Program Core (PCC)	21BT321	Agricultural Microbiology	15	20	5	5	5	50	50	100

Course-Curriculum Detailing:

Student will understand the basic microbial groups and study characteristics of prokaryotes and eukaryotes. To know the structure and various physical and chemical growth requirements of bacteria. To understand the bacterial genetics and mode of genetic recombination. To highlight the role of soil microorganisms in soil fertility by biological nitrogen fixation, free, associative and symbiotic association. Student will understand the agriculture residue degradation or conversion to useful product.

21BT321.01: Student will understand the basic microbial groups and study characteristics of prokaryotes and eukaryotes. To know the structure and various physical and chemical growth requirements of bacteria.

Approximate Hours

Item	Appx Hrs
CI	04
LI	06
SW	01
SL	01
Total	12

Session Outcomes (SOs)	Laboratory Instructions (LI)	Classroom Instructions (CI)	Self-Learning (SL)
<p>SO1.1 Comparing different types of cell system and microbial groups</p> <p>SO1.2 Identifying and associating eukaryotic micro organisms.</p> <p>SO1.3 Identifying and associating prokaryotic micro organisms.</p> <p>SO1.4 Interferring growth and development of micro organisms.</p> <p>LO1.1 Finding how to work in microbiology lab.</p> <p>LO1.2 Identifying parts and use of microscope.</p> <p>LO1.3 Understanding Microscopy</p>	<p>1-Introduction to microbiology laboratory and its equipments</p> <p>2- Microscope- parts</p> <p>3- principles of microscopy, resolving power and numerical aperture.</p>	<p>Unit – I: Cell system, microbial groups, Structure, growth and development of bacteria.</p> <p>1.1 Introduction to microbial world and types of cell system.</p> <p>1.2 Eukaryotic microbes</p> <p>1.3 Prokaryotic microbes Archea and Bacteria: cell structure.</p> <p>1.4 Chemoautotrophy, photo autotrophy, growth.</p>	<p>Classification of Algae</p>

Suggested Sessional Work I

Assignment: 1. Identification and processing of essential oils from algal cells.

21BT321.02: To understand the bacterial genetics and mode of genetic recombination.

Approximate Hours

Item	Appx Hrs
CI	04
LI	04
SW	00
SL	01
Total	09

Session Outcomes (SOs)	Laboratory Instructions (LI)	Classroom Instructions (CI)	Self-Learning (SL)
<p>SO2.1 Find structure and organization of DNA in bacterial chromosome.</p> <p>SO2.2 Articulate the process of gene expression by learning the steps of Transcription and Translation</p> <p>SO2.3 Discuss about various methods of genetic recombination in bacteria</p> <p>SO2.4 Discuss more method of genetic recombination and behaviour of bacterial chromosomes.</p> <p>LO2.1 Understanding the method of sterilization</p> <p>LO2.2 Prepare media for microbial culture</p>	<p>1- Methods of sterilization.</p> <p>2- Nutritional media and their preparations</p>	<p>Unit II: Bacterial genetics and Genetic recombination</p> <p>2.1 Organization of Bacterial Genome, its replication.</p> <p>2.2 Expression of Bacterial Genome.</p> <p>2.3 Bacterial genetic recombination: transformation, conjugation</p> <p>2.4 Bacterial genetic recombination: transduction, plasmids, transposon</p>	<p>Structure of Bacteriophage and its lifecycle</p>

21BT321.03: To highlight the role of soil microorganisms in soil fertility and plant growth promotion by nutrient mobilization of elements through geochemical cycle.

Approximate Hours

Item	Appx Hrs
CI	02
LI	04
SW	01
SL	02
Total	09

Session Outcomes (SOs)	Laboratory Instructions (LI)	Classroom Instructions (CI)	Self-Learning (SL)
<p>SO3.1 Recognize the importance of microbes in soil and its impact in crop production. Will be able to tabulate the flow of Carbon and Nitrogen in soil and its impact on living organisms.</p> <p>SO3.2 tabulate the flow of Phosphorus and Sulphur in soil and its impact on living organisms.</p> <p>LO3.1 methods to isolate microbes.</p> <p>LO3.2 Learn methods of establishing pure culture</p>	<p>1- Enumeration of microbial population in soil- bacteria, fungi, actinomycetes.</p> <p>2-Methods of isolation and purification of microbial cultures.</p>	<p>Unit III: Role of microbes in soil fertility and crop production.</p> <p>3.1 Role of microbes in soil, Carbon, Nitrogen cycles</p> <p>3.2 Phosphorus and Sulphur cycles.</p>	<p>How other elements are cycled in soil.</p>

Suggested Sessional Work III

Assignment: 1. List the name and mechanism of nutrient cycling by various microbial groups.

21BT321.04: To students will understand the concepts of biological nitrogen fixation, free, associative and symbiotic association.

Approximate Hours

Item	Appx Hrs
CI	03
LI	08
SW	02
SL	00
Total	13

Session Outcomes (SOs)	Laboratory Instructions (LI)	Classroom Instructions (CI)	Self-Learning (SL)
<p>SO4.1 Describe and compare the mechanism of nitrogen fixation by the action of microbes.</p> <p>SO4.2 Recognize the character of various microbial group and assess its suitability as biofertilizers for crops</p> <p>SO4.3 discover the interaction between plant and microbes and effect created by them</p> <p>LO4.1 Understanding use of differential media</p> <p>LO4.2 Understanding methods of specific bacteria.</p> <p>LO4.3 Staining process</p> <p>LO4.4 Specific Staining methods</p>	<p>1. Isolation of Rhizobium from legume root nodule</p> <p>2. Isolation of Azotobacter from soil.</p> <p>3. Staining and microscopic examination of microbes.</p> <p>4. Differential staining methods</p>	<p>Unit IV: Biological nitrogen fixation.</p> <p>4.1 Symbiotic, associative and asymbiotic.</p> <p>4.2 Azolla, blue green algae and mycorrhiza.</p> <p>4.3 Rhizosphere and phyllosphere.</p>	

Suggested Sessional Work IV

Mini Project: 1. Herbarium preparation of roots containing rhizobium from various plants of leguminous family.

21BT321.05: Student will understand the agriculture residue degradation or conversion to useful product.

Approximate Hours

Item	Appx Hrs
CI	02
LI	04
SW	02
SL	02
Total	14

Session Outcomes (SOs)	Laboratory Instructions (LI)	Classroom Instructions (CI)	Self-Learning (SL)
<p>SO 5.1 Recall and discover the process of composting and converting agrowaste to useful product</p> <p>SO5.2 Identifying the potential of microbes as potential biofertilizer and biopesticides.</p> <p>LO5.1 learn about isolation and maintenance of Azospirillum</p> <p>LO5.2 learn about isolation and maintenance of BGA</p>	<p>1. Isolation of Azospirillum from roots.</p> <p>2. Isolation of BGA.</p>	<p>Unit V: Microbes in human welfare</p> <p>5.1 Biodegradation of agro-waste, biofuel production, Silage production</p> <p>5.2 Biofertilizers and biopesticides,</p>	<p>Methods of microbial strain improvement</p>

Suggested Sessional Work V

Assignment 1. Identifying the protocol for strain improvement of a microbe and enumerate suitability to use as biofertilizer

2. 1. Identifying the protocol for strain improvement of a microbe and enumerate suitability to use as biopesticides.

Brief of Hours suggested for the Course Outcome

	Class Lecture (CL)	Lab Lecture (LI)	Sessional Work (SW)	Self-Learning (SL)	Total hour (CL+SW+SL)
Course Outcomes					
21BT321.01: Student will understand the basic microbial groups and study characteristics of prokaryotes and eukaryotes. To know the structure and various physical and chemical growth requirements of bacteria.	4	6	1	1	12
21BT321 02: To understand the bacterial genetics and mode of genetic recombination.	4	4	0	1	9
21BT321.03: To highlight the role of soil microorganisms in soil fertility and plant growth promotion by nutrient mobilization of elements through geochemical cycle.	2	4	1	2	9
21BT321.04: To students will understand the concepts of biological nitrogen fixation, free, associative and symbiotic association.	3	8	2	0	13
21BT321: Student will understand the agriculture residue degradation or conversion to useful product.	2	4	2	2	10
Total Hours	15	30	6	6	57

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO1	Introduction to microbial world	6	4	0	10
CO2	Molecular Biology of Bacteria and Genetic Recombination	0	6	4	10
CO3	Role of Microbes in Soil and Soil Fertility	0	6	4	10
CO4	Biological nitrogen fixation	0	4	6	10
CO5	Microbes for Human welfare	2	4	4	10
Total		8	24	18	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Agricultural Microbiology will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Demonstration
6. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, Whatsapp, Mobile, Online sources)
7. Brainstorming

Suggested Learning Resources:

Sl. No.	Title	Author	Publisher	Edition & Year
1	Text Book of Soil Sciences	Biswas, T.D. and Mukherjee, S.K	Tata McGraw-Hill Publishing Company Limited, New Delhi.	1990
2	Agricultural Microbiology	Mukherjee, N. and Ghosh T	Kalyani Publishers, New Delhi.	1998
3	Microbiology	Pelczar, Jr. Michel J. Chan, E.C.S. and Krieg, Noel R.	Tata McGraw - Hill	1997
4	Agricultural Microbiology	Rangaswami, G. and Bagyaraj, D.J	Prentice Hall of India Pvt. Limited, New Delhi.	2010

Curriculum Development Team:

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Cos, Pos and PSOs Mapping

Course Code: 21BT321

Course Title: Agricultural Microbiology

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprises with different scales in area of agricultural production, process and trade	Hold a post on supply in administration and policy	Analyze and control commercial and economical process in the field of agriculture.	Teach how to control and manage agricultural production	Introduce general production technologies	Teach how to teach and manage production technology	Preparation of managerial and social responsibility	Student will identify different underutilized crops	Student will practice different reeding techniques used in crop production.	Student will recognize different insect pest and diseases and their symptoms of crops	Student will apply different recent techniques in crop production
CO1_21BT32 1.01 : Student will understand the basic microbial groups and study characteristic s of prokaryotes and eukaryotes. To know the structure and	2	1	3	2	1	3	1	1	2	1	1

various physical and chemical growth requirements of bacteria.											
CO2_21BT32 1.02: To understand the bacterial genetics and mode of genetic recombination.	1	2	2	3	2	3	1	3	2	1	3
CO3_21BT32 1.03: To highlight the role of soil microorganisms in soil fertility and plant growth promotion by nutrient mobilization of elements through geochemical cycle.	1	1	3	2	1	3	1	2	1	3	1
CO3_21BT32 1.04: To students will understand the concepts	1	2	3	2	3	1	2	1	2	2	1

of biological nitrogen fixation, free, associative and symbiotic association.											
CO4_21BT32 1.05: Student will understand the agriculture residue degradation or conversion to useful product.	1	3	1	2	1	2	1	2	3	2	1

Legend: 1 – Low, 2 – Medium, 3 – High

Curriculum Map: Agricultural Microbiology

Pos & PSOs	Cos No. & Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
PO1,2,3,4,5,6,7 PSO 1,2,3,4	CO1_21BT321.01 : Student will understand the basic microbial groups and study characteristics of prokaryotes and eukaryotes. To know the structure and various physical and chemical growth requirements of bacteria.	SO1.1 SO1.2 SO1.3 SO1.4 LO1.1 LO1.2 .LO1.3	Introduction to microbiology laboratory and its equipments Microscope- parts Principles of microscopy, resolving power and numerical aperture. 1.1, 1.2, 1.3	Introduction to microbial world and types of cell system. Eukaryotic microbes Prokaryotic microbes Archea and Bacteria: cell structure. Chemoautotrophy, photo autotrophy, growth. 1.1, 1.2, 1.3, 1.4	Classification of Algae
PO1,2,3,4,5,6,7 PSO 1,2,3,4	CO2_21BT321.02: To understand the bacterial genetics and mode of genetic recombination.	SO2.1 SO2.2 SO2.3 SO2.4 LO2.1 LO2.2	Methods of sterilization. Nutritional media and their preparations 2.1, 2.2	Organization of Bacterial Genome, its replication. Expression of Bacterial Genome. Bacterial genetic recombination: transformation, conjugation Bacterial genetic recombination: transduction, plasmids, transposon 2.1, 2.2, 2.3, 2.4	Structure of Bacteriophage and its lifecycle
PO1,2,3,4,5,6,7 PSO 1,2,3,4	CO3_21BT321.03: To highlight the role of soil microorganisms in soil fertility and plant growth promotion by nutrient mobilization of elements through geochemical cycle.	SO3.1 SO3.2 LO3.1 LO3.2	Enumeration of microbial population in soil- bacteria, fungi, actinomycetes. Methods of isolation and purification of microbial	Role of microbes in soil, Carbon, Nitrogen cycles Phosphorus and Sulphur cycles. 3.1, 3.2	How other elements are cycled in soil.

			cultures. 3.1, 3.2		
PO1,2,3,4,5,6,7 PSO 1,2,3,4	CO3_21BT321.04: To students will understand the concepts of biological nitrogen fixation, free, associative and symbiotic association.	SO4.1 SO4.2 SO4.3 LO4.1 LO4.2 LO4.3 LO4.4	Isolation of Rhizobium from legume root nodule Isolation of Azotobacter from soil. Staining and microscopic examination of microbes. Differential staining methods 4.1, 4.2, 4.3, 4.4	4.1 Symbiotic, associative and asymbiotic. 4.2 Azolla, blue green algae and mycorrhiza. 4.3 Rhizosphere and phyllosphere. 4.1, 4.2, 4.3	
PO1,2,3,4,5,6,7 PSO 1,2,3,4	CO4_21BT321.05: Student will understand the agriculture residue degradation or conversion to useful product.	SO 5.1 SO5.2 LO5.1 LO5.2	Isolation of Azospirillum from roots. Isolation of BGA. 5.1, 5.2	Biodegradation of agro-waste, biofuel production, Silage production Biofertilizers and biopesticides. 5.1, 5.2	Methods of microbial strain improvement

Course Name Practical Crop Production-I (Kharif Crops)

Course Code 21AN380

Pre-requisite: practical knowledge of crop production is not only imperative but essential
With a view to Enhance production of particular crop.

Rationale: practical knowledge is the only solution for desired production for any
particular crops.

Scheme of Studies

Code	Course Code	Course Title	Scheme of Studies (Hours/Week)					Total Credit (C)
			CI	LI	SW	SL	Total Study Hours	
Program Core (PCC)	21AN380	Practical Crop Production-I (Kharif Crops)	00	2	00	00	2	01

Course outcome

21AN380.1 Student will able to become expert identify the kharif crops.

21AN380.2 Students will acquaint with underline the field preparation, seed treatment, seed inoculation, and nursery management etc.

21AN380.3 Student will have knowledge about seed production technology of kharif crops.

21AN380.4 Students of UG Agronomy will become expert to review the integrated nutrient, insect-pest and disease management technology.

21AN380.5 Student will able to become expert for preparation of balance sheet and estimate the cost of cultivation of Rabi crops.

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture(L)and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field Or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL:Self Learning,

C:Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Code	Course Code	Course Title	Scheme of Assessment (Marks)							End Semester Assessment (ESA)	Total Marks (PRA + ESA)
			Progressive Assessment (PRA)						Total Marks (CA+CT+SA+CAT+AT)		
			Class/Home Assignment 5 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar	Class Activity anyone (CAT)	Class Attendance (AT)				
Program Core (PCC)	21AN380	Practical Crop Production-I (Kharif Crops)							100	100	

Course-Curriculum Detailing:

Practical Crop planning, raising field crops in multiple cropping systems: Field preparation, seed, treatment, nursery raising, sowing, nutrient, water and weed management and management of insect-pests diseases of crops, harvesting, threshing, drying winnowing, storage and marketing of produce. The emphasis will be given to seed production, mechanization, resource conservation and integrated nutrient, insect-pest and disease management technologies. Preparation of balance sheet including cost of cultivation, net returns per student as well as per team of 8-10 students.

Practical Crop Production-I (Kharif Crops)

Approximate Hours

Item	Appx Hrs
CI	00
LI	24
SW	00
SL	00
Total	24

Session Outcomes (SOs)	Laboratory Instructions (LI)	Classroom Instructions (CI)	Self-Learning (SL)
SO.L1 Raising field crops in multiple cropping systems:	L1. Crop planning, raising field crops in multiple cropping systems:		
SO.L2 seed, treatment, nursery raising, sowing of Crops	L2. : Field preparation, seed, treatment, nursery raising, sowing, L3. Nutrient management of Paddy		
SO.L3 To know the deficiency symptom.	L4. Water and weed management		
SO.L4 Critical stages of Crops	L5. management of insect-pests diseases of Paddy		
SO.L5 Describe the insect and disease.	L6 harvesting of Paddy L7. Threshing of Paddy		
SO.L6 Describe about harvesting.	L8. drying winnowing, storage and marketing of produce		
SO.L7 Describe about threshing.	L9. . The emphasis will be given to seed production, L10. mechanization, resource conservation		
SO.L8 Discover handling techniques of drying and winnowing	L11. integrated nutrient, insect-pest and disease management technologies.		
SO.L9 Identify the handling of crop for seed production	L12. Preparation of balance sheet including cost of cultivation, net returns		
SO.L10 Discover the seed grader for grading of seed			
SO.L11 Identify the use of lab instruments			

SO.L12 Cost of cultivation, Grossreturn and B:C Ratio	per student as well as per team of 8-10 students.		
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Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO 1	Student will able to become expert identify the kharif crops.	10	5	5	20
CO 2	Students will acquaint with underline the field preparation, seed treatment, seed inoculation, and nursery management etc.	10	5	5	20
CO 3	Student will have knowledge about seed production technology of kharif crops.	10	5	5	20
CO 4	Students of UG Agronomy will become expert to review the integrated nutrient, insect- pest and disease management technology.	10	5	5	20
CO 5	Student will able to become expert for preparation of balance sheet and estimate the cost of cultivation of Kharif crops.	10	5	5	20
	Total				100

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Introduction to Practical Crop Production I (Kharif Crop) will be held with written examination of 100 marks

Note. Detailed Assessment rubric need to be prepared by the course-wise teachers for the above tasks.

Teachers can also design different tasks as per requirement, for end-semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Visit to Field Work
7. Demonstration
8. ICT Based Teaching Learning
9. Brainstorming

Brief of Hours Suggested for the Course Outcome

Course Outcomes	Class Lecture (CI)	Laboratory Instruction (LI)	Sessional Work (SW)	Self Learning (SI)	Total hour (CI+LI+SW+SI)
<p>21AN380.1 Student will able to become expert identify the kharif crops.</p> <p>21AN380.2 Students will acquaint with underline the field preparation, seed treatment, seed inoculation, and nursery management etc.</p> <p>21AN380.3 Student will have knowledge about seed production technology of kharif crops.</p> <p>21AN380.4 Students of UG Agronomy will become expert to review the integrated nutrient, insect- pest and disease management technology.</p> <p>21AN380.5 Student will able to become expert for preparation of balance sheet and estimate the cost of cultivation of Rabi crops.</p>	0	24	0	0	24
Total Hours	00	24	00	00	24

Suggested Learning Resources: (a) Books :

S. No.	Title	Author	Publisher	Edition & Year
1.	Manures and Fertilizers	Yawalkar, K.S., Agarwal, J.P. and Bokde, S.	Agri-Horticultural Publishing House, Nagpur.	10th edition 2008
2.	Principles and Practices of Agronomy Agrobios (India), Jodhpur.	Balasubramaniyan, P. and Palaniappan, S.P.	Agrobios (India), Jodhpur.	2016
3.	Principles of Agronomy	Reddy, S. R.,	Kalyani Publishers, Ludhiana	5 th edition 2016
4.	Principles and Practices of Agronomy	Singh, S.S. and Singh, Rajesh	Kalyani Publishers, New Delhi,	5 th edition 2015

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Cos, POs and PSOs Mapping

Course Title: Practical Crop Production-I (Kharif Crops)

Course Code: 21AN380

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprises with different scales in area of agricultural production, process and trade	Hold a post on supply in administration and policy	Analyze and control commercial and economical process in the field of agriculture.	Teach how to control and manage agricultural production	Introduce general production technologies	Teach how to teach and manage production technology	Preparation of managerial and social responsibility	Student will identify different underutilized crops	Student will practice different reeding techniques used in crop production.	Student will recognize different insect pest and diseases and their symptoms of crops	Student will apply different recent techniques in crop production
21AN380.1 Student will able to become expert identify the kharif crops.	2	1	3	2	1	3	2	3	2	1	1
21AN380.2 Students will acquaint with underline the field preparation, seed treatment, seed inoculation, and nursery	2	2	2=1	3	2	2	1	3	2	1	1=3

management etc.											
21AN380.3 Student will have knowledge about seed production technology of kharif crops.	1	1	2	2	1	3	1	3	1	1	3
21AN380.4 Students of UG Agronomy will become expert to review the integrated nutrient, insect- pest and disease management technology.											
21AN380.5 Student will able to become expert for preparation of balance sheet and estimate the cost of cultivation of Rabi crops.	1	2	1	2	1	1	2	1	2	2	3

21AN380.1 Student will able to become expert identify the kharif crops.	1	2	3	2	1	3	1	1	3	2	1
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Legend: 1 – Low, 2 – Medium, 3 – High

Curriculum Map: Practical Crop Production-I (Kharif Crops) 21AN380

Pos & PSOs	Cos No. & Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
PO1,2,3,4,5,6,7 PSO 1,2,3,4	1 Student will able to become expert identify the kharif crops. 2 Students will acquaint with underline the field preparation, seed treatment, seed inoculation, and nursery management etc. 3 Student will have knowledge about seed production technology of kharif crops. 4 Students of UG Agronomy will become expert to review the integrated nutrient, insect-pest and disease management technology. 5 Student will able to become expert for preparation of balance sheet and estimate the cost of cultivation of Rabi crops.	SO 1.1 SO 1.2 SO 1.3 SO 1.4 SO 1.5 SO 1.6 SO 1.7 SO 1.8 SO 1.9 SO 1.10 SO 1.11 SO 1.12	L1. Crop planning, raising field crops in multiple cropping systems: L2. : Field preparation, seed, treatment, nursery raising, sowing, L3. Nutrient management of Paddy L4. Water and weed management of Paddy L5. management of insect-pests diseases of Paddy L6 harvesting of Paddy L7. Threshing of Paddy L8. drying winnowing, storage and marketing of produce L9. . The emphasis will be given to seed production, L10. mechanization, resource conservation L11. integrated nutrient, insect-pest and disease management technologies. L12. Preparation of balance sheet including cost of cultivation, net returns per student as well as per team of 8-10 students.		

Semester 4

Course Code: 21AN422

Course title: Crop production technology II (Rabi crops)

Pre- Requisite: Through this knowledge of production technology of crop will be proven as boom pushing up the production of crops.

Rationale: Practical knowledge in production technology of crops is become essential and with the practice desired production may be done.

Course Outcomes:

21AN422.1 Student will become expert to know the crop production technology of kharif cereals crop.

21AN322.2 Student acquired knowledge about scientific pulse crops production packages and practices.

21AN322.3 UG students acquainted knowledge about oilseeds crop production and oil extractions process.

21AN322.4 Student acquired knowledge about scientific sugar crop and medicinal crops production packages and practices.

21AN322.5 Students of UG classes gain knowledge on aromatic and forage crops with the familiar relationship.

Scheme of Studies:

Code	Course Code	Course Title	Scheme of studies(Hours/Week)				Total Study Hours(CI+LI+SW+SL)	Total Credits (C)
			CI	LI	SW	SL		
Program Core (PCC)	21AN422	Crop Production Technology (Rabi Crop)		01	01	01	4	(1+1)

Legend: **CI:**ClassroomInstruction(Includesdifferentinstructionalstrategiesi.e.Lecture(L)andTutorial(T)and others),
LI:LaboratoryInstruction(IncludesPracticalperformancesinlaboratoryworkshop, field or other locations using different instructional strategies)
SW: Sessional Work(includes assignment, seminar, mini project etc.),
SL: Self Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

Code	Course Code	Course Title	Scheme of Assessment (Marks)							End Semester Assessment	Total Marks (PRA + ESA)
			Progressive Assessment (PRA)						Total Marks		
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	(CA+CT+SA+CAT+AT)			
Program Core (PCC)	21AN422	Crop Production Technology(Rabi Crop)	15	30	0	0	05	50	50	100	

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

21AN422.1 Students will become expert to know the crop production technology of kharif cereals crop.

A

**pprox
imate
Hours**

Item	Appx Hrs.
CI	03
LI	04
SW	01
SL	01
Total	09

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO1.1To aquent with modern production technology of wheat crop.</p> <p>SO1.2 Students will be introduced regarding production of barley crop.</p> <p>SO1.3 To aquent with modern production technology of Barley crop.</p>	<p>1. Sowing methods of wheat</p> <p>2. Study of morphological characteristics of rabi crops</p>	<p>Unit-1. Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Rabi crops; cereals –wheat and barley.</p> <p>1.1. Origin, geographical distribution, economic importance, soil and climatic requirement and varieties of Wheat crop.</p> <p>1.2 Introduction to cultural practices and yield of wheat crop.</p> <p>1.3 Origin, geographical distribution, economic importance, soil and climatic requirement and varieties of Barley crop.</p> <p>1.4 Introduction to cultural practices and yield of barley crop.</p>	<p>Study on SWI Method of wheat crop.</p>

SW-1 Suggested Sessional Work (SW):

Assignments:

Modern production technology of barley crop in dryland agriculture.

a. Other Activities (Specify):

Course outcome 21AN422.2 Student acquired knowledge about scientific pulse crops production packages and practices

Approximate Hours

Item	Appx Hrs.
CI	03
LI	04
SW	01
SL	01
Total	09

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO1.1 To acquaint with modern production technology of chickpea crop.</p> <p>SO1.2 Students will be introduced regarding production of lentil crop.</p> <p>SO1.3 To acquaint with modern production technology of peas crop.</p>	<p>1. Identification of weeds in rabi season crops.</p> <p>2. Study of yield contributing characters of rabi season crops</p>	<p>Unit-2 Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Rabi crops; pulses-chickpea, lentil, peas</p> <p>• 1.1 Origin, geographical distribution, economic importance, soil and climatic requirement and varieties of chickpea crop.</p> <p>1.2 2 Introduction to cultural practices and yield of Chickpea crop.</p> <p>1.3. Origin, geographical distribution, economic importance, soil and climatic requirement and varieties of Lentil crop.</p> <p>1.4 4 Introduction to cultural practices and yield of lentil crop.</p> <p>1.5 Origin, geographical distribution, economic importance, soil and climatic requirement and varieties of peas crop.</p> <p>1.6 Introduction to cultural practices and yield of peas crop.</p>	<p>1. Preparation of Assignment on legume crops through study</p>

SW-1 Suggested Sessional Work (SW):

Assignments: Modern production technology of pea crop.

b. Other Activities(Specify):

Identification of Different varieties of lentil crop.

Course out come 21AN422.3 UG students acquainted knowledge about oilseeds crop production and oil extractions process.

Approximate Hours

Item	Appx Hrs.
CI	03
LI	04
SW	01
SL	01
Total	09

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO1.1 To acquaint with modern production technology of Oilseed – rapeseed crop.</p> <p>SO1.2 Students will be introduced regarding production of Mustard crop.</p> <p>SO1.3 To acquaint with modern production technology of sunflower crop.</p>	<p>1. Study of important agronomic experiments of rabi crops at experimental farms.</p> <p>2 . Study of rabi forage experiments,</p>	<p>Unit-3 - Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of <i>Rabi</i> crops; oilseeds-rapeseed, mustard and sunflower.</p> <p>1.1 Origin, geographical distribution, economic importance, soil and climatic requirement and varieties of Oilseed – rapeseed crop.</p> <p>1.2 2 Introduction to cultural practices and yield of Oilseed –rapeseed crop.</p> <p>1.3. Origin, geographical distribution, economic importance, soil and climatic requirement and varieties of mustard crop.</p> <p>1.4 4 Introduction to cultural practices and yield of mustard crop.</p> <p>1.5 Origin, geographical distribution, economic importance, soil and climatic requirement and varieties of sunflower crop.</p> <p>1.6 Introduction to cultural practices and yield of sunflower crop.</p>	<p>Prepare package and practices of sunflower crop.</p>

SW-1 Suggested Sessional Work (SW):

Assignments: Modern production technology of mustard crop.

c. Other Activities(Specify): Field work and students associated with research trials.

Course outcome 21AN422.4 Student acquired knowledge about scientific sugar crop and medicinal crops production packages and practices

Approximate Hours

Item	Appx Hrs.
CI	03
LI	04
SW	01
SL	01
Total	09

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO1.1 To acquaint with modern production technology of Sugar crop-Sugarcane.</p> <p>SO1.2 Students will be introduced regarding production of Medicinal crop.</p>	<p>1.Sowing methods of sugarcane.</p> <p>2.Yield and juice quality analysis of sugarcane,</p>	<p>Unit-4 - Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of <i>Rabi</i> crops; sugar crops-sugarcane; medicinal</p> <p>1. 1.1 Origin, geographical distribution, economic importance, soil and climatic requirement and varieties of sugar crop – Sugarcane crop.</p> <p>1.2 2 Introduction to cultural practices and yield of sugar crop – Sugarcane crop.</p> <p>1.3. Origin, geographical distribution, economic importance, soil and climatic requirement and varieties of medicinal crop.</p> <p>1.4 4 Introduction to cultural practices and yield of medicinal crop.</p>	<p>Studies of sucrose on sugarcane crop by use of refractometer ,submitted a project report by students.</p>

SW-1 Suggested Sessional Work (SW):

Assignments: Modern production technology of Sugarcane crop.

Other Activities(Specify):Identification of medicinal plants and their uses.

Course outcome 21AN422.5 Students of UG classes gain knowledge on aromatic and forage crops with the familiar relationship.

Approximate Hours

Item	Appx Hrs.
CI	03
LI	04
SW	01
SL	01
Total	09

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO1.1 To acquaint with modern production technology of aromatic crop -mentha crop.</p> <p>SO1.2 Students will be introduced regarding production of lemon grass crop.</p> <p>SO1.3 To acquaint with modern production technology of aromatic crop –citronella crop.</p> <p>SO1.4 To acquaint with modern production technology of berseem crop.</p> <p>SO1.5 To acquaint with modern production technology of lucern crop.</p> <p>SO1.6 Students will be introduced regarding production of oat crop.</p>	<p>1.Oil extraction of medicinal crops,</p> <p>2. Visit to research stations of related crops.</p>	<p>Unit-5 - Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Rabi crops ;aromatic crops- mentha , lemon grass and citronella, Forage crops-berseem, lucerne and oat</p> <p>1.1 Origin, geographical distribution, economic importance, soil and climatic requirement and varieties of aromatic crop – mentha,lemon grass, citronella crop.</p> <p>1.2 Introduction to cultural practices and yield of aromatic crop –mentha,lemon grass, citronella crop.</p> <p>1.3. Origin, geographical distribution, economic importance, soil and climatic requirement and varieties of berseem ,Lucerne and oat crop.</p> <p>1.4 Introduction to cultural practices and yield of berseem ,Lucerne crop.</p> <p>1.5 Origin, geographical distribution, economic importance, soil and climatic requirement and varieties of oat crop.</p> <p>1.6 Introduction to cultural practices and yield of oat crop.</p>	<p>1.. Prepare a short notes on barseem cultivation with all aspects.</p>

SW-1 Suggested Sessional Work (SW):

Assignments: Students instruct to prepare a brief assignments on berseen,lucern and oat forage crop production technology.

Other Activities(Specify): Practices for yield estimation of rabi crops on the field.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self Learning (Sl)	Total hour (Cl+SW+Sl)
Student will become expert to know the crop production technology of kharif cereals crop.	7	1	1	9
Student acquired knowledge about scientific pulse crops production packages and practices.	7	1	1	9
UG students acquainted knowledge about oilseeds crop production and oil extractions process.	7	1	1	9
Student acquired knowledge about scientific sugar crop and medicinal crops production packages and practices.	7	1	1	9
Students of UG classes gain knowledge on aromatic and forage crops with the familiar relationship	7	1	1	9
Total Hours	35	05	05	45

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Rabi crops; cereals –wheat and barley.	03	01	01	05
CO-2	Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Rabi crops; pulses-chickpea, lentil, peas	02	06	02	10
CO-3	Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of <i>Rabi</i> crops; oilseeds-rapeseed, mustard and sunflower.	03	07	05	15
CO-4	Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of <i>Rabi</i> crops; sugar crops-sugarcane; medicinal	-	10	05	15
CO-5	Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Rabi crops ;aromatic crops- mentha, lemon grass and citronella, Forage crops-berseem, lucerne and oat	03	02	-	05
Total		11	26	13	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Introduction to Portland cement will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks.

Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method

4. Group Discussion
5. Role Play
6. Demonstration
7. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT,Blog, Facebook,Twitter, Whatsapp, Mobile, Online sources)
8. Brainstorming

Suggested Learning Resources:

(a) Books :

S. No.	Title	Author	Publisher	Edition & Year
1	Modern Techniques of Raising Field Crops	Oxford & IBH Publishing Co., New Delhi.	Chhidda Singh , Prem Singh and , Rajbir Singh	2003
2	Crop Management Under Irrigated and Rainfed Conditions.	Kalyani Publishers, New Delhi	S.S. Singh	1998
3	Modern Concepts and Advance Principles in Crop Production.	Agrobios (India), Jodhpur	S.C. Panda2012	2012
4	S.S. Singh and Rajesh Singh	Kalyani Publishers, New Delhi	P.S. Rathore	2000
6	Lecture note provided by Dept. of Faculty of agriculture science and technology, AKS University, Satna .			

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Cos, Pos and PSOs Mapping

Course Code: 21AN422

Course Title: Crop Production Technology-II (Rabi Crops)

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprises	Identify and supply in administrative and	Analyze and control commercial and	Teach how to control and manage agricultural	Introduce general production technologies	Teach how to implement and manage	Prepare for managerial and social responsibility	Student will identify different underutilized	Student will practice different breeding	Student will recognize different insect pest	Student will apply different recent techniques
21AN422.1 Student will become expert to know the crop production technology of kharif cereals crop.	2	2	1	2	2	1	2	3	2	2	1
21AN322.2 Student acquired knowledge about scientific pulse crops production packages and practices.	1	2	2	1	2	1	2	1	2	1	3

21AN322.3 UG students acquainted knowledge about oilseeds crop production and oil extractions process.	2	1	2	2	1	2	2	1	3	2	22
21AN322.4 Student acquired knowledge about scientific sugar crop and medicinal crops production packages and practices.	2	1	2	2	3	2	1	3	3	2	1
21AN322.5 Students of UG classes gain knowledge on aromatic and forage crops with the familiar relationship.	1	2	2	2	2	2	1	3	3	2	2

Legend: 1 – Low, 2 – Medium, 3 – High

Curriculum Map: Crop production technology II (Rabi crops) 21AN422

Pos & PSOs	Cos No. & Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
PO1,2,3,4,5,6,7 PSO 1,2,3,4	Students will become expert to know the crop production technology of kharif cereals crop.	SO 1.1 SO 1.2 SO 1.3	1. Sowing methods of wheat. 2. Study of morphological characteristics of rabi crops.	Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Rabi crops; cereals –wheat and barley. 1.1, 1.2, 1.3,1.4	Study on SWI Method of wheat crop.
PO1,2,3,4,5,6,7 PSO 1,2,3,4	Student acquired knowledge about scientific pulse crops production packages and practices	SO 1.1 SO 1.2 SO 1.3	1. Identification of weeds in rabi season crops. 2 .Study of yield contributing characters of rabi season crops	Student acquired knowledge about scientific pulse crops production packages and practices 1.1, 1.2, 1.3,1.4,1.5,1.6	Preparation of Assignment on legume crops through study
PO1,2,3,4,5,6,7 PSO 1,2,3,4	UG students acquainted knowledge about oilseeds crop production and oil extractions process.	SO 1.1 SO 1.2 SO 1.3	.Study of important agronomic experiments of rabi crops at experimental farms. 2 . Study of rabi forage experiments,	Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of <i>Rabi</i> crops; oilseeds-rapeseed, mustard and sunflower. 1.1, 1.2, 1.3,1.4,1.5,1.6	Prepare package and practices of sunflower crop.
PO1,2,3,4,5,6,7 PSO 1,2,3,4	Student acquired knowledge about scientific sugar crop and medicinal crops production packages and practices	SO 4.1 SO 4.2	1.Sowing methods of sugarcane. . 2.Yield and juice quality analysis of sugarcane,	Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of <i>Rabi</i> crops; sugar crops-sugarcane; medicinal. 1.1, 1.2, 1.3,1.4	Study on plant ideotypes, crop rotation and its principles.

PO1,2,3,4,5,6,7 PSO 1,2,3,4	Students of UG classes gain knowledge on aromatic and forage crops with the familiar relationship.	SO 5.1 SO 5.2 SO 5.3 SO 5.4 SO 5.5 SO 5.6	1.Oil extraction of medicinal crops, 2 Visit to research stations of related crops.	Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Rabi crops ;aromatic crops- mentha , lemon grass and citronella, Forage crops-berseem, lucerne and oat 1.1, 1.2, 1.3,1.4,1.5, 1.6	Study on crop management technologies in problematic areas
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Course Code: 21HO426

Course Title: Diseases of Field & Horticultural Crops & their Management-II

Pre- requisite: Student should have basic knowledge of Fundamentals of Plant Pathology

Rationale: To minimize the losses due to plant diseases in crop production and healthy 5Fs

Course Outcomes:

CO1 Define various terminology used in the course

CO2 Identify various plant diseases and life-cycles of Rabi season crops

CO3 Isolate/detect different plant pathogens from infected plant parts and soil

CO4 Minimize the losses caused by diseases through suitable management practices

CO5 Develop integrated disease management models/strategies for particular crop

Scheme of Studies:

Code	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			CI	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Program Core (PCC)	21HO426	Diseases of Field & Horticultural Crops & their Management-II	2	1	1	1	6	3

Legend:

CI: Classroom Instruction (Includes different instructional strategies i.e., Lecture (L) and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning, C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

Code	Course Code	Course Title	Scheme of Assessment (Marks)						
			Progressive Assessment (PRA)					End Semester Assessment (ESA)	Total Marks (PRA+ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2, 15 marks each (CT)	Seminar one (SA)	Activity any one (CAT)	Class Attendance (AT)		
Program Core (PCC)	21HO426	Diseases of Field & Horticultural Crops & their Management-II		30	-	-		50	100

Course-Curriculum Detailing: This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

21HO426 .1: Define various terminology used in the cereal crop diseases and their identification

Approximate Hours

Item	Appx. Hrs
CI	6
LI	6
SW	1
SL	1
Total	14

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
<p>SO1.1 Understand the importance of cereal crop diseases</p> <p>SO1.2 Recognize the symptoms of diseases</p> <p>SO1.3 Apply the method of disease management</p> <p>SO1.4 Understand the life cycle of diseases</p>	<ul style="list-style-type: none"> • Identification and histopathological studies of selected cereal diseases 	<p>Unit-1 Symptoms, etiology, disease cycle and management of following diseases: Field Crops: Wheat: rusts, loose smut, karnal bunt, powdery mildew, alternaria blight, and ear cockle.</p> <p>1.1 Symptoms, etiology, disease cycle and management of Wheat: rusts</p> <p>1.2 Symptoms, etiology, disease cycle and management of loose smut</p> <p>1.3 Symptoms, etiology, disease cycle and management of karnal bunt</p> <p>1.4 Symptoms, etiology, disease cycle and management of powdery mildew</p> <p>1.5 Symptoms, etiology, disease cycle and management of Alternaria blight</p> <p>1.6 Symptoms, etiology, disease cycle and management of ear cockle</p>	<p>1 Causal organisms of cereal diseases</p>

SW-1 Suggested Sessional Work (SW):

a) Assignments:

- i) Management of wheat rust, ear cockle and karnal bunt

21HO426 .2: Identify various plant diseases and life-cycles of Rabi season crops

Approximate Hours

Item	Appx Hrs
CI	06
LI	6
SW	1
SL	1
Total	14

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
<p>SO2.1 Understand the causes of the diseases</p> <p>SO2.2 Discuss the primary and secondary inoculum of crop diseases</p> <p>SO2.3 Illustrate microscopic characters of the pathogens</p>	<p>Identification and histopathological studies of sugarcane, sunflower and mustard diseases</p>	<p>Unit-2 Symptoms, etiology, disease cycle and management of following diseases: sugarcane; red rot, smut, wilt, grassy shoot, ratoon stunting and Pokkah Boeng; Sunflower; Sclerotinia stem rot and Alternaria blight; Mustard; Alternaria blight, white rust, downy mildew and Sclerotinia stem rot.</p> <p>1.1 Red rot, smut and wilt of sugarcane</p> <p>1.2 grassy shoot, ratoon stunting and Pokkah Boeng of sugarcane</p> <p>1.3 Sclerotinia stem rot and Alternaria blight of sunflower</p> <p>1.4 Alternaria blight, white rust of mustard</p> <p>1.5 Downy mildew of mustard</p> <p>1.6 Sclerotinia stem rot of mustard</p>	<p>1 Causal organisms and primary inoculum</p>

SW-2 Suggested Sessional Work (SW):

a) Assignments:

- i) Life cycles of the major diseases of sugarcane, mustard and sunflower

21HO426.3: Isolate/detect different plant pathogens causing diseases in rabi season crops from infected plant parts and soil

Approximate Hours

Item	Appx. Hrs
CI	06
LI	6
SW	1
SL	1
Total	14

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
<p>SO3.1 Describe pulse crop diseases</p> <p>SO3.2 Practice to identify and control of pulse crop diseases</p> <p>SO3.3 Illustrate microscopic characters of the pathogens causing pulse crops</p> <p>SO3.4 Diagnose pulse crop diseases</p>	<ul style="list-style-type: none"> • Identification and histopathological studies of pulse crop diseases • Field visit for disease identification 	<p>Unit-3 Gram: wilt, grey mold and Ascochyta blight; Lentil: rust and wilt; Cotton: anthracnose, vascular wilt, and black arm; Pea: downy mildew, powdery mildew and rust.</p> <p>3.1 Wilt of Gram, lentil & cotton</p> <p>3.2 Grey mold and Ascochyta blight of gram</p> <p>3.3 Rust of pea and lentil</p> <p>3.4 Anthracnose & black arm of cotton</p> <p>3.5 Downy mildew of pea</p> <p>3.6 Powdery mildew of pea</p>	<p>1 Life cycles of pulse crop diseases</p>

SW-3 Suggested Sessional Work (SW):

a. Assignments:

- i) Causal organisms and their descriptions

21HO426.4: Acquaintance with nematodes and phanerogamic plant parasites and losses caused by them

Approximate Hours

Item	Appx Hrs
CI	06
LI	6
SW	1
SL	1
Total	14

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO4.1 Diagnose fruit crop diseases</p> <p>SO4.2 Illustrate microscopic characters of the pathogens causing fruit crops</p> <p>SO4.3 Evaluate the damage caused by different diseases</p> <p>SO4.4 Inspect the fruit diseases in the field</p>	<ul style="list-style-type: none"> • Identification and histopathological studies of fruit crop diseases • Field visit for identification of disease 	<p>Unit-4 Horticultural Crops: Mango: anthracnose, malformation, bacterial blight and powdery mildew; Citrus: canker and gummosis; Grape vine: downy mildew, Powdery mildew and anthracnose; Apple: scab, powdery mildew, fire blight and crown gall; Peach: leaf curl. Strawberry: leaf spot</p> <p>Potato: early and late blight, black scurf, leaf roll, and mosaic.</p> <p>4.1 Anthracnose, powdery mildew & downy mildew of mango, grape & apple</p> <p>4.2 Bacterial blight of mango and citrus canker</p> <p>4.3 Citrus gummosis, fire blight and crown gall</p> <p>4.4 Apple scab & Strawberry leaf spot</p> <p>4.5 Peach leaf curl, early & late blight of potato</p> <p>4.6 Black scurf, leaf roll, and mosaic of potato</p>	<p>1 Causal organisms of fruit diseases</p>

SW-4 Suggested Sessional Work (SW):

a) Assignments:

- i) Tabulate fruit crop diseases and their symptoms

21HO426.5: Develop integrated disease management models/strategies for particular crop

Approximate Hours

Item	Appx Hrs
CI	06
LI	6
SW	1
SL	1
Total	14

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
<p>SO5.1 Diagnose flower crop diseases</p> <p>SO5.2 Illustrate microscopic characters of the pathogens causing flower & vegetable diseases</p> <p>SO5.3 Evaluate the damage caused by different diseases</p> <p>SO5.4 Inspect the flower & vegetable diseases in the field</p>	<ul style="list-style-type: none"> • Identification and histopathological studies of fruit crop diseases • Collection and preservation of plant diseased specimens for herbarium 	<p>Unit-5 Cucurbits: downy mildew, powdery mildew, wilt; Onion and garlic: purple blotch, and Stemphylium blight; Chillies: anthracnose and fruit rot, wilt and leaf curl; Turmeric: leaf spot Coriander: stem gall Marigold: Botrytis blight; Rose: dieback, powdery mildew and black leaf spot.</p> <p>5.1 Cucurbit diseases</p> <p>5.2 Onion and garlic diseases</p> <p>5.3 Chilly diseases</p> <p>5.4 Turmeric diseases</p> <p>5.5 Coriender diseases</p> <p>5.6 Rose diseases</p>	<p>1 Learning of causal organisms</p>

SW-5 Suggested Sessional Work (SW):

a) Assignments:

- i) Collection and preservation of plant diseased specimens for herbarium

Brief of Hours suggested for the Course Outcome

ii)

Course Outcomes	Class Lecture (C)	Lab (LI)	Sessional Work (SW)	Self Learning(Sl)	Total hour (C+SW+Sl)
21HO426 .1: Define various terminology used in the cereal crop diseases and their identification	06	6	1	1	14
21HO426 .2: Identify various plant diseases and life-cycles of Rabi season crops	06	6	1	1	14
21HO426.3: Isolate/detect different plant pathogens causing diseases in rabi season crops from infected plant parts and soil	06	6	1	1	14
21HO426.4: Acquaintance with nematodes and phanerogamic plant parasites and losses caused by them	06	6	1	1	14
21HO426.5: Develop integrated disease management models/strategies for particular crop	06	6	1	1	14
Total Hours	30	30	05	05	70

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Diseases of cereal crops	03	02	01	10
CO-2	Diseases of sugarcane, sunflower & mustard	02	06	02	10
CO-3	Diseases of pulse crops	03	07	05	10
CO-4	Diseases of fruit crops		10	05	10
CO-5	Diseases of flower & vegetable crops	03	02		10
Total		11	26	13	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for **Diseases of Field & Horticultural Crops & their Management-II** will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Case study
3. Group Discussion
4. Role Play
5. Demonstration
6. Brainstorming

Suggested Learning Resources:**(a) Books:**

S. No.	Title	Author	Publisher	Edition & Year
1	Plant Pathology	Agrios GN.	Academic Press, New York. (Indian Ed.)	2005 5th Ed.
2	Plant Pathology	Mehrotra R S and Aggarwal A.	Tata McGraw-Hill Publishing Co Ltd. ND.	2012. 12th ed.
3	Diseases of field crops.	Gupta V K and Paul, Y S	Kalyani Publishing Co. New Delhi.	2008. II ed.
4	Diseases of tropical and sub-tropical field fiber and oil plants.	Cook, A A.	Mac Millan Publishing Co. New York.	1981.

Curriculum Development Team

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Cos, Pos and PSOs Mapping

Course Code: 21HO426

Course Title: Diseases of Field and Horticultural Crops and Their Management-I

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprises with different scales in area of agricultural production, process and trade	Hold a post on supply in administration and policy	Analyze and control commercial and economical process in the field of agriculture	Teach how to control and manage agricultural production	Introduce general production technologies	Teach how to implement and manage production technologies	Prepare for managerial and social responsibilities	Student will identify different underutilized crops	Student will practice different breeding techniques used in crop production.	Student will recognize different insect pest and diseases and their symptoms of crops	Student will apply different recent techniques in crop production
21HO426.1: Define various terminology used in the cereal crop diseases and their identification	2	2	1	2	2	1	2	3	2	2	1
21HO426.2: Identify various plant diseases and life-cycles of Rabi season crops	1	2	2	1	2	1	2	1	2	1	3

21HO426.3: Isolate/detect different plant pathogens causing diseases in rabi season crops from infected plant parts and soil	2	1	2	2	1	2	2	1	3	2	22
21HO426.4: Acquaintance with nematodes and phanerogamic plant parasites and losses caused by them	2	1	2	2	3	2	1	3	3	2	1
21HO426.5: Develop integrated disease management models/strategies for particular crop	1	2	2	2	2	2	1	3	3	2	2

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map: Diseases of Field & Horticultural Crops & their Management I

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO1,2,3,4,5,6,7 PSO 1,2,3,4	1: Define various terminology used in the cereal crop diseases and their identification	SO 1.1 SO 1.2 SO 1.3 SO 1.4	• Identification and histopathological studies of selected cereal diseases.	Symptoms, etiology, disease cycle and management of major diseases of following crops: Field Crops: Rice: blast, brown spot, bacterial blight, sheath blight, false smut, khaira and tungro; Maize: stalk rots, downy mildew, leaf spots; Sorghum: smuts, grain mold and anthracnose. Bajra: downy mildew and ergot. 1.1,1.2,1.3,1.4,1.5,1.6	1. Causal organisms of cereal diseases
PO1,2,3,4,5,6,7 PSO 1,2,3,4	2: Diagnose various plant diseases with their life-cycles of Kharif season crops	SO 2.1 SO 2.2 SO 2.3	• Identification and histopathological studies of sugarcane, sunflower and mustard diseases.	Groundnut: early and late leaf spots, wilt, Soybean: Rhizoctonia blight, bacterial spot, seed and seedling rot and mosaic; Pigeonpea: Phytophthora blight, wilt and sterility mosaic; Finger millet. Blast and leaf spot. 2.1,2.2,2.3,2.4,2.5,2.6	1. Causal organisms and primary inoculum
PO1,2,3,4,5,6,7 PSO 1,2,3,4	3: Determine the relationship between pathogens, host and environment	SO 3.1 SO 3.2 SO 3.3 SO 3.4	• Identification and histopathological studies of pulse crop diseases • Field visit for disease identification	Black & green gram: <i>Cercospora</i> leaf spot and anthracnose, web blight and yellow mosaic; Castor: Phytophthora blight; Tobacco: black shank, black root rot and mosaic. 3.1,3.2,3.3,3.4,3.5	1. Life cycles of pulse crop diseases
PO1,2,3,4,5,6,7 PSO 1,2,3,4	4: Minimize the quantitative, qualitative and esthetic losses caused by diseases through suitable management practices	SO 4.1 SO 4.2 SO 4.3 SO 4.4	• Identification and histopathological studies of fruit crop diseases • Field visit for identification of disease	Horticultural Crops: Guava: wilt and anthracnose; Banana: Panama wilt, bacterial wilt, Sigatoka and bunchy top; Papaya: foot rot, leaf curl and mosaic, Pomegranate: bacterial blight; Cruciferous vegetables: Alternaria leaf spot and black rot; Brinjal: Phomopsis blight and fruit rot and Sclerotinia blight. 4.1,4.2,4.3,4.4,4.5,4.6	1 Causal organisms of fruit diseases

PO1,2,3,4,5,6,7 PSO 1,2,3,4	5: Develop integrated disease management models/strategies for particular crop	SO 5.1 SO 5.2 SO 5.3 SO 5.4	<ul style="list-style-type: none"> • Identification and histopathological studies of fruit crop diseases • Collection and preservation of plant diseased specimens for herbarium. 	Tomato: damping off, wilt, early and late blight, buck eye rot and leaf curl and mosaic; Okra: Yellow Vein Mosaic; Beans: anthracnose and bacterial blight; Ginger: soft rot; Colocasia: Phytophthora blight; Coconut: wilt and bud rot; Tea: blister blight; Coffee: rust. 5.1,5.2,5.3,5.4,5.5,5.6,5.7	1. Learning of causal organisms
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Course Code: 21EC429

Course Title: Farm Management, Production and Resources Economics

Pre requisite: -Students should have advance knowledge of Farm Management, Production and Resources Economics, for developed the ability of farm management and enterprise economic analysis in agriculture enterprises.

Rationale: - Farm Management, Production and Resources Economics is the express through the concept and provide the information to Agricultural Economist and professionals in accurate manners. Agricultural Economist or scientist should develop skill in the enterprise analysis and farm business with apply the principle of Farm management.

Course Outcomes:

1. Define the principles of farm management, production function and different input out relationships.
2. Analyze the cost concept, types of costs and different income measures
3. Interpret the farm business analysis, farm inventory, balance sheet, profit and loss accounts for practical purpose
- 4 Apply the risk, uncertainty, farm planning and budgeting in farm production.
5. Discusses to natural resource economics and agricultural economics.

Scheme of studies

Code	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			CI	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Program Core (PCC)	21EC429	Farm Management, Production and Resources Economics	01	01	02	01	05	02

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Code	Course Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ESA)
			Class/ Home Assignment number 5 3 marks each (CA)	Class Tests 2 (2 best out of 3) 10 marks each (CT)	Seminars one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
(Program Core (PCC))	21E C429	Farm Management, Production and Resources Economics	15	30	00	00	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

21EC429 CO-1: Define the principles of farm management, production function and different input out relationships

Approximate Hours

Item	AppX Hrs
CI	5
LI	4
SW	2
SL	1
Total	11

Session Outcomes (SOs)	Laboratory Instruction(LI)	Class room Instruction(CI)	Self Learning (SL)
<p>SO1.1- Introduce to meaning and concept of farm management, objectives and relationship with other Sciences.</p> <p>SO1.2 - Introduce about Meaning and definition of farms, its types and characteristics, factor determining types and size of farms.</p> <p>SO1.3 - Discussion about the Principles of farm management. under law of equi-marginal/or principles of opportunity cost and law of comparative advantage</p> <p>SO1.4- Describes the concept of production function and its type, use of production function in decision-making on a farm</p> <p>SO1.5 - Discuss about the factor-product, factor-factor and product-product</p>	<p>LE1.1: Preparation of farm layout</p> <p>LE1.2: Determination of cost of fencing of a farm.</p> <p>LE1.3: Computation of depreciation cost of farm assets.</p> <p>LE1.4: Application of cost principles including CACP concepts in the estimation of cost of crop and livestock enterprises.</p>	<p>Unit-1</p> <p>Meaning and concept of farm management, objectives and relationship with other Sciences. Meaning and definition of farms, its types and characteristics, factor determining types and size of farms. Principles of farm management: law of equi-marginal/or principles of opportunity cost and law of comparative advantage, concept of production function and its type, use of production function in decision-making on a farm, factor-product, factor-factor and product-product relationship,.</p> <p>1.1- Meaning and concept of farm management, objectives and relationship with other Sciences</p> <p>1.2- Meaning and definition of farms, its types and characteristics, factor determining types and size of farms</p> <p>1.3- Principles of farm management: law of equi-marginal/or principles of opportunity cost and law of comparative advantage</p> <p>1.4- Concept of production function and its type, use of production function in decision-making on a</p>	<p>1.1- Prepare the assignment on Meaning and definition of farms, its types and characteristics, factor determining types and size of farms</p>

relationship.		farm	
SO1.6 – Laboratory or fieldwork		1.5- Factor-product, factor-factor and product-product relationship	

SW-1 Suggested Sessional Work (SW):

a. Assignments: Prepare the assignment on Meaning and definition of farms, its types and characteristics, factor determining types and size of farms

b. Mini Project: -

c. Other Activities (Specify):

21EC429 CO-2: Analyze the cost concept, types of costs and different income measures

Approximate Hours

Item	AppX Hrs
C 1	02
LI	02
SW	02
SL	01
Total	07

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO2.1 – introduce to Meaning and concept of cost, types of costs and their interrelationship and importance of cost in managing farm business</p> <p>SO2.2- Briefing the estimation of gross farm income, net farm income, family labour income and farm business income,</p> <p>SO2.3- Briefing the lab work and field work.</p>	<p>LE2.1: Computation of depreciation cost of farm assets.</p> <p>LE2.2: Application of cost principles including CACP concepts in the estimation of cost of crop and livestock enterprises.</p>	<p>Unit-2.0 – Meaning and concept of cost, types of costs and their interrelationship, importance of cost in managing farm business and estimation of gross farm income, net farm income, family labour income and farm business income</p> <p>2.1 - Introduction to Meaning and concept of cost, types of costs and their interrelationship, importance of cost in managing farm business</p> <p>2.2- Discuss to estimation of gross farm income, net farm income, family labour income and farm business income</p>	<p>2.1 – Prepare the assignment on cost, types of costs and their interrelationship, importance of cost in managing farm business</p>

SW-1 Suggested Sessional Work (SW):

a. Assignments: Prepare the assignment on cost, types of costs and their interrelationship, importance of cost in managing farm business.

b. Mini Project:

c. Other Activities (Specify):

21EC429 CO -3: Interpret the farm business analysis, farm inventory, balance sheet, profit and loss accounts for practical purposes.

Approximate Hours

Item	AppX Hrs
C1	02
LI	02
SW	02
SL	01
Total	07

Session Outcomes (SOs)	Laboratory Instruction(LI)	Class room Instruction(CI)	Self Learning (SL)
<p>SO3.1 – Identify to the Farm business analysis: meaning and concept of farm income and profitability, technical and economic efficiency measures in crop and livestock enterprises.</p> <p>SO3.2 – Discuss to the Importance of farm records and accounts in managing a farm, various types of farm records needed to maintain on farm.</p> <p>SO3.3- Apply the farm inventory, balance sheet, profit and loss accounts</p> <p>SO3.4- Discuss to lab work and field work</p>	<p>LE3.1: Application of equi-marginal returns/opportunity cost principle in allocation of farm resources.</p> <p>LE3.2: - Determination of most profitable level of inputs use in a farm production process.</p>	<p>Unit-3.0 Farm business analysis: meaning and concept of farm income and profitability, technical and economic efficiency measures in crop and livestock enterprises. Importance of farm records and accounts in managing a farm, various types of farm records needed to maintain on farm, farm inventory, balance sheet, profit and loss accounts.</p> <p>3.1- Introduce the Farm business analysis: meaning and concept of farm income and profitability, technical and economic efficiency measures in crop and livestock enterprises</p> <p>3.2- Discuss the Importance of farm records and accounts in managing a farm, various types of farm records needed to maintain on farm, farm inventory, balance sheet, profit and loss account</p>	<p>3.1 Prepare the assignment on Importance of farm records and accounts in managing a farm, various types of farm records needed to maintain on farm</p>

SW-1 Suggested Sessional Work (SW):

a. Assignments: Prepare the assignment on Importance of farm records and accounts in managing a farm, various types of farm records needed to maintain on farm

b. Mini Project:

c. Other Activities (Specify):

21EC429 CO -4: Apply the risk, uncertainty, farm planning and budgeting in farm production

Approximate Hours

Item	App X Hrs
CI	04
LI	02
SW	02
SL	01
Total	09

Session Outcomes (SOs)	Laboratory Instruction(LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO1.1 –Identify the Meaning and importance of farm planning and budgeting, partial and complete budgeting, steps in farm planning and budgeting linear programming,</p> <p>SO1.2 - Apply the appraisal of farm resources, selection of crops and livestock’s enterprises.</p> <p>SO1.3- Concept of risk and uncertainty occurs in agriculture production, nature and sources of risks and its management strategies</p> <p>SO1.4- Describes the Crop/livestock/machinery insurance – weather based crop insurance, features, determinants of compensation;</p> <p>SO1.5– Brief the laboratory and field works</p>	<p>LE4.1 - Preparation of farm plan and budget, farm records and accounts and profit & loss accounts.</p> <p>LE3.3: Determination of least cost combination of inputs.</p>	<p>Unit-4.0:</p> <p>Meaning and importance of farm planning and budgeting, partial and complete budgeting, steps in farm planning and budgeting-linear programming, appraisal of farm resources, selection of crops and livestock’s enterprises. Concept of risk and uncertainty occurs in agriculture production, nature and sources of risks and its management strategies, Crop/livestock/machinery insurance – weather based crop insurance, features, determinants of compensation.</p> <p>4.1- Discusses to meaning and importance of farm planning and budgeting, partial and complete budgeting, steps in farm planning and budgeting</p> <p>4.2- Describe the linear programming, appraisal of farm resources, selection of crops and livestock’s</p>	<p>1.1- Prepare the assignment on farm planning and budgeting, partial and complete budgeting, steps in farm planning and budgeting-linear programming.</p>

		<p>enterprises</p> <p>4.3- Brief the concept of risk and uncertainty occurs in agriculture production, nature and sources of risks and its management strategies</p> <p>4.4- Brief Crop / livestock/machinery insurance – weather based crop insurance, features, determinants of compensation</p>	
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SW-1 Suggested Sessional Work (SW):

a. Assignments: Prepare the assignment on farm planning and budgeting, partial and complete budgeting, steps in farm planning and budgeting-linear programming

b. Mini Project:

c. Other Activities (Specify):

21EC429 CO -5: Discusses to natural resource economics and agricultural economic

Approximate Hours.

Item	App X Hrs
CI	03
LI	02
SW	02
SL	01
Total	08

Session Outcomes (SOs)	Laboratory Instruction(LI)	Class room Instruction(CI)	Self Learning (SL)
<p>SO1.1 –Identify Concepts of resource economics, differences between NRE and agricultural economics, unique properties of natural resources.</p> <p>SO1.2- Identify the Positive and negative externalities in agriculture, Inefficiency and welfare loss, solutions.</p> <p>SO1.3- Discuss the, Important issues in economics and management of common property resources of land, water, pasture and forest resources etc.</p> <p>SO1.4- Briefs the laboratory and field work</p>	<p>LE1: Selection of most profitable enterprise combination.</p> <p>LE1:2 Collection and analysis of data on various resources in India</p>	<p>Unit-5.0</p> <p>Concepts of resource economics, differences between NRE and agricultural economics, unique properties of natural resources.</p> <p>Positive and negative externalities in agriculture, Inefficiency and welfare loss, solutions, Important issues in economics and management of common property resources of land, water, pasture and forest resources etc</p> <p>5.1- Discuss concepts of resource economics, differences between NRE and agricultural economics</p> <p>5.2- Describes the unique properties of natural resources. Positive and negative externalities in agriculture</p> <p>5.3- Introduce to Inefficiency and welfare loss, solutions, Important</p>	<p>1.1 - Prepare the assignment on Concepts of resource economics, differences between NRE and agricultural economics</p>

		issues in economics and management of common property resources of land, water, pasture and forest resources etc	
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SW-1 Suggested Sessional Work (SW):

a. Assignments: Prepare the assignment on Fiscal policy. BOP & Adjustment Policies - Foreign Exchange Policy - Foreign sector: Capital and Current Account

b. Mini Project:

c. Other Activities (Specify):

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (C I)	Laboratory Lecture (L I)	Sessional Work (SW)	Self Learning (S I)	Total hour (C I + L I + SW + S I)
21EC429 CO-01 Define the principles of farm management, production function and different input out relationships	05	04	02	01	12
21EC429 CO -02: Analyze the cost concept, types of costs and different income measures	02	02	02	01	07
21EC429 CO -03: Interpret the farm business analysis, farm inventory, balance sheet, profit and loss accounts for practical purpose	02	02	02	01	07
21EC429CO -04: Apply the risk, uncertainty, farm planning and budgeting in farm production	04	02	02	01	09
21EC429CO -05: Discusses to natural resource economics and agricultural economics	03	02	02	01	08
Total Hours	16	12	10	05	43

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit title	Marks Distribution			Total
		R	U	A	Marks
CO-1	Define the principles of farm management, production function and different input out relationships	02	03	00	05
CO-2	Analyze the cost concept, types of costs and different income measures	02	05	03	10
CO-3	Interpret the farm business analysis, farm inventory, balance sheet, profit and loss accounts for practical purpose	00	08	07	15
CO-4	Apply the risk, uncertainty, farm planning and budgeting in farm production	02	05	08	15
CO-5	Discusses to natural resource economics and agricultural economics	00	03	02	05
	Total	06	24	20	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Introduction to Portland cement will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Visit to Industry

7. Demonstration
8. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Face book, Twitter, Whatsapp, Mobile, Online sources)
9. Brainstorming

Suggested Learning Resources:

S. No.	Title	Author	Publisher	Edition & Year
01	Farm Management – An Economic Analysis	Dhondyal, S.P	Aman Publishing House, Madhu Market, Meerut (U.P.).	Fifth Ed.
02	Agricultural economics	Bhavani Devi,P. Raghu Ram,S. Subba Reddy,T.V. Neelakanta Sastry	Oxford and IBH Co. Pvt. Ltd., New Delhi	2009
03	Fundamentals of Farm Business Management	Johl, S.S. and T.R. Kapur	Kalyani Publishers, Ludhiana	1989
04	Economics of Farm Production and Management	Raju, V. T. and D. V. S. Rao	Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi	2002
05	Production Economics & Farm Management.	S.P. Dhondyal & G.N. Singh	Aman Publishing House, Madhu Market, Meerut (U.P.).	First Ed.

Curriculum Development Team:

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Cos, Pos and PSOs Mapping

Course Code: 21EC429

Course Title: Farm Management, Production & Resource Economics

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprises with different scales in area of agricultural production, process and trade	Hold a post on supply in administrative and policy	Analyze and control commercial and economical process in the field of agriculture	Teach how to control and manage agricultural production	Introduce general production technologies	Teach how to implement and manage production technologies	Prepare for managerial and social responsibilities	Student will identify different underutilized crops	Student will practice different breeding techniques used in crop production.	Student will recognize different insect pest and diseases and their symptoms of crops	Student will apply different recent techniques in crop production
21EC429 CO-01 Define the principles of farm management, production function and different input output relationships	2	2	1	2	2	1	2	3	2	2	1

21EC429 CO -02: Analyze the cost concept, types of costs and different income measures	1	2	2	1	2	1	2	1	2	1	3
21EC429 CO -03: Interpret the farm business analysis, farm inventory, balance sheet, profit and loss accounts for practical purpose	2	1	2	2	1	2	2	1	3	2	22
21EC429CO -04: Apply the risk, uncertainty, farm planning and budgeting in farm production	2	1	2	2	3	2	1	3	3	2	1
21EC429CO -05: Discuses to natural resource economics and agricultural economics	1	2	2	2	2	2	1	3	3	2	2

Legend: 1 – Low, 2 – Medium, 3 – High

Curriculum Map: Agricultural Marketing Trade and Prices

Pos & PSOs	Cos No. & Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
PO1,2,3,4,5,6,7 PSO 1,2,3,4	Identify the different types of agricultural markets and agricultural marketing concept	SO 1.1 SO 1.2 SO 1.3 SO 1.4 SO 1.5 SO 1.6	1: Preparation of farm layout 2: Determination of cost of fencing of a farm. 3: Computation of depreciation cost of farm assets. 4: Application of cost principles including CACP concepts in the estimation of cost of crop and livestock enterprises.	Meaning and concept of farm management, objectives and relationship with other Sciences. Meaning and definition of farms, its types and characteristics, factor determining types and size of farms. Principles of farm management: law of equi-marginal/or principles of opportunity cost and law of comparative advantage, concept of production function and its type, use of production function in decision-making on a farm, factor-product, factor-factor and product-product relationship. 1.1, 1.2, 1.3,1.4,1.5	1.1- Prepare the assignment on Meaning and definition of farms, its types and characteristics, factor determining types and size of farms
PO1,2,3,4,5,6,7 PSO 1,2,3,4	Express the product life cycle, pricing and marketing promotional strategies	SO 2.1 SO 2.2 SO 2.3	1: Computation of depreciation cost of farm assets. 2: Application of cost principles including CACP concepts in the estimation of cost of crop and livestock enterprises.	Concepts of resource economics, differences between NRE and agricultural economics, unique properties of natural resources. Positive and negative externalities in agriculture, Inefficiency and welfare loss, solutions, Important issues in economics and management of common property	2.1 – Prepare the assignment on cost, types of costs and their interrelationship, importance of cost in managing farm business

				resources of land, water, pasture and forest resources etc 2.1,2.2	
PO1,2,3,4,5,6,7 PSO 1,2,3,4	Interpret the marketing function under exchange, physical and facilitating functions and marketing channel in the market	SO 3.1 SO 3.2 SO 3.3 SO 3.4	1: Application of equi-marginal returns/opportunity cost principle in allocation of farm resources. 2: - Determination of most profitable level of inputs use in a farm production process.	Farm business analysis: meaning and concept of farm income and profitability, technical and economic efficiency measures in crop and livestock enterprises. Importance of farm records and accounts in managing a farm, various types of farm records needed to maintain on farm, farm inventory, balance sheet, profit and loss accounts. 3.1,3.2	3.1 Prepare the assignment on Importance of farm records and accounts in managing a farm, various types of farm records needed to maintain on farm
PO1,2,3,4,5,6,7 PSO 1,2,3,4	Examine the marketing efficiency and price spread with role of govt. institution and public institute in agricultural Market	SO 4.1 SO 4.2 SO 4.3 SO 4.4 SO 4.5	4.1 - Preparation of farm plan and budget, farm records and accounts and profit & loss accounts. 4.3: Determination of least cost combination of inputs.	Meaning and importance of farm planning and budgeting, partial and complete budgeting, steps in farm planning and budgeting-linear programming, appraisal of farm resources, selection of crops and livestock's enterprises. Concept of risk and uncertainty occurs in agriculture production, nature and sources of risks and its management strategies, Crop/livestock/machinery insurance – weather based crop insurance, features, determinants of compensation.	4.1- Prepare the assignment on farm planning and budgeting, partial and complete budgeting, steps in farm planning and budgeting-linear programming.

				4.1,4.2,4.3,.4.4	
PO1,2,3,4,5,6,7 PSO 1,2,3,4	Evaluate the marketing risk and trade with international trade and need for agricultural price policy.	SO 5.1 SO 5.2 SO 5.3 SO 5.4	5:1: Selection of most profitable enterprise combination. 5:2 Collection and analysis of data on various resources in India	Risk in marketing: Types of risk in marketing; speculation & hedging; an overview of futures trading; Agricultural prices and policy: Meaning and functions of price; administered prices; need for agricultural price policy; Trade: Concept of International Trade and its need, theories of absolute and comparative advantage. Present status and prospects of international trade in agri-commodities; GATT and WTO; Agreement on Agriculture (AoA) and its implications on Indian agriculture; IPR. 5.1,5.2,5.3	5.1 Prepare the assignment on Concepts of resource economics, differences between NRE and agricultural economics

Course Code: 21AN430

Course Title: Introductory Agro meteorology and climate change

Pre-requisite: Before study of IAC UG students required to know in details climatic conditions of region along with basic knowledge of agrometeorological instruments.

Rationale: In agriculture and crop production technology IAC has an impact to determine the adoptions of package and practices on the basis of predictions related to agricultural crop production and crop management .

Course Outcomes: **21AN430.1** Student will become to differentiate between climate and weather.

21AN430.2 Student will have to knowledge about agricultural meteorology its meaning and scope

21AN430.3 Students acquire knowledge about energy balance of earth and atmosphere

21AN430.4 Students will able to know definition of dew, fog, frost, mist and cloud

21AN430.5 Student will have to knowledge about the method for determination of weather forecasting.

Scheme of Studies:

Code	Course Code	Course Title	Scheme of studies(Hours/Week)				Total Credits (C)	
			CI	LI	SW	SL		
Program Core (PCC)	21AN430	introductory Agrometeorology and climate change	1	1	2	1	5	2(1+1)

Legend: **CI:**Classroom Instruction(Includes different instructional strategies i.e.Lecture(L)and Tutorial (T)and others),
LI:Laboratory Instruction(Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)
SW: Sessional Work(includes assignment, seminar, miniproject etc.),
SL:Self Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

Code	Course Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment	Total Marks
			Class/ Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CA T+AT)		
Program Core (PCC)	21AN 430	introductory Agrometeorology and climate change	15	30	0	0	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion

Course outcome. 21AN430.1 Student will become to differentiate between climate and weather.

Approximate Hours

Item	Appx Hrs.
CI	4
LI	4
SW	1
SL	1
Total	10

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO1.1 To acquired knowledge about in meaning and scope of IAC.</p> <p>SO1.2 Student gain detail information regarding winds and its type</p> <p>SO1.3 UG students acquainted with familiar at the time of class study.</p> <p>SO1.4. UG students to gain knowledge in regards difference between cyclone and cyclone phenomena.</p>	<p>1-Visit of Agrometeorological Observatory.</p> <p>2-Site selection of observatory.</p>	<p>Unit-1. Meaning and scope of agricultural meteorology; Earth atmosphere- its composition, extent and structure; Atmospheric weather variables; Atmospheric pressure, its variation with height; Wind, types of wind, daily and seasonal variation of wind speed,cyclone,anticyclone, land breeze and sea breeze.</p> <p>1.1 Instruction in regards to difference between weather and climate and its scope in agriculture.</p> <p>1.2 The detail knowledge brought to the students about atmospheric weather variables.</p> <p>1.3 Student exploit with the different layer of atmosphere and its composition.</p> <p>1.4 Student instructe in classes with the knowledge of barometer and aestivation screen.</p>	<p>1. To make a project in relation to different earth and atmospheric studies.</p>

SW-1 Suggested Sessional Work (SW):

Assignments: Prepare a assignment to study of wind and types of wind.

a. Other Activities (Specify): field visit to know detail information about AWS.

Course outcome 21AN430.2 Student will have to knowledge about agricultural meteorology its meaning and scope

Approximate Hours

Item	Appx Hrs.
CI	4
LI	4
SW	1
SL	1
Total	10

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO1.1 1. Students will able to gain knowledge about solar radiation.</p> <p>SO1.2 Students will become to differentiate atmospheric temperature and others factors.</p> <p>SO1.3 It provide knowledge to make seasonal variable graphs.</p> <p>SO1.4. Detail study provide to Ug students how to make able as expert in the subject.</p> <p>SO1.5.They will become to know about lapse rate.</p>	<p>1.Exposure of instruments and weather data recording.</p> <p>2.Measurement of total, shortwave and longwave radiation,and its estimation using Planck's intensity law.</p>	<p>Unit-2 Nature and properties of solar radiation, solar constant, depletion of solar radiation, short wave, long wave and thermal radiation, net radiation, albedo; Atmospheric temperature, temperature inversion, lapse rate, daily and seasonal variations of temperature, vertical profile of temperature.</p> <p>1.1 instruct the ug student at class to bring knowledge about solar radiations properties.</p> <p>1.2 To acuarired knowledge seasonal variations of temperature.</p> <p>1.3. Ug student acquainted with the knowledge of Aledo</p> <p>1.4 Student instructe and explicite very well to know the difference between short web and long wave</p>	<p>1. Assignment has been allotted during the time of study.</p>

SW-1 Suggested Sessional Work (SW):

Assignments: A assignment prepared on nature and properties of solar radiation

b. Other Activities (Specify): field visit to know detail information about effect of climate on crops.

Course out come 21AN430.3 Students acquire knowledge about energy balance of earth and atmosphere

Approximate Hours

Item	Appx Hrs.
CI	3
LI	4
SW	1
SL	1
Total	9

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO1.1 To acquired knowledge about in energy balance of earth.</p> <p>SO1.2 Students will able to gain knowledge about atmospheric humidity , concept of saturation and vapor pressure .</p> <p>SO1.3 Students will become to differentiate formation of dew, fog, mist, frost , cloud.</p> <p>SO1.4 To acquired knowledge about in meaning and definition of precipitation, process ,types of precipitation .</p> <p>SO1.5 They will become to know about snow, sleet, and hail, cloud formation and classification.</p>	<p>1.Measurement of albedo and sunshine duration.</p> <p>2. computation of Radiation Intensity using BSS</p>	<p>Unit-3 Energy balance of earth; Atmospheric humidity, concept of saturation, vapor pressure, process of condensation, formation of dew, fog, mist, frost, cloud; Precipitation, process of precipitation, types of precipitation such as rain, snow, sleet, and hail, cloud formation and classification; Artificial rainmaking</p> <p>1.1.1 instruct the ug student at class to bring knowledge about atmospheric humidity.</p> <p>1.2 . Ug student acquainted with the knowledge of . dew, fog, mist, frost, cloud; Precipitation, process of precipitation, types of precipitation.</p> <p>1.3 Student instructe in classes with the knowledge of such as rain, snow, sleet, and hail, cloud formation and classification; Artificial rainmaking</p>	<p>Detail study report prepared on formation on dew, fog , mist and frost</p>

SW-1 Suggested Sessional Work (SW):

Assignments: A short notes as ready reckoner on precipitation and its related terms as rain, snow sleet, and hail.

c. Other Activities (Specify):To gain knowledge in relation to selection of site for model agro met observatory.

Course outcome 21AN430.4 Students will able to know definition of dew, fog, frost, mist and cloud

Approximate Hours

Item	Appx Hrs.
CI	3
LI	4
SW	1
SL	1
TOTAL	9

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO1.1 To acquired knowledge about in importance in Indian agriculture.</p> <p>SO1.2 Students will become to differentiate drought, floods, frost, tropical cyclones.</p> <p>SO1.3 Student instruct and explicit very well to know the difference between heat wave and cold wave</p>	<p>1.Measurement of maximum and minimum air temperatures, its tabulation, trend and variation analysis.</p> <p>2.Measurement of soil temperature and computation of soil heat flux.</p>	<p>Unit-4 Monsoon- mechanism and importance in Indian agriculture, Weather hazards - drought, floods, frost, tropical cyclones and extreme weather conditions such as heat-wave and cold-wave. Agriculture and weather relations; Modifications of crop microclimate, climatic normals for crop and livestock production.</p> <p>1.1. Instruction in regards to difference between drought and floods its importance in indian agriculture.</p> <p>1.2Student instructe in classes with the knowledge of frost, tropical cyclones.</p> <p>1.3The ug Student instruct and explicit very well to know the difference between heat wave and cold wave</p>	<p>1.To prepare a short notes on monsoon mechanism and importance in Indian agriculture.</p>

SW-1 Suggested Sessional Work (SW):

Assignments: prepare a short notes on drought, floods and frost activities.

d. Other Activities (Specify): field visit.

Course outcome 21AN430.5 Student will have to knowledge about the method for determination of weather forecasting

Approximate Hours

Item	Appx Hrs.
CI	3
LI	6
SW	1
SL	1
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO1.1 Student gain detail information regarding Weather forecasting- types of weather forecast and their uses.</p> <p>SO1.2 Students will able to gain knowledge about global wrming.</p> <p>SO1.3 They will become to know about climatic variability.</p>	<p>1.Determination of dew point temperature</p> <p>2. Measurement of atmospheric pressure and analysis of atmospheric conditions</p> <p>3.Measurement of wind speed and wind direction, preparation of wind rose</p>	<p>Unit-5 Weather forecasting- types of weather forecast and their uses. Climate change, climatic variability, global warming, causes of climate change and its impact on regional and national Agriculture.</p> <p>1.1 Difine weather forecasting- types of weather forecast</p> <p>1.2The detail knowledge brought to the students about climate change and climatic variability</p> <p>1.3. Ug student acquainted with the knowledge of impact on regional and national Agriculture.</p>	<p>1.Study in detail about weather forecasting their types and uses</p>

SW-1 Suggested Sessional Work (SW):

Assignments: Prepare a reports on climate change

Other Activities(Specify): Field activities and study of crop growth in relation to climatic variability.

SW-5 Suggested Sessional Work (SW):

a. Assignments: Prepare a assignment to study of wind and types of wind.

b. Other Activities (Specify): field visit to know detail information about effect of climate on crops.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (CI)	Laboratory Instruction (LI)	Sessional Work (SW)	Self Learning (SI)	Total hour(CI+LI+SW+SI)
CO.1 Student will become to differentiate between climate and weather.	4	4	1	1	10
CO.2 Student will have to knowledge about agricultural meteorology its meaning and scope	4	4	1	1	10
CO.3 Students acquire knowledge about energy balance of earth and atmosphere	3	4	1	1	9
CO.4 Students will able to know definition of dew, fog, frost, mist and cloud	3	4	1	1	9
CO.5 Student will have to knowledge about the method for determination of weather forecasting.	3	6	1	1	11
Total Hours	17	22	5	5	49

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Origin, geographical distribution economic importance, soil and climatic requirements varieties cultural practices and yield of kharif crops Rice, Maize, Sorghum	03	01	01	05
CO-2	Origin, geographical distribution economic importance, soil and climatic requirements varieties cultural practices and yield of pearl millet and finger millet crops	02	05	03	10
CO-3	Origin, geographical distribution economic importance, soil and climatic requirements varieties cultural practices and yield of kharif crops pigeonpea, mungbean and urdbean;	03	06	06	15
CO-4	Origin, geographical distribution economic importance, soil and climatic requirements varieties cultural practices and yield of kharif crops groundnut, and soybean	-	10	05	15
CO-5	Origin, geographical distribution economic importance, soil and climatic requirements varieties cultural practices and yield of kharif crops cotton & jute.	02	03	-	05
Total		10	25	15	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for introductory Agro meteorology and climate change will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks.

Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Demonstration
7. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT,Blog, Facebook,Twitter, Whatsapp, Mobile, Online sources)
8. Brainstorming

Suggested Learning Resources:

(a) Books :

S. No.	Title	Author	Publisher	Edition & Year
1	Manures and Fertilizers	Yawalkar, K.S., Agarwal, J.P. and Bokde, S.	Agri-Horticultural Publishing House, Nagpur	2008
2	Principles and Practices of Agronomy	Balasubramanian, P. and Palaniappan, S.P.	Agrobios (India), Jodhpur	2016
3	Principles of Agronomy	Reddy, S. R., 2016	Kalyani Publishers, Ludhiana	2016
4	Principles and Practices of Agronomy	Singh, S.S. and Singh, Rajesh.	Kalyani Publishers, New Delhi, Kalyani Publishers, Ludhiana.	2015
5.	Lecture note provided by Dept. of Faculty of agriculture science and technology, AKS University, Satna .			

Curriculum Development Team

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Cos, Pos and PSOs Mapping

Course Code: 21AN430

Course Title: Introductory Agro- meteorology & Climate Change

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprise with	hold a position in supply administration and policy	Analyze and control commercial and	teach how to control and manage agricultural production	Introduce general production technologies	Teach how to implement and manage production	Prepare for managerial and social responsibility	Student will identify different underutilized	Student will practice different breeding	Student will recognize different insect pest	Student will apply different recent techniques
21AN430.1 Student will become to differentiate between climate and weather.	2	2	1	2	2	1	2	3	2	2	1
21AN430.2 Student will have to knowledge about agricultural meteorology its meaning and scope	1	2	2	1	2	1	2	1	2	1	3

21AN430.3 Students acquire knowledge about energy balance of earth and atmosphere	2	1	2	2	1	2	2	1	3	2	22
21AN430.4 Students will be able to know definition of dew, fog, frost, mist and cloud	2	1	2	2	3	2	1	3	3	2	1
21AN430.5 Student will have to knowledge about the method for determination of weather forecasting.	1	2	2	2	2	2	1	3	3	2	2

Legend: 1 – Low, 2 – Medium, 3 – High

Curriculum Map: Introductory Agro meteorology and Climate Change

Pos & PSOs	Cos No. & Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
PO1,2,3,4,5,6,7 PSO 1,2,3,4	Student will become to differentiate between climate and weather.	SO 1.1 SO 1.2 SO 1.3 SO 1.4	Visit of Agrometeorological Observatory. Site selection of observatory	Meaning and scope of agricultural meteorology; Earth atmosphere- its composition, extent and structure; Atmospheric weather variables; Atmospheric pressure, its variation with height; Wind, types of wind, daily and seasonal variation of wind speed, cyclone, anticyclone, land breeze and sea breeze. 1.1, 1.2, 1.3, 1.4	To make a project in relation to different earth and atmospheric studies.
PO1,2,3,4,5,6,7 PSO 1,2,3,4	Student will have to knowledge about agricultural meteorology its meaning and scope	SO 1.1 SO 1.2 SO 1.3 SO 1.4 SO 1.5	Exposure of instruments and weather data recording. 2.Measurement of total, shortwave and longwave radiation, and its estimation using Planck's intensity law.	Nature and properties of solar radiation, solar constant, depletion of solar radiation, short wave, long wave and thermal radiation, net radiation, albedo; Atmospheric temperature, temperature inversion, lapse rate, daily and seasonal variations of temperature, vertical profile of temperature. 2.1, 2.2, 2.3, 2.4	1 Assignment has been allotted during the time of study.
PO1,2,3,4,5,6,7 PSO 1,2,3,4	Students acquire knowledge about energy balance of earth and atmosphere	SO 1.1 SO 1.2 SO 1.3 SO 4.4 SO 4.5	Measurement of albedo and sunshine duration. computation of Radiation Intensity using BSS	Energy balance of earth; Atmospheric humidity, concept of saturation, vapor pressure, process of condensation, formation of dew, fog, mist, frost, cloud; Precipitation, process of precipitation, types of precipitation such as rain, snow, sleet, and hail, cloud formation and classification; Artificial rainmaking 3.1, 3.2, 3.3	Detail study report prepared on formation on dew, fog, mist and frost
PO1,2,3,4,5,6,7 PSO 1,2,3,4	Students will able to know definition of dew, fog, frost, mist and cloud	SO 4.1 SO 4.2 SO 4.3	Measurement of maximum and minimum air temperatures, its tabulation, trend and variation analysis. 2.Measurement of soil temperature and computation of soil heat flux.	Monsoon- mechanism and importance in Indian agriculture, Weather hazards - drought, floods, frost, tropical cyclones and extreme weather conditions such as heat-wave and cold-wave. Agriculture and weather relations; Modifications of crop microclimate, climatic normals for crop and livestock production.	1. To prepare a short notes on monsoon mechanism and importance in Indian agriculture.

				4.1, 4.2, 4.3	
PO1,2,3,4,5,6,7 PSO 1,2,3,4	Student will have to knowledge about the method for determination of weather forecasting.	SO 5.1 SO 5.2 SO 5.3	1. Determination of dew point temperature 2. Measurement of atmospheric pressure and analysis of atmospheric conditions 3.Measurement of wind speed and wind direction, preparation of wind rose	Weather forecasting- types of weather forecast and their uses. Climate change, climatic variability, global warming, causes of climate change and its impact on regional and national Agriculture 5.1, 5.2, 5.3	1. Study in detail about weather forecasting their types and uses

Course Code: 21SC423

Course Title : Manure Fertilizer and Soil Fertility Management

Pre- requisite: Student should have basic knowledge of plant essential nutrients and various grades of synthetic fertilizers available in market for proper growth and development of crops. They know about the various organic waste (plant /animal/rural and urban wastes).

Rationale: The Student learn about available forms of plant essential nutrients absorbed by the crop. The manufacturing of various grades of synthetic fertilizers available in market, their composition, combination, properties and use. Importance, principle and role organic farming for maintaining fertility and sustainability in soil.

Course Outcomes:

- 21SC423.1: This subject will give general introduction on Organic farming and practices involved in making organic field through organic fertilizers, its classification, use and importance.
- 21SC423.2: To know about INM, FCO, fertilizer storage orders. Various types of Chemical fertilizer and its manufacturing processes, use, advantages, disadvantages, and nutrient content in it.
- 21SC423.3: Students will learn regarding nutrient classification, its criteria of essentiality, deficiency, symptoms, functional role in crop production, and disease occur from them. Nutrients transport method in plants, nutrient cycle of macro and micro nutrients.
- 21SC423.4: It give knowledge in various techniques for Evaluation of soil health, indicator plants and its symptoms in different crops during rainfed and irrigated condition.
- 21SC423.5: Help in Calculating the Nutrient use efficiency of different nutrients.

Scheme of Studies:

Code	Course Code	Course Title	Scheme of studies(Hours/Week)				Total Study Hours (CI+LI+SW+SL)	Total Credit (C)
			CI	LI	SW	SL		
Program Core (PCC)	21SC423	Manure Fertilizer and Soil Fertility Management	2	1	1	1	5	3

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C:Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

Code	Course Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment	Total Marks
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
PC C	21SC423	Manure fertilizer and soil fertility management	15	30	0	0	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

21SC423.1: To classify the various organic manures, its properties application and methods of preparation

Approximate Hours

Item	AppX Hrs
CL	05
LI	4
SW	2
SL	2
Total	13

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO1.1: It gives General introduction on Organic farming and organic fertilizers, its use and importance.</p> <p>SO1.2: To study about classification and preparation of organic manures, compost, green manures and contribution of various nutrient in it.</p> <p>SO1.3 Understand scope, concept, recommendation and importance of Fertilizer control order</p>	<ol style="list-style-type: none"> Introduction of analytical instruments and their principles Estimation of soil organic carbon 	<p>Unit-1 General introduction about different types the organic manure</p> <p>1.1 Classification and importance of organic manures</p> <p>1.2 Preparation of bulky and concentrated manures</p> <p>1.3 Identification application of Green and Green leaf manure</p> <p>1.4 Concept, and principle of FCO</p> <p>1.5 Standard application and recommendation approach of various grades of fertilizer given by FCO</p>	<ol style="list-style-type: none"> To know about various biodegradable rural and urban waste Enlisting Green/leaf manuring

SW-1 Suggested Sessional Work (SW):

a. Assignments:

- Preparation of concentrated manures.
- Importance, application and Preparation of FYM, NADEP, Vermicompost, Bangalore and Indore compost

b. Mini Project:

- Prepare chart of different organic manures

c. Other Activities(Specify): NA

21SC423.2: To learn the classification, composition and properties of various grades of chemical fertilizers with interactive effect bio fertilizers.

Approximate Hours

Item	AppX Hrs
CI	5
LI	6
SW	2
SL	2
Total	15

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO2.1 To know about Integrated nutrient management of various synthetic and bio fertilizers in field.</p> <p>SO2.2 To understand the principle and role of Fertilizer control order.</p> <p>SO2.3 To discriminate the various process involved in preparation, use, advantages and packaging of various types of chemical fertilizer.</p> <p>SO2.4 Management of various fertilizers for different crops in field.</p>	<ol style="list-style-type: none"> 1. Estimation of soil available in plants 2. Estimation of soil extractable K in plants 3. Estimation of P in plants 	<p>Unit : 2: The basic concept , Principle and role of INM and FCO</p> <p>2.1 To learn the principle and role of Integrated nutrient management.</p> <p>2.2 To identify the Chemical fertilizers: its classification, composition and properties of nitrogenous, phosphatic, potassic fertilizers, secondary & micronutrient fertilizers.</p> <p>2.3To identify the Chemical fertilizers: its classification, composition and properties of secondary nutrient fertilizers.</p> <p>2.4To identify the Chemical fertilizers: its classification, composition and properties of micronutrient fertilizers.</p> <p>2.5 To manage the Soil amendments practices , Fertilizer Storage, Fertilizer Control Order Principle</p>	<ol style="list-style-type: none"> 1. Making chart of important micronutrient fertilizers in Soil 2. Making chart of important Chemical fertilizers

SW-2 Suggested Sessional Work(SW):

a. Assignments:

- Classification, composition and properties of major nutrient fertilizers.
- b. Mini Project:**
 - Prepare flow chart of integrated nutrient management
- c. Other Activities(Specify): NA**

21SC423 .3: To analyses the role, function, and deficiency symptoms of various essential plant nutrients in maintain soil fertility, productivity and sustainability

Approximate Hours

Item	AppX Hrs
CI	5
LI	6
SW	2
SL	1
Total	14

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO3.1 To understands history of soil fertility and plant nutrition. Criteria of essentiality</p> <p>SO3.2 To Understand about Role, deficiency and toxicity symptoms of essential plant nutrients.</p> <p>SO3.3 To assess the ability to understand the Mechanisms of nutrient transport to plants, factors affecting nutrient availability to plants.</p>	<p>1. To know the working principle and handling of Colorimetry</p> <p>2. To know the working principle and handling of flame photometry</p> <p>3. Estimation of available soil extractable S in soils</p>	<p>Unit-3 : Function , role and deficiency symptoms of various essential plant nutrients</p> <p>3.1 History of soil fertility and plant nutrition. criteria of essentiality</p> <p>3.2 Role, deficiency toxicity symptoms of essential plant nutrients.</p> <p>3.3 Toxicity symptoms of essential plant nutrients.</p> <p>3.4Mechanisms of nutrient transport to plants</p> <p>3.5Factors affecting nutrient availability to plants</p>	<p>1. Making chart of factors affecting nutrient availability to plants</p>

SW-3 Suggested Sessional Work (SW):

- a. **Assignments:**
 - Classification of soil water retention for growth and development of plants
- b. **Other Activities (Specify): NA**

21SC423.4: Identification of various nutrients deficiency symptoms, Indicator plants for scarcity of particular nutrients and their critical limit

Approximate Hours

Item	AppX Hrs
CI	5
LI	8
SW	2
SL	2
Total	15

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO4.1 Understand about Chemistry of soil nitrogen, phosphorus, potassium, calcium, magnesium, sulphur and micronutrients</p> <p>SO4.2 ability to understand Soil fertility evaluation, Soil testing. Critical levels of different nutrients in soil</p> <p>SO4.3 Forms of nutrients in soil, plant analysis, rapid plant tissue tests and Indicator plants.</p>	<ol style="list-style-type: none"> 1. Estimation of exchangeable K in soils 2. Estimation of exchangeable K in plants 3. Estimation of exchangeable Ca in soil 4. Estimation of exchangeable Mg in a given soil 	<p>Unit-4: Availability, role and Importance of various essential plant nutrients</p> <p>4.1 Chemistry of soil nitrogen, phosphorus, potassium in soil and plants.</p> <p>4.2. Role of secondary nutrients (calcium, magnesium, sulphur) in soil and plants.</p> <p>4.3. Role of Micro nutrients (Fe, Mn, Cu, Zn, B, Mo, Ni.. etc) in soil and plants.</p> <p>4.4. Soil fertility evaluation, Soil testing. Critical levels of different nutrients in soil.</p> <p>4.5. Forms of nutrients in soil, plant analysis, rapid plant tissue tests and Indicator plants.</p>	<ol style="list-style-type: none"> 1. Making chart of Critical levels of different nutrients in soil 2. Identification of different nutrients in soil.

SW-4 Suggested Sessional Work (SW):

a. Assignments:

- Role, deficiency and toxicity symptoms of essential plant nutrients.

b. Mini-Project

- Preparation of flow chart of Mechanisms of nutrient transport to plants

c. Other Activities (Specify):

- Power Point Presentation of deficiency symptoms of plant nutrients .

21SC423.5: Role, importance , composition and properties of soil organic matter in maintaining the sustainability of soil.

Approximate Hour

Item	AppX Hrs
CI	5
LI	6
SW	2
SL	1
Total	14

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO5.1 Understand about Methods of fertilizer recommendations to crops.</p> <p>SO5.2 Understand about Factor influencing nutrient use efficiency (NUE), methods of application under rainfed and irrigated conditions</p>	<p>1.Estimation of alkaline hydrolysable N in soils</p> <p>2. Estimation of DTPA extractable Zn in soils</p> <p>3.Estimation of DTPA extractable Zn in plants</p>	<p>Unit5: Application of various fertilizers in rainfed and irrigated condition</p> <p>5.1 Methods of fertilizer recommendations to crops.</p> <p>5.2 To understand the importance and concept of NUE in growth and development of crop</p> <p>5.3 Factor influencing nutrient use efficiency (NUE)</p> <p>5.4 Methods of application under rainfed conditions.</p> <p>5.5 Methods of application under irrigated conditions.</p>	<p>1. Making chart of different Methods of fertilizer recommendations to crops</p>

SW-5 Suggested Sessional Work (SW):

a. *Assignments:*

- Methods of fertilizer recommendations to crops.

b. **Mini Project:**

- Prepared flow chart of important micronutrient fertilizers in Soil.

Other Activities (Specify):

NA

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (CI)	Laboratory Instruction(LI)	Sessional Work (SW)	Self Learning (SI)	Total hour (CI+SW+SI)
21SC423.1: To classify the various organic manures, its properties, application and methods of preparation	5	4	2	2	13
21SC423.2: To learn the classification, composition and properties of various grades of chemical fertilizers with interactive effect bio fertilizers.	7	6	2	2	17
21SC423 .3: To analyses the role, function , and deficiency symptoms of various essential plant nutrients in maintain soil fertility, productivity and sustainability	7	6	2	1	16
21SC423 .4: Identification of various nutrients deficiency symptoms, Indicator plants for scarcity of particular nutrients and their critical limit	6	8	2	2	18
21SC423 .5: Role, importance , composition and properties of soil organic matter in maintaining the sustainability of soil.	5	6	2	1	14
Total Hours	30	30	10	8	78

Suggestion for End Semester Assessment

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	General introduction about different types the organic manure	02	01	02	05
CO-2	The basic concept , Principle and role of INM and FCO	04	04	02	10
CO-3	Function , role and deficiency symptoms of various essential plant nutrients	5	05	05	15
CO-4	Availability, role and Importance of various essential plant nutrients	5	5	05	15
CO-5	Application of various fertilizers in rainfed and irrigated condition	01	01	3	05
Total		17	16	17	50

Legend: R:Remember, U:Understand, A: Apply

The end of semester assessment for Manure Fertilizer and Soil Fertility Management will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Demonstration
7. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, Whatsapp, Mobile, Online sources)
8. Brainstorming

Suggested Learning Resources:

(a) Books :

S. No.	Title	Author	Publisher	Edition & Year
1	Texte book of Soil science	T. D Biswas and S.K Mukharji	Tata Mc Grew Hill Publication Co. Ltd, New Delhi	2006
2	Introductory Soil Science	D.K Das	Kalyani Publication, New Delhi	2002
3	Principal of Soil Science	M.M. Rai	Mac Millan India Ltd, New Delhi	2002
4	Text book of Soil Science	R.K. Mehra	ICAR, New Delhi	2004
5	Fundamental of Soil Science	-	ISSS, Dept. of Soil Science . IARI, New Delhi	(2002)

Curriculum Development Team

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Cos, Pos and PSOs Mapping

Course Code: 21SC423

Course Title: Manures, Fertilizers and Soil Fertility Management

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprises with different scales in area of	Hold a post on supply i administration and policy	analyze and control commercial an economical process in the field of	Teach how to control and manage agricultural production	Introduce general production technologies	Teach how to implement and manage production technologies	Prepare for managerial and social responsibilities	Student will identify different underutilized crops	Student will practice different breeding techniques used in crop	Student will recognize different insect pest and diseases and their	Student will apply different recent techniques in crop
21SC423.1: To classify the various organic manures, its properties, application and methods of preparation .	2	2	1	2	2	1	2	3	2	2	1
21SC423.2: To learn the classification, composition and properties of various grades of chemical fertilizers with interactive effect bio fertilizers.	1	2	2	1	2	1	2	1	2	1	3
21SC423.3: To analyses the role, function , and deficiency symptoms of various essential plant nutrients in maintain soil fertility, productivity and sustainability	2	1	2	2	1	2	2	1	3	2	22
21SC423.4: Identification of various nutrients deficiency symptoms, Indicator plants for scarcity of particular nutrients and their critical limit	2	1	2	2	3	2	1	3	3	2	1

21SC423.5: Role, importance , composition and properties of soil organic matter in maintaining the sustainability of soil.	1	2	2	2	2	2	1	3	3	2	2
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Legend: 1 – Low, 2 – Medium, 3 – High

Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self Learning (SL)
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4	21SC423.1: To classify the various organic manures, its properties, application and methods of preparation	SOs: 1.1, SOs:1.2, SOs:1.3	LI: 1.1 LI: 1.2 LI: 1.3	General introduction about different types the organic manure 1.1,1.2,1.3,1.4,1.5	1. To know about various biodegradable rural and urban waste 2. Enlisting Green/leaf manuring
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4	21SC423.2: To learn the classification, composition and properties of various grades of chemical fertilizers with interactive effect bio fertilizers.	SOs: 2.1, SOs:2.2 , SOs:2.3 , SOs:2.4	LI: 2.1, LI: 2.2, LI: 2.3,	The basic concept , Principle and role of INM and FCO 2.1, 2.2, 2.3, 2.4, 2.5	1. Making chart of important micronutrient fertilizers in Soil 2. Making chart of important Chemical fertilizers
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4	21SC423.3: To analyses the role, function , and deficiency symptoms of various essential plant nutrients in maintain soil fertility, productivity and sustainability	SOs: 3.1, SOs:3.2, SOs:3.3	LI: 3.1, LI:3.2, LI:3.3, LI:3.4, LI:3.5, LI:3.6	Function , role and deficiency symptoms of various essential plant nutrients 3.1, 3.2,3.3, 3.4,3.5	1. Making chart of factors affecting nutrient availability to plants
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4	21SC423.4:Identification of various nutrients deficiency symptoms, Indicator plants for scarcity of particular nutrients and their critical limit	SOs: 4.1, SOs:4.2, SOs:4.3	LI: 1.1, LI:1.2, LI:1.3, LI:1.4, LI: 1.5, LI: 1.6,LI:1.7, LI:1.8	Availability, role and Importance of various essential plant nutrients 4.1,4.2,4.3,4.4,4.5	1. Making chart of Critical levels of different nutrients in soil 2. Identification of different nutrients in soil.

<p>PO 1,2,3,4,5,6,7</p> <p>PSO 1,2, 3, 4</p>	<p>21SC423.5: Role, importance , composition and properties of soil organic matter in maintaining the sustainability of soil.</p>	<p>SOs: 5.1, SOs:5. 2</p>	<p>LI: 1.1, LI: 1.2, LI: 1.3</p>	<p>Application of various fertilizers in rainfed and irrigated condition</p> <p>5.1,5.2,5.3,5.4,5.5</p>	<p>1. Making chart of different Methods of fertilizer recommendations to crops</p>
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Course Code: 21AE428
Course Title : Protected cultivation and secondary Agriculture
Pre- requisite: Student should have basic knowledge of Protected structures and secondary structures.

Rationale: The students studying Protected structures and secondary Agriculture should possess foundational understanding about the technology to be employed in proper manner to boosting up the Agriculture by adopting modern technology of Protected structures. This encompasses familiarity with the traditional and recent technology to be applied to check and compensate the Agricultural yields. Additionally, students ought to understand the Concepts of Different structures needed to Enhance the Agriculture from all corners.

Course Outcomes:

- 21AE428.1:** Recognize the Green house technology: Introduction, Types of Green Houses; Plant response to Green house environment, Planning and design of greenhouses, Design criteria of green house for cooling and heating purposes.
- 21AE428.2:** Green house equipments, materials of construction for traditional and low cost green houses. Irrigation systems used in greenhouses, typical applications, passive solar green house, hot air green house heating systems, green house drying. Cost estimation and economic analysis.
- 21AE428.3:** Important Engineering properties such as physical, thermal and aero & hydrodynamic properties of cereals, pulses and oilseed, their application in PHT equipment design and operation.
- 21AE428.4:** Drying and dehydration; moisture measurement, EMC, drying theory, various drying method, commercial grain dryer (deep bed dryer, flat bed dryer, tray dryer, fluidized bed dryer, recirculatory dryer and solar dryer).
- 21AE428.5:** Material handling equipment; conveyer and elevators, their principle, working and selection

Scheme of Studies:

Code	Course Code	Course Title	Scheme of studies(Hours/Week)				Total Credits(C)	
			CI	LI	SW	SL		Total Study Hours (CI+LI+SW+SL)
Program Core (PCC)	21AE 428	Protected cultivation and secondary Agriculture	1	1	1	1	4	2

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

Code	Course Code	Course Title	Scheme of Assessment (Marks)						End Semester Assessment (ES A)	Total Marks (PRA+ESA)
			Progressive Assessment (PRA)							
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CA T)	Class Attendance (AT)	Total Marks (CA+CT+SA+AT)		

Program Core (PCC)	21 AE 428	Protected cultivation and secondary Agriculture	15	30	0	0	5	50	50	100
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Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

21 AE 428.1: Recognize the Green house technology: Introduction, Types of Green Houses; Plant response to Green house environment, Planning and design of greenhouses, Design criteria of green house for cooling and heating purposes.

Approximate Hours

Item	AppX Hrs
CI	03
LI	04
SW	02
SL	02
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
<p>SO1.1 Student will understand the Green house technology and various Types of Green Houses</p> <p>SO1.2 Student will understand the Plant response to Green house environment</p> <p>SO1.3 Student will understand Planning and design of greenhouses</p> <p>SO1.3 Student will recognize the basic principles and design criteria of green house for cooling and heating purposes</p>	<p>1. Study of different type of green houses based on shape.</p> <p>2. Determine the rate of air exchange in an active summer and winter cooling system</p>	<p>Unit-1.0 Green house technology: Introduction, Types of Green Houses; Plant response to Green house environment, Planning and design of greenhouses, Design criteria of green house for cooling and heating purposes.</p> <p>1.1 Importance of Green house technology and various types of Green Houses, Planning and design of greenhouses.</p> <p>1.2 Plant response to Green house environment</p> <p>1.3 Design criteria of green house for cooling and heating purposes.</p>	<p>1 Principle of Green house technology.</p> <p>2 various types of Green Houses structures.</p>

SW-1 Suggested Sessional Work (SW):

a. Assignments:

(1) Chart Preparation of various types of Green Houses structures.

Other Activities (Specify):

Note on green house effect and its role in greenhouse technology.

21 AE 428.2: Green house equipments, materials of construction for traditional and low cost green houses. Irrigation systems used in greenhouses, typical applications, passive solar green house, hot air green house heating systems, green house drying. Cost estimation and economic analysis

Approximate Hours

Item	AppX Hrs
CI	03
LI	04
SW	02
SL	02
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self -Learning (SL)
<p>SO2.1 Identify the various green house equipments</p> <p>SO2.2 Understand the materials required for the construction of traditional and low cost green houses.</p> <p>SO2.3 Identify the various irrigation systems and their applications in greenhouse.</p> <p>SO2.4 Identify the various heating and drying systems and their applications in greenhouse</p> <p>SO2.4 Practice of cost estimation and economic analysis.</p>	<p>1. Study of green house equipments.</p> <p>2. Determination of drying rate of agricultural products inside green house</p>	<p>Unit-2 Green house equipments, materials of construction for traditional and low cost green houses. Irrigation systems used in greenhouses, typical applications, passive solar green house, hot air green house heating systems, green house drying. Cost estimation and economic analysis.</p> <p>2.1 Green house equipments, materials of construction for traditional and low cost green houses.</p> <p>2.2 Irrigation systems used in greenhouses and their typical applications.</p> <p>2.3 passive solar and hot air green house heating systems, green house drying. Cost estimation and economic analysis.</p>	<p>1. Equipments used in greenhouse.</p> <p>2. Cost estimation and economic analysis</p>

SW-2 Suggested Seasonal Work (SW):

a. Assignments:

- i. Preparation of balance sheet for cost estimation and economic analysis.
- ii. Preparation of chart for equipments used in greenhouse.

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21 AE 428.3: Important Engineering properties such as physical, thermal and aero & hydrodynamic properties of cereals, pulses and oilseed, their application in PHT equipment design and operation.

Approximate Hours

Item	AppX Hrs
CI	03
LI	04
SW	02
SL	02
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO3.1 Understand the important Engineering properties such as physical, thermal and aero & hydrodynamic properties of cereals, pulses and oilseed</p> <p>SO3.2 Understand the Engineering properties application in PHT equipment design and operation.</p>	<p>1. Determination of engineering properties (shape and size, bulk density and porosity of biomaterials).</p> <p>2. Visit to various Post Harvest Laboratories</p>	<p>Unit-3: Important Engineering properties such as physical, thermal and aero & hydrodynamic properties of cereals, pulses and oilseed, their application in PHT equipment design and operation</p> <p>3.1 Understand Engineering properties (physical, thermal and aero & hydrodynamic properties) of cereals, pulses and oilseed</p> <p>3.2 Understand the Engineering properties in PHT</p> <p>3.3 application of equipment design and operation in PHT</p>	<p>1. Engineering properties of cereals, pulses and oilseed.</p> <p>2. PHT equipments.</p>

SW-3 Suggested Sessional Work (SW):

a. Assignments:

- i. Classification of engineering properties of cereals based on shape and size.
- ii. PHT equipments and their uses in greenhouse.

d. Other Activities (Specify):

- i. Visit to Post Harvest Laboratories.

21 AE 428.4:Drying and dehydration; moisture measurement, EMC, drying theory, various drying method, commercial grain dryer (deep bed dryer, flat bed dryer, tray dryer, fluidized bed dryer, recirculatory dryer and solar dryer

Approximate Hours

Item	AppX Hrs
CI	03
LI	04
SW	02
SL	02
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO4.1 Understand the principles of drying and dehydration.</p> <p>SO4.2 Understand the drying theory, different drying and dehydration methods.</p> <p>SO4.2 practice of various commercial grain dryers uses and their principles.</p>	<p>1. Determination of Moisture content of various grains by oven drying & infrared moisture methods.</p> <p>2. Determination of Moisture content of various grains by moisturemeter.</p>	<p>Unit-4.0 Drying and dehydration; moisture measurement, EMC, drying theory, various drying method, commercial grain dryer (deep bed dryer, flat bed dryer, tray dryer, fluidized bed dryer, recirculatory dryer and solar dryer).</p> <p>4.1 Understand the principles of drying and dehydration, moisture measurement, EMC</p> <p>4.2 Understand the drying theory and various drying Methods.</p> <p>4.3 Understand the uses of commercial grain dryers and their working principles.</p>	<p>1. Drying and dehydration; moisture measurement,</p> <p>2. various drying methods.</p>

SW-4 Suggested Sessional Work (SW):

- a. Assignments:**
Classification commercial grain dryers with their working principles.
- b. MiniProjects:**
 - i. Preparation of chart of different grain dryers.
- e. Other Activities (Specify):**
 - i. Visit to Commercial seed processing laboratories for identification of various drying equipment

21 AE 428.5: Material handling equipment; conveyer and elevators, their principle, working and selection

Approximate Hours

Item	AppX Hrs
CI	03
LI	02
SW	02
SL	02
Total	09

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO5.1Recognize the Material handling equipments.</p> <p>SO5.2Understand the working principles of conveyer and elevators.</p>	<p>1.Field visit to seed processing plant</p>	<p>Unit5:Material handling equipment; conveyer and elevators, their principle, working and selection</p> <p>5.1. Identification of conveyer and elevators.</p> <p>5.2. Understand the working principles of conveyer and elevators.</p> <p>5.3. Practice of Material handling equipment (conveyer and elevators).</p>	<p>1. Identify the role of material handling equipments.</p> <p>2. Difference between conveyer and elevators.</p>

SW-5 Suggested Sessional Work (SW):

Assignments:

Note on working principles of conveyer and elevators.

Mini Projects:

Preparation of chart of different material handling equipments with their figures.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self Learning (Sl)	Total hour (Cl+SW+Sl)
21HO221.1: Recognize the Green house technology: Introduction, Types of Green Houses; Plant response to Green house environment, Planning and design of greenhouses, Design criteria of green house for cooling and heating purposes.	3	2	2	7
21HO221.2: Green house equipments, materials of construction for traditional and low cost green houses. Irrigation systems used in greenhouses, typical applications, passive solar green house, hot air green house heating systems, green house drying. Cost estimation and economic analysis .	3	2	2	7
21HO221.3: Important Engineering properties such as physical, thermal and aero & hydrodynamic properties of cereals, pulses and oilseed, their application in PHT equipment design and operation	3	2	2	7
21HO221.4: Drying and dehydration; moisture measurement, EMC, drying theory, various drying method, commercial grain dryer (deep bed dryer, flat bed dryer, tray dryer, fluidized bed dryer, recirculatory dryer and solar dryer.	3	2	2	7
21HO221.5: Material handling equipment; conveyer and elevators, their principle, working and selection.	3	2	2	7
Total Hours	15	10	10	35

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Recognize the Green house technology: Introduction, Types of Green Houses; Plant response to Green house environment, Planning and design of greenhouses, Design criteria of green house for cooling and heating purposes.	02	03	03	08
CO-2	Green house equipments, materials of construction for traditional and low cost green houses. Irrigation systems used in greenhouses, typical applications, passive solar green house, hot air green house heating systems, green house drying. Cost estimation and economic analysis	02	03	04	9
CO-3	Important Engineering properties such as physical, thermal and aero & hydrodynamic properties of cereals, pulses and oilseed, their application in PHT equipment design and operation	03	03	05	11
CO-4	Drying and dehydration; moisture measurement, EMC, drying theory, various drying method, commercial grain dryer (deep bed dryer, flat bed dryer, tray dryer, fluidized bed dryer, recirculatory dryer and solar dryer	2	4	06	12
CO-5	Material handling equipment; conveyer and elevators, their principle, working and	01	3	6	10
Total		10	16	24	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Fundamental of Horticulture will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play

6. Demonstration
7. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, Whatsapp, Mobile, Online sources)
8. Brainstorming

Suggested Learning Resources

Sl. No.	Title	Author	Publisher	Edition & Year
1	Green house: Science and Technology	Kothari S, S.C.Kaushic and A.N.Mathur	Himanshu Publication, Udaipur.	2016
2	Green House Technology- Application and Practice	Sharma A and V.M.Salokhe. 2006	Agro Tech. publication, Udaipur	2006
3	Principles of Agricultural Engineering, Vol. I	Michael, A.M. and T. P. Ojha	Jain Brothers, New Delhi.	2012
4	Post Harvest Technology of Cereals, Pulses and Oil Seeds	Chakravarty, A.	Oxford and IBH Pub. New Delhi.	1999
5	Agricultural Process Engineering	Henderson, S.M. and R.L. Perry	John Willy and Sons, New York.	1955

Cos, POs and PSOs Mapping

Course Title: Protected cultivation and secondary Agriculture

Course Code: 21AE428

Course Outcomes	Programme Outcomes				Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PSO 1	PSO 2	PSO-3	PSO-4
	Students will demonstrate a strong understanding of core principles of agricultural sciences	Students will be proficient in applying scientific principles and techniques to solve real world problems in agriculture	Students will be competent in using modern agricultural technologies and tools, GIS to optimize agricultural productivity and sustainability.	Students will be able to communicate effectively in written, oral, and visual formats to convey agricultural concepts, research findings, and recommendations to diverse stakeholders	Student will identify different underutilized crops	Student will practice different breeding techniques used in crop production.	Student will recognize different insect pest and diseases and their symptoms	Student will apply different recent techniques in crop production
1. Recognize the Green house technology: Introduction, Types of Green Houses; Plant response to Green house environment, Planning and design of greenhouses, Design criteria of green house for cooling and heating purposes..	3	3	3	2	2	2	3	2
2. Green house equipments, materials of construction for traditional and low cost green houses. Irrigation systems used in greenhouses, typical applications, passive solar green house, hot air green house heating systems, green house drying. Cost estimation and economic analysis.	2	3	3	2	1	2	3	3
3. Important Engineering properties such as physical, thermal and aero & hydrodynamic properties of cereals, pulses and oilseed, their application in PHT equipment	3	3	3	3	1	2	2	3

design and operation.								
4. Drying and dehydration; moisture measurement, EMC, drying theory, various drying method, commercial grain dryer (deep bed dryer, flat bed dryer, tray dryer, fluidized bed dryer, recirculatory dryer and solar dryer	3	2	2	3	1	2	3	3
5. Material handling equipment; conveyer and elevators, their principle	3	2	1	1	2	2	3	3

Legend: 1 – Low, 2 – Medium, 3 – High

Course Code: 21 HO424

Course Title : Production Technology for Ornamental Crops, MAPs and Landscaping

Pre- requisite: The student should enable to understand fundamental aspects of production Technology for Ornamental Crops, MAPs and Landscaping in vary sound manner.

Rationale: The student studying production Technology for Ornamental Crops, MAPs and Landscaping should possess foundational understanding about the technology to be employ in proper manner to boosting up the ornamental crops, MAPs and landscaping. In addition to this they also gain the knowledge to be require for ornamental crops under protected as well as open condition including post harvest handling of ornamental, medicinal and aromatic plants

Course Outcomes:

21 HO424.1: Student understand about the importance and scope of ornamental plants, medicinal and aromatic plants including landscaping

21 HO424.2: Ability to understand production technology of importance cut flower like rose, gerbera, carnation, lillium and orchid under protected conditions as well as gladiolus, tuberose, chrysanthemum under open condition

21 HO424.3: Ability to understand package of practices for loose flowers like marigold and jasmine under open condition.

21 HO424.4: To elaborate production technology of important medicinal and Aromatic plants.

21 HO424.5: Observing students and knowledge about Processing and value addition in ornamental crops and MAPs produce.

Scheme of Studies:

Code	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits(C)
			CI	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
ProgramCore (PCC)	21HO424	Production Technology for Ornamental Crops, MAPs and Landscaping	1	1	1	1	4	2

Legend: CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture

(L) and Tutorial

(T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

Code	Course Code	Course Title	Scheme of Assessment (Marks)							End Semester Assessment (ESA)	Total Marks (PRA+ESA)
			Progressive Assessment (PRA)						Total Marks (CA+CT+SA+CAT+A)		
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CA T)	Class Attendance (AT)				
Program Core (PCC)	21HO424	PTOC M	15	30	0	0	5	50	50	100	

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

21HO424.1: Student understand about the importance and scope of ornamental plants, medicinal and aromatic plants including landscaping

Approximate Hours

Item	AppX Hrs
CI	03
LI	00
SW	02
SL	03
Total	08

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO1.1 ability to understand importance of ornamental, medicinal, aromatic plants and landscaping</p> <p>SO1.2 Understand scope of ornamental, medicinal, aromatic plants and landscaping</p> <p>SO1.3 Application and uses of trees, shrub and climbers in landscape work of place</p>		<p>Unit-1 Importance and scope of ornamental crops, medicinal and aromatic plants and landscaping. Principles of landscaping. Landscape uses of trees, shrubs and climbers.</p> <p>1.1 Importance of ornamental crops, medicinal and aromatic plants including landscaping</p> <p>1.2 Scope of ornamental crops, medicinal and aromatic plants including landscaping</p> <p>1.3 Uses of trees shrub and climbers in landscaping work.</p>	<p>1. Enlisting medicinal and aromatic plants</p> <p>2. Enlisting of ornamental plants</p> <p>3. Enlisted trees, shrub, climber use in landscaping</p>

SW-1 Suggested Sessional Work (SW):

a. Assignments:

i. Preparation of chart importance of ornamental crops, medicinal and aromatic plants as per present scenario in India and International level.

b. Mini Project:

Prepare chart of different trees, shrub and climbers use in landscaping

Other Activities (Specify):

Collect recent year data of area, production and productivity of medicinal and aromatic plants in India as per secondary data sources like NHB, ICAR websites.

21HO424.2: Ability to understand production technology of importance cut flower like rose, gerbera, carnation, lillium and orchid under protected conditions as well as gladiolus, tuberose, chrysanthemum under open condition

Approximate Hours

Item	AppX Hrs
CI	03
LI	06
SW	02
SL	02
Total	13

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO2.1 Understand about important cut flower production technology under protected condition</p> <p>SO2.2 Understand about package and practices of important loose flower under open condition</p> <p>SO2.3 Application of care and maintenance practices followed for protected structure</p> <p>SO2.4 Applied harvesting and post- harvest handling practiced followed for cut flower production</p>	<p>Protected structure, care and maintenance, harvesting and post harvest handling of cut flower</p> <p>2.1 care and maintenance of protected structure</p> <p>2.2 Harvesting of Different cut-flower</p> <p>2.3 Post harvest handling of cut-flowers</p>	<p>Unit-2 Production technology of important cut flowers like rose, gerbera, carnation, lillium and orchids under protected conditions and gladiolus, tuberose, chrysanthemum under open conditions.</p> <p>2.1 Production technology and important cut flower rose and gerbera under protected condition.</p> <p>2.2 Production technology of economical important cut flowers like carnation, lillium and orchids under protected condition.</p> <p>2.3 Production technology of gladiolus, tuberose and chrysanthemum under open condition.</p>	<p>2.1 Making chart of important cut flower production technology under protected condition.</p> <p>2.2 Making chart of important cut flower production technology under open condition.</p>

SW-2 Suggested Seasonal Work (SW):

a. Assignments:

Protected cultivation practices of rose and gerbera under sub tropical climatic condition, cut flower production technology like gladiolus and tuberose under open condition in sub tropical regions.

b. Mini- Project:

Prepare flow chart of harvesting and post- harvesting handling followed for cut- flower production like rose, gerbera, carnation, lillium and chrysanthemum.

21HO424.3: Ability to understand package of practices for loose flowers like marigold and jasmine under open condition.

Approximate Hours

Item	AppX Hrs
CI	02
LI	04
SW	02
SL	01
Total	9

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO3.1 understand package and practices of loose flowers like marigold and jasmine under open condition</p> <p>SO3.2 Applied nursery bed preparation and seed sowing of marigold flower and jasmine cutting in nursery</p> <p>SO3.3 Harvesting and post harvest handling of loose flower like marigold and jasmine.</p>	<p>Nursery beds preparation and seed sowing, harvesting and post harvest handling of loose flower marigold and jasmine</p> <p>3.1 Nursery beds preparation and seed sowing of marigold seed and raising of jasmine cutting</p> <p>3.2 Harvesting and post- harvest handling of loose flower marigold and jasmine</p>	<p>Unit-3 Package of practices for loose flowers like marigold and jasmine under open conditions.</p> <p>3.1 Package of practices of marigold under open condition</p> <p>3.2 Package of practices of loose flower jasmine under open condition</p>	<p>Making chart of loose flower production for marigold and jasmine crops</p>

SW-3 Suggested Sessional Work (SW):

a. Assignments:

Package of practices followed for jasmine production under open condition.

b. Mini-Project

Preparation of flow chart package of practices for loose flowers like jasmine

21HO 424.4: To elaborate production technology of important medicinal and Aromatic plants.

Approximate Hours

Item	AppX Hrs
CI	03
LI	06
SW	02
SL	02
Total	13

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO4.1 production technology of important medicinal plants</p> <p>SO4.2 production technology of important Aromatic plants</p> <p>SO4.3 Physical Verification medicinal and Aromatic plants</p> <p>SO4.3 Applied bed preparation and planting of MAP</p>	<p>Unit 4.0 Identification of Medicinal and Aromatic Plants</p> <p>Intercultural operations in followed and MAPs</p> <p>Bed preparation and planting of MAPs</p> <p>4.1 Identification of Medicinal and Aromatic Plants.</p> <p>4.2 Bed preparation and planting of MAPs</p> <p>4.3 Intercultural operations followed in MAPs</p>	<p>Unit-4.0 production technology of important medicinal plants ashwagandha, asparagus, aloe, costus, Cinnamomum, periwinkle, isabgol and aromatic plants like mint, lemongrass, citronella, palmarosa, ocimum, rose, geranium, vetiver</p> <p>4.1 production technology of important medicinal plants like ashwagandha, asparagus, aloe, costus, Cinnamomum, periwinkle, isabgol</p> <p>4.2 production technology of important aromatic plants like mint, lemongrass, citronella, palmarosa, ocimum, rose, geranium, vetiver</p>	<p>1. Making chart of botanical description of Medicinal and Aromatic Plants</p> <p>2. Prepare planting method, harvesting techniques chart of Medicinal and Aromatic Plants</p>

SW-1 Suggested Sessional Work (SW):

c. Assignments:

- ii. production technology of important medicinal plants like asparagus, aloe, periwinkle, isabgol
- iii. production technology of important aromatic plants like mint, citronella

d. Mini Project:

Make Short Summary of production technology of important medicinal plants

Other Activities (Specify):

NA

21HO224.5: Observing students and knowledge about Processing and value addition in ornamental crops and MAPs produce

Approximate Hours

Item	AppX Hrs
CI	03
LI	06
SW	02
SL	01
Total	12

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO5.1 Application of processing practices for ornamental crops and MAPs.</p> <p>SO5.2 Understand about value addition in ornamental crops and MAPs produce</p> <p>SO5.3 Applied Training and pruning practices of ornamental plants.</p> <p>SO5.4 Application of processing technology of MAPs.</p>	<p>Unit 5.0 Training and pruning of Ornamental plants, Planning and layout of garden, Processing of MAP</p> <p>5.1 Training and pruning of Ornamental plants.</p> <p>5.2 Planning and layout of garden.</p> <p>5.3 Processing of MAP.</p>	<p>Unit-5 Processing and value addition in ornamental crops and MAPs produce</p> <p>5.1 To Know the Processing and value addition of important ornamental crops.</p> <p>5.2 Processing and value addition of medicinal Crops</p> <p>5.3 Processing and value addition of Aromatic Crops.</p>	<p>1. Making chart of Value Added product proposed by using ornamental plants medicinal plants</p>

SW-2 Suggested Seasonal Work (SW):

b. Assignments:

Make a Leaf let of two important medicinal Crops processing according to Potential Area.

b. Mini Project:

1. Prepared flow chart of two important medicinal Crops Processing like ashwagandha, asparagus
2. Prepared flow chart of two important Aromatic Crops grown in this region like Mint, vetiver

Other Activities (Specify):

NA

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self Learning (Sl)	Total hour (Cl+SW+Sl)
21HO221.1: Student understand about the importance and scope of ornamental plants, medicinal and aromatic plants including landscaping .	3	2	3	8
21HO221.2: Ability to understand production technology of importance cut flower like rose, gerbera, carnation, lillium and orchid under protected conditions as well as gladiolus, tuberose, chrysanthemum under open condition.	3	2	2	7
21HO221.3: Ability to understand package of practices for loose flowers like marigold and jasmine under open condition	2	2	1	5
21HO221.4: To elaborate production technology of important medicinal and Aromatic plants.	3	2	2	7
21HO221.5: Observing students and knowledge about Processing and value addition in ornamental crops and MAPs produce .	3	2	1	6
Total Hours	14	10	9	33

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Student understand about the importance and scope of ornamental plants, medicinal and aromatic plants including landscaping	03	03	01	07
CO-2	Ability to understand production technology of importance cut flower like rose, gerbera, carnation, lillium and orchid under protected conditions as well as gladiolus, tuberose, chrysanthemum under open condition	02	03	04	10
CO-3	Ability to understand package of practices for loose flowers like marigold and jasmine under open condition	02	04	06	12
CO-4	To elaborate production technology of important medicinal and Aromatic plants	2	4	06	11
CO-5	Observing students and knowledge about Processing and value addition in ornamental crops and MAPs produce	01	4	5	10
Total		10	18	22	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Fundamental of Horticulture will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Demonstration
7. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog,

Facebook, Twitter, Whatsapp, Mobile, Online sources)

8. Brainstorming

Suggested Learning Resources

Sl. No.	Title	Author	Publisher	Edition & Year
1	Fundamentals of ornamental horticulture and landscape gardening	A.K. Tiwari and R. Kumar	New India	2012
2	Introductory Ornamental Horticulture	Arora, J.S	Kalyani Publishers	2006
3	Cultivation and Utilization of Medicinal and Aromatic plants	Atal, E. K. and Kapur, B	CSIR, New Delhi	1982
4	Cultivation of medicinal and aromatic plants	Azhar Ali Farooqui and Sreeramu, B.S.	United Press Limited	2001
5	Flowering Garden trees	Bimaldas Chowdhury and Balai Lal Jana	Pointer publishers, Jaipur	2014
6	Floriculture and Landscaping	Bose, T.K. Malti, R.G. Dhua, R.S. & Das, P.	Nayaprakash	2004

Cos, POs and PSOs Mapping

Course Title: Production Technology for Ornamental Crops, MAPs and Landscaping

Course Code: 21HO424

Course Outcomes	Programme Outcomes				Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PSO 1	PSO 2	PSO-3	PSO-4
	Students will demonstrate a strong understanding of core principles of agricultural sciences	Students will be proficient in applying scientific principles and techniques to solve real world problems in agriculture	Students will be competent in using modern agricultural technologies and tools, GIS to optimize agricultural productivity and sustainability.	Students will be able to communicate effectively in written, oral, and visual formats to convey agricultural concepts, research findings, and recommendations to diverse stakeholders	Student will identify different underutilized crops	Student will practice different breeding techniques used in crop production.	Student will recognize different insect pest and diseases and their symptoms	Student will apply different recent techniques in crop production
1. Student understand about the importance and scope of ornamental plants, medicinal and aromatic plants including landscaping..	3	3	3	2	2	2	3	2
2. Ability to understand production technology of importance cut flower like rose, gerbera, carnation, lillium and orchid under protected condition as well as gladiolus, tuberose, chrysanthemum under open condition.	2	2	2	2	1	2	3	3
3. Ability to understand package of practices for loose flowers like marigold and jasmine under open condition..	3	3	3	3	1	2	2	3
4. To elaborate production technology of important medicinal and Aromatic plants.	3	2	2	3	1	2	3	3

5. Observing students and knowledge about Processing and value addition in ornamental crops and MAPs produce	3	2	1	1	2	2	3	3
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Legend: 1 – Low, 2 – Medium, 3 – High

Curriculum Map: Production Technology for Ornamental Crops, MAPs and Landscaping

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4	21 HO424.1: Student understand about the importance and scope of ornamental plants, medicinal and aromatic plants including landscaping	SO1.1 SO1.2 SO1.3		Unit-1 Importance and scope of ornamental crops, medicinal and aromatic plants and landscaping. Principles of landscaping. Landscape uses of trees, shrubs and climbers. 1.1, 1.2, 1.3	4. Enlisting medicinal and aromatic plants 5. Enlisting of ornamental plants 6. Enlisted trees, shrub, climber use in landscaping
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4	21 HO424.2: Ability to understand production technology of importance cut flower like rose, gerbera, carnation, lillium and orchid under protected conditions as well as gladiolus, tuberose, chrysanthemum under open condition	SO2.1 SO2.2 SO2.3 SO2.4	Protected structure, care and maintenance, harvesting and post harvest handling of cut flower 2.1 care and maintenance of protected structure 2.2 Harvesting of Different cut- flower 2.3 Post harvest handling of cut- flowers	Unit-2 Production technology of important cut flowers like rose, gerbera, carnation, liliium and orchids under protected conditions and gladiolus, tuberose, chrysanthemum under open conditions. 2.1, 2.2, 2.3, 2.4	2.1 Making chart of important cut flower production technology under protected condition. 2.2 Making chart of important cut flower production technology under open condition.
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4	21 HO424.3: Ability to understand package of practices for loose flowers like marigold and jasmine under open condition.	SO3.1 SO3.2 SO3.3	Nursery beds preparation and seed sowing, harvesting and post harvest handling of loose flower marigold and jasmine 3.1 Nursery beds preparation and seed sowing of marigold seed and raising of jasmine cutting 3.2 Harvesting and post-harvest handling of loose	Unit-3 Package of practices for loose flowers like marigold and jasmine under open conditions. 3.1, 3.2	Making chart of loose flower production for marigold and jasmine crops

			flower marigold and jasmine		
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4	HO424.4: To elaborate production technology of important medicinal and Aromatic plants.	SO4.1 SO4.2 SO4.3 SO4.4	Unit 4.0 Identification of Medicinal and Aromatic Plants Intercultural operations in followed and MAPs Bed preparation and planting of MAPs 4.1 Identification of Medicinal and Aromatic Plants. 4.2 Bed preparation and planting of MAPs 4.3 Intercultural operations followed in MAPs	Unit-4.0 production technology of important medicinal plants ashwagandha, asparagus, aloe, costus, Cinnamomum, periwinkle, isabgol and aromatic plants like mint, lemongrass, citronella, palmarosa, ocimum, rose, geranium, vetiver 4.1, 4.2 4.3	1. Making chart of botanical description of Medicinal and Aromatic Plants 2. Prepare planting method, harvesting techniques chart of Medicinal and Aromatic Plants
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4	21 HO424.5: Observing students and knowledge about Processing and value addition in ornamental crops and MAPs produce.	SO5.1 SO5.2 SO5.3 SO5.4	Unit 5.0 Training and pruning of Ornamental plants, Planning and layout of garden, Processing of MAP 5.1 Training and pruning of Ornamental plants. 5.2 Planning and layout of garden. 5.3 Processing of MAP.	Unit-5 Processing and value addition in ornamental crops and MAPs produce 5.1, 5.2,5.3	1. Making chart of Value Added product proposed by using ornamental plants medicinal plants

CourseCode: 21AN427

Course Title: Rainfed Agriculture and Watershed Management

Pre-requisite: Student should have basic knowledge of Rainfed Agriculture and watershed management. Students also get knowledge to how will a manage a drought and soil water conservation measures technique.

Rationale: The students should be acquainted with the knowledge of Rainfed agriculture is distinguished in most of the literature from irrigated agriculture, which applies water from other sources, such as freshwater from streams, rivers and lakes or groundwater. As farmers become more aware of and develop better water resource management strategies, most agriculture exists on a spectrum between rainfed and irrigated agriculture. The students should be acquainted with the knowledge of water harvesting techniques.

Course Outcomes:

21AN427.1 To impart knowledge about Rainfed Agriculture and Watershed Management and aslo know about the problem and prospect of rainfed agriculture.

21AN427.2 To acquaint skillness towards soil and climatic condition in india and soil and water conservation Practices

21AN427.3 To acquaint skillness towards drought management and its mitigation through foliar application of hormones on crops

21AN427.4 Students may become expert to apply soil and water conservation Practices and efficient utilization of water through soil and crop management practices.

21AN427.5 To impart knowledge about demonstrate the water harvesting techniques and crop planning for aberrant weather conditions

Scheme of Studies:

Code	Course Code	CourseTitle	Scheme of studies(Hours/Week)					TotalCredits (C)
			CI	LI	SW	SL	Total StudyHours(CI+LI+SW+SL)	
Program Core (PCC)	21AN427	Rainfed Agriculture and Watershed Management	01	01	1	1	04	02

Legend: CI:ClassroomInstruction(Includes different instructionalstrategiesi.e.Lecture(L)andTutorial (T)andothers),

LI:Laboratory Instruction(Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work(includes assignment, seminar, miniproject etc.),

SL:Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

Code	Course Code	Course Title	Scheme of Assessment (Marks)							End Semester Assessment (ESA)	Total Marks (PRA+ESA)
			Progressive Assessment (PRA)						Total Marks (CA+CT+SA+CAT+AT)		
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)				
Program Core (PCC)	21AN427	Rainfed Agriculture and Watershed Management	15	30	0	0	5	50	50	100	

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

21AN427.1 To impart knowledge about Rainfed Agriculture and Watershed Management and also know about the problem and prospect of rainfed agriculture.

Approximate Hours

Item	Appx Hrs.
CI	03
LI	06
SW	01
SL	01
Total	15

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO1.1 Understand the rainfed agriculture and importance in dryland area for getting the maximum production.</p> <p>SO1.2 Understand the types of rainfed farming in india and history of rainfed agriculture.</p> <p>SO1.3 Understand the watershed management and watershed management technique in india and Madhya Pradesh.</p> <p>SO1.4 Understand the problems and prospects of rainfed agriculture and overcome to problem of rainfed agriculture.</p>	<p>1. Studies on rainfall pattern in rainfed areas of the country and pattern of onset and withdrawal of monsoons.</p> <p>2. Studies on cropping pattern of different rainfed areas in the country and demarcation of rainfed area on map of India.</p>	<p>Unit-1 Rainfed agriculture: Introduction, types, History of rainfed agriculture and watershed in India; Problems and prospects of rainfed agriculture in India</p> <p>1.1 Introduction to Rainfed agriculture I, types, History of rainfed agriculture in India.</p> <p>1.2 Introduction to watershed management in india</p> <p>1.3 Introduction to Problems and prospects of rainfed agriculture in India</p>	<p>1. Study on watershed management in satna region.</p>

SW-1 Suggested Sessional Work (SW):

Assignments:

What is rainfed agriculture. Its types, History of rainfed agriculture and watershed in India.

Other Activities(Specify): Study on watershed management technology in AKS University Campus.

21AN427.2 To acquaint skillness towards soil and climatic condition in india and soil and water conservation Practices

Approximate Hours

Item	AppxHrs.
CI	03
LI	06
SW	01
SL	0
Total	10

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO1.1 Understand the soil and climate condition in rainfed areas.</p> <p>SO1.2 Understand the soil and climate condition in india and Madhya Pradesh for Rainfed Farming.</p> <p>SO1.3 Understand the soil erosion and loss of water through runoff and seepage in the farmers field.</p> <p>SO1.4. Understand the Soil and water conservation measures techniques to protect the soil and conserve the water.</p>	<p>1. Studies on climate classification.</p> <p>2. Interpretation of meteorological data and scheduling of supplemental irrigation on the basis of evapo-transpiration demand of crops.</p> <p>3. Field demonstration on soil & moisture conservation measures.</p>	<p>Unit-2 Soil and climatic conditions prevalent in rainfed areas; Soil and water conservation Techniques.</p> <p>1.1Introduction to Soil and climatic and climatic conditions prevalent in rainfed areas.</p> <p>1.2 Introduction to loss of soil and water through erosion and runoff.</p> <p>1.3 1Introduction to Soil and water conservation measures techniques to protect the soil and conserve the water.</p>	

SW-1 Suggested Sessional Work (SW):

Assignments:

What is erosion and its types and explain Soil and water conservation Technique.

a. Other Activities(Specify):

21AN427.3 To acquaint skillness towards drought management and its mitigation through foliar application of hormones on crops

Approximate Hours

Item	Appx Hrs.
CI	03
LI	04
SW	01
SL	01
Total	15

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO1.1 Understand the Drought and its types and problems created through the drought.</p> <p>SO1.2 Understand the Drought management strategies for managing the drought to save the farmers crops from the drought.</p> <p>SO1.3 Understand the effect of . water deficit on physio-morphological characteristics of the plants and effect of water scarcity in reducing the crop yield.</p> <p>SO1.4. Understand the Crop adaptation to sever weather condition and mitigation to drought management strategies for the drought condition.</p>	<p>1. Critical analysis of rainfall and possible drought period in the country, effective rainfall and its calculation.</p> <p>2. Studies on cultural practices for mitigating moisture stress</p>	<p>Unit-3 Drought: types, effect of water deficit on physio-morphological characteristics of the plants, Crop adaptation and mitigation to drought</p> <p>1.1Introduction to Drought its types and management strategies for managing the drought.</p> <p>1.2 Introduction to effect of water deficit on physio-morphological characteristics of the plants</p> <p>1.3. Introduction to Crop adaptation and mitigation to drought management strategies for the drought condition.</p>	<p>1.Study on Drought management strategies in Satna condition.</p>

SW-1 Suggested Sessional Work (SW):

Assignments:

What is drought and its types. Explain the drought management strategies.

Other Activities (Specify):

21AN427.4 Students may become expert to apply soil and water conservation Practices and efficient utilization of water through soil and crop management practices.

Approximate Hours

Item	Appx Hrs.
CI	03
LI	02
SW	1
SL	1
Total	07

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO1.1 Understand the Water harvesting its importance and its techniques to conserve the water for agriculture purpose to irrigate the crop</p> <p>SO1.2 Understand the efficient utilization of water through soil and crop management practices in rainfed area.</p> <p>SO1.3 Understand the Management of crops in rainfed areas to protect the crop from drought.</p>	<p>1. Field demonstration on construction of water harvesting structures.</p>	<p>Unit-4 Water harvesting: importance, its techniques, Efficient utilization of water through soil and crop management practices, Management of crops in rainfed areas</p> <p>1.1Introduction to Water harvesting importance its techniques in rainfed area to conserve the water for agriculture purpose.</p> <p>1.2. Explain to efficient utilization of water through soil and crop management practices in rainfed area.</p> <p>1.3. Explain to Management of crops in rainfed areas to protect the crop from drought.</p>	<p>1.Study on Water harvesting importance its techniques in Satna region</p>

SW-1 Suggested Sessional Work (SW):

Assignments:

What is Water harvesting its importance and its techniques.

b.Other Activities(Specify):

21AN427.5 To impart knowledge about demonstrate the water harvesting techniques and crop planning for aberrant weather condition.

Approximate Hours

Item	Appx Hrs.
CI	03
LI	04
SW	1
SL	1
Total	09

SW-1 Suggested Sessional Work (SW):

Assignments: What is watershed management. Explain Concept, objective, principles and components of watershed management, factors affecting watershed management **Other Activities (Specify):**

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO1.1 Understand the crop planning for unfavourable weather condition and protect the crop and get maximum production .</p> <p>SO1.2 Understand the watershed management in dry land area for conserving the water resources.</p> <p>SO1.3 Understand the Concept, objective, principles and components of watershed management</p> <p>SO1.4. Understand the factors affecting watershed management in dryland areas.</p>	<p>1. Characterization and delineation of model watershed.</p> <p>2. Visit to rainfed research station/watershed</p>	<p>Unit-5 Contingent crop planning for aberrant weather conditions, Concept, objective, principles and components of watershed management, factors affecting watershed management.</p> <p>1.1Introduction to Contingent crop planning for aberrant weather conditions for get the maximum yield and pushing up the production.</p> <p>1.2. Introduction to watershed management and its importance in dryland area.</p> <p>1.3 Introduction to Concept, objective, principles and components of watershed management.</p> <p>1.4 Introduction to factors affecting watershed management.</p>	<p>1. Study on watershed management .</p>

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (CI)	Sessional Work (SW)	Self Learning (SI)	Total hour (CI+SW+SI)
21AN427.1 To impart knowledge about Rainfed Agriculture and Watershed Management and also know about the problem and prospect of rainfed agriculture.	09	01	01	11
21AN427.2 To acquaint skillness towards soil and climatic condition in india and soil and water conservation Practices	09	01	0	10
21AN427.3 To acquaint skillness towards drought management and its mitigation through foliar application of hormones on crops	07	01	01	09
21AN427.4 Students may become expert to apply soil and water conservation Practices and efficient utilization of water through soil and crop management practices.	05	01	01	07
21AN427.5 To impart knowledge about demonstrate the water harvesting techniques and crop planning for aberrant weather conditions	07	01	01	09
Total Hours	37	05	04	46

Suggestion for End Semester Assessment

Suggested Specification Table (ForESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Rainfed agriculture types History of rainfed agriculture and watershed in India.	03	01	01	05
CO-2	Soil and climatic conditions prevalent in rainfed areas Soil and water conservation Techniques.	02	06	02	10
CO-3	Drought, effect of water deficit on physiomorphological characteristics of the plants, Crop adaptation and mitigation to drought	03	07	05	15
CO-4	Water harvesting, Efficient utilization of water through soil and crop management	-	10	05	15
CO-5	Contingent crop planning for aberrant weather conditions, Concept, objective, principles and components of watershed management.	03	02	-	05
Total		11	26	13	50

Legend: R:Remember, U:Understand, A:Apply

The end of semester assessment for Rainfed Agriculture and Watershed Management Will be held with written examination of 50 marks

Note.Detailed Assessment rubric need to be prepared by the course wise teachers for abovet asks.

Teachers can also design different task as per requirement, for end semester assessment.

Suggested Instructional/ImplementationStrategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Demonstration
7. ICT Based Teaching Learning
(VideoDemonstration/Tutorials CBT, Blog,Facebook, Twitter, Whatsapp, Mobile, Online sources)
8. Brain stormin

Suggested Learning Resources:

(a)Books:

S. No.	Title	Author	Publisher	Edition& Year
1	Dryland Agriculture,.	Jayanthi, C. and Kalpana, R	Kalyani Publishers, Ludhiana	2016
2	Dryland Agriculture	Reddy, S.R. and Reddy, G. Prabhakara	Kalyani Publishers, Ludhiana	2015
3	Watershed Management	Murthy, J. V. S.	Wiley Eastern Limited. New Age International Limited, New Delhi	1994.

Curriculum Development Team

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9. Ms. Prachi Awadhiya, Teaching Associate, Dept. Of Agronomy AKS University

Cos, Pos and PSOs Mapping

Course Code: 21AN427

Course Title: Rainfed Agriculture & Watershed Management

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprises with different scales in area of agricultural production, process and trade	Hold a post on supply in administration and policy	Analyze and control commercial and economical process in the field of agriculture	Teach how to control and manage agricultural production	Introduce general production technologies	Teach how to implement and manage production technologies	Prepare for managerial and social responsibilities	Student will identify different underutilized crops	Student will practice different breeding techniques used in crop production.	Student will recognize different insect pest and diseases and their symptoms of crops	Student will apply different recent techniques in crop production
21AN427.1 To impart knowledge about Rainfed Agriculture and Watershed Management and also know about the problem and prospect of rainfed agriculture.	1	1	2	1	1	2	3	2	2	1	1
21AN427.2 To acquaint skillness towards soil and climatic condition in india and soil and water conservation Practices	2	1	1	2	2	3	2	2	2	1	3
21AN427.3 To acquaint skillness	2	2	1	2	2	1	2	2	3	1	1

towards drought management and its mitigation through foliar application of hormones on crops											
21AN427.4 Students may become expert to apply soil and water conservation Practices and efficient utilization of water through soil and crop management practices.	2	1	1	2	2	1	2	2	1	2	2
21AN427.5 To impart knowledge about demonstrate the water harvesting techniques and crop planning for aberrant weather conditions	2	2	1	2	2	2	2	3	1	2	2

Legend: 1 – Low, 2 – Medium, 3 – High

Curriculum Map: Rainfed Agriculture and Watershed Management 21AN427

Pos & PSOs	Cos No. & Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
PO1,2,3,4,5,6,7 PSO 1,2,3,4	To impart knowledge about Rainfed Agriculture and Watershed Management and aslo know about the problem and prospect of rainfed agriculture.	SO 1.1 SO 1.2 SO 1.3 SO 1.4	Studies on rainfall pattern in rainfed areas of the country and pattern of onset and withdrawal of monsoons. Studies on cropping pattern of different rainfed areas in the country and demarcation of rainfed area on map of India.	Rainfed agriculture: Introduction, types, History of rainfed agriculture and watershed in India; Problems and prospects of rainfed agriculture in India 1.1, 1.2, 1.3	. Study on watershed management in satna region.
PO1,2,3,4,5,6,7 PSO 1,2,3,4	To acquaint skillness towards soil and climatic condition in india and soil and water conservation Practices	SO 1.1 SO 1.2 SO 1.3 SO 1.4	Studies on climate classification. Interpretation of meteorological data and scheduling of supplemental irrigation on the basis of evapo-transpiration demand of crops. Field demonstration on soil & moisture conservation measures.	Soil and climatic conditions prevalent in rainfed areas; Soil and water conservation Techniques. 1.1, 1.2, 1.3	
PO1,2,3,4,5,6,7 PSO 1,2,3,4	To acquaint skillness towards drought management and its mitigation through foliar application of hormones on crops	SO 1.1 SO 1.2 SO 1.3 SO 4.4	Measurement of albedo and sunshine duration. computation of Radiation Intensity using BSS	Drought: types, effect of water deficit on physio-morphological characteristics of the plants, Crop adaptation and mitigation to drought 1.1, 1.2, 1.3	Study on Drought management strategies in Satna condition.

PO1,2,3,4,5,6,7 PSO 1,2,3,4	Students may become expert to apply soil and water conservation Practices and efficient utilization of water through soil and crop management practices.	SO 1.1 SO 1.2 SO 1.3	Field demonstration on construction of water harvesting structures.	Water harvesting: importance, its techniques, Efficient utilization of water through soil and crop management practices, Management of crops in rainfed areas 1.1, 1.2, 1.3	Study on Water harvesting importance its techniques in Satna region
PO1,2,3,4,5,6,7 PSO 1,2,3,4	To impart knowledge about demonstrate the water harvesting techniques and crop planning for aberrant weather conditions	SO 1.1 SO 1.2 SO 1.3 SO 4.4	Characterization and delineation of model watershed. Visit to rainfed research station/watershed	Contingent crop planning for aberrant weather conditions, Concept, objective, principles and components of watershed management, factors affecting watershed management. 1.1, 1.2, 1.3, 1.4	Study on watershed management

Course Code: 21AE421

Course Title: Introductory Soil and Water Conservation Engineering

Pre-requisite: Students should have a basic understanding of mathematics, physics, and chemistry, as well as introductory courses in environmental science, agriculture, or civil engineering.

Rationale: Soil and water conservation engineering is crucial for sustainable development and environmental protection. It helps to prevent soil erosion, water scarcity, and environmental degradation. This subject provides students with the knowledge and skills to design and implement conservation measures. It equips students to address global challenges and promote sustainable agriculture and infrastructure development.

Course Outcomes:

- AE 207.1:** Students will be able to explain the fundamental concepts of soil and water conservation, identify the causes and agents of soil erosion, and understand the importance of conserving these natural resources.
- AE 207.2:** Students will gain knowledge of the different forms of water erosion, learn to classify gullies, and apply control measures. They will also be able to estimate soil loss using the Universal Soil Loss Equation and employ various soil loss measurement techniques.
- AE 207.3:** Students will understand and apply the principles of erosion control, including contouring, strip cropping, contour bunding, graded bunding, bench terracing, and designing grassed waterways.
- AE 207.4:** Students will learn about various water harvesting techniques and understand the mechanics of wind erosion and the different types of soil movement caused by wind.
- AE 207.5:** Students will be able to explain the principles of wind erosion control and implement effective control measures to mitigate wind erosion and conserve soil.

Scheme of Studies:

Code	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			CI	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Program Core (PCC)	21AE421	Introductory Soil and Water Conservation Engineering	1	1	1	1	4	2

Legend:

CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

**Scheme of Assessment
Theory & Practical**

Code	Course Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ESA)
			Class/Home Assignment (CA) (For Practical)	Mid Term-1	Mid Term-2	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
Program Core (PCC)	21AE421	Introductory Soil and Water Conservation Engineering (Theory)	0	15	15	0	0	30	50	80
		Introductory Soil and Water Conservation Engineering (Practical/Lab)	15	0	0	5		20	0	20
		Total								

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

AE207.1: Students will be able to explain the fundamental concepts of soil and water conservation, identify the causes and agents of soil erosion, and understand the importance of conserving these natural resources.

Approximate Hours

Item	AppX Hrs
CL	3
LI	4
SW	2
SL	2
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO1.1 Introduction of soil and water conservation and explain its importance.</p> <p>SO1.2 Students will Identify the causes and agents of soil erosion.</p> <p>SO1.3 Students will be able to explain the different types of soil erosion.</p> <p>SO1.4 Analyzing the effects of soil erosion on the environment.</p>	<p>1. General status of soil conservation in India.</p> <p>2. Calculation of erosion index.</p>	<p>Unit-1.0 Soil erosion</p> <p>1.1 basic concepts and importance of soil and water conservation.</p> <p>1.2 The various natural and human-induced causes of soil erosion.</p> <p>1.3 the different agents of soil erosion, including water, wind, and gravity.</p>	<p>1. write a brief report on the historical development of soil and water conservation practices in a specific region.</p> <p>2. Students watch educational videos on soil erosion and conservation.</p>

SW-1 Suggested Sessional Work (SW):

a. Assignments:

- i. Define soil erosion and list its primary causes.
- ii. Identify and describe the main agents of soil erosion.

b. Mini Project:

- i. a mini-project to assess soil erosion in the university area, including field visits, soil sampling, and data collection.

AE 207 .2: Students will gain knowledge of the different forms of water erosion, learn to classify gullies, and apply control measures. They will also be able to estimate soil loss using the Universal Soil Loss Equation and employ various soil loss measurement techniques.

Approximate Hours

Item	AppX Hrs
CL	3
LI	4
SW	2
SL	2
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO2.1 Students will identify and explain the different forms of water erosion.</p> <p>SO2.2 Students will classify different types of gullies and propose appropriate control measures.</p> <p>SO2.3 Students will learn to estimate soil loss using the Universal Soil Loss Equation (USLE).</p> <p>SO2.4 Students will understand and apply various techniques for measuring soil loss.</p>	<p>1. Estimation of soil loss using universal soil loss equation.</p> <p>2. Measurement of soil loss using different techniques.</p>	<p>Unit-2 Water erosion</p> <p>2.1 Lecture on the principles of water erosion and gully classification.</p> <p>2.2 A detailed explanation on soil loss estimation using USLE.</p> <p>2.3 Interactive presentation on soil loss measurement techniques.</p>	<p>i. Watch online tutorials on water erosion control measures.</p> <p>ii. Read online chapters provided by ICAR and TNAU portals.</p>

SW-2 Suggested Sessional Work (SW):

a. Assignments:

1. Define water erosion and list its primary forms.
2. Write down universal soil loss equation(USLE) and also explain factors affecting the soil loss.

207.3: Students will understand and apply the principles of erosion control, including contouring, strip cropping, contour bunding, graded bunding, bench terracing, and designing grassed waterways.

Approximate Hours

Item	AppX Hrs
CI	3
LI	4
SW	2
SL	2
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO3.1 Students will explain the principles and benefits of contouring and strip cropping for erosion control.</p> <p>SO3.2 Students will describe the design and implementation of contour bunds and graded bunds as erosion control measures.</p> <p>SO3.3 Students will understand the methods and advantages of bench terracing in preventing soil erosion on sloped lands.</p> <p>SO3.4 Students will learn to design and implement grassed waterways to manage surface runoff and control erosion.</p>	<p>1. Preparation of contour maps in a chart of a specific area.</p> <p>2. Design of grassed water ways to control the soil erosion.</p>	<p>Unit-3: Principles of erosion control</p> <p>1. A lecture on the contouring and strip cropping to control water erosion.</p> <p>2. A presentation class on the types of Bunding and terracing.</p> <p>3. study on the implementation of erosion control measures in an agricultural area.</p>	<p>1. Make notes on Grassed Waterways.</p> <p>2. Read and watch online tutorials for the erosion control measures.</p>

SW-3 Suggested Sessional Work (SW):

a. Assignments:

1. Define contour bunding and its primary purpose.
2. List the benefits of grassed waterways in erosion control.

b. Mini Projects:

1. Designing and Implementing Erosion Control Measures for a Small Agricultural Plot.

AE 207.4: Students will learn about various water harvesting techniques and understand the mechanics of wind erosion and the different types of soil movement caused by wind.

Approximate Hours

Item	AppX Hrs
CI	3
LI	6
SW	2
SL	2
Total	13

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO4.1 Students will understand the principles and importance of water harvesting techniques.</p> <p>SO4.2 Students will understand the mechanics of wind erosion and how it affects soil.</p> <p>SO4.3 Students will describe various water harvesting techniques and their applications in different environments.</p> <p>SO4.4 Students will identify and explain the different types of soil movement caused by wind.</p>	<p>1. Design of contour bunds.</p> <p>2. Design of graded bunds.</p> <p>3. Design of bench terracing system.</p>	<p>Unit-4 Water harvesting and its techniques</p> <p>4.1 the principles and benefits of water harvesting and its applications.</p> <p>4.2 the different techniques of water harvesting, including roof water collection and groundwater recharge.</p> <p>4.3 the mechanics of wind erosion and the different types of soil movement due to wind erosion.</p>	<p>1. Read from ICAR website e-krisi and TNAU portal to know more about water harvesting and list its primary techniques.</p> <p>2. Watch online videos for the mechanics of wind erosion and its effects on soil.</p>

SW-4 Suggested Sessional Work (SW):

a. Assignments:

- i. Make an interactive presentation on the mechanics of wind erosion and its control measures.

b. Mini project:

- i. Design a water harvesting system in the university, including calculation of water yield and storage capacity.

AE 207.5: Students will be able to explain the principles of wind erosion control and implement effective control measures to mitigate wind erosion and conserve soil.

Approximate Hours

Item	Appx Hrs
CI	3
LI	2
SW	2
SL	2
Total	09

Session Outcomes (SOs)	(LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO5.1 Students will explain the principles behind controlling wind erosion.</p> <p>SO5.2 Students will describe various techniques for controlling wind erosion and their applications.</p> <p>SO5.3 Students will assess the effectiveness of different wind erosion control measures.</p> <p>SO5.4 Students will learn to design comprehensive wind erosion control plans for different environments.</p>	<p>1. Problem on wind erosion and solution of wind erosion.</p>	<p>Unit 5: Wind erosion and controls</p> <p>5.1 the principles of wind erosion control and its importance in soil conservation.</p> <p>5.2 the different control measures to prevent wind erosion</p> <p>5.3 the design and implementation of wind erosion control structures, such as windbreaks and shelterbelts.</p>	<p>1. Watch online videos on wind erosion control techniques.</p> <p>2. Read and summarize the importance of wind erosion control in preventing soil degradation.</p>

SW-5 Suggested Sessional Work (SW):

a. Assignments:

1. Explain the effectiveness of windbreaks in controlling wind erosion.
2. Define wind erosion control and list its primary techniques.

b. Mini Project:

1. develop a comprehensive wind erosion control plan in the university area, including field visits, data collection, and analysis.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (CL)	LI	Sessional Work (SW)	Self-Learning (SL)	Total hour (CL+SW+SL+LI)
AE207.1: Students will be able to explain the fundamental concepts of soil and water conservation, identify the causes and agents of soil erosion, and understand the importance of conserving these natural resources.	3	4	2	2	11
AE207.2: Students will gain knowledge of the different forms of water erosion, learn to classify gullies, and apply control measures. They will also be able to estimate soil loss using the Universal Soil Loss Equation and employ various soil loss measurement techniques.	3	4	2	2	11
AE207.3: Students will understand and apply the principles of erosion control, including contouring, strip cropping, contour bunding, graded bunding, bench terracing, and designing grassed waterways.	3	4	2	2	11
AE207 .4: Students will learn about various water harvesting techniques and understand the mechanics of wind erosion and the different types of soil movement caused by wind.	3	6	2	2	13
AE207 .5: Students will be able to explain the principles of wind erosion control and implement effective control measures to mitigate wind erosion and conserve soil.	3	2	2	2	9
Total Hours	15	20	10	10	55

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Soil Erosion	01	02	03	06
CO-2	Water Erosion	01	03	07	11
CO-3	Principles of Erosion controls	01	07	04	12
CO-4	Water Harvesting and its Techniques	01	06	04	11
CO-5	Wind Erosion and Controls	01	06	03	10
Total		5	24	21	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Soil and Water Conservation Engineering will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/ Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Visit to fields and laboratories.
7. Demonstration
8. ICT Based Teaching Learning (Video Demonstration/ Tutorials CBT, Blog, Facebook, Twitter, Whatsapp, Mobile, Online sources)
9. Brainstorming

Suggested Learning Resources:**(a)Books:**

S. No.	Title	Author	Publisher	Edition & Year
1	Land and Water Management Engineering	Murthy V.V.N.	Kalyani Publishers, New Delhi.	1982
2	Irrigation: Theory and Practices	Michael A.M.	Vikas Publishing House Pvt. Ltd., New Delhi.	2012
3	Principles of Agricultural. Engineering	Michael A.M. and T.P. Ojha	Jain Brothers, New Delhi.	Vol. II. 2012
4	Soil and Water Conservation Water Management	Mahnot, S.C., Singh P.K. and Chaplot, P.C.	Apex Publication House, Udaipur	2010
4	Lecture notes provided by Dept. of Agricultural Engineering, AKS University, Satna			

Curriculum Development Team

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Cos, Pos and PSOs Mapping

Course Code: 21AE421

Course Title: Introductory Soil and Water Conservation Engineering

Course Outcomes	Program Outcome								Program Specific Outcome		
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO1	PSO2	PSO3	PSO4
	Manage agricultural enterprises with different scales in area of agricultural production, process and trade	Hold a post on supply in administration and policy	Analyze and control commercial and economical process in the field of agriculture	Teach how to control and manage agricultural production	Introduce general production technologies	Teach how to implement and manage production technologies	Prepare for managerial and social responsibilities	Student will identify different underutilized crops	Student will practice different breeding techniques used in crop production.	Student will recognize different insect pest and diseases and their symptoms	Student will apply different recent techniques in crop production
CO1: Students will be able to explain the fundamental concepts of soil and water conservation, identify the causes and agents of soil erosion, and understand the importance of conserving these natural resources.	1	1	2	2	2	1	2	2	3	3	1
CO 2: Students will gain knowledge of the different forms of water erosion, learn to classify gullies, and apply control measures. They will also be able to estimate soil loss using the Universal Soil Loss Equation and employ various soil loss measurement techniques.	1	1	2	2	2	2	3	2	2	2	1
CO3: Students will understand and apply the principles of erosion control, including contouring, strip cropping, contour bunding, graded bunding, bench terracing, and designing grassed waterways.	2	2	1	1	2	1	2	1	1	2	2
CO 4: Students will learn about various water harvesting techniques and understand the mechanics of wind erosion and the different types of soil movement caused by wind.	3	2	2	2	3	2	2	3	3	3	2

CO5: Students will be able to explain the principles of wind erosion control and implement effective control measures to mitigate wind erosion and conserve soil.	2	3	2	1	1	2	3	3	3	1	3
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Legend: 1–Low, 2–Medium, 3–High

Curriculum Map

POs & PSOs No.	Cos No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO1,2,3,4,5,6,7 PSO 1,2,3,4	CO-1: Students will be able to explain the fundamental concepts of soil and water conservation, identify the causes and agents of soil erosion, and understand the importance of conserving these natural resources.	SO1.1 SO1.2 SO1.3 SO1.4	As Mentioned along with the concern units	Unit-1: Soil Erosion 1.1, 1.2, 1.3	As Mentioned along with the concern units
PO1,2,3,4,5,6,7 PSO 1,2,3,4	CO 2: Students will gain knowledge of the different forms of water erosion, learn to classify gullies, and apply control measures. They will also be able to estimate soil loss using the Universal Soil Loss Equation and employ various soil loss measurement techniques.	SO2.1 SO2.2 SO2.3 SO2.4		Unit-2 Water Erosion 2.1,2.2,2.3	
PO1,2,3,4,5,6,7 PSO 1,2,3,4	CO3: Students will understand and apply the principles of erosion control, including contouring, strip cropping, contour bunding, graded bunding, bench terracing, and designing grassed waterways.	SO3.1 SO3.2 SO3.3 SO3.4		Unit-3 Principles of Erosion controls 3.1, 3.2, 3.3	
PO1,2,3,4,5,6,7 PSO 1,2,3,4	CO 4: Students will learn about various water harvesting techniques and understand the mechanics of wind erosion and the different types of soil movement caused by wind.	SO4.1 SO4.2 SO4.3 SO4.4		Unit-4 Water harvesting and its techniques 4.1, 4.2, 4.3	
PO1,2,3,4,5,6,7 PSO 1,2,3,4	CO 5: Students will be able to explain the principles of wind erosion control and implement effective control measures to mitigate wind erosion and conserve soil.	SO5.1 SO5.2 SO5.3 SO5.4		Unit-5 Wind Erosion and controls 5.1, 5.2, 5.3	

Semester 5

Course Code:-21EC525

Course Title: -Agricultural Marketing, Trade and Prices

Pre requisite: -Student should have basic knowledge of basic concepts of agricultural marketing.

Rationale: - A Applied Subject-Agricultural Marketing, Trade and Prices is the express through at analyzing the efficient market information can be shown to have positive benefits for farmers and traders. Up-to-date information on prices and other market factors enables farmers to negotiate with traders and also facilitates spatial distribution of products from rural areas to towns and between markets.

Course Outcomes:

1. Identify the different types of agricultural markets and agricultural marketing concept
2. Express the product life cycle, pricing and marketing promotional strategies 3. Interpret the marketing function under exchange, physical and facilitating functions and marketing channel in the market
4. Examine the marketing efficiency and price spread with role of govt. institution and public institute in agricultural Market .
5. Evaluate the marketing risk and trade with international trade and need for agricultural price policy.

Scheme of studies

Code	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			CI	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Program Core (PCC)	21EC525	Agricultural Marketing, Trade and Prices	02	01	02	01	06	03

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Code	Course Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ESA)
			Class/ Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
Program Core (PCC)	21EC 525	Agricultural Marketing , Trade and Prices	15	20	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

21EC525 CO-1 Identify the different types of agricultural markets and agricultural marketing concept.

Approximate Hours

Item	Appx hrs
C 1	06
LI	02
SW	01
SL	01
Total	10

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO1.1- Brief introduce about the agricultural marketing</p> <p>SO1.2 - Define the basic concept of Agricultural marketing</p> <p>SO1.3 - Describe the concept of demand and supply</p> <p>SO1.4- Discussion the use producer surplus</p> <p>SO1.5 Describe the phases of product life cycle</p>	<p>LE1.1 –</p> <p>1-Plotting and study of demand and supply curves and calculation of elasticities.</p>	<p>Unit-1.0</p> <p>Agricultural Marketing: Concepts and definitions of market, marketing, agricultural marketing, market structure, marketing mix and market segmentation, classification and characteristics of agricultural markets; demand, supply and producer’s surplus of agri-commodities: nature and determinants of demand and supply of farm products, producer’s surplus – meaning and its types, marketable and marketed surplus, factors affecting marketable surplus of agri-commodities. Product life cycle (PLC) and competitive strategies. Meaning and stages in PLC; characteristics of PLC, strategies in different stages of PLC.</p> <p>1.1- Introduction of agri marketing</p> <p>1.2- Market structure, Marketing Mix</p> <p>1.3- Market Segmentation</p> <p>1.4- Concepts of Demand and Supply</p> <p>1.5- Producer Surplus, Factors affecting marketable surplus</p> <p>1.6- Different stages of PLC</p>	<p>1.1- Prepare the assignment</p>

SW-1 Suggested Sessional Work (SW):

- a. Assignments:** Prepare the assignment on management function evaluation thought
- b. Mini Project:** -
- c. Other Activities (Specify):**

21EC525CO-2: Express the product life cycle, pricing and marketing promotional strategies.

Approximate Hours

Item	Appx Hrs
C1	05
LI	02
SW	01
SL	02
Total	10

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO2. – Introduce to concept of pricing</p> <p>SO2. – Learned about the type of promotional strategies</p> <p>SO3.- Briefing about the selling methods..</p> <p>SO4.- Discuss about the merits and demerits of different promotional methods</p> <p>SO5.–Describe the phases of marketing process</p>	<p>LE2.1- Study of relationship between market arrivals and prices of some selected commodities.</p>	<p>Unit-2.0 - Pricing and promotion strategies: pricing considerations and approaches – cost based and Competition based pricing; market promotion – advertising, personal selling, sales promotion and publicity – their meaning and merits & demerits; marketing process and functions: Marketing process-concentration, dispersion and equalization.</p> <p>2.1 – Pricing and objective of pricing</p> <p>2.2- Strategies of marketing Promotion</p> <p>2.3 Pricing considerations</p> <p>2.4 Cost, Price and Competition based pricing</p> <p>2.5 Marketing process</p>	<p>2.1 – Prepare the assignment</p>

SW-1 Suggested Sessional Work (SW):

a. Assignments:

b. Mini Project:

c. Other Activities (Specify):

21EC525CO-3: Interpret the marketing function under exchange, physical and facilitating functions and marketing channel in the market.

Approximate Hours

Item	Appx hrs
C1	07
LI	04
SW	02
SL	01
Total	14

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO3.1 – Discuss to the exchange functions</p> <p>SO3.2 –Determine the marketing physical function</p> <p>SO3.3- Knowledge the different facilitating function</p> <p>SO3.4- Discuss the marketing channels</p> <p>SO3.5- Describe the marketing channels for different commodities</p>	<p>LE</p> <p>3.1 Computation of marketable and marketed surplus of important commodities.</p> <p>3.2- Study of price behaviour over time for some selected commodities;</p> <p>Construction of index numbers.</p>	<p>Unit-3.0 Exchange functions – buying and selling; physical functions – storage, transport and processing;</p> <p>facilitating functions – packaging, branding, grading, quality control and labeling (Agmark), Market functionaries and marketing channels: Types and importance of agencies involved in agricultural marketing; meaning and definition of marketing channel; number of channel levels; marketing channels for different farm products.</p> <p>3.1- Physical and exchange functions</p> <p>3.2- Storage, Transportation Processing</p> <p>3.3- Facilitating function Packaging, Branding</p> <p>3.4- Quality control (Agmark), Grading</p> <p>3.5- Marketing functionaries</p> <p>3.6- Marketing channels</p> <p>3.7 Types of marketing channels</p>	<p>3.1 Prepare the assignment</p>

SW-1 Suggested Sessional Work (SW):

a. Assignments:

b. Mini Project:

c. Other Activities (Specify):

21EC525CO-4: Examine the marketing efficiency and price spread with role of govt. institution and public institute in agricultural Market.

Approximate Hours

Item	App X Hrs
CI	06
LI	04
SW	02
SL	01
Total	13

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO4.1 –Identify the marketing efficiency</p> <p>SO4.2 - Apply the concept of marketing cost, margin and efficiency</p> <p>SO4.3- Known the reason of high marketing cost</p> <p>SO4.4- Describes the role govt institutions</p> <p>SO4.5– Brief the cooperative marketing</p>	<p>LE4.1 - Visit to a local market to study various marketing functions performed by different agencies.</p> <p>4.2-Identification of marketing channels for selected commodity, collection of data regarding marketing costs, margins and price spread and presentation of report in the class.</p>	<p>Unit-4.0Integration; marketing efficiency; marketing costs, margins and price spread; factors affecting cost of marketing; reasons for higher marketing costs of farm commodities; ways of reducing marketing costs; Role of Govt. in agricultural marketing: Public sector institutions- CWC, SWC, FCI, CACP & DMI – their objectives and functions; cooperative marketing in India;</p> <p>4.1-Market Integration</p> <p>4.2- Concept of marketing efficiency, marketing margin and marketing costs</p> <p>4.3- Factor effecting cost of marketing cost-factor effecting and reason of higher</p> <p>4.4- Role of govt institution in Ag marketing-CWC, SWC, FCI,</p> <p>4.5- CACP, DMI</p> <p>4.6-Cooperative marketing</p>	<p>1.1- Prepare the assignment</p>

SW-1 Suggested Sessional Work (SW):

a. Assignments:

b. Mini Project:

c. Other Activities (Specify):

21EC525CO-5: Evaluate the marketing risk and trade with international trade and need for agricultural price policy

Approximate Hours

Item	Appx hrs
CI	06
LI	04
SW	02
SL	02
Total	14

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO1.1 –Identify the risk in marketing</p> <p>SO1.2- Identify the tools of risk management</p> <p>SO1.3- Discuss the needs of price policy</p> <p>SO 1.4 Discuss the role of international trade</p> <p>SO1.5- Describe the concept of GATT,WTO and AoA</p>	<p>LE5.1 Visit to market institutions – NAFED, SWC, CWC, cooperative marketing society, etc. to study their organization and functioning.</p> <p>5.2- Application of principles of comparative advantage of international trade.</p>	<p>Unit-5.0 Risk in marketing: Types of risk in marketing; speculation & hedging; an overview of futures trading; Agricultural prices and policy: Meaning and functions of price; administered prices; need for agricultural price policy; Trade: Concept of International Trade and its need, theories of absolute and comparative advantage. Present status and prospects of international trade in agri-commodities; GATT and WTO; Agreement on Agriculture (AoA) and its implications on Indian agriculture; IPR.</p> <p>5.1- Risk in marketing</p> <p>5.2- Speculation and Hedging</p> <p>5.3-Agricultural Pricing</p> <p>5.4- Price policy</p> <p>5.5-International Trade(GATT,WTO)</p> <p>5.6-AoA, IPR</p>	<p>1.1-Prepare the assignment</p>

SW-1 Suggested Sessional Work (SW):

a. Assignments:

b. Mini Project:

c. Other Activities (Specify):

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (C I)	Laborator y Lecture (L I)	Sessional Work (SW)	Self Learning (S I)	Total hour (C I + LI+ SW +S I)
01: Identify the different types of agricultural markets and agricultural marketing concept.	06	02	01	01	10
02: Express the product life cycle, pricing and marketing promotional strategies.	05	02	01	02	10
03: Interpret the marketing function under exchange, physical and facilitating functions and marketing channel in the market.	07	04	02	01	14
04: Examine the marketing efficiency and price spread with role of govt. institution and public institute in agricultural Market.	06	04	02	01	13
05: Evaluate the marketing risk and trade with international trade and need for agricultural price policy.	06	04	02	02	14
Total Hours	30	16	08	07	61

**Suggestion for End Semester Assessment
Suggested Specification Table (For ESA)**

CO	Unit title	Marks Distribution			Total Marks
		R	U	A	
CO-1	Identify the basic concepts of agricultural marketing.	02	02	02	06
CO-2	Elaborate the overall view of various marketing strategies.	02	03	03	08
CO-3	Apply the fundamentals of facilitating function and marketing channels	02	04	04	10
CO-4	Apply the fundamentals of marketing costs and cooperative marketing	03	04	05	12
CO-5	Evaluate the ability understanding the role of public institutions	04	05	05	14
	Total	13	18	19	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Agricultural Marketing, Trade and Prices will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Demonstration
7. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, Whatsapp, Mobile, Online sources)
8. Brainstorming

Suggested Learning Resources:

S. No.	Title	Author	Publisher	Edition & Year
01	Agricultural Price Analysis and Price Policy	Acharya, S.S. and Agarwal, N.L	Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi	2021 12 th adition
02	Govt sites	G. L. Meena, S. S. Burark, D. C. Pant and Rajesh Sharma	Agrotech Publishing Academy, Udaipur	2017. First edition
03	Kohls, Richard L. and Uhl, Joseph N.	Marketing of Agricultural Products	Macmillan Publishing Co., Inc.	05th Edition 2010

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Cos, Pos and PSOs Mapping

Course Code: 21EC525

Course Title: Agricultural Marketing Trade & Price

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprise with different	Identify a position in supply chain administrative and policy	Analyze and control commercial and economical	Teach how to control and manage agricultural	Introduce general	Teach how to implement	Prepare for managerial	Student will identify different	Student will practice different	Student will recognize different	Student will apply different
21EC525.1: Identify the different types of agricultural markets and agricultural marketing concept.	1	2	2	2	2	1	2	1	1	2	2
21EC525.2: Express the product life cycle, pricing and marketing	1	2	3	2	1	3	2	2	1	1	1

promotional strategies.											
21EC525.3: Interpret the marketing function under exchange, physical and facilitating functions and marketing channel in the market.	2	1	1	2	2	3	3	2	1	1	2
21EC525.4: Examine the marketing efficiency and price spread with role of govt. institution and public institute in agricultural Market.	2	1	1	2	2	1	2	2	1	2	1
21EC525.5: Evaluate the	2	1	1	2	2	1	3	2	1	2	2

marketing risk and trade with international trade and need for agricultural price policy.												
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Legend: 1 – Low, 2 – Medium, 3 – High

Curriculum Map: Agricultural Marketing Trade and Prices

Pos & PSOs	Cos No. & Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
PO1,2,3,4,5,6,7 PSO 1,2,3,4	Identify the different types of agricultural markets and agricultural marketing concept	SO 1.1 SO 1.2 SO 1.3 SO 1.4 SO 1.5	Plotting and study of demand and supply curves and calculation of elasticities	Agricultural Marketing: Concepts and definitions of market, marketing, agricultural marketing, market structure, marketing mix and market segmentation, classification and characteristics of agricultural markets; demand, supply and producer's surplus of agri-commodities: nature and determinants of demand and supply of farm products, producer's surplus – meaning and its types, marketable and marketed surplus, factors affecting marketable surplus of agri-commodities. Product life cycle (PLC) and competitive strategies. Meaning and stages in PLC; characteristics of PLC, strategies in different stages of PLC. 1.1, 1.2, 1.3,1.4,1.5,1.6	Prepare the assignment
PO1,2,3,4,5,6,7 PSO 1,2,3,4	Express the product life cycle, pricing and marketing promotional strategies	SO 2.1 SO 2.2 SO 2.3 SO 2.4 SO 2.5	Study of relationship between market arrivals and prices of some selected commodities	Pricing and promotion strategies: pricing considerations and approaches – cost based and Competition based pricing; market promotion – advertising, personal selling, sales promotion and publicity – their meaning and merits & demerits; marketing process and functions: Marketing process-	Prepare the assignment

				concentration, dispersion and equalization. 2.1,2.2,2.3,2.4,2.5	
PO1,2,3,4,5,6,7 PSO 1,2,3,4	Interpret the marketing function under exchange, physical and facilitating functions and marketing channel in the market	SO 3.1 SO 3.2 SO 3.3 SO 3.4 SO 3.5	3.1 Computation of marketable and marketed surplus of important commodities. 3.2- Study of price behaviour over time for some selected commodities; Construction of index numbers.	Exchange functions – buying and selling; physical functions – storage, transport and processing; facilitating functions – packaging, branding, grading, quality control and labeling (Agmark), Market functionaries and marketing channels: Types and importance of agencies involved in agricultural marketing; meaning and definition of marketing channel; number of channel levels; marketing channels for different farm products. 3.1,3.2,3.3,3.4,3.5,3.6,3.7	Prepare the assignment
PO1,2,3,4,5,6,7 PSO 1,2,3,4	Examine the marketing efficiency and price spread with role of govt. institution and public institute in agricultural Market	SO 4.1 SO 4.2 SO 4.3 SO 4.4 SO 4.5	4.1 - Visit to a local market to study various marketing functions performed by different agencies. 4.2-Identification of marketing channels for selected commodity,	Integration; marketing efficiency; marketing costs, margins and price spread; factors affecting cost of marketing; reasons for higher marketing costs of farm commodities; ways of reducing marketing costs; Role of Govt. in agricultural marketing: Public sector institutions- CWC, SWC, FCI, CACP & DMI – their objectives and functions; cooperative marketing in India 4.1,4.2,4.3,.4.4,4.5,4.6	Prepare the assignment

			collection of data regarding marketing costs, margins and price spread and presentation of report in the class.		
PO1,2,3,4,5,6,7 PSO 1,2,3,4	Evaluate the marketing risk and trade with international trade and need for agricultural price policy.	SO 5.1 SO 5.2 SO 5.3 SO 5.4 SO 5.5	5.1 Visit to market institutions – NAFED, SWC, CWC, cooperative marketing society, etc. to study their organization and functioning. 5.2- Application of principles of comparative advantage of international trade.	Risk in marketing: Types of risk in marketing; speculation & hedging; an overview of futures trading; Agricultural prices and policy: Meaning and functions of price; administered prices; need for agricultural price policy; Trade: Concept of International Trade and its need, theories of absolute and comparative advantage. Present status and prospects of international trade in agri-commodities; GATT and WTO; Agreement on Agriculture (AoA) and its implications on Indian agriculture; IPR. 5.1,5.2,5.3,5.4,5.5,5.6	Prepare the assignment

Course Code: 21HO426

Course Title: Diseases of Field & Horticultural Crops & their Management

Pre- requisite: Student should have basic knowledge of Fundamentals of Plant Pathology

Rationale: The course is added in the programme to minimize the losses due to plant diseases in crop production and healthy 5Fs production.

Course Outcomes:

CO1 Define various terminology used in the course

CO2 Diagnose various plant diseases with their life-cycles of Kharif season crops

CO3 Determine the relationship between pathogens, host and environment

CO4 Minimize the quantitative, qualitative and esthetic losses caused by diseases through suitable management practices

CO5 Develop integrated disease management models/strategies for particular crop

Scheme of Studies:

Code	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			CI	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Program Core (PCC)	21HO426	Diseases of Field & Horticultural Crops & their Management-I	2	1	1	1	6	3

Legend:

CI: Classroom Instruction (Includes different instructional strategies i.e., Lecture (L) and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning, C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

Code	Course Code	Course Title	Scheme of Assessment (Marks)						
			Progressive Assessment (PRA)					End Semester Assessment (ESA)	Total Marks (PRA+ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2, 15 marks each (CT)	Seminar one (SA)	Activity any one (CAT)	Class Attendance (AT)		
Program Core (PCC)	21HO426	Diseases of Field & Horticultural Crops & their Management-I		30	-	-		50	100

Course-Curriculum Detailing: This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

21HO426 .1: Define various terminology used in the cereal crop diseases and their identification

Approximate Hours

Item	Appx. Hrs
CI	6
LI	6
SW	1
SL	1
Total	14

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
<p>SO1.1 Understand the importance of cereal crop diseases</p> <p>SO1.2 Recognize the symptoms of diseases</p> <p>SO1.3 Apply the method of disease management</p> <p>SO1.4 Understand the life cycle of diseases</p>	<ul style="list-style-type: none"> • Identification and histopathological studies of selected cereal diseases 	<p>Unit-1 Symptoms, etiology, disease cycle and management of major diseases of following crops: Field Crops: Rice: blast, brown spot, bacterial blight, sheath blight, false smut, khaira and tungro; Maize: stalk rots, downy mildew, leaf spots; Sorghum: smuts, grain mold and anthracnose. Bajra: downy mildew and ergot.</p> <p>1.1 Symptoms, etiology, disease cycle and management of Rice: blast, brown spot & sheath blight</p> <p>1.2 Symptoms, etiology, disease cycle and management of bacterial blight, Khaira & false smut of rice</p> <p>1.3 Symptoms, etiology, disease cycle and management of tungro of rice</p> <p>1.4 Symptoms, etiology, disease cycle and management of stalk rots, downy mildew & leaf spot of maize</p> <p>1.5 Symptoms, etiology, disease cycle and management of sorghum diseases</p> <p>1.6 Symptoms, etiology, disease cycle and management of bajra diseases</p>	<p>1 Causal organisms of cereal diseases</p>

SW-1 Suggested Sessional Work (SW):

a) Assignments:

- i) Management of paddy diseases

21HO426 .2: Diagnose various plant diseases with their life-cycles of Kharif season crops

Approximate Hours

Item	Appx Hrs
CI	06
LI	6
SW	1
SL	1
Total	14

Session utcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
<p>SO2.1 Understand the causes of the diseases</p> <p>SO2.2 Discuss the primary and secondary inoculum of crop diseases</p> <p>SO2.3 Illustrate microscopic characters of the pathogens</p>	<p>Identification and histopathological studies of sugarcane, sunflower and mustard diseases</p>	<p>Unit-2 Groundnut: early and late leaf spots, wilt, Soybean: Rhizoctonia blight, bacterial spot, seed and seedling rot and mosaic; Peginopea: Phytophthora blight, wilt and sterility mosaic; Finger millet. Blast and leaf spot.</p> <p>2.1 Early and late leaf spots of groundnut</p> <p>2.2 Rhizoctonia blight, bacterial spot of soybean</p> <p>2.3 seed and seedling rot and mosaic, of soybean</p> <p>2.4 Wilt of groundnut & wilt & phytophthora blight of peginopea</p> <p>2.5 Sterility mosaic of peginopea</p> <p>2.6 Blast and leaf spot of finger millet</p>	<p>1 Causal organisms and primary inoculum</p>

SW-2 Suggested Sessional Work (SW):

a) Assignments:

- i) Life cycles of the major diseases of groundnut, soybean and peginopea

21HO426.3: Determine the relationship between pathogens, host and environment

Approximate Hours

Item	Appx. Hrs
CI	05
LI	6
SW	1
SL	1
Total	13

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
<p>SO3.1 Describe pulse crop diseases</p> <p>SO3.2 Practice to identify and control of pulse crop diseases</p> <p>SO3.3 Illustrate microscopic characters of the pathogens causing pulse crops</p> <p>SO3.4 Diagnose pulse crop diseases</p>	<ul style="list-style-type: none"> • Identification and histopathological studies of pulse crop diseases • Field visit for disease identification 	<p>Unit-3 Black & green gram: Cercospora leaf spot and anthracnose, web blight and yellow mosaic; Castor: Phytophthora blight; Tobacco: black shank, black root rot and mosaic.</p> <p>3.1 Cercospora leaf spot and anthracnose of black & green gram</p> <p>3.2 Web blight and yellow mosaic of black & green gram</p> <p>3.3 Phytophthora blight of castor</p> <p>3.4 Black shank, black root rot of tobacco</p> <p>3.5 Mosaic of tobacco</p>	<p>1 Life cycles of pulse crop diseases</p>

SW-3 Suggested Sessional Work (SW):

a. Assignments:

- i) Causal organisms and their descriptions

21HO426.4: Minimize the quantitative, qualitative and esthetic losses caused by diseases through suitable management practices

Approximate Hours

Item	Appx Hrs
CI	06
LI	6
SW	1
SL	1
Total	14

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
<p>SO4.1 Diagnose fruit crop diseases</p> <p>SO4.2 Illustrate microscopic characters of the pathogens causing fruit crops</p> <p>SO4.3 Evaluate the damage caused by different diseases</p> <p>SO4.4 Inspect the fruit diseases in the field</p>	<ul style="list-style-type: none"> • Identification and histopathological studies of fruit crop diseases • Field visit for identification of disease 	<p>Unit-4 Horticultural Crops: Guava: wilt and anthracnose; Banana: Panama wilt, bacterial wilt, Sigatoka and bunchy top; Papaya: foot rot, leaf curl and mosaic, Pomegranate: bacterial blight; Cruciferous vegetables: Alternaria leaf spot and black rot; Brinjal: Phomopsis blight and fruit rot and Sclerotinia blight.</p> <p>4.1 Wilt of guava & fungal & bacterial wilt of banana</p> <p>4.2 Anthracnose, Sigatoka and bunchy top of banana</p> <p>4.3 Papaya : foot rot, leaf curl</p> <p>4.4 Mosaic of papaya & Pomegranate: bacterial blight</p> <p>4.5 Cruciferous vegetables: Alternaria leaf spot and black rot</p> <p>4.6 Brinjal : Phomopsis blight and fruit rot and Sclerotinia blight</p>	<p>1 Causal organisms of fruit diseases</p>

SW-4 Suggested Sessional Work (SW):

a) Assignments:

- Tabulate fruit crop diseases and their symptoms

21HO426.5: Develop integrated disease management models/strategies for particular crop

Approximate Hours

Item	Appx Hrs
CI	07
LI	6
SW	1
SL	1
Total	15

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
<p>SO5.1 Diagnose flower crop diseases</p> <p>SO5.2 Illustrate microscopic characters of the pathogens causing flower & vegetable diseases</p> <p>SO5.3 Evaluate the damage caused by different diseases</p> <p>SO5.4 Inspect the flower & vegetable diseases in the field</p>	<ul style="list-style-type: none"> • Identification and histopathological studies of fruit crop diseases • Collection and preservation of plant diseased specimens for herbarium 	<p>Unit-5 Tomato: damping off, wilt, early and late blight, buck eye rot and leaf curl and mosaic; Okra: Yellow Vein Mosaic; Beans: anthracnose and bacterial blight; Ginger: soft rot; Colocasia: Phytophthora blight; Coconut: wilt and bud rot; Tea: blister blight; Coffee: rust.</p> <p>5.1 Wilt of tomato & coconut</p> <p>5.2 Early & late blight & damping off of tomato & Phytophthora blight of colocasia</p> <p>5.3 Buck eye rot, leaf curl and mosaic of tomato</p> <p>5.4 Beans: anthracnose and bacterial blight</p> <p>5.5 Ginger: soft rot & Okra: Yellow Vein Mosaic</p> <p>5.6 Coconut: wilt and bud rot</p> <p>5.7 Tea: blister blight & Coffee: rust.</p>	<p>1 Learning of causal organisms</p>

SW-5 Suggested Sessional Work (SW):

a) Assignments:

- Collection and preservation of plant diseased specimens for herbarium

Brief of Hours suggested for the Course Outcome

i)

Course Outcomes	Class Lecture (C)	Lab (LI)	Sessional Work (SW)	Self Learning (SI)	Total hour (CI+SW+SI)
21HO426 .1: Define various terminology used in the cereal crop diseases and their identification	06	6	1	1	14
21HO426 .2: Diagnose various plant diseases with their life-cycles of Kharif season crops	06	6	1	1	14
21HO426.3: Determine the relationship between pathogens, host and environment	05	6	1	1	13
21HO426.4: Minimize the quantitative, qualitative and esthetic losses caused by diseases through suitable management practices	06	6	1	1	14
21HO426.5: Develop integrated disease management models/strategies for particular crop	07	6	1	1	15
Total Hours	30	30	05	05	70

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Diseases of cereal crops	03	02	01	10
CO-2	Diseases of groundnut, soybean & pignonpea	02	06	02	10
CO-3	Diseases of pulse crops	03	07	05	10
CO-4	Diseases of fruit crops		10	05	10
CO-5	Diseases of plantation & vegetable crops	03	02		10
Total		11	26	13	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for **Diseases of Field & Horticultural Crops & their Management-II** will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

- i. Improved Lecture
- ii. Case study
- iii. Group Discussion
- iv. Role Play
- v. Demonstration
- vi. Brainstorming

Suggested Learning Resources:**(a) Books:**

S. No.	Title	Author	Publisher	Edition & Year
1	Plant Pathology	Agrios GN.	Academic Press, New York. (Indian Ed.)	2005 5th Ed.
2	Plant Pathology	Mehrotra R S and Aggarwal A.	Tata McGraw-Hill Publishing Co Ltd. ND.	2012. 12th ed.
3	Diseases of field crops.	Gupta V K and Paul, Y S	Kalyani Publishing Co. New Delhi.	2008. II ed.
4	Diseases of tropical and sub-tropical field fiber and oil plants.	Cook, A A.	Mac Millan Publishing Co. New York.	1981.

Curriculum Development Team

1. Associate Professor & Head, Dr. Doomar Singh, Department of Plant Pathology, AKS University

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprises with different scales in area of agricultural production,	Hold a post on supply in administration and policy.	Analyze and control commercial and economical process in the field of agriculture	Teach how to control and manage agricultural production	Introduce general production technologies	Teach how to implement and manage production technologies	Prepare for managerial and social responsibilities	Student will identify different underutilized crops	Student will practice different breeding techniques used in crop production.	Student will recognize different insect pests and diseases and their symptoms	Student will apply different recent techniques in crop production
1: Define various terminology used in the cereal crop diseases and their identification	3	2	3	2	3	1	1	1	2	3	2
2: Diagnose various plant diseases with their life-cycles of Kharif season crops	3	2	3	2	2	1	2	1	2	3	3
3: Determine the relationship between pathogens, host and	3	3	2	2	1	2	2	1	2	2	3

environment											
4: Minimize the quantitative, qualitative and esthetic losses caused by diseases through suitable management practices	2	2	1	3	2	1	2	1	1	3	2
5: Develop integrated disease management models/strategies for particular crop	2	3	3	2	1	2	2	1	3	2	3

Course Curriculum Map: Diseases of Field & Horticultural Crops & their Management II

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self- Learning (SL)
POs 1,2,3,4,,5,6,7 PSOs 1,2,3,4	1: Define various terminology used in the cereal crop diseases and their identification	SO 1.1 SO 1.2 SO 1.3 SO 1.4	<ul style="list-style-type: none"> • Identification and histopathological studies of selected cereal diseases. 	Symptoms, etiology, disease cycle and management of following diseases: Field Crops: Wheat: rusts, loose smut, karnal bunt, powdery mildew, Alternaria blight, and ear cockle. 1.1,1.2,1.3,1.4,1.5,1.6	1 Causal organisms of cereal diseases
POs 1,2,3,4,,5,6,7 PSOs 1,2,3,4	2: Identify various plant diseases and life-cycles of Rabi season crops	SO 2.1 SO 2.2 SO 2.3	<ul style="list-style-type: none"> • Identification and histopathological studies of sugarcane, sunflower and mustard diseases. 	Symptoms, etiology, disease cycle and management of following diseases: sugarcane; red rot, smut, wilt, grassy shoot, ratoon stunting and Pokkah Boeng; Sunflower; Sclerotinia stem rot and Alternaria blight; Mustard; Alternaria blight, white rust, downy mildew and Sclerotinia stem rot. 2.1,2.2,2.3,2.4,2.5,2.6	1 Causal organisms and primary inoculum
POs 1,2,3,4,,5,6,7 PSOs 1,2,3,4	3: Isolate/detect different plant pathogens causing diseases in rabi season crops from infected plant parts and soil	SO 3.1 SO 3.2 SO 3.3 SO 3.4	<ul style="list-style-type: none"> • Identification and histopathological studies of pulse crop diseases • Field visit for disease identification 	Gram: wilt, grey mold and Ascochyta blight; Lentil: rust and wilt; Cotton: anthracnose, vascular wilt, and black arm; Pea: downy mildew, powdery mildew and rust. 3.1,3.2,3.3,3.4,3.5,3.6	1 Life cycles of pulse crop diseases
POs 1,2,3,4,,5,6,7 PSOs 1,2,3,4	4: Acquaintance with nematodes and phanerogamic plant parasites and losses caused by them	SO 4.1 SO 4.2 SO 4.3 SO 4.4	<ul style="list-style-type: none"> • Identification and histopathological studies of fruit crop diseases • Field visit for identification of disease 	Horticultural Crops: Mango: anthracnose, malformation, bacterial blight and powdery mildew; Citrus: canker and gummosis; Grape vine: downy mildew, Powdery mildew and anthracnose; Apple: scab, powdery mildew, fire blight and crown gall; Peach: leaf curl. Strawberry: leaf spot Potato: early and late blight, black scurf, leaf roll, and mosaic. 4.1,4.2,4.3,4.4,4.5,4.6	1 Causal organisms of fruit diseases

<p>POs 1,2,3,4,,5,6,7</p> <p>PSOs 1,2,3,4</p>	<p>5: Develop integrated disease management models/strategies for particular crop</p>	<p>SO 5.1 SO 5.2 SO 5.3 SO 5.4</p>	<ul style="list-style-type: none"> • Identification and histopathological studies of fruit crop diseases • Collection and preservation of plant diseased specimens for herbarium. 	<p>Cucurbits: downy mildew, powdery mildew, wilt; Onion and garlic: purple blotch, and Stemphylium blight; Chillies: anthracnose and fruit rot, wilt and leaf curl; Turmeric: leaf spot Coriander: stem gall Marigold: Botrytis blight; Rose: dieback, powdery mildew and black leaf spot.</p> <p>5.1,5.2,5.3,5.4,5.5,5.6</p>	<p>1. Learning of causal organisms</p>
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Course Code: 21AG527

Course Title: Intellectual Property Rights

Pre requisite: Basic idea about benefits of rights

Rationale: Studying intellectual property rights is crucial for safeguarding innovation and creativity. It provides legal frameworks to protect inventions, artistic works, and proprietary information, fostering economic growth, encouraging research and development, and ensuring fair recognition and rewards for intellectual contributions in diverse fields of science, technology, and the arts.

Course Outcomes: **CO1_21AG527_01** Students will develop understanding of intellectual property. Learn about different organizations of world trade and trade related IPR.

CO2_21AG527_02 To impart the skills in patenting. Understanding of application procedure and execution.

CO3_21AG527_03 Understanding the role of UPOV. Know about UPOV criteria of new plant varieties and its registration procedure.

CO4_21AG527_04 Know about registration of new plant varieties under PPV and FR act in India. Understanding of traditional knowledge as IPR.

CO5_21AG527_05 Student will have insight about need of conservation. Learn about important treaties in this regard.

Scheme of Studies

Code	Course Code	Course Title	Scheme of Studies (Hours/Week)					Total Credit (C)
			CI	LI	SW	SL	Total Study Hours	
Program Core (PCC)	21AG527	Intellectual Property Rights	01	00	00	00	1	01

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and

Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment

Code	Course Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA + ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Classes Test 2 (2 best out of 3) 10 marks each (CT)	Seminars	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
PC C	21AG 527	Intellectual Property Rights	0	40	0	10	0	50	50	100

Course-Curriculum Detailing:

Students will develop understanding of intellectual property. Learn about different organizations of world trade and trade related IPR. Categorize types of IPR and licensing procedure. Understanding the role of UPOV. Know about UPOV criteria of new plant varieties and its registration procedure. Explain the importance of IPR in agriculture. Gained expertise on process of application for IPR for an agricultural produce. Student will have insight about need of conservation. Learn about important treaties in this regard.

21AG527.01: Introduction to IPR and various trade related IPR

Approximate Hours

Item	Appx Hrs
CI	03
LI	00
SW	00
SL	00
Total	03

Session Outcomes (SOs)	Laboratory Instructions (LI)	Classroom Instructions (CI)	Self-Learning (SL)
<p>SO 1.1 Identify the value of IPR and recognize its potential when it comes to trade.</p> <p>SO1.2 Discover the role of IPR in trade system and also learn about UN agency working for IPR</p> <p>SO1.3 Name the important treaties related to IPR and IPR legislation in India</p>		<p>Unit I: Introduction and meaning of intellectual property. Treaties for IPR protection</p> <p>1.1 Introduction and meaning of intellectual property, brief introduction to GATT, WTO,</p> <p>1.2 TRIPs and WIPO,</p> <p>1.3 Madrid protocol, Berne Convention, Budapest treaty, etc. legislations covering IPR in India</p>	

21AG527.02: Product specific Intellectual Property Rights

Approximate Hours

Item	Appx Hrs
CI	06
LI	00
SW	03
SL	01
Total	10

Session Outcomes (SOs)	Laboratory Instructions (LI)	Classroom Instructions (CI)	Self-Learning (SL)
<p>SO2.1 Identifying the product and integrating with suitable IPR</p> <p>SO2.2 Assessing other specific IPR's</p> <p>SO2.3 Identifying the scope and importance of Patent and its legislation.</p> <p>SO2.4 Finding the procedure of patent filing</p> <p>SO2.5 Understanding the procedure and stages of patent filing</p> <p>SO2.6 Identifying the provisions of exceptions in patents</p>		<p>Unit II: Various IPR based on different product.</p> <p>2.1 Copyrights, Trademark, Industrial design,</p> <p>2.2 Geographical indications, Integrated circuits, Trade secrets.</p> <p>2.3 Patents, Patents Act 1970 and Patent system in India, patentability,</p> <p>2.4 Process and product patent, filing of patent,</p> <p>2.5 Patent specification, patent claims, Patent opposition and revocation, infringement,</p> <p>2.6 Compulsory licensing, Patent Cooperation Treaty, Patent search and patent database.</p>	<p>Finding the zone wise patent filing procedure in India.</p>

Suggested Sessional work

Model: Making flowchart depicting filing and obtaining patent

21AG527.03: Identification and guideline for registration of new plant varieties

Approximate Hours

Item	Appx Hrs
CI	02
LI	00
SW	00
SL	01
Total	03

Session Outcomes (SOs)	Laboratory Instructions (LI)	Classroom Instructions (CI)	Self-Learning (SL)
<p>SO3.1 Identify the criteria of new plant variety at international level</p> <p>SO3.2 Identify the Indian legislation for protection of new plant varieties</p>		<p>Unit III: Identification and guideline for registration of new plant varieties at global and national level</p> <p>3.1 Origin and history including a brief introduction to UPOV for protection of plant varieties,</p> <p>3.2 Protection of plant varieties under UPOV and PPV&FR Act of India, Plant breeders' rights.</p>	Learn the DUS characters of specified crop

21AG527.04: Registration of Breeder’s right and Traditional Knowledge

Approximate Hours

Item	Appx Hrs
CI	02
LI	00
SW	00
SL	00
Total	02

Session Outcomes (SOs)	Laboratory Instructions (LI)	Classroom Instructions (CI)	Self-Learning (SL)
<p>SO4.1 Describe the procedure of registering new plant varieties and obtaining breeder’s right</p> <p>SO4.2 Identifying and protecting local information of human welfare</p>		<p>Unit IV: Breeder’s right and Traditional Knowledge</p> <p>4.1 Registration of plant varieties under PPV&FR Act 2001, breeders, researcher and farmers rights.</p> <p>4.2 Traditional knowledge-meaning and rights of TK holders.</p>	

21AG527.05: Important treaties for human welfare and conservation of nature

Approximate Hours

Item	Appx Hrs
CI	02
LI	00
SW	00
SL	00
Total	02

Session Outcomes (SOs)	Laboratory Instructions (LI)	Classroom Instructions (CI)	Self-Learning (SL)
<p>SO5.1 Recall the treaty and enumerate its provisions for conservation of nature.</p> <p>SO5.2 Recall the ITPGRFA treaty and understand its salient features.</p>		<p>Unit V: Important treaties for human welfare and conservation of nature</p> <p>5.1 Convention on Biological Diversity, Indian Biological Diversity Act, 2002 and its salient features, access and benefit sharing.</p> <p>5.2 International treaty on plant genetic resources for food and agriculture (ITPGRFA). Indian Biological Diversity Act, 2002 and its salient features, access and benefit sharing.</p>	

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class ecture (CL)	Sessional Work (SW)	Self- Learning (SL)	Total hour (CL+SW+SL)
21AG527.01: Introduction to IPR and various trade related IPR	3	0	0	3
21AG527.02: Product specific Intellectual Property Rights	6	3	1	10
21AG527.03: Identification and guideline for registration of new plant varieties	2	0	1	3
21AG527.04: Registration of Breeder's right and Traditional Knowledge	2	0	0	2
21AG527.05: Important treaties for human welfare and conservation of nature	2	0	0	2
Total Hours	15	3	2	20

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO1	Introduction to IPR and various trade related IPR	6	4	6	10
CO2	Product specific Intellectual Property Rights	4	6	4	10
CO3	Identification and guideline for registration of new plant varieties	0	6	4	10
CO4	Registration of Breeder's right and Traditional Knowledge	4	6	0	10
CO5	Important treaties for human welfare and conservation of nature	6	4	0	10
Total		20	26	14	50

Legend: **R: Remember,** **U: Understand,** **A: Apply**
Suggested Learning Resources:

Sl. No.	Title	Author	Publisher	Edition & Year
1	IPR and Plant Breeders Rights	P.Singh	New Vishal Publications	2009
2	Plant Breeding: Principles and Method	B.D.Singh.	Kalyani Publications	2005

Cos, Pos and PSOs Mapping

Course Code: 21AG527

Course Title: Intellectual Property Rights

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprises with different	Hold a post on supply i administration and policy	Analyze and control commercial and economical process in the field of agriculture	Teach how to control and manage agricultural production	introduce general production technologies	Teach how to implement and manage production technologies	Prepare for managerial and social responsibilities	Student will identify differen underutilized crops	Student will practice different breeding technique used in crop production.	Student will recognize different insect pest and diseases and their symptoms of crops	Student will apply different recent techniques in crop production
21AG527.01: Introduction to IPR and various trade related IPR	1	3	3	2	2	2	3	3	3	3	3
21AG527.02: Product specific Intellectual Property Rights	1	3	3	2	1	2	2	3	3	3	3
21AG527.03: Identification and guideline for registration of new plant varieties	1	3	3	2	3	2	2	3	1	3	3
21AG527.04: Registration of Breeder's	1	3	2	2	2	3	3	3	1	3	3

right and Traditional Knowledge											
21AG527.05: Important treaties for human welfare and conservation of nature	1	3	2	2	1	1	2	3	2	3	3

Legend: 1 – Low, 2 – Medium, 3 – High

Curriculum Map: Intellectual Property Rights

Pos & PSOs	Cos No. & Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
PO1,2,3,4 PSO 1,2,3,4	CO1_21AG527_01 Students will develop understanding of intellectual property. Learn about different organizations of world trade and trade related IPR.	SO 1.1 SO1.2 SO1.3		Introduction and meaning of intellectual property, brief introduction to GATT, WTO, TRIPs and WIPO, Madrid protocol, Berne Convention, Budapest treaty, etc. legislations covering IPR in India 1.1, 1.2, 1.3	
PO1,2,3,4 PSO 1,2,3,4	CO2_21AG527_02 To impart the skills in patenting. Understanding of application procedure and execution.	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5		Copyrights, Trademark, Industrial design, Geographical indications, Integrated circuits, Trade secrets. Patents, Patents Act 1970 and Patent system in India, patentability, Process and product patent, filing of patent, Patent specification, patent claims, Patent opposition and revocation,	Finding the zone wise patent filing procedure in India.

		SO2.6		infringement, Compulsory licensing, Patent Cooperation Treaty, Patent search and patent database. 2.1, 2.2, 2.3, 2.4, 2.5, 2.6	
PO1,2,3,4 PSO 1,2,3,4	CO3_21AG527_03 Understanding the role of UPOV. Know about UPOV criteria of new plant varieties and its registration procedure.	SO3.1 SO3.2		Origin and history including a brief introduction to UPOV for protection of plant varieties, Protection of plant varieties under UPOV and PPV&FR Act of India, Plant breeders' rights. 3.1, 3.2	Learn the DUS characters of specified crop
PO1,2,3,4 PSO 1,2,3,4	CO4_21AG527_04 Know about registration of new plant varieties under PPV and FR act in India. Understanding of traditional knowledge as IPR.	SO4.1 SO4.2		Registration of plant varieties under PPV&FR Act 2001, breeders, researcher and farmers rights. Traditional knowledge-meaning and rights of TK holders. 4.1, 4.2	
PO1,2,3,4 PSO 1,2,3,4	CO5_21AG527_05 Student will have insight about need of conservation. Learn about important treaties in this regard.	SO5.1 SO5.2		Convention on Biological Diversity, Indian Biological Diversity Act, 2002 and its salient features, access and benefit sharing. International treaty on plant genetic resources for food and agriculture (ITPGRFA). Indian Biological Diversity Act, 2002 and its salient features, access and benefit sharing. 5.1, 5.2	

Course Code: 21AH521

Course-Livestock and Poultry Management

Pre-requisite: Student should have Cleared 4th Semester

Rational: The syllabus of this course gives the expected learning achievements both at the course and session levels, where students go through the various modes of instructions like Classroom Instruction (CI), Laboratory Instruction (LI), Sectional Work (SW) and Self Learning (SL). With the progression of course students are expected to show case their mastery of session out comes (SO's), impacting in the overall achievement of course outcomes (CO's) upon the courses conclusion.

Course Outcome:

CO-1: Develop and evaluate animal production and management systems by integrating knowledge of animal genetics, nutrition, reproduction, and other relevant disciplines and applying scientific and quantitative reasoning to solve real-world challenges.

CO-2: Locate, critically evaluate, and apply information from scholarly animal science literature and other sources to expand personal understanding and knowledge of animal sciences, providing a foundation for lifelong learning.

CO-3: Create and interpret graphs, tables and diagrams illustrating scientific data and concepts, and understand basic concepts relating to the design and analysis of research in the animal sciences.

CO-4: Communicate effectively about animal sciences to a range of audiences, both orally and in writing, using appropriate traditional and emerging media.

CO-5: Engage actively and effectively in discussion of complex issues relevant to the animal sciences by understanding and appreciating

Scheme of Studies:

Code	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			CI	LI	SW	SL	Total Study Hours CI+LI+SW+SL	
Program Core (PCC)	21AH521	Livestock and Poultry Management	3	1	0	0	3	3+1= 4

Legend:

CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others), **LI:** Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies), **SW:** Sessional Work (includes assignment, seminar, mini project etc.), **SL:** Self Learning, **C:** Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Code	Course Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
PCC	21AH521	Livestock and Poultry Management	15	30	0	0	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

Course Outcome (CT21AH521.1): Livestock’s role in national economy, reproduction in farm animals, housing for different livestock and poultry.

Approximate Hours	
Item	Appx.Hrs.
CI	9
LI	4
SW	1
SL	1
Total	15

Session Out comes (SO’s)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
<p>SO1.1 Understanding the definition of livestock.</p> <p>SO1.2 Knowledge of live stock species and reproduction process in animal.</p> <p>SO1.3 Knowing housing principles and space requirements. .</p> <p>SO1.4 Housing system In Poultry.</p> <p>SO1.5 Housing and farm building.</p>	<p>1.To know about external body parts of different species of livestock and poultry</p> <p>2.Handling and restraining of live stock and poultry birds</p>	<p>Unit-1. Classification of livestock, role of livestock and poultry in national economy.</p> <p>1.1Introduction to Farm livestock.</p> <p>1.2 Housing principles for farm animals.</p> <p>1.3 Reproduction in Farm animal.</p> <p>1.4 Male and Female reproductive organs.</p>	<p>1. Acquainting self learning over regional importance, benefits and problems related to livestock owners.</p> <p>2. Understanding basic features of reproduction in males and females livestock and poultry birds.</p> <p>3. Knowing selection of site for farm building, space requirements and layout and designs.</p>

SW-1 Suggested Seasonal Work(SW):

Assignments:

What is role of Livestock and Poultry in national economy? Explain with related data on relevant parameters.

CT 21AH521.2 : Management of calves, growing heifers and milch animals. Management of sheep, Goat and Swine . Incubation, hatching and brooding . Management of grower and layers .

Approximate Hours

Item	Appx.hrs.
CI	9
LI	4
SW	1
SL	1
Total	15

Sessional Outcomes (SO's)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO2.1 To know aspects of calf management.</p> <p>2 Importance of heifers and their management</p> <p>Principles of managing the milking animals.</p> <p>4 Sheep, Goat, Pigs and poultry management.</p> <p>5 Incubation & hatching layers Management.</p>	<p>Handling and restraining of livestock, milking methods and clean milk production.</p> <p>Identification methods of farm animals and poultry , hatchery management and poultry equipments.</p>	<p>Unit-2 Management of young, adult and milking animals. Management of layer birds.</p> <p>2.1. Care of calf before and after birth.</p> <p>2.2 Heifer management, their feeding and housing requirement.</p> <p>2.3 Managemtn of milking cows & Buffalos.</p> <p>2.4Managemt of sheep, Goat & Pigs.</p> <p>2.5 Management of Poultry.</p>	<p>How to approach animals for controlling during different operations.</p> <p>How to care and manage the layers.</p>

SW-2 Suggested Sessional Work (SW):

a. Assignments:

1. Preparation of labeled diagrams of cattle, Buffalo, Sheep, Goat, Pigs and Poultry.
2. What are different identification methods of farm animals?
3. Describe milking methods and clean milk production.

CT 21AH521.3: Important Indian and exotic breeds of cattle, Buffalo, sheep, goat, swine and poultry.

Approximate Hours

Item	Appx. Hrs.
CI	9
LI	4
SW	1
SL	1
Total	15

Seasonal Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO3.1 Understand cattle breeds</p> <p>SO3.2 Understand Buffalo breeds.</p> <p>SO3.3 Understand sheep & poultry breeds.</p> <p>SO3.4 Discuss improvement of farm animals.</p> <p>SO3.5. Understanding digestion in livestock and poultry.</p>	<p>1.1 Visit to Instructional Dairy Farm to learn livestock breeds.</p> <p>1.2 Visit to Instructional poultry farm.</p>	<p>Unit-3: Important Indian and exotic breeds of cattle, Buffalo, sheep, goat, swine and poultry. Improvement of farm animals and poultry, Digestion in live stock and poultry.</p> <p>3.1 Indian and exotic cattle and buffalo breeds.</p> <p>3.2 Indian and exotic breeds of sheep goat.</p> <p>3.3 Different breeds of swine.</p> <p>3.4 Improvement of live stock and poultry.</p> <p>3.5 Understanding digestion in live stock animals.</p>	<p>i. Learning breed models and important traits of cattle, buffalo, sheep, goat & Poultry.</p> <p>ii. Understating system and methods of breeding for their improvement.</p> <p>iii. Basic different in digestion process in ruminant & non-ruminant</p>

SW-3 Suggested Sessional Work (SW):

Assignments:

- i. Breeds Characteristics of cattle raised in AKS Instructional Dairy farm and different management practices adapted.
- ii. Classification of Indian and Exotic breeds of poultry raised at Instructional Poultry farm of AKS University along with routine management practices adapted.

CT 21AH521.4: Classification of feedstuffs. Proximate principles of feed, nutrients and their functions. Feed ingredients for ration for livestock and poultry.

Approximate Hours

Item	Appx. Hrs
CI	09
LI	06
SW	01
SL	01
Total	15

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO4.1 Understanding Concentrate & Roughage.</p> <p>SO4.2 Knowledge of Classification of feedstuffs.</p> <p>SO4.3 Knowledge of type of Ration.</p>	<p>1.Computation of rations for livestock.</p> <p>2.Formulation of concentrate mixtures.</p>	<p>Unit-4 : Identification Farm Animal & Poultry Feeds.</p> <p>4.1 Classification of feedstuffs.</p> <p>4.2 Proximate principles of feed.</p> <p>4.3Nutrients and their functions.</p> <p>4.4Feed ingredients for ration for livestock and poultry.</p>	<p>i. Understanding of different fodder crops.</p> <p>ii. Knowing the Computation of Ration Mixture.</p>

SW-4 Suggested Sessional Work (SW):

a)Assignments: 1.What is Role of balance ration in Milk Production & Poultry Egg Production.

CT 21AH521.5: Feed supplements and feed additives. Feeding of livestock and poultry. Introduction of livestock and poultry diseases. Prevention (including vaccination schedule) and control of important diseases of livestock and poultry.

Approximate Hours

Item	Appx Hrs
CI	09
LI	04
SW	01
SL	01
Total	15

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO5.1 Understanding the Livestock and Poultry Diseases</p> <p>SO5.2 Knowledge of Prevention, Control & Eradication.</p> <p>SO5.3 Learning about the Vaccination Schedule.</p> <p>SO4.4 Knowing the Contagious and Non-contagious Diseases .</p>	<p>1. Management of chicks, growers and layers. Debeaking, dusting and vaccination.</p> <p>2. Economics of cattle, buffalo, sheep, goat, swine and poultry production.</p>	<p>Unit-5 : Introduction of livestock and poultry diseases.</p> <p>5.1 Feed supplements and feed additives.</p> <p>5.2 Feeding of livestock and poultry.</p> <p>5.3 Introduction of livestock and poultry diseases.</p> <p>5.4 Prevention (including vaccination schedule) and control of important diseases of livestock and poultry.</p>	<p>1. Knowing the Prevention & Control of Livestock & Poultry Diseases.</p> <p>2. Learning about the Different Vaccination schedules in Livestock & Poultry Diseases.</p>

SW-5 Suggested Sessional Work (SW):

- a) Assignments:** 1. Role of feed Additives for improvement of milk production.
2. Livestock & Poultry Vaccination Schedule .

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (CL)	Laboratory Instruction (LI)	Sessional Work (SW)	Self Learning (SL)	Total hour (CL+SW+SL)
CO-1: Develop and evaluate animal production and management systems by integrating knowledge of animal genetics, nutrition, reproduction, and other relevant disciplines and applying scientific and quantitative reasoning to solve real-world challenges.	09	4	1	1	15
CO-2: Locate, critically evaluate, and apply information from scholarly animal science literature and other sources to expand personal understanding and knowledge of animal sciences, providing a foundation for lifelong learning.	09	4	1	1	15
CO-3: Create and interpret graphs, tables and diagrams illustrating scientific data and concepts, and understand basic concepts relating to the design and analysis of research in the animal sciences.	09	4	1	1	15
CO -4: Communicate effectively about animal sciences to a range of audiences, both orally and in writing, using appropriate traditional and emerging media..	09	6	1	1	17
CO -5: Engage actively and effectively in discussion of complex issues relevant to the animal sciences by understanding and appreciating a. the importance of animals to the health and well-being of society; b. economic, environmental, animal welfare, and societal impacts of animal production and management systems at the global and local level; c. varied ethical perspectives on animal practices; d. the role of science in informing debates.	09	4	1	1	15
Total Hours	45	22	5	5	77

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Role of livestock in the national economy.	04	06	-	10
CO-2	Management of calves, growing heifers and milch animals.	03	07	-	10
CO-3	Important Indian and exotic breeds of cattle, buffalo, sheep, goat, swine and poultry. Improvement of farm animals and poultry.	04	07	-	11
CO-4	Classification of feedstuffs.	03	06	-	09
CO-5	Introduction of livestock and poultry diseases.	03	07	-	10
Total		17	33	-	50

Legend: R: Remember, U: Understand, A: Apply

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Visit to Animal & Poultry Unit
6. Demonstration
7. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, Whatsapp, Mobile, Online sources)
8. Brainstorming

Suggested Learning Resources:

(a) Books :

S. No.	Title	Author	Publisher	Edition & Year
1	Hand Book Of Animal Husbandry	ICAR	Bio-Green Book	2017
2	Hand Book Of Poultry Farming & feed Formulation	Ramesh Nandan	Anmol Publications	2015
3	Animal Husbandry & Dairy Science.	Jagdish Prasad	Kalyani Publishers	3 rd Edition,2001
4	Sheep, Goat And Swine Production And Management.	Jagdish Prasad	Kalyani Publishers	3 rd Edition, 2007

Cos, Pos and PSOs Mapping

Course Code: 21AH521

Course Title: Livestock and Poultry Management

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprises with different scale in area of agricultural production,	Hold a post on supply i administration and policy	Analyze and control commercial and economical process in the field of agriculture	Teach how to control and manage agricultural production	Introduce general production	Teach how to implement and manage production technologies	Prepare for managerial and social responsibilities	Student will identify different underutilized crops	Student will practice different breeding techniques used in crop production.	Student will recognize different insect pest and diseases and their symptoms of crops	Student will apply different recent techniques in crop production
21AH521.1: Develop and evaluate animal production and management systems by integrating knowledge of animal genetics, nutrition, reproduction, and other relevant disciplines and applying scientific and quantitative reasoning to solve real-world challenges.	1	2	1	1	2	2	3	1	1	1	1
21AH521.2: Locate, critically evaluate, and apply information from scholarly animal science literature and other sources to expand personal understanding and knowledge of animal sciences, providing a foundation for lifelong learning.	2	2	1	1	1	2	2	1	1	1	1
21AH521.3: Create and interpret graphs, tables and diagrams illustrating scientific data and concepts, and understand basic concepts relating to the design and analysis	2	2	1	1	1	2	3	1	1	1	1

of research in the animal sciences.											
21AH521.4: Communicate effectively about animal sciences to a range of audiences, both orally and in writing, using appropriate traditional and emerging media..	3	2	1	1	2	1	3	1	1	1	1
21AH521.5: Engage actively and effectively in discussion of complex issues relevant to the animal sciences by understanding and appreciating a. the importance of animals to the health and well-being of society; b. economic, environmental, animal welfare, and societal impacts of animal production and management systems at the global and local level; c. varied ethical perspectives on animal practices; d. the role of science in informing debates.	2	3	1	1	3	2	2	1	1	1	1

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map: Livestock and Poultry Management

Pos & PSOs	Cos No. & Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
PO1,2,3,4,5,6,7 PSO 1,2,3,4	Develop and evaluate animal production and management systems by integrating knowledge of animal genetics, nutrition, reproduction, and other relevant disciplines and applying scientific and quantitative reasoning to solve real-world challenges.	SO 1.1 SO 1.2 SO 1.3 SO 1.4 SO 1.5	1.1 To know about external body parts of different species of livestock and poultry 1.2 Handling and restraining of live stock and poultry birds	Classification of livestock, Role of livestock in national economy, Role of Poultry in national economy, Introduction to Farm livestock, Housing principles for farm animals, Space Requirement of Farm Animals, Reproduction in Farm animal, Reproduction of Male organs, Female reproductive organs, Reproduction of Poultry. 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9	1. Acquainting self learning over regional importance, benefits and problems related to livestock owners. 2. Understanding basic features of reproduction in males and females livestock and poultry birds. 3. Knowing selection of site for farm building, space requirements and layout and designs.
PO1,2,3,4,5,6,7 PSO 1,2,3,4	Locate, critically evaluate, and apply information from scholarly animal science literature and other sources to expand personal understanding and knowledge of animal sciences,	SO 2.1 SO 2.2 SO 2.3 SO 2.4 SO 2.5	2.1 Milking methods and clean milk production. 2.2 Identification methods of farm animals and poultry, hatchery management and poultry equipments	Care of calf before and after birth. Heifer management feeding and housing requirement. Management of milking cows & Buffalos. Management of sheep, Goat and Swine . Management of Broiler and Layer. 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9	ii. How to approach animals for controlling during different operations. How to care and manage the layers.

	providing a foundation for lifelong learning				
PO1,2,3,4,5,6,7 PSO 1,2,3,4	Create and interpret graphs, tables and diagrams illustrating scientific data and concepts, and understand basic concepts relating to the design and analysis of research in the animal sciences	SO 3.1 SO 3.2 SO 3.3 SO 3.4 SO 3.5	3.1 Visit to Instructional Dairy Farm to learn livestock breeds. 3.2 Visit to Instructional poultry farm.	Indian and exotic cattle ,buffalo, sheep, goat, Swine and Poultry Breed. Improvement of live stock and poultry, Understanding digestion in livestock animals. 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9	i. Learning breed models and important traits of cattle, buffalo, sheep, goat & Poultry. ii. Understanding system and methods of breeding for their improvement. Basic difference in digestion process in ruminant & non-ruminant
PO1,2,3,4,5,6,7 PSO 1,2,3,4	Communicate effectively about animal sciences to a range of audiences, both orally and in writing, using appropriate traditional and emerging media	SO 4.1 SO 4.2 SO 4.3	4.1 Computation of rations for livestock. 4.2 Formulation of concentrate mixtures.	Identification of Farm Animal & Poultry Feed, Classification of feedstuffs, Proximate principles of feed, Nutrients and their functions, 4.8 Feed ingredients for ration for livestock & Poultry. 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9	Understanding of different fodder crops. Knowing the Computation of Ration Mixture
PO1,2,3,4,5,6,7 PSO 1,2,3,4	Engage actively and effectively in discussion of complex issues relevant to the animal sciences by understanding and appreciating a. the importance of animals to the health and well-being of society	SO 5.1 SO 5.2 SO 5.3 SO 5.4	5.1 Management of chicks, growers and layers. Debeaking, dusting and vaccination. 5.2 Economics of cattle, buffalo, sheep, goat, swine and poultry production.	Feed supplements and Feed additives, Feeding of livestock & poultry, Introduction of livestock Diseases & poultry diseases, Prevention (including vaccination schedule) Control of important diseases of livestock & Poultry. 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9	1. Knowing the Prevention & Control of Livestock & Poultry Diseases. 2. Learning about the Different Vaccination schedules in Livestock & Poultry Diseases.

Course Code: 21EN530
Course Title : Pest of Crops and Stored grain and their Management
Pre- requisite: Student should have basic knowledge of crop pest, insect's life stages and storage procedures.

Rationale: The students studying confident to address the insect pest problems of farmers both under field and storage conditions so that immediate steps can be taken up by the stakeholders to keep the pest population under check and to avoid significant crop damage.

Course Outcomes:

21EN530.1: Understand the damage symptoms and systematic positions of various insect pest and non-insect pest.

21EN530.2: Acquired the knowledge about different crop-based insect pest, understanding their nature of the damage, identifying weak links in their life cycle, and utilizing economic and ecofriendly techniques of management in a compatible manner in order to maintain the pest population at levels below those causing economic injury/damage.

21EN530.3: Assess the causes of grain deterioration during storage by mechanical, chemical physical and biological factors.

21EN530.4: Advocate the sustainable ecofriendly integrated pest management strategies of insect pest and non-insect pest.

21EN530.5: Gain knowledge about different methods of storage and preservation the quality of grain and protect them from pests and other potential contaminant

Scheme of Studies:

Code	Course Code	Course Title	Scheme of studies(Hours/Week)				Total Study Hours (CI+LI+SW+SL)	Total Credits (C)
			CI	LI	SW	SL		
Program Core (PCC)	21EN530	Pest of Crops and stored grain and their management	2	1	1	1	7	3

Scheme of Assessment:

Theory

Code	Course Code	Course Title	Scheme of Assessment (Marks)							End Semester Assessment (ESA)	Total Marks (PRA+ESA)
			Progressive Assessment (PRA)						Total Marks (CA+CT+SA+CAT+AT)		
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CA T)	Class Attendance (AT)				
Program Core (PCC)	21EN530	Pest of Crops and stored grain and their management	15	20	5	5	5	50	50	100	

21EN530.1: Understand the damage symptoms and systematic positions of various insect pest and non-insect pest.

Approximate Hours

Item	AppX Hrs
CI	06
LI	04
SW	1
SL	1
Total	12

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO1.1 Understand different classes and characters of Arthropoda phylum.</p> <p>SO1.2 Knowledge about nomenclature and systematic position.</p> <p>SO1.3 Biology and host range of particular pest.</p> <p>SO1.4 Different stages of life cycles of various pests.</p> <p>SO1.5 Identification of damage symptoms of particular pest.</p>	<p>LI1.1 Identification of different types of damage.</p> <p>LI 1.2 Identification and study of life cycle of seasonal pest.</p>	<p>Unit-1.0 Introduction of Arthropoda pests</p> <p>1.1 General account on nature and type of damage by different arthropods pests.</p> <p>1.2 Scientific name, order, family of different arthropods pests.</p> <p>1.3 Host range, distribution, biology of different arthropods pests.</p> <p>1.4 Bionomics, nature of damage of different arthropods pests.</p>	<p>1. Characteristics of Arthropods.</p> <p>2. Classification and biology of different arthropods.</p>

SW-1 Suggested Sessional Work (SW):

a. Assignments:

- i. Collection and preservation of different types of damage symptoms.

b. Mini Project:

- i. Flow diagram of phylum Arthropoda up to their classes.

c. Other Activities(Specify):

Visit agriculture field to identify different insect pests based on their morphology.

21EN530.2: Acquired the knowledge about different crop-based insect pest, understanding their nature of the damage, identifying weak links in their life cycle, and utilizing economic and ecofriendly techniques of management in a compatible manner in order to maintain the pest population at levels below those causing economic injury/damage.

Approximate Hours

Item	AppX Hrs
CI	06
LI	04
SW	1
SL	1
Total	12

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO2.1 To Understand the nature of damage and IPM practices of Field crop pest.</p> <p>SO2.2 To learn about nature of damage and economy control practices of vegetable crop pest.</p> <p>SO2.3 To Understand the nature of damage and IPM practices of fruit crop pest.</p> <p>SO2.4 To learn about nature of damage and economy control practices of plantation and narcotics crop pest.</p> <p>SO2.5 To Understand the nature of damage and IPM practices of spices and condiment crop pest.</p>	<p>LI 2.1 History of various insect pests attacking crops and their produce: (a) Field Crops; (b) Vegetable Crops; (c) Fruit Crops; (d) Plantation, gardens, Narcotics, spices & condiments.</p> <p>LI 2.2 Determination of insect infestation by different methods.</p>	<p>Unit-2 : Damage and Management</p> <p>2.1 Management of major pests and scientific name, order, family, host range, distribution, nature of damage and control practice other important arthropod pests of various field crop.</p> <p>2.2 Management of major pests and scientific name, order, family, host range, distribution, nature of damage and control practice other important arthropod pests of various vegetable crop.</p> <p>2.3 Management of major pests and scientific name, order, family, host range, distribution, nature of damage and control practice other important arthropod pests of various fruit crop.</p> <p>2.4 Management of major pests and scientific name, order, family, host range, distribution, nature of damage and control practice other important arthropod pests of various plantation crop.</p> <p>2.5 Management of major pests and scientific name, order, family, host range, distribution, nature of damage and control practice other important arthropod pests of various ornament crop.</p> <p>2.6 Management of major pests and scientific name, order, family, host range, distribution, nature of damage and control practice other important arthropod pests of various spices and condiment crop.</p>	<p>1. Management practices including physical, cultural, mechanical biological and chemical practices of concern crop pests.</p>

SW-2

Suggested Sessional Work(SW):

a. Assignments:

i. Physical, Chemical Cultural and Biological control of field,vegetable ,fruits and ornamental crop pest.

b. Mini project: Make a flow chart of different crop pest.

c. Other Activities(Specify):

Visit agriculture field and observe nature of damage and symptoms of damage caused by different insect pest.

21EN530.3: Assess the causes of grain deterioration during storage by mechanical, chemical physical and biological factors.

Approximate Hours

Item	AppX Hrs
CI	06
LI	06
SW	1
SL	1
Total	14

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO3.1 Types of losses, qualitative and quantitative.</p> <p>SO3.2 Basics of grain storage</p> <p>SO3.3 Negative impact of chemicals and physical components on grain quality.</p> <p>SO3.4 Damage caused to grain by machine and living organism.</p> <p>SO3.5 Properties of qualitative grain.</p>	<p>LI3.1 Assessment of losses due to insects.</p> <p>LI3.2: Calculations on the doses of insecticides application technique.</p> <p>LI3.3 Determination of moisture content of grain.</p>	<p>Unit-3: Type of factors and losses</p> <p>3.1 Factors affecting losses of stored grain.</p> <p>3.2 Role of physical factor such as, temperature, time, humidity and light etc. in grain lose.</p> <p>3.3 Role of chemical factor in grain lose.</p> <p>3.4 Role of Mechanical factor in grain lose.</p> <p>3.5 Role of biological factor in grain lose.</p>	<p>i. Type of post-harvest losses.</p> <p>ii. Causal factors of postharvest losses.</p>

SW-3 Suggested Sessional Work (SW):

a. Assignments:

Factors affecting losses during storage condition.

b. Mini Project:

Visit nearest godowns and collect recent year data of grain loss.

c. Other Activities (Specify):

Search innovative techniques of grain storage.

CT 101.4: Advocate the sustainable ecofriendly integrated pest management strategies of insect pest and non-insect pest.

Approximate Hours

Item	AppX Hrs
CI	06
LI	08
SW	1
SL	1
Total	16

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO4.1 Identification of mite and insect pest and their damaging stages.</p> <p>SO4.2 Understanding the safe and ecofriendly control practices under storage condition.</p> <p>SO4.3 Understanding the damaging nature of rodent pest and their sage management procedure.</p> <p>SO4.4 Management of bird pest in open area.</p> <p>SO4.5 Understanding the fumigation process and precautions during application of fumigants.</p>	<p>LI4.1 Identification of insect pests and Mites associated with stored grain.</p> <p>LI4.2 Identification of rodents and rodent control operations in godowns.</p> <p>LI4.3 Identification of birds and bird control operations in godowns.</p> <p>LI4.4 Fumigation of grain store / godown.</p>	<p>Unit-4 : Storage pest and their Management:</p> <p>4.1 Insect pests of stored grain and their Management.</p> <p>4.2 Mite pests of stored grain and their Management.</p> <p>4.3 Rodent pests of stored grain and their Management.</p> <p>4.4 Bird pests of stored grain and their Management.</p> <p>4.5 Microorganisms associated with stored grain and their Management.</p>	<p>i. Preparation of control practice flow chart of stored grain pest.</p>

SW-4 Suggested Sessional Work (SW):

a. Assignments:

Making a list of different pests affecting stored grain and listing their harmful conditions and control practices.

d. Mini Project:

Collection and preservation of stored grain insect pests.

e. Other Activities (Specify):

Visit FCI/CWC and farmers godowns for observation of different storage pest.

21EN530.5: Gain knowledge about different methods of storage and preservation the quality of grain and protect them from pests and other potential contaminants.

Approximate Hours

Item	AppX Hrs
CI	06
LI	02
SW	1
SL	1
Total	10

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO5.1 Information about ideal and scientific storage structure.</p> <p>SO5.2 Over view of various regulatory bodies in India dedicated for Cement Industry</p> <p>SO5.3 Role of storage principles in maintaining the quality of grains.</p> <p>SO5.4 Overview of Merits and demerits of traditional and modern methods of storage.</p> <p>SO5.5 Basic requirement for safe storage of grain.</p>	<p>LI5.1 Methods of grain sampling under storage condition.</p>	<p>Unit 5: Principles and method of Storage:</p> <p>5.1Types of storage structure.</p> <p>5.2Traditional methods of Storage.</p> <p>5.3Modern and scientific method of storage.</p> <p>5.4Fundamental principles of storage.</p> <p>5.5Definition and guideline of grain storage.</p>	<p>1. Guideline of grain storage by food corporation of India.</p> <p>2. Different methods of grain storage.</p>

SW-5 Suggested Sessional Work (SW):

a. Assignments:

Listing the location and establishment year of Government and Semi-Government Warehousing Agencies in India.

b. Mini Project: Making comparative charts with pictures of modern and traditional methods of storage

- c. **Other Activities (Specify):** To prepare a list of quality and shortcomings by surveying the commodities and FCI godowns operating within the district

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Laboratory Instructions (LI)	Sessional Work (SW)	Self Learning (Sl)	Total hour (Cl+SW+Sl)
21EN530.1: Understand the damage symptoms and systematic positions of various insect pest and non-insect pest.	6	4	1	1	12
21EN530.2: Acquired the knowledge about different crop-based insect pest, understanding their nature of the damage, identifying weak links in their life cycle, and utilizing economic and ecofriendly techniques of management in a compatible manner in order to maintain the pest population at levels below those causing economic injury/damage.	6	4	1	1	12
21EN530.3: Assess the causes of grain deterioration during storage by mechanical, chemical physical and biological factors.	6	6	1	1	14
21EN530.4: Advocate the sustainable ecofriendly integrated pest management strategies of insect pest and non-insect pest.	6	8	1	1	16
21EN530.5: Gain knowledge about different methods of storage and preservation the quality of grain and protect them from pests and other potential contaminants.	6	2	1	1	10
Total Hours	30	24	5	5	64

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Introduction of Arthropoda Pests	03	01	01	05
CO-2	Damage and Management	06	02	02	10
CO-3	Type of Factors and Losses	07	03	05	15
CO-4	Storage pest and their Management	7	3	05	15
CO-5	Principles and method of Storage	04	01	-	05
Total		27	10	13	50

Legend: **R: Remember,** **U: Understand,** **A: Apply**

The end of semester assessment for Introduction to Portland cement will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Visit to agriculture field, FCI, farmers godowns and other commodities.
7. Demonstration/collection and preservation of insect pest
8. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, Whatsapp, Mobile, Online sources)
9. Brainstorming

Suggested Learning Resources:**(a) Books :**

S.N o.	Title	Author	Publisher	Edition & Year
1	Stored grain Pests and their Management	S.P. Khare	Kalyani publisher, Ludhiana	1993
2	Agricultural Pests of India and South East Asia	A.S. Atwal	Kalyani publisher, Ludhiana	1976
3	Elements of Economic Entomology.	B. David Vasantharaj	Popular Book Depot, Coimbatore.	2003
4	General and Applied Entomology	B. David, Vasantharaj and T.N. Ananthakrishnan	Tata McGraw-Hill Publishing House, New Delhi.	2006
5	Practical Manual			
6	Lecture note provided by Dept. of Entomology, AKS University, Satna			

Curriculum Development Team

1. Associate Professor Dr Rama Sharma, HOD Entomology Dept., AKS University

Cos, Pos and PSOs Mapping

Course Code: 21EN530

Course Title: Pests of Crops and Stored Grain and their Management

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprises with different scales in area of agricultural production, process and trade	Hold a post on supply in administrative and policy	Analyze and control commercial and economical process in the field of agriculture	Teach how to control and manage agricultural production	Introduce general production technologies	Teach how to implement and manage production technologies	Prepare for managerial and social responsibilities	Student will identify different underutilized crops	Student will practice different breeding techniques used in crop production.	Student will recognize different insect pest and diseases and their symptoms on crops	Student will apply different recent techniques in crop production
21EN530.1: Understand the damage symptoms and systematic positions of various insect pest and non-insect pest.	2	2	3	2	2	1	2	2	1	1	2
21EN530.2: Acquired the knowledge about different crop-based insect pest, understanding their nature of the damage, identifying weak links in their life cycle, and utilizing economic and ecofriendly techniques of management in a compatible manner in order to maintain the pest population at levels below those causing economic injury/damage.	1	2	2	3	2	3	2	2	2	1	2
21EN530.3: Assess the causes of grain deterioration during storage	2	2	3	3	2	1	2	1	2	1	1

by mechanical, chemical physical and biological factors.											
21EN530.4: Advocate the sustainable ecofriendly integrated pest management strategies of insect pest and non-insect pest.	2	1	1	2	3	2	2	1	1	2	2
21EN530.5: Gain knowledge about different methods of storage and preservation the quality of grain and protect them from pests and other potential contaminants.	1	2	2	3	1	2	2	1	2	2	1

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map: Pest of Crops and Stored grain and their Management

Pos & PSOs	Cos No. & Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
PO1,2,3,4,5,6,7 PSO 1,2,3,4	1. Understand the damage symptoms and systematic positions of various insect pest and non-insect pest.	SO 1.1 SO 1.2 SO 1.3 SO 1.4 SO 1.5	1.1 Identification of different types of damage. 1.2 Identification and study of life cycle of seasonal pest.	General account on nature. Type of damage by different arthropods pests. Scientific name, order, family of different arthropods pests. Host range, distribution, biology of different arthropods pests. Bionomics, nature of damage of Sucking type of pests. Bionomics, nature of damage of different biting chewing type of pests. 1.1, 1.2, 1.3,1.4,1.5,1.6	Characteristics of Arthropods. Classification and biology of different arthropods
PO1,2,3,4,5,6,7 PSO 1,2,3,4	2. Acquired the knowledge about different crop-based insect pest, understanding their nature of the damage, identifying weak links in their life cycle, and utilizing economic and ecofriendly techniques of management in a compatible manner in order to maintain the pest population at levels below those causing economic injury/damage.	SO 2.1 SO 2.2 SO 2.3 SO 2.4 SO 2.5	2.1 History of various insect pests attacking crops and their produce: (a) Field Crops; (b) Vegetable Crops; (c) Fruit Crops; (d) Plantation, gardens, Narcotics, spices & condiments. 2.2 Determination of insect infestation by different methods.	Management of major pests and scientific me, order, family, host range, strribution, nature of damage and control actice other important arthropod pests of rious field crop. anagement of major pests and scientific me, order, family, host range, strribution, nature of damage and control actice other important arthropod pests of rious vegetable crop. anagement of major pests and scientific me, order, family, host range, strribution, nature of damage and control actice other important arthropod pests of rious fruit crop. anagement of major pests and scientific me, order, family, host range, strribution, nature of damage and control actice other important arthropod pests of rious plantation crop. anagement of major pests and scientific me, order, family, host range, strribution, nature of damage and control	Management practices including physical, cultural, mechanical biological and chemical practices of concern crop pests.

				<p>practice other important arthropod pests of various ornamental crop.</p> <p>Management of major pests and scientific name, order, family, host range, distribution, nature of damage and control practice other important arthropod pests of various spices and condiment crop.2.1,2.2,2.3,2.4,2.5,2.6</p>	
PO1,2,3,4,5,6,7 PSO 1,2,3,4	3. Assess the causes of grain deterioration during storage by mechanical, chemical physical and biological factors.	SO 3.1 SO 3.2 SO 3.3 SO 3.4 SO 3.5	<p>3.1 Assessment of losses due to insects.</p> <p>3.2: Calculations on the doses of insecticides application technique.</p> <p>3.3 Determination of moisture content of grain.</p>	<p>Factors affecting losses of stored grain. Role of physical factor such as, temperature, time, humidity and light etc. in grain loss.</p> <p>Role of chemical factor in grain loss.</p> <p>Role of Mechanical factor in grain loss.</p> <p>Role of biological factor in grain loss.</p> <p>Role of birds and rodents in grain loss.3.1,3.2,3.3,3.4,3.5,3.6</p>	Type of post-harvest losses. Causal factors of postharvest losses.
PO1,2,3,4,5,6,7 PSO 1,2,3,4	4. Advocate the sustainable ecofriendly integrated pest management strategies of insect pest and non-insect pest.	SO 4.1 SO 4.2 SO 4.3 SO 4.4 SO 4.5	<p>4.1 Identification of insect pests and Mites associated with stored grain.</p> <p>4.2 Identification of rodents and rodent control operations in godowns.</p> <p>4.3 Identification of birds and bird control operations in godowns.</p> <p>4.4 Fumigation of grain store / godown.</p>	<p>Insect pests of stored grain and their Management.</p> <p>Mite pests of stored grain and their Management.</p> <p>Rodent pests of stored grain and their Management.</p> <p>Bird pests of stored grain and their Management.</p> <p>Microorganisms associated with stored grain</p> <p>Various Management practices during storage.</p> <p>4.1,4.2,4.3,4.4,4.5,4.6</p>	Preparation of control practice flow chart of stored grain pest.
PO1,2,3,4,5,6,7 PSO 1,2,3,4	5: Gain knowledge about different methods of storage and preservation the quality of grain and protect them from pests and other potential contaminants.	SO 5.1 SO 5.2 SO 5.3 SO 5.4	5.1 Methods of grain sampling under storage condition	<p>Types of storage structure.</p> <p>Traditional methods of Storage.</p> <p>Modern and scientific method of storage.</p> <p>Merits and demerits of storage methods.</p> <p>Fundamental principles of storage.</p> <p>Definition and guideline of grain storage.</p> <p>5.1,5.2,5.3,5.4,5.5,5.6</p>	Guideline of grain storage by food corporation of India. Different methods of grain storage.

Course Code: 21SC623
Course Title : Problematic soils and their management
Pre- requisite: Student should have basic knowledge about the climatic situation of India and world. Study of India and world.
Rationale: The Student learn about various problematic soil and waste / barren lands distributed in all over the world and in India. Management of the problematic soils

Course Outcomes:

- 21SC623.1:** To learn the various problems occurs in Indian soils in maintain optimum nutrient availability and soil health, its sources with its area of distribution as per agro climatic zones of India.
- 21SC623.2:** To learn the various amelioration techniques for reclamation of different problematic soil for maintain proper soil health, its fertility and productivity.
- 21SC623.3:** To understand the various criteria of irrigation water suitable for maintaining optimum label of nutrient availability and high productivity in agriculture sector.
- 21SC623.4:** To assess the use of GIS system in locating the problematic soil. Land Suitable classification for different agricultural and nonagricultural activates.

Scheme of Studies:

Code	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Study Hours (CI+LI+SW+SL)	Total Credits (C)
			CI	LI	SW	SL			
Program Core (PCC)	21SC623	Problematic soils and their management	2	0	1	1	4	2	

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C:Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

Code	Course Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CA T)	Class Attendance (AT)	Total Marks (CA+CT+SA+CA T+AT)		
Program Core (PCC)	21SC623	Problematic soils and their management	10	40	0	0	0	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

21SC623.1: Soil quality and health and distribution of waste land and problem soil in India.

Approximate Hours

Item	AppX Hrs
CI	08
LI	0
SW	2
SL	1
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO1.1 To recollect the various problem occurs in Indian soils</p> <p>SO1.2 Distribution of waste land and their management in maintain optimum nutrient availability and soil health</p> <p>SO1.3 Chemical changes in Occurs in Problem soil</p>		<p>Unit-1.0 Soil health and quality To discuss about the soil quality and health. To distribution of waste land Problem soil in India and their management Categorization of problem soil of India Properties and management of problematic soil (Acidic/ basic/ barren / waste land)</p>	<p>1 Students differentiate between the cultivated and uncultivated land and their basic properties.</p>

SW-1 Suggested Sessional Work (SW):

a. Assignments:

i. Soil quality and health in details

b. Other Activities(Specify): NA

21SC623.2: Amelioration and identification of various problematic soils

Approximate Hours

Item	AppX Hrs
CI	8
LI	0
SW	2
SL	1
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO2.1: To learn the various amelioration techniques of different problematic soils of India</p> <p>SO2.2 To learn maintain proper soil health, its fertility and productivity.</p>		<p>Unit-2 : Reclamation and management of saline and sodic soil</p> <p>2.1 Amelioration of saline soil</p> <p>2.2 Amelioration of sodic soil</p> <p>2.3 Amelioration of Acidic soil</p> <p>2.4 Amelioration of acid-sulphate soil</p> <p>2.5 Discuss about management of flooded soil</p> <p>2.6 Discuss about management of Polluted soil</p>	<p>1.Chemical properties of various problem soil (pH, EC, ESP, and SAR)</p>

SW-2 Suggested Sessional Work(SW):

a. Assignments:

- i. Reclamation and management of saline and sodic soils
- ii. Formation and management of Eroded and compacted soil

b. Other Activities(Specify): NA

21SC623 .3: To understand the various standards and parameter used in classification of quality of good irrigated water

Approximate Hours

Item	AppX Hrs
CI	8
LI	0
SW	2
SL	2
Total	12

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO3.1 To learn various criteria of irrigation water suitable for maintaining optimum level of nutrient availability and high productivity in agriculture sector</p> <p>SO3.2 To assess the use of GIS system in locating the problematic soil</p>		<p>Unit-3 : Quality and standards of irrigated water</p> <p>Discuss about and standards of irrigated water Utilization and their impact of saline water in agriculture Uses of remote sensing in agriculture Management of problem soil through GIS techniques</p>	<p>Basic concept of use of GIS software , Basic knowledge and handling of Computer and internet</p>

SW-3 Suggested Sessional Work (SW):

a. Assignments:

- iii. Quality and standards of irrigation water in detail
- iv. Uses of remote sensing in agriculture

b. Other Activities (Specify):

NA

21SC623.4: To understand the representation of land capability classification and bioremediation of problematic soils

Approximate Hours

Item	AppX Hrs
CI	8
LI	0
SW	2
SL	1
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO4.1 To understand the basic criteria for distribution of land for different agricultural and nonagricultural activate.		<p>se of multi purpose tree species</p> <p>4.1 Introduction about multipurpose tree species</p> <p>4.2 Bio remediation through MPTS techniques of soil</p> <p>4.3 Classification and capability of land</p> <p>4.4 Land suitability classification</p>	Name of different multipurpose trees

SW-4 Suggested Sessional Work (SW):

a. Assignments:

- i. Land capability and classification in detail
- ii. Land suitability classification in detail

d. Other Activities (Specify): NA

21S623.5: Distribution of various problematic soils on the basis of Agro climatic zones of India

Approximate hours

Item	AppX Hrs
CI	8
LI	0
SW	2
SL	1
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO5.1 To discriminate the distribution of problematic soil in different agro climatic zones of India.		Unit 5: Management of problem soil under different Agro- eco system To know about different Agro ecosystem in India To know about different Agro ecosystem in world Management of problematic soil under different agro eco system	1. To study the map of India and world

SW-5 Suggested Sessional Work (SW):

a. Assignments:

- Management of problematic soil under different Agro- ecosystem
- To know about different agro ecosystem in India and world

b. Other Activities (Specify):

Distribution of various problematic soils in India in Map

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self Learning (Sl)	Total hour (Cl+SW+Sl)
21SC623.1: Soil quality and health and distribution of waste land and problem soil in India.	8	0	1	9
21SC623.2: Amelioration and identification of various problematic soils	8	0	1	9
21SC623 .3: To understand the various standards and parameter used in classification of quality of good irrigated water	8	0	2	10
21SC623 .4: To understand the representation of land capability classification and bioremediation of problematic soils	8	0	1	9
21SC623 .5: Distribution of various problematic soils on the basis of Agro climatic zones of India	8	0	1	9
Total Hours	40	0	6	46

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Soil health and quality	03	01	01	05
CO-2	Reclamation and management of saline and sodic soil	02	06	02	10
CO-3	Quality and standards of irrigated water	03	07	05	15
CO-4	Use of multi purpose tree species	02	05	03	10
CO-5	Management of problem soil under different Agro-eco system	03	03	04	10
Total		13	22	15	50

Legend: **R: Remember,** **U: Understand,** **A: Apply**

The end of semester assessment for Problematic soils and their management will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks.
Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Demonstration
7. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, Whatsapp, Mobile, Online sources)
8. Brainstorming

Suggested Learning Resources:

(a) Books :

S. No.	Title	Author	Publisher	Edition & Year
1	Chemistry of the Soil.	Bear FE.	Oxford & IBH.	1964
2	Department of Soil Science & Biometeorology.	Jurinak jj.	Utah State Univ	1978
3	Diagnosis and improvement of Saline and Alkali Soils.	USDA Handbook No. 60.	Oxford & IBH.	1954
4	Technologies for wasteland development,	I.P. and Dhurva narayana, V.V.	ICAR, New Delhi-110012	1998
5	Principles of remote sensing,	Cirsan Paul, J.	Longman, New York.	1985

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Cos, Pos and PSOs Mapping
Course Code: 21SC526
Course Title: Problematic Soils and their Management

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprises with different scales in area of agricultural production process and trade	Hold a post on supply i dministration and policy	Analyze and control ommercial and economic process in the field of agriculture	Teach how to control and manage agricultural production	Introduce general production technologies	Teach how to implement and manage production technologies	Prepare for managerial an social responsibilities	Student will identify different underutilized crops	Student will practice different breeding techniques used in crop production.	Student will recognize different insect pest and diseases and their symptoms.of.crons	Student will apply different techniques in crop production
21SC623.1: Soil quality and health and distribution of waste land and problem soil in India.	1	2	2	1	2	2	1	1	1	2	2
21SC623.2: Amelioration and identification of various problematic soils	2	1	1	2	1	2	2	2	1	1	1
21SC623.3: To understand the various standards and parameter used in classification of quality of good	2	2	1	1	2	2	3	2	1	1	1

irrigated water											
21SC623.4: To understand the representation of land capability classification and bioremediation of problematic soils	1	2	2	2	3	2	2	1	1	2	1
21SC623.5: Distribution of various problematic soils on the basis of Agro climatic zones of India	1	2	2	1	1	2	2	1	2	2	2

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map: 21SC623: Problem Soil and Their Management

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self Learning(SL)
PO 1,2,3,4 PSO 1,2, 3, 4	21SC623.1: Soil quality and health and distribution of waste land and problem soil in India.	SOs: 1.1, SOs:1.2, SOs:1.3	-	Unit-1.0 Soil health and quality 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8	As mentioned in page number 2 to 6
PO 1,2,3,4 PSO 1,2, 3, 4	21SC623.2: Amelioration and identification of various problematic soils	SOs: 1.1, SOs:1.2	-	Unit 2.0 Reclamation and management of saline and sodic soil 2.1, 2.2, 2.3, 2.4, 2.5,2.6,2.7,2.8	
PO 1,2,3,4 PSO 1,2, 3, 4	21SC623 .3: To understand the various standards and parameter used in classification of quality of good irrigated water	SOs: 3.1, SOs:3.2,	-	Unit-3.0: Quality and standards of irrigated water 3.1, 3.2,3.3,3.4,3.5,3.6,3.7,3.8	
PO 1,2,3,4 PSO 1,2, 3, 4	21SC623 .4: To understand the representation of land capability classification and bioremediation of problematic soils	SOs: 4.1	-	Unit-4.0 : Use of multi purpose tree species 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8	
PO 1,2,3,4 PSO 1,2, 3, 4	21SC623 .5: Distribution of various problematic soils on the basis of Agro climatic zones of India	SOs: 5.1	-	Unit-5.0 : Management of problem soil under different Agro-eco system in soil 5.1,5.2,5.3,5.4,5.5, 5.6,5.7,5.8	

Course Code: 21AN524
Course Title: Principles of Seed Technology
Pre- requisite: To impart knowledge on principles of seed production and certification. This will help the students to understand seed production practices and seed certification procedures in different crops.

Rationale: After completing this course the student will be able to know about seed production of different crop varieties and hybrids, their processing, marketing and seed laws.

Course Outcomes:

21AN524.1: Student will be able to understand seed quality concept and Genetic purity in seed production, different classes of seed.

21AN524.2: Students will have the ability to apply the knowledge gained about foundation and certified seed production in different crops, seed certification and minimum Seed Certification for different crops.

21AN524.3: To understand principles of detection of genetically modified crops and seed treatment, packing and seed storage.

21AN524.4: Student will be able to understand seed marketing and promotional media.

21AN524.5: Students will get knowledge on role of WTO and OECD in seed marketing, marketing strategies.

Scheme of Studies:

Code	Course Code	Course Title	Scheme of studies (Hours/Week)				Total Study Hours CI+LI+SW+SL	Total Credits (C)
			CI	LI	SW	SL		
Program Core (PCC)	21AN524	Principles of Seed Technology	1	2	0	0	3	1+2= 3

Legend:

CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others), **LI:** Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies), **SW:** Sessional Work (includes assignment, seminar, mini project etc.), **SL:** Self Learning, **C:** Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Code	Course Code	Course Title	Scheme of Assessment (Marks)							End Semester Assessment (ESA)	Total Marks (PRA+ESA)
			Progressive Assessment (PRA)								
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)			
Program Core (PCC)	21AN524	Principles of Seed Technology	15	30	0	0	5	50	50	100	

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

21AN524.1 Student will be able to understand seed quality concept and Genetic purity in seed production, different classes of seed.

Item	Approximate Hours
CI	3
LI	4
SW	2
SL	1
Total	10

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO1.1. Understand the Seed and seed technology: introduction, definition and importance. Deterioration causes of crop Varieties and their control.</p> <p>SO1.2. Understand the Maintenance of genetic purity during seed production.</p> <p>SO1.3. Understand the seed quality; Definition, Characters of good quality seed, different classes of seed.</p>	<p>1. Planning for seed production: cost benefit ratio,</p> <p>2. Planning for seed multiplication ratio and seed replacement rate.</p>	<p>Unit-1. Seed and seed technology: introduction, definition and importance. Deterioration causes of crop quality seed, different classes of seed.</p> <p>1.1. Seed and seed technology: introduction, definition and importance. Deterioration causes of crop Varieties and their control.</p> <p>1.2. Maintenance of genetic purity during seed production.</p> <p>1.3. seed quality; Definition, Characters of good quality seed, different classes of seed.</p>	<p>1. causes of crop quality seed, different classes of seed.</p>

SW-1 Suggested Sessional Work (SW):

a. Assignments:

introduction, definition and importance. Deterioration causes of crop quality seed.

b. Mini Project:

Quality seed, different classes of seed.

c. Other Activities (Specify):

Importance of seed as basic input in agriculture

21AN524.2: Students will have the ability to apply the knowledge gained about foundation and certified seed production in different crops, seed certification and minimum Seed Certification for different crops.

Item	Approximate Hours
CI	3
LI	24
SW	2
SL	1
Total	30

Session (SOs)	Outcomes	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
	<p>SO2.1. Understand the foundation and certified seed production of important cereals, pulses, oilseeds, fodder and vegetables.</p> <p>SO2.2. Understand the Seed certification, phases of certification, procedure for seed certification, field inspection.</p> <p>SO2.3. Understand the Seed Act and Seed Act enforcement. Duty and powers of seed inspector, offences and penalties. Seeds Control Order 1983, Varietal Identification through Grow Out Test and Electrophoresis, Molecular and Biochemical test.</p>	<p>1. Foundation and Certified seed production of wheat.</p> <p>2. Foundation and Certified seed production of Rice.</p> <p>3. Foundation and Certified seed production of Maize.</p> <p>4. Foundation and Certified seed production of Sorghum.</p> <p>5. Foundation and Certified seed production of pigeon Bajra.</p> <p>6. Foundation and Certified seed production of Ragi.</p> <p>7. Foundation and Certified seed production of Urad.</p> <p>8. Foundation and Certified seed production of Mung.</p> <p>9. Foundation and Certified seed production of Pigeonpea.</p> <p>10. Foundation and Certified seed production of Lentil.</p> <p>11. Foundation and Certified seed production of Gram.</p> <p>12. Foundation and Certified seed production of Field bean.</p>	<p>Unit-2. Foundation and certified seed production of important cereals, pulses, oilseeds, fodder and vegetables.</p> <p>2.1. Foundation and certified seed production of important cereals, pulses, oilseeds, fodder and vegetables.</p> <p>2.2. Seed certification, phases of certification, procedure for seed certification, field inspection.</p> <p>2.3. Seed Act and Seed Act enforcement. Duty and powers of seed inspector, offences and penalties. Seeds Control Order 1983, Varietal Identification through Grow Out Test and Electrophoresis, Molecular and Biochemical test.</p>	<p>Varietal Identification through Grow Out Test and. Electrophoresis, Molecular and Biochemical test.</p>

SW-2 Suggested Sessional Work (SW):

a. Assignments:

Seed Act and Seed Act enforcement. Duty and powers of seed inspector, offences and penalties.

b. Mini Project:

Grow Out Test and Electrophoresis, Molecular and Biochemical test.

c. Other Activities (Specify):

21AN524.3: To understand principles of detection of genetically modified crops and seed treatment, packing and seed storage.

Item	Approximate Hours
CI	3
LI	12
SW	2
SL	1
Total	18

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
<p>SO3.1. Understand the detection of genetically modified crops, Transgene contamination in non-GM crops.</p> <p>SO3.2. Understand the Organic seed production. Seed drying, processing and their steps, seed testing for quality assessment.</p> <p>SO3.3. Understand the seed treatment, its importance, method of application and seed packing. Seed storage.</p>	<p>1. Foundation and Certified seed production of Pea.</p> <p>2. Foundation and Certified seed production of Soybean.</p> <p>3. Foundation and Certified seed production of Sunflower.</p> <p>4. Foundation and Certified seed production of Rapeseed.</p> <p>5. Foundation and Certified seed production of Groundnut.</p> <p>6. Foundation and Certified seed production of Mustard.</p>	<p>Unit 3 Detection of genetically modified crops. Seed drying, processing and their steps, seed testing for quality assessment, seed treatment, Seed storage.</p> <p>3.1. Detection of genetically modified crops, Transgene contamination in non-GM crops.</p> <p>3.2. Organic seed production. Seed drying, processing and their steps, seed testing for quality assessment.</p> <p>3.3. seed treatment, its importance, method of application and seed packing. Seed storage.</p>	<p>Transgene contamination in non-GM crops.</p>

SW-3 Suggested Sessional Work (SW):

a. Assignments:

Processing and their steps, seed testing for quality assessment.

b. Mini Project:

Method of application and seed packing and Seed storage.

c. Other Activities (Specify):

21AN524.4: Student will be able to understand seed marketing and promotional media.

Item	Approximate Hours
CI	3
LI	10
SW	2
SL	1
Total	16

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO4.1. Understand General principles, stages and factors affecting seed longevity during storage.</p> <p>SO4.2 Understand the Measures for pest and disease control during storage.</p> <p>SO4.3. Understand the Seed marketing: structure and organization, sales generation activities, promotional media.</p>	<p>1.Seed production in important vegetable crops.</p> <p>2. Seed sampling and testing: Physical purity.</p> <p>3. Seed sampling and testing: for Germination.</p> <p>4. Seed sampling and testing: for Viability.</p> <p>5. Seed and seedling vigour test.</p>	<p>Unit 4. General principles, stages and factors affecting seed longevity during storage, Seed marketing, promotional media.</p> <p>4.1. General principles, stages and factors affecting seed longevity during storage.</p> <p>4.2. Measures for pest and disease control during storage.</p> <p>4.3. Seed marketing: structure and organization, sales generation activities, promotional media.</p>	<p>1. factors affecting seed longevity during storage. Measures for pest.</p>

SW-4 Suggested Sessional Work (SW):

a. Assignments:

Seed longevity during storage, Seed marketing, promotional media.

b. Mini Project:

Seed longevity, structure and organization.

c. Other Activities (Specify):

21AN524.5: Students will get knowledge on role of WTO and OECD in seed marketing, marketing strategies.

Item	Approximate Hours
CI	3
LI	10
SW	2
SL	1
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO5.1. Understand the Factors affecting seed marketing.</p> <p>SO5.2. Role of WTO and OECD in seed marketing.</p> <p>SO5.3. Private and public sectors and their production and marketing strategies.</p>	<p>1. To study about Genetic purity test. electrophoresis.</p> <p>2. To study about Grow out test and electrophoresis.</p> <p>3. Visit to seed production farms, seed testing laboratories.</p> <p>4. Visit to seed production farms, seed testing seed processing plant.</p> <p>5. To study about marketing and marketing strategies.</p>	<p>Unit-5. Factors affecting seed marketing and marketing strategies.</p> <p>5.1. Factors affecting seed marketing.</p> <p>5.2. Role of WTO and OECD in seed marketing.</p> <p>5.3. Private and public sectors and their production and marketing strategies.</p>	<p>1. Role of WTO and OECD in seed marketing.</p>

SW-5 Suggested Sessional Work (SW):

a. Assignments:

Private and public sectors and their production and marketing strategies.

b. Mini Project:

Role of WTO and OECD in seed marketing.

c. Other Activities (Specify):

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self Learning (Sl)	Total hour (Cl+SW+Sl)
21AN524.1: Student will be able to understand seed quality concept and Genetic purity in seed production, different classes of seed.	7	2	1	10
21AN524.2: Students will have the ability to apply the knowledge gained about foundation and certified seed production in different crops, seed certification and minimum Seed Certification for different crops.	27	2	1	30
21AN524.3: To understand principles of detection of genetically modified crops and seed treatment, packing and seed storage.	15	2	1	18
21AN524.4: Student will be able to understand seed marketing and promotional media.	13	2	1	16
21AN524.5: Students will get knowledge on role of WTO and OECD in seed marketing, marketing strategies.	13	2	1	16

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO 1	Seed and seed technology: introduction, definition and importance. Deterioration causes of crop quality seed, different classes of seed.				
CO 2	Foundation and certified seed production of important cereals, pulses, oilseeds, fodder and vegetables, Electrophoresis, Molecular and Biochemical test.				
CO 3	Detection of genetically modified crops. Seed drying, processing and their steps, seed testing for quality assessment, seed treatment, Seed storage.				
CO 4	General principles, stages and factors affecting seed longevity during storage Seed marketing, promotional media.				
CO 5	Factors affecting seed marketing and marketing strategies.				
Total					

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for **Principles of Seed Technology** will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Group Discussion
3. Role Play
4. Demonstration
5. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, Whatsapp, Mobile, Online sources)
6. Brainstorming
7. Smart Board

Suggested Learning Resources:

(a) Books:

S. No.	Title	Author	Publisher	Edition & Year
1	Seed Technology	Agarwal, R.L.	Oxford & IBH Publishing Co. Delhi	1991
2	Seed Technology	Agarwal, P.K.	ICAR, New Delhi	1999
3	Seed Science and Technology	Subir Sen and Nabinanda Ghosh.	Kalyani Publishers. New Delhi	1999
4	Beej Pradyogiki	Maloo, S.R., Intodia, S.K. and Pratap Singh.	Agrotech Publishing Academy.	2008
5	Seed Technology.	A.K. Joshi and B.D. Singh.	Kalyani Publishers, New Delhi.	2005
6	Seed Technology In The Tropics	Mackay D B	Scientific Publishers	2013
7	Seed Science and Technology	K. Vanangamudi	New India Publishing Agency	2014
8	Field Inspection Manual and Minimum Seed Certification Standards	Anonymous	NSC Publication, New Delhi	1965

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Cos, Pos and PSOs Mapping
Course Code: 21AN524
Course Title: Principles of Seed Technology

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprises with different	Hold a post on supply i dministration and policy	Analyze and control commercial and economical process in the field of agriculture	Teach how to control and manage agricultural production	ntroduce general production technologies	Teach how to implement and manage production technologies	Prepare for managerial and social responsibilities	student will identify differen underutilized crops	Student will practice different breeding technique used in crop production.	Student will recognize different insect pest and diseases and their symptoms of crops	Student will apply different recent techniques in crop production
21AN524.1: Student will be able to understand seed quality concept and Genetic purity in seed production, different classes of seed.	1	3	3	2	2	2	3	3	3	3	3
21AN524.2: Students will have the ability to apply the knowledge gained about foundation and certified seed production in different crops, seed certification and minimum Seed	1	3	3	2	1	2	2	3	3	3	3
21AN524.3: To understand principles of detection of genetically	1	3	3	2	3	2	2	3	1	3	3

modified crops and seed treatment, packing and seed storage.											
21AN524.4: Student will be able to understand seed marketing and promotional media.	1	3	2	2	2	3	3	3	1	3	3
21AN524.5: Students will get knowledge on role of WTO and OECD in seed marketing, marketing strategies.	1	3	2	2	1	1	2	3	2	3	3

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map: Principles of Seed Technology

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4	21AN524.1: Student will be able to understand seed quality concept and Genetic purity in seed production, different classes of seed.	SO1.1 SO1.2 SO1.3	To study about Genetic purity test. electrophoresis.	Seed and seed technology: introduction, definition and importance. Deterioration causes of crop quality seed, different classes of seed.	As mentioned in page number
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4	21AN524.2: Students will have the ability to apply the knowledge gained about foundation and certified seed production in different crops, seed certification and minimum Seed	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5	To study about Grow out test and electrophoresis.	Foundation and certified seed production of important cereals, pulses, oilseeds, fodder and vegetables, Electrophoresis, Molecular and Biochemical test.	As mentioned in page number

PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4	21AN524.3: To understand principles of detection of genetically modified crops and seed treatment, packing and seed storage.	SO3.1 SO3.2 SO3.3	Visit to seed production farms, seed testing laboratories.	Detection of genetically modified crops. Seed drying, processing and their steps, seed testing for quality assessment, seed treatment, Seed storage.	As mentioned in page number
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4	21AN524.4: Student will be able to understand seed marketing and promotional media.	SO4.1 SO4.2	Visit to seed production farms, seed testing seed processing plant.	General principles, stages and factors affecting seed longevity during storage Seed marketing, promotional media.	As mentioned in page number
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4	21AN524.5: Students will get knowledge on role of WTO and OECD in seed marketing, marketing strategies.	SO5.1 SO5.2	To study about marketing and marketing strategies	Factors affecting seed marketing and marketing strategies.	As mentioned in page number

Course Code: 21 HO523

Course Title : Production Technology for Fruit and Plantation Crops

Pre- requisite: Student should have basic knowledge of package and practices, crop geometry, crop nutrition, weed and its management and growth and development of fruit and plantation crops.

Rationale: The students should be acquainted with the knowledge of fruit and plantation crops its scope and importance and also knows the propagation method. Students also get the knowledge about the crop growth, development and adaptation. This field of study and practices is driven by several key factors and considerations: sustainability, innovation and technology, economic efficiency.

Course Outcomes:

- 21 HO523.1:** Ability understand about importance and scope of industries which are working under fruit and plantation crops are crucial under preservation and packaged food production.
- 21 HO523.2:** Students understand about how different types of fruits and plantation crop root stocks are important under its commercial scale.
- 21 HO523.3:** Understand the production technologies for the cultivation of major fruit crops.
- 21 HO523.4:** Understand the concept of package and practices of minor fruit crops.
- 21 HO523.5:** Understand the concept of production technology of plantation crops

Code	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits(C)
			CI	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Program Core (PCC)	21HO523	Production Technology for Fruit and Plantation Crops	1	1	1	1	4	2

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop,field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.), **SL:** Self Learning, **C:**Credits.
Note: SW & SL has to be planned and performed under the continuous guidance and feedback ofteacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

Code	Course Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ES A)	Total Marks (PRA+ESA)
			Class/Home Assignment number 5 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CA T)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+A)		
Program Core (PCC)	21HO523	Production Technology for Fruit and Plantation Crops	15	30	0	0	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

21HO523.1: Ability understand about importance and scope of industries which are working under fruit and plantation crops are crucial under preservation and packaged food production.

Approximate Hours

Item	AppX Hrs
CI	03
LI	00
SW	02
SL	02
Total	07

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO1.1 Understand about importance and scope of fruit crops</p> <p>SO1.2 Understand about importance and scope of plantation crops</p> <p>SO1.3 Learn about the preservation and package food production technology.</p>		<p>Unit-1.0 Importance and scope of fruit and plantation crop industry in India.</p> <p>1.1 Importance and scope of fruit crop in India</p> <p>1.2 Importance and scope of plantation crop in India</p> <p>1.3 Preservation and package food production</p>	<p>1. Recent scope of fruit crops in M.P and India</p> <p>2.Recent scope of Plantation crops in M.P. and India</p>

SW-1 Suggested Sessional Work (SW):

a. Assignments:

- i. Importance of fruit crops in India
- ii. Importance of Plantation crops in India
- iii. Scope of fruit crops in India
- iv. Scope of Plantation crops in India

b. Mini- Project

Prepare the flow chart of recent year data of Area, Production and Productivity of fruit and plantation crops in India

21 HO 523.2: Students understand about how different types of fruits and plantation crop root stocks are important under its commercial scale.

Approximate Hours

Item	AppX Hrs
CI	02
LI	06
SW	02
SL	01
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO2.1 Ability to understand about the rootstock, scion and inter-stock.</p> <p>SO2.2 Understand about the importance of different rootstock in fruit and plantation crops.</p>	<p>2.1 Practices of seed production in different fruit and plantation crops.</p> <p>2.2 Practices of scarification and stratification of seed for germination</p> <p>2.3 Description and identification of different fruit crops</p>	<p>Unit: 2 Importance of rootstocks.</p> <p>2.1 Introduction of rootstock, scion and inter-stock in different fruit crops.</p> <p>2.2 Importance of rootstocks in fruit and plantation crops.</p>	<p>Making the chart of different rootstock in fruit and plantation crops.</p>

SW-2 Suggested Seasonal Work (SW):

- a. Assignments:**
Importance of rootstock in fruit crops.
- b. Mini- project**
Prepare the flow chart with description of different rootstock in fruit crops

21HO523.3: Understand the production technologies for the cultivation of major fruit crops.

Approximate Hours

Item	AppX Hrs
CI	07
LI	08
SW	02
SL	03
Total	20

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO3.1 Understand the production technology of mango and sapota</p> <p>SO3.2 Introduce the production technology of banana and litchi</p> <p>SO3.3 Understand about the package and practices of guava and papaya</p> <p>SO3.4 Understand about the package and practices of grape</p> <p>SO3.5 introduce the package and practices of citrus</p> <p>SO3.6 Understand about the cultivation practices of apple and pear</p> <p>SO3.7 Understand the production technology of peach, walnut and almond</p>	<p>3.1 Practices of asexual propagation methods different fruit and plantation crops.</p> <p>3.2 Application of plant bio-regulators and their uses in fruit crops.</p> <p>3.3 Identification the important pest and disease in fruit and plantation crops.</p> <p>3.4 Identification of different physiological disorders in fruit and plantation crops.</p>	<p>Unit-3 : Production technologies for the cultivation of major fruits-mango, banana, citrus, grape, guava, litchi, papaya, sapota, apple, pear, peach, walnut, almond.</p> <p>3.1 Production technology of mango and sapota</p> <p>3.2 Production technology banana and litchi</p> <p>3.3 Production technology of guava and papaya</p> <p>3.4 Production technology of grape</p> <p>3.5 Production technology of citrus</p> <p>3.6 Package and practices of apple and pear</p> <p>3.7 cultivation practice of peach, walnut and almond</p>	<p>Production technology of tropical fruit crops.</p> <p>Production technology of sub tropical fruit crops.</p> <p>Production technology of temperate fruit crops.</p>

SW-3 Suggested Sessional Work (SW):

a. Assignments:

- i. Production technology of tropical fruit crops
- ii. Production technology of subtropical fruit crops
- iii. Production technology of temperate fruit crops

b. Mini- Project

- i. Prepare flow chart of botanical description of different fruit crops
- ii. Prepare flow chart of varietal description different fruit crops.

21HO523.4: Understand the concept of package and practices of minor fruit crops.

Approximate Hours

Item	AppX Hrs
CI	02
LI	04
SW	03
SL	02
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO4.1 Understand the production technology of date, ber and pineapple</p> <p>SO4.2 Introduce the package and practices of pomegranate, jackfruit and strawberry</p>	<p>1. Practices of asexual propagation methods arid fruit crops.</p> <p>2. Identified of physiological disorder in arid fruit crops.</p>	<p>Unit-4.0 : minor fruits- date, ber, pineapple, pomegranate, jackfruit and strawberry.</p> <p>4.1 production technology of date, ber and pineapple</p> <p>4.2 production technology of pomegranate, jackfruit and strawberry</p>	<p>Production technology of arid fruit crops.</p> <p>Cultivation practices of strawberry and jackfruit</p>

SW-4 Suggested Sessional Work (SW):

a. Assignments:

Production technology of arid fruit crops.

b. Mini Projects:

i. Preparation of chart of production technology of arid fruit crops

e. Other Activities (Specify):

i. Visit to Commercial orchard of arid crops

21 HO523.5: Understand the concept of production technology of plantation crops

Approximate Hours

Item	AppX Hrs
CI	01
LI	06
SW	01
SL	01
Total	09

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO5.1 Understand the production technology of coconut, arecanut and cashew</p> <p>SO5.2 Understand the production technology of tea, coffee and rubber</p>	<p>1. Visit to commercial orchards.</p> <p>2. Identified of physiological disorder in plantation fruit crops.</p> <p>3. Identification and description of plantation crops</p>	<p>Unit 5: plantation crops- coconut, arecanut, cashew, tea, coffee & rubber</p> <p>5.1 Production technology of coconut, arecanut , cashew, tea, coffee and rubber</p>	<p>1. production technology of plantation crops</p>

SW-5 Suggested Sessional Work (SW):

Assignments:

Production technology of plantation crops

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (CI)	Sessional Work (SW)	Self Learning (SI)	Total hour (CI+SW+SI)
21HO221.1: Ability understand about importance and scope of industries which are working under fruit and plantation crops are crucial under preservation and packaged food production.	3	2	2	7
21HO221.2: Students understand about how different types of fruits and plantation crop root stocks are important under its commercial scale.	2	2	1	5
21HO221.3: Understand the production technologies for the cultivation of major fruit crops.	7	2	3	12
21HO221.4: Understand the concept of package and practices of minor fruit crops.	2	3	2	7
21HO221.5: Understand the concept of production technology of plantation crops.	1	1	1	3
Total Hours	15	8	6	29

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Ability understand about importance and scope of industries which are working under fruit and plantation crops are crucial under preservation and packaged food production	03	03	01	07
CO-2	Students understand about how different types of fruits and plantation crop root stocks are important under its commercial scale	02	03	05	10
CO-3	Understand the production technologies for the cultivation of major fruit crops	02	04	05	11
CO-4	Understand the concept of package and practices of minor fruit crops.	2	4	05	11
CO-5	Understand the concept of production technology of plantation crops	01	5	5	11
Total		10	19	21	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Fundamental of Horticulture will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks.
Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Demonstration
7. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, Whatsapp, Mobile, Online sources)
8. Brainstorming

Suggested Learning Resources

Sl. No.	Title	Author	Publisher	Edition & Year
1	Fruit Growing	Bal, J.S.	Kalyani Publishers	2010
2	Advances in Temperate Fruit Production	Banday F.A. and Sharma M.K.	Kalyani Publishers	2010
3	Tropical and Sub-Tropical-Vol-I	Bose, T.K., Mitra, S.K. and Sanyal, D.	Nayaprakash, Kolkata	2000
4	Text Book of Temperate Fruits	Chadha, T.R	ICAR Publication	2001
5	A text book on Pomology-IV Devoted to Temperate fruits	Chattopadhyay T.K.	Kalyani Publishers	2009

Cos, POs and PSOs Mapping

Course Title: Production Technology for Fruit and Plantation Crops

Course Code: 21HO6523

Course Outcomes	Programme Outcomes				Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PSO 1	PSO 2	PSO-3	PSO-4
	Students will demonstrate a strong understanding of core principles of agricultural sciences	Students will be proficient in applying scientific principles and techniques to solve real world problems in agriculture	Students will be competent in using modern agricultural technologies and tools, GIS to optimize agricultural productivity and sustainability.	Students will be able to communicate effectively in written, oral, and visual formats to convey agricultural concepts, research findings, and recommendations to diverse stakeholders	Student will identify different underutilized crops	Student will practice different breeding techniques used in crop production.	Student will recognize different insect pest and diseases and their symptoms	Student will apply different recent techniques in crop production
1. Ability understand about importance and scope of industries which are working under fruit and plantation crops are crucial under preservation and packaged food production	3	2	2	3	2	2	3	2
2. Students understand about how different types of fruits and plantation crop root stocks are important under its commercial scale..	3	2	2	2	1	1	3	3
3. Understand the production technologies for the cultivation of major fruit crops.	2	3	1	3	1	1	2	3
4. Understand the concept of package and practices of minor fruit crops.	2	2	3	2	1	1	3	3
5. Understand the concept of production technology of plantation crops	2	2	1	1	2	1	3	3

Legend: 1 – Low, 2 – Medium, 3 – High

Curriculum Map: Production Technology for Fruit and Plantation Crops

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4,	21 HO523.1: Ability understand about importance and scope of industries which are working under fruit and plantation crops are crucial under preservation and packaged food production	SO1.1 SO1.2 SO1.3		Unit-1.0 Importance and scope of fruit and plantation crop industry in India. 1.1, 1.2, 1.3	1. Recent scope of fruit crops in M.P and India 2.Recent scope of Plantation crops in M.P. and India
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4	21 HO523.2: Students understand about how different types of fruits and plantation crop root stocks are important under its commercial scale.	SO2.1 SO2.2	2.1 Practices of seed production in different fruit and plantation crops. 2.2 Practices of scarification and stratification of seed for germination 2.3 Description and identification of different fruit crops	Unit: 2 Importance of rootstocks. 2.1, 2.2	Making the chart of different rootstock in fruit and plantation crops.
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4	21 HO523.3: Understand the production technologies for the cultivation of major fruit crops	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5 SO3.6 SO3.7	3.1 Practices of asexual propagation methods different fruit and plantation crops. 3.2 Application of plant bio-regulators and their uses in fruit crops. 3.3 Identification the important pest and disease in fruit and plantation crops. 3.4 Identification of different physiological disorders in fruit and plantation crops.	Unit-3 : Production technologies for the cultivation of major fruits- mango, banana, citrus, grape, guava, litchi, papaya, sapota, apple, pear, peach, walnut, almond. 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7	Production technology of tropical fruit crops. Production technology of sub tropical fruit crops. Production technology of temperate fruit crops.

<p>PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4</p>	<p>21 HO523.4: Understand the concept of package and practices of minor fruit crops</p>	<p>SO4.1 SO4.2</p>	<p>1. Practices of asexual propagation methods arid fruit crops. 2. Identified of physiological disorder in arid fruit crops.</p>	<p>Unit-4.0 : minor fruits- date, ber, pineapple, pomegranate, jackfruit and strawberry. 4.1, 4.2</p>	<p>Production technology of arid fruit crops. Cultivation practices of strawberry and jackfruit</p>
<p>PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4</p>	<p>21 HO523.5: Understand the concept of production technology of plantation crops</p>	<p>SO5.1 SO5.2</p>	<p>1. Visit to commercial orchards. 2. Identified of physiological disorder in plantation fruit crops. 3. Identification and description of plantation crops</p>	<p>Unit 5: plantation crops-coconut, arecanut, cashew, tea, coffee & rubber 5.1</p>	<p>1. production technology of plantation crops</p>

Course Code: 21AE522

Course Title: Renewable Energy and Green Technology

Pre- requisite: Student should have basic knowledge of physics, chemistry, and biology, as well as introductory courses in agriculture and environmental science.

Rationale: The course "Renewable Energy and Green Technology" is designed to equip students with the knowledge and skills necessary to understand and apply renewable energy sources and green technologies in agricultural practices. This course will enable students to understand the intersection of agriculture, energy, and technology, and to develop sustainable solutions for a greener future.

Course Outcomes:

- AE 105.1:** Classification of Energy Sources - Identify and classify different energy sources, including renewable and non-renewable sources, and understand their contributions to the agricultural sector.
- AE105.2:** Biomass Utilization - Understand the conversion of biomass into biofuels, including bioethanol and biodiesel, and apply this knowledge to develop sustainable energy solutions for agricultural applications.
- AE105.3:** Biogas and Bioenergy Production - Explain the principles of biogas production, including anaerobic digestion and gasification, and understand the applications of biogas, bio-alcohol, biodiesel, and biooil as bioenergy resources. Additionally, introduce solar energy collection and application.
- AE105.4:** Solar Energy Gadgets - Design, install, and operate solar energy gadgets, including solar cookers, solar water heaters, and solar dryers, for agricultural and rural development applications.
- AE105.5:** Solar and Wind Energy Systems - Understand the principles of solar photovoltaic systems, solar drying, solar ponds, and solar distillation, and apply this knowledge to design and install sustainable energy systems. Additionally, introduce wind energy principles and applications

Scheme of Studies:

Code	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits(C)
			CI	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Program Core (PCC)	21AE522	Renewable Energy and Green Technology	1	1	1	1	4	2

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Theory & Practical

Code	Course Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA + ESA)
			Class/ Home Assignment (CA)	Mid Term-1	Mid Term-2	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
Program Core (PCC)	21AE522	Renewable Energy and Green Technology (Theory)	0	15	15	0	0	30	50	80
		Renewable Energy and Green Technology (Practical/Lab)	15	0	0	5	0	20	0	20
		Total								100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

AE 105.1: Classification of Energy Sources - Identify and classify different energy sources, including renewable and non-renewable sources, and understand their contributions to the agricultural sector.

Approximate Hours

Item	AppX Hrs
CI	03
LI	02
SW	02
SL	02
Total	09

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
<p>SO1.1 Define different types of energy sources.</p> <p>SO1.2 Identify renewable and non-renewable energy sources.</p> <p>SO1.3 Classify energy sources based on their applications.</p> <p>SO1.4 Analyze the advantages and limitations of different energy sources.</p>	<p>1.1 To study about renewable energy gadgets.</p>	<p>Unit-1.0 Classification of Energy Sources:</p> <p>1.1 Lecture on energy sources and their classifications.</p> <p>1.2 The advantages and limitations of different energy sources.</p> <p>1.3 Energy source selection for different applications.</p>	<p>1. Watch online tutorials on energy source selection.</p> <p>2. Read and summarize a technical article on renewable energy systems.</p>

SW-1 Suggested Sessional Work (SW):

a. Assignments:

- i. Write a report on the advantages and limitations of different energy sources.
- ii. Create a diagram or illustration of a renewable energy system, labelling key components and explaining their functions.

b. Mini Project:

1. Design and develop a small-scale renewable energy system for a rural agricultural application, including a detailed report and cost estimate.

AE 105.2: Biomass Utilization - Understand the conversion of biomass into biofuels, including bioethanol and biodiesel, and apply this knowledge to develop sustainable energy solutions for agricultural applications.

Approximate Hours

Item	AppX Hrs
CI	03
LI	04
SW	02
SL	02
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO2.1 Explain the principles of biomass conversion into biofuels.</p> <p>SO2.2 Identify different types of biomass feedstocks and their potential for biofuel production.</p> <p>SO2.3 Analyze the advantages and limitations of bioethanol and biodiesel production from biomass.</p> <p>SO2.4 Design a biomass conversion process for a specific agricultural application.</p>	<p>1.1 To study briquetting machine</p>	<p>Unit-2: Biomass Utilization</p> <p>1.1 Lecture on biomass conversion technologies and their applications.</p> <p>1.2 Discussions on biomass feedstock selection and processing.</p> <p>1.3 biomass conversion process design and optimization.</p>	<p>i. Watch online tutorials on biomass conversion process design and operation.</p> <p>ii. Read and summarize a technical article on recent advances in biomass utilization for biofuel production.</p>

SW-2 Suggested Sessional Work (SW):

a. Assignments:

- i. Write the advantages and limitations of bioethanol and biodiesel production.
- ii. Explain biomass conversion process, labelling key components and explaining their functions.

b. Mini Project:

- Design and develop a small-scale biomass conversion system for a rural agricultural application, including a detailed report and cost estimate. The system should be able to produce either bioethanol or biodiesel from a selected biomass feedstock.

AE 105. 3: Biogas and Bioenergy Production - Explain the principles of biogas production, including anaerobic digestion and gasification, and understand the applications of biogas, bio-alcohol, biodiesel, and biooil as bioenergy resources. Additionally, introduce solar energy collection and application.

Approximate Hours

Item	AppX Hrs
CI	3
LI	4
SW	2
SL	2
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CL)	Self Learning (SL)
<p>SO3.1 Explain the principles of anaerobic digestion and gasification for biogas production.</p> <p>SO3.2 Identify the applications of biogas, bio-alcohol, biodiesel, and biooil as bioenergy resources.</p> <p>SO3.3 Analyze the advantages and limitations of biogas production from organic waste.</p> <p>SO3.4 Design a biogas production system for a specific agricultural application.</p>	<p>1. Conduct an experiment to produce biogas from organic waste using anaerobic digestion.</p> <p>2. Build a small-scale gasifier to produce biogas from biomass.</p>	<p>Unit-3: Biogas and Bioenergy Production</p> <p>3.1 Lecture on biogas production principles and applications.</p> <p>3.2 Group discussion on biogas system design and operation.</p> <p>3.3 Interactive session on biogas production and utilization.</p>	<p>i. Watch online tutorials on biogas system design and operation.</p> <p>ii. Read and summarize a technical article on recent advances in biogas production and application.</p>

SW-3 Suggested Sessional Work (SW):

a. Assignments:

- Write the advantages and limitations of biogas production from organic waste.
- Describe biogas production system, labelling key components and explaining their functions.

b. Mini Project:

Design and develop a small-scale biogas production system for a rural agricultural application, The system should be able to produce biogas from organic waste and utilize it for energy generation.

AE 105.4: Solar Energy Gadgets - Design, install, and operate solar energy gadgets, including solar cookers, solar water heaters, and solar dryers, for agricultural and rural development applications.

Approximate Hours

Item	AppX Hrs
CI	3
LI	4
SW	2
SL	2
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO4.1 Explain the principles of solar energy collection and application.</p> <p>SO4.2 Design a solar energy gadget for a specific agricultural or rural development application.</p> <p>SO4.3 Install and operate a solar energy gadget, including solar cookers, solar water heaters, and solar dryers.</p> <p>SO4.4 Analyze the advantages and limitations of solar energy gadgets for agricultural and rural development applications.</p>	<p>1- Conduct an experiment to build a small-scale solar cooker.</p> <p>2. - Build a small-scale solar water heater using a solar collector and storage tank.</p>	<p>Solar Energy Gadgets</p> <p>1 4.1 Lecture on solar energy collection and application principles.</p> <p>4.2 solar energy gadget design and installation.</p> <p>4.3 Interactive session on solar energy gadget operation and maintenance.</p>	<p>i. Watch online tutorials on solar energy gadget design and installation.</p> <p>ii. Read and summarize a technical article on recent advances in solar energy gadgets for agricultural and rural development applications.</p>

SW-4 Suggested Sessional Work (SW):

a. Assignments:

- i. Write the advantages and limitations of solar energy gadgets for agricultural and rural development applications.
- ii. Create a diagram or illustration of a solar energy gadget, labelling key components and explaining their functions.

b. Mini Project:

Design, build, and operate a small-scale solar energy gadget (solar cooker, solar water heater, or solar dryer) for a rural agricultural application, including a detailed report and cost estimate.

AE 105.5: Solar and Wind Energy Systems - Understand the principles of solar photovoltaic systems, solar drying, solar ponds, and solar distillation, and apply this knowledge to design and install sustainable energy systems. Additionally, introduce wind energy principles and applications.

Approximate Hours

Item	AppX Hrs
CI	3
LI	4
SW	2
SL	2
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO5.1 Explain the principles of solar photovoltaic systems and their applications.</p> <p>SO5.2 Understand the principles of solar drying, solar ponds, and solar distillation.</p> <p>SO5.3 Design a sustainable energy system using solar energy.</p> <p>SO5.4 Introduce wind energy principles and applications.</p>	<p>1. Conduct an experiment to build a small-scale solar photovoltaic system.</p> <p>2. Build a small-scale solar dryer using a solar collector and drying chamber.</p>	<p>Unit 5: Solar and Wind Energy Systems:</p> <p>5.1 Lecture on solar photovoltaic principles and applications.</p> <p>5.2 discussion on solar energy system design and installation.</p> <p>5.3 Interactive session on wind energy system design and operation.</p>	<p>1. Watch online tutorials on solar energy system design and installation.</p> <p>2. Read and summarize a technical article on recent advances in wind energy systems.</p>

SW-5 Suggested Sessional Work (SW):

a. Assignments:

- Write the advantages and limitations of solar photovoltaic systems.
- Create a diagram of a wind energy system, labeling key components and explaining their functions.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (CL)	Session alWork (SW)	Self Learning (SL)	Total hour (CL+ SW+SL)
AE 105.1: Classification of Energy Sources - Identify and classify different energy sources, including renewable and non-renewable sources, and understand their contributions to the agricultural sector.	3	2	2	07
AE 105.2: Biomass Utilization - Understand the conversion of biomass into biofuels, including bioethanol and biodiesel, and apply this knowledge to develop sustainable energy solutions for agricultural applications.	3	2	2	07
AE 105.3: Biogas and Bioenergy Production - Explain the principles of biogas production, including anaerobic digestion and gasification, and understand the applications of biogas, bio-alcohol, biodiesel, and biooil as bioenergy resources. Additionally, introduce solar energy collection and application.	3	2	2	07
AE 105.4: Solar Energy Gadgets - Design, install, and operate solar energy gadgets, including solar cookers, solar water heaters, and solar dryers, for agricultural and rural development applications.	3	2	2	07
AE 105.5: Solar and Wind Energy Systems - Understand the principles of solar photovoltaic systems, solar drying, solar ponds, and solar distillation, and apply this knowledge to design and install sustainable energy systems. Additionally, introduce wind energy principles and applications.	3	2	2	07
Total Hours	15	10	10	35

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Classification of Energy Sources	01	04	04	9
CO-2	Biomass Utilization	02	04	04	10
CO-3	Biogas and Bioenergy Production	2	04	05	11
CO-4	Solar Energy Gadgets	02	08	05	15
CO-5	Solar and Wind Energy Systems	03	02	-	05
Total		10	22	18	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for “Renewable Energy and Green Technology” will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Visit to plants
7. Demonstration
8. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, Whatsapp, Mobile, Online sources)
9. Brainstorming

Suggested Learning Resources:**(a) Books:**

S. No.	Title	Author	Publisher	Edition & Year
1	Non-Conventional Energy Sources	G.D. Rai	Kh Publishers, New Delhi.	
2	Non-Conventional Energy Sources	N. S. Rathore. A.K. Kurchania, N.L. Panwar	Himanshu Publications	2007
3	Renewable Energy, Theory and Practice	N.S. Rathore. A. K. Kurchania, N.L. Panwar	Himanshu Publications	2007
4	Biogas Technology	K.C. Khandelwal. & S.S. Mandi		1990

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Cos, POs and PSOs Mapping

Course Title: B. Sc. Agriculture – 3rd Semester

Course Code: 21AE522

Course Title: Renewable Energy and Green Technology

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1 Manage agricultural enterprises with different scales in area of agricultural production, process and trade	PO 2 Hold a post on supply in administration and policy	PO-3 Analyze and control commercial and economic process in the field of agriculture	PO-4 Teach how to control and manage agricultural production	PO-5 Introduce general production technologies	PO-6 Teach how to implement and manage production technologies	PO-7 Prepare for managerial and social responsibilities	PSO 1 Student will identify different underutilized crops	PSO 2 Student will practice different breeding techniques used in crop production.	PSO-3 Student will recognize different insect pest and diseases and their symptoms of crops	PSO-4 Student will apply different recent techniques in crop production
AE 105.1: Classification of Energy Sources - Identify and classify different energy sources, including renewable and non-renewable sources, and understand their contributions to the agricultural sector.	1	3	2	1	2	1	2	2	1	1	2
AE 105.2: Biomass Utilization - Understand the conversion of biomass into biofuels, including bioethanol and biodiesel, and apply this knowledge to develop sustainable energy solutions for agricultural applications.	1	2	1	1	2	2	3	2	3	1	1
AE 105.3: Biogas and Bioenergy Production - Explain the principles of biogas production, including anaerobic digestion and gasification, and understand the applications of biogas, bio-alcohol, biodiesel, and biooil as bioenergy resources. Additionally, introduce solar	2	1	1	3	2	2	1	2	1	1	2

energy collection and application.											
AE 105.4: Solar Energy Gadgets - Design, install, and operate solar energy gadgets, including solar cookers, solar water heaters, and solar dryers, for agricultural and rural development applications.	1	1	2	3	2	1	2	2	1	1	1
AE 105.5: Solar and Wind Energy Systems - Understand the principles of solar photovoltaic systems, solar drying, solar ponds, and solar distillation, and apply this knowledge to design and install sustainable energy systems. Additionally, introduce wind energy principles and applications.	1	1	1	2	1	2	3	2	1	3	1

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map: Renewable Energy and Green Technology

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4	CO-1: Classification of Energy Sources - Identify and classify different energy sources, including renewable and non-renewable sources, and understand their contributions to the agricultural sector.	SO1.1 SO1.2 SO1.3 SO1.4	As Mentioned along with the concern units	Classification of Energy Sources 1.1,1.2,1.3	As Mentioned along with the concern units
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4	CO 2: Biomass Utilization - Understand the conversion of biomass into biofuels, including bioethanol and biodiesel, and apply this knowledge to develop sustainable energy solutions for agricultural applications.	SO2.1 SO2.2 SO2.3 SO2.4		Biomass Utilization 2.1, 2.2, 2.3	
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4	CO3: Biogas and Bioenergy Production - Explain the principles of biogas production, including anaerobic digestion and gasification, and understand the applications of biogas, bio-alcohol, biodiesel, and biooil as bioenergy resources. Additionally, introduce solar energy collection and application.	SO3.1 SO3.2 SO3.3 SO3.4		Biogas and Bioenergy Production 3.1, 3.2,3.3	
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4	CO 4: Solar Energy Gadgets - Design, install, and operate solar energy gadgets, including solar cookers, solar water heaters, and solar dryers, for agricultural and rural development applications.	SO4.1 SO4.2 SO4.3 SO4.4		Solar Energy Gadgets 4.1, 4.2,4.3	
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4	CO 5: Solar and Wind Energy Systems - Understand the principles of solar photovoltaic systems, solar drying, solar ponds, and solar distillation, and apply this knowledge to design and install sustainable energy systems. Additionally, introduce wind energy principles and applications.	SO5.1 SO5.2 SO5.3 SO5.4		Solar and Wind Energy Systems 5.1,5.2,5.3	

Course Code: 21AG529

Course Title: Weed Management

Pre-requisite: Student should have basic knowledge weed management is an essential aspect of agriculture and landscaping to ensure the optimal growth of desired plants and crops.

Rationale: The students should be acquainted with the knowledge of Weed management is crucial for several reasons, and its rationale extends to various aspects of agriculture, horticulture, and land management. They are involved in crop production as they to maintain soil productivity and to prevent pests and diseases. further the also maintain the ecological balance, and ensure efficient use of resources such as water and nutrients.

Course Outcomes:

21AG529.1 Students will be acquainted about why to undertake environmental weed control.

21AG529.2 Students will be acquainted about different approaches of weed management

21AG529.3 Students may acquire knowledge about allelopathic effect towards weed control

21AG529.4 Students will be acquainted about harmful and beneficial effects of weeds in Agriculture.

21AG529.5 Students will be acquainted planning for weed management and weed management processes.

Scheme of Studies:

Code	Course Code	Course Title	Scheme of studies (Hours/Week)				Total Credits (C)	
			CI	LI	SW	SL		Total Study Hours (CI+LI+SW+SL)
Program Core (PCC)	21AG529	Weed Management	3	1	1	1	6	3

Legend:

CI:Classroom Instruction (Includes different instructional strategies i.e. Lecture(L) and Tutorial (T) and others,

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini projectetc.),

SL: Self learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:**Theory**

Code	Course Code	Course Title	Scheme of Assessment (Marks)							End Semester Assessment	Total Marks (PRA + ESA)
			Progressive Assessment (PRA)						Total Marks		
			Class/ Home Assignmen t 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Semi nar one (SA)	Class Activ ity any one (CA T)	Class Attendance (AT)	(CA+CT+SA+C AT+AT)			
Program Core (PCC)	21A G529	Weed Management	15	20	5	5	5	50	50	100	

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

21AG529.1 Students will be acquainted about why to undertake environmental weed control.

Approximate Hours

Item	AppxHrs.
CI	6
LI	4
SW	1
SL	2
Total	13

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO1.1 Understand the weed.</p> <p>SO1.2 Understand the characteristics of weeds.</p> <p>SO1.3 Understand the harmful and beneficial effects on ecosystem.</p> <p>SO1.4 Classification, reproduction and dissemination of weeds.</p>	<p>1. Techniques of weed preservation.</p> <p>2. Weed identification and their losses study.</p>	<p>Unit-1 Introduction to weeds, characteristics of weeds their harmful and beneficial effects on ecosystem. Classification, reproduction and dissemination of weeds.</p> <p>1.1 Introduction of weeds.</p> <p>1.2 Different characteristics of weeds.</p> <p>1.3 Harmful effects of weeds.</p> <p>1.4 Beneficial effects of weeds.</p> <p>1.5 Different classification, reproduction of weeds.</p> <p>1.6 Dissemination of weeds.</p>	<p>1. Introduction and identification of different crop weed.</p> <p>2. Identification some beneficial and harmful effect of weed.</p>

SW-1 Suggested Sessional Work (SW):

Assignments:

What is weed? Their identification, harmful and beneficial effect and method of reproduction.

Other Activities (Specify):

Preparing a plant for mounting Commensurate with the need to identify the specimen, it is essential to include in a herbarium sheet as much of the plant as possible (e.g., roots, flowers, stems, leaves etc).

21AG529.2 Students will be acquainted about different approaches of weed management.

Approximate Hours

Item	Appx Hrs.
CI	6
LI	4
SW	1
SL	1
Total	12

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO1.1 Understand the Herbicide ad weedicide.</p> <p>SO1.2 Understand the Herbicide classification</p> <p>SO1.3 Understand the concept of adjuvant and surfactant.</p> <p>SO1.4. Understand the herbicide formulation and their use.</p> <p>SO1.5 Understand the introduction to mode of action of herbicides and selectivity.</p>	<p>1. Study of herbicide formulations.</p> <p>2. Study of mixture of herbicide.</p>	<p>Unit-2 Herbicide classification, concept of adjuvant, surfactant, herbicide formulation and their use. Introduction to mode of action of herbicides and selectivity.</p> <p>1.1 Introduction to Concept of Herbicide.</p> <p>1.2 Different Herbicide classification.</p> <p>1.3. Introduction and concept of adjuvant.</p> <p>1.4 Introduction and concept of surfactant.</p> <p>1.5 Introduction to different mode of action of herbicides.</p> <p>1.6 Introduction to herbicide selectivity.</p>	<p>1. Use of different Herbicide, their trade and chemical name.</p>

SW-1 Suggested Sessional Work (SW):

Assignments:

Introduction to mode of action of herbicides and Herbicide classification.

Other Activities (Specify):

Research on study of use of different herbicide in field crop.

21AG529.3 Students may acquire knowledge about allelopathic effect towards weed control

Approximate Hours

Item	AppxHrs.
CI	6
LI	4
SW	1
SL	1
Total	12

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO1.1 Understand the Allelopathy.</p> <p>SO1.2 Understand the application of allelopathy for weed management.</p> <p>SO1.3 Understand the Bioherbicides.</p> <p>SO1.4. Understand the different types of Bioherbicides.</p> <p>SO1.5 Understand the different types of Bioherbicides available in market.</p>	<p>1.Biology of important weeds.</p> <p>2.Calculations of weed control efficiency and weed index.</p>	<p>Unit-3 Allelopathy and its application for weed management. Bioherbicides and their application in agriculture.</p> <p>1.1 Introduction to allelopathy.</p> <p>1.2 Introduction to application of allelopathy for weed management.</p> <p>1.3.Introduction tobioherbicides.</p> <p>1.4. Role of organic farming of bioherbicide.</p> <p>1.5Role of bioherbicide of different crop.</p> <p>1.6 New research need on bioherbicide for sustainable agriculture.</p>	<p>1. Study on allelopathic effect on crop and new research on sustainable agriculture.</p>

SW-1 Suggested Sessional Work (SW):

Assignments:

Role of Allelopathy and Bioherbicides on sustainable agriculture

Other Activities(Specify):

New Research on Allelopathy and Bioherbicides for sustainable agriculture.

21AG529.4 Students will be acquainted about harmful and beneficial effects of weeds in Agriculture.

Approximate Hours

Item	Appx Hrs.
CI	6
LI	4
SW	1
SL	1
Total	12

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO1.1 Understand Commercial herbicide mixture.</p> <p>SO1.2 Understand the different herbicide mixture and their utility in agriculture.</p> <p>SO1.3 Understand the Herbicide compatibility.</p> <p>SO1.4. Understand the Herbicide compatibility with agrochemicals.</p> <p>SO1.5 Understand use of different agrochemicals.</p>	<p>1. Study of methods of herbicide application, spraying equipments.</p> <p>2.Herbicide and agrochemicals study.</p>	<p>Unit-4 Concept of herbicide mixture and utility in agriculture. Herbicide compatibility with agrochemicals and their application.</p> <p>1.1Introduction to Commercial herbicide mixture.</p> <p>1.2. Introduction to different herbicide mixture and their utility in agriculture.</p> <p>1.3.Introduction to Herbicide compatibility.</p> <p>1.4 Introduction to Herbicide compatibility with agrochemicals.</p> <p>1.5 Identification of different agrochemicals.</p> <p>1.6Introduction to different agrochemicals using in weed managements.</p>	<p>1.Study on crop herbicide mixture and herbicide compatibility with agrochemicals.</p>

SW-1 Suggested Sessional Work (SW):

Assignments:

herbicide mixture and utility in agriculture. Herbicide compatibility with other agrochemicals.

Other Activities (Specify):

Research on herbicide use efficiency.

21AG529.5 Students will be acquainted planning for weed management and weed management processes.

Approximate Hours

Item	Appx Hrs.
CI	6
LI	4
SW	1
SL	1
Total	12

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO1.1 Understand the integration of herbicides.</p> <p>SO1.2 Understand the weed management.</p> <p>SO1.3 Understand the nonchemical methods of weed management.</p> <p>SO1.4 Understand herbicide resistance and its management.</p>	<p>1. Shift of weed flora study in long term experiments.</p> <p>2. Calculations of herbicide doses.</p>	<p>Unit-5 Integration of herbicides with nonchemical methods of weed management. Herbicide Resistance and its management.</p> <p>1.1 Integration of herbicides.</p> <p>1.2. Introduction weed management.</p> <p>1.3 Introduction different method of weed management.</p> <p>1.4 Introduction to the nonchemical methods of weed management.</p> <p>1.5 Introduction to herbicide resistance and its management.</p> <p>1.6 Introduction to management herbicide resistance.</p>	<p>1. Study on different non chemical methods of weed management.</p>

SW-1 Suggested Sessional Work (SW):

Assignments: Understand the nonchemical methods of weed management and herbicide resistance.

Other Activities (Specify):

Study on time and methods of herbicide spray and their role in sustainability.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Laboratory Instruction (LI)	Sessional Work (SW)	Self Learning (SI)	Total hour (Cl+LI+SW+SI)
CO.1 Student will become to differentiate between climate and weather.	6	4	1	2	13
CO.2 Student will have to knowledge about agricultural meteorology its meaning and scope	6	4	1	1	12
CO.3 Students acquire knowledge about energy balance of earth and atmosphere	6	4	1	1	12
CO.4 Students will able to know definition of dew, fog, frost, mist and cloud	6	4	1	1	12
CO.5 Student will have to knowledge about the method for determination of weather forecasting.	6	4	1	1	12
Total Hours	30	16	5	5	61

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Origin, geographical distribution economic importance, soil and climatic requirements varieties cultural practices and yield of kharif crops Rice, Maize, Sorghum	03	01	01	05
CO-2	Origin, geographical distribution economic importance, soil and climatic requirements varieties cultural practices and yield of pearl millet and finger millet crops	02	05	03	10
CO-3	Origin, geographical distribution economic importance, soil and climatic requirements varieties cultural practices and yield of kharif crops pigeonpea, mungbean and urdbean;	03	06	06	15
CO-4	Origin, geographical distribution economic importance, soil and climatic requirements varieties cultural practices and yield of kharif crops groundnut, and soybean	-	10	05	15
CO-5	Origin, geographical distribution economic importance, soil and climatic requirements varieties cultural practices and yield of kharif crops cotton & jute.	02	03	-	05
Total		10	25	15	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for introductory Agro meteorology and climate change will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks.

Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Demonstration
7. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, Whatsapp, Mobile, Online sources)
8. Brainstorming

Suggested Learning Resources:*(a) Books:*

S. No.	Title	Author	Publisher	Edition & Year
1	Weed Management ,.	Saraswat, V.N., Bhan, V.M. and Yaduraju, N.T.	ICAR, New Delhi	2003.
2	Weed Management: Principles and Practices	Gupta, O.P	(2nd Ed.), Agribios (India), Jodhpur.	. 2015
3	Weed Science : Basics and Applications	Das, T.K.	Jain Brothers, New-Delhi	2008.

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Cos, Pos and PSOs Mapping

Course Code: 21AG529

Course Title: Weed Management

	Programme Outcomes				Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PSO 1	PSO 2	PSO-3	PSO-4
Course Outcomes	Students will demonstrate a strong understanding of core principles and theories in agriculture including plant science, soil science, animal science, agricultural economics, and agricultural engineering	Students will be proficient in applying scientific principles and techniques to solve realworld problems in agriculture, including crop management, livestock production, and natural resource management	Students will be competent in using modern agricultural technologies and tools, such as precision farming equipment, GIS (Geographic Information Systems), remote sensing, and biotechnology, to optimize agricultural productivity and sustainability.	Students will be able to communicate effectively in written, oral, and visual formats to convey agricultural concepts, research findings, and recommendations to diverse stakeholders including farmers, policymakers, and the public.	Student will identify different underutilized crops	Student will practice different breeding techniques used in crop production.	Student will recognize different insect pest and diseases and their symptoms of crops	Student will apply different recent techniques in crop production
21AG529.1 Students will be	2	1	3	1	1	1	1	1

acquainted about why to undertake environmental weed control.								
21AG529.2 Students will be acquainted about different approaches of weed management	1	2	1	3	1	1	2	1
21AG529.3 Students may acquire knowledge about allelopathic effect towards weed control	1	1	1	3	1	3	1	1
21AG529.4 Students will be acquainted about harmful and beneficial effects of weeds in Agriculture. .	2	1	3	1	2	3	1	1
21AG529.5 Students will be acquainted planning for weed management and weed management processes.	1	1	3	1	1	1	1	1

Legend: 1 – Low, 2 – Medium, 3 – High

Cos, Pos and PSOs Mapping

Course Code: 21AG529

Course Title: Weed Management

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprises with different scales in area of agricultural production, process and trade	Hold a post on supply i administration and policy	Analyze and control commercial and economical process in the field of agriculture	Teach how to control and manage agricultural production	Introduce general production technologies	Teach how to implement and manage production technologies	Prepare for managerial and social responsibilities	Student will identify different underutilized crops	Student will practice different breeding techniques used in crop production	Student will recognize different insect pest and diseases and their symptoms of crops	Student will apply different recent techniques in crop production
21AG529.1 Students will be acquainted about why to undertake environmental weed control.	1	3	3	2	2	2	3	3	3	3	3
21AG529.2 Students will be acquainted about different approaches of weed management	1	3	3	2	1	2	2	3	3	3	3
21AG529.3 Students may acquire knowledge about allelopathic effect towards weed control	1	3	3	2	3	2	2	3	1	3	3

21AG529.4 Students will be acquainted about harmful and beneficial effects of weeds in Agriculture. .	1	3	2	2	2	3	3	3	1	3	3
21AG529.5 Students will be acquainted planning for weed management and weed management processes.	1	3	2	2	1	1	2	3	2	3	3

Curriculum Map: Weed Management 21AG529

Pos & PSOs	Cos No. & Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
PO1,2,3,4,5,6,7 PSO 1,2,3,4	Students will be acquainted about why to undertake environmental weed control.	SO 1.1 SO 1.2 SO 1.3 SO 1.4	1. Techniques of weed preservation. 2. Weed identification and their losses study	Introduction to weeds, characteristics of weeds their harmful and beneficial effects on ecosystem. Classification, reproduction and dissemination of weeds. 1.1, 1.2, 1.3, 1.4, 1.5, 1.6	1. Introduction and identification of different crop weed. 2. Identification some beneficial and harmful effect of weed.
PO1,2,3,4,5,6,7 PSO 1,2,3,4	Students will be acquainted about different approaches of weed	SO 1.1 SO 1.2 SO 1.3 SO 1.4 SO 1.5	. Study of herbicide formulations. 2. Study of mixture of herbicide.	Soil and climatic conditions prevalent in rainfed areas; Soil and water conservation Techniques. 1.1, 1.2, 1.3, 1.4, 1.5, 1.6	1. Use of different Herbicide, their trade and chemical name.

	management				
PO1,2,3,4,5,6,7 PSO 1,2,3,4	Students may acquire knowledge about allelopathic effect towards weed control	SO 1.1 SO 1.2 SO 1.3 SO 4.4 SO 1.5	1. Biology of important weeds. 2. Calculations of weed control efficiency and weed index	Allelopathy and its application for weed management. Bioherbicides and their application in agriculture 1.1, 1.2, 1.3, 1.4, 1.5, 1.6	Study on allelopathic effect on crop and new research on sustainable agriculture.
PO1,2,3,4,5,6,7 PSO 1,2,3,4	Students will be acquainted about harmful and beneficial effects of weeds in Agriculture.	SO 1.1 SO 1.2 SO 1.3 SO 4.4 SO 1.5	1. Study of methods of herbicide application, spraying equipments. 2. Herbicide and agrochemicals study	Concept of herbicide mixture and utility in agriculture. Herbicide compatibility with agrochemicals and their application. 1.1, 1.2, 1.3, 1.4, 1.5, 1.6	Study on crop herbicide mixture and herbicide compatibility with agrochemicals.
PO1,2,3,4,5,6,7 PSO 1,2,3,4	Students will be acquainted planning for weed management and weed management processes.	SO 1.1 SO 1.2 SO 1.3 SO 4.4	1. Shift of weed flora study in long term experiments. 2. Calculations of herbicide doses.	Integration of herbicides with nonchemical methods of weed management. Herbicide Resistance and its management. 1.1, 1.2, 1.3, 1.4, 1.5, 1.6	Study on different non chemical methods of weed management.

Semester- 6

Course Code: 21AN627

Course Title: Crop Improvement –II (Rabi Crops)

Pre- requisite: To provide insight into recent advances in improvement of Rabi cereals, legumes, oilseeds, fiber, sugarcane and vegetative propagated crops using conventional and modern biotechnological approaches.

Rationale: After completing this course, the student will be able to know about important botanical status and reproductive structures of crops and genetics of important Rabi field crops.

Course Outcomes:

21AN627.1: Students will have able to learn importance of wild relative to produce new varieties of Rabi crops.

21AN627.2: Students will have able to learn Gene preservation method for further use to improve Rabi crops.

21AN627.3 Students will have able to understand the breeding methods, objectives, and identification of resistance gene relate to Rabi crop with high yield potential against Pest and pathogen and utilization genes.

21AN627.4 Students will have able to understand about different hybrid seed production methods used in different rabi crops.

21AN627.5: Students will have able to understand new genetic approaches to achieve a definite ideotype of Rabi crop.

Scheme of Studies:

Code	Course Code	Course Title	Scheme of studies(Hours/Week)				Total Study Hours CI+LI+SW+SL	Total Credits (C)
			CI	LI	SW	SL		
Program Core (PCC)	21AN627	Crop Improvement –II (Rabi Crops)	1	2	0	0	3	(1+1)= 2

Legend:

CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others), **LI:** Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies) **SW:** Sessional Work (includes assignment, seminar, mini project etc.), **SL:** Self Learning, **C:** Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Code	Course Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA + ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+S A+ CAT+AT)		
PCC	21AN6 27	Crop Improvement – II (Rabi Crops)	15	30	0	0	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

21AN627.1: Students will have able to learn importance of wild relative to produce new varieties of rabi crops.

Approximate Hours

Item	Approximate Hours
CI	3
LI	8
SW	2
SL	1
Total	14

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO1.1. Students are able to understand the Centers of origin, distribution of species of different cereals, and pulses.</p> <p>SO1.2. Students are able to understand the Centers of origin, distribution of species of different oilseeds, fodders and cash crops.</p> <p>SO1.3. Students are able to understand the Centers of origin, distribution of species of different vegetable and horticultural crops.</p>	<p>1. To Study floral biology, emasculation and hybridization techniques in Wheat, Oat, Barley, Chickpea.</p> <p>2. To Study floral biology, emasculation and hybridization techniques in Lentil, Field pea, Rajma, Horse gram.</p> <p>3. To Study floral biology, emasculation and hybridization techniques in Rapeseed Mustard, Sunflower, Safflower, Potato.</p> <p>4. To Study floral biology, emasculation and hybridization techniques in Berseem. Sugarcane, Tomato, Chilli, Onion.</p>	<p>Unit-1 Centers of origin, distribution of species, wild relatives in different rabi cereals;</p> <p>1.1 Centers of origin, distribution of species Wild relatives in different cereals, and pulses.</p> <p>1.2 Centers of origin, distribution of species Wild relatives in different oilseeds, fodders and cash crops.</p> <p>1.3 Centers of origin, distribution of species Wild relatives in different vegetable and horticultural crops.</p>	<p>1. Wild relatives in different rabi fodders and cash crops.</p> <p>2. Wild relatives in different rabi cereals.</p>

SW-1 Suggested Sessional Work (SW):

a. Assignments:

- i. Floral biology, emasculation and hybridization techniques in different crop species in rabi season cereals.

b. Mini Project:

- i. Centers of origin, distribution of species in kharif crops.

c. Other Activities (Specify):

21AN627.2 Students will have able to learn Gene preservation method for further use to improve rabi crops.

Approximate Hours

Item	Approximate Hours
CI	4
LI	8
SW	2
SL	1
Total	17

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO2.1. Students are able to understand the Plant genetic resources, its types and their utilization in crop improvement.</p> <p>SO2.2. Students are able to understand the techniques used for conservation of plant genetic resources.</p> <p>SO2.3. Students are able to understand the genetics of qualitative characters.</p> <p>SO2.4. Students are able to understand the genetics of quantitative characters.</p>	<p>1. Handling of germplasm and segregating populations by pedigree method.</p> <p>2. Handling of germplasm and segregating populations by bulk method.</p> <p>3. Handling of germplasm and segregating populations by single seed decent method.</p> <p>4. Study of quality characters and donor parents for different characters.</p>	<p>Unit-2. - Plant genetic resources, its utilization and conservation,</p> <p>2.1. Plant genetic resources, and utilization.</p> <p>2.2. Conservation of Plant genetic resources.</p> <p>2.3. Study of genetics of qualitative characters of different rabi crops.</p> <p>2.4. Study of genetics of quantitative characters of different rabi crops.</p>	<p>1. Learn about qualitative and quantitative characters of different rabi crops.</p>

SW-2 Suggested Sessional Work (SW):

a. Assignments:

2. Plant genetic resources, its utilization and conservation.

a. Mini Project:

1. Study of genetics, handling of germplasm of different rabi crops.

c. Other Activities (Specify):

21AN627.3 Students will have able to understand the breeding methods, objectives, and identification of resistance gene relate to Rabi crop with high yield potential against Pest and pathogen and utilization genes.

Item	Approximate Hours
CI	3
LI	10
SW	2
SL	1
Total	16

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO3.1. Students are able to understand the Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for yield, adaptability.</p> <p>SO3.2. Students are able to understand the Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for stability, abiotic and biotic stress tolerance.</p> <p>SO3.3. Students are able to understand the Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for quality (physical, chemical, nutritional). chemical)</p>	<p>1. Study of field techniques for seed production Kharif crops.</p> <p>2. Study of field techniques for hybrid seeds production in Kharif crops.</p> <p>3. Estimation of heterosis, inbreeding depression</p> <p>4. Estimation of heritability.</p> <p>5. Layout of field experiments</p>	<p>Unit 3. Major breeding objectives and procedures including conventional and modern innovative approaches of rabi crops.</p> <p>1. Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for yield, adaptability.</p> <p>2. Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for stability, abiotic and biotic stress tolerance.</p> <p>3. Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for quality (physical, chemical, nutritional).</p>	<p>1.Varieties for abiotic and biotic stress tolerance.</p> <p>2.Procedures including conventional and modern innovative approaches.</p>

SW-3 Suggested Sessional Work (SW):

a. Assignments:

- i. Major breeding objectives and procedures including modern innovative approaches of different rabi crops.

b. Mini Project:

- i. Quality traits identification in different rabi crops (physical, chemical, and nutritional).

3. Other Activities (Specify):

4. 21AN627.4 Students will have able to understand about different hybrid seed production methods used in different rabi crops.

Item	Approximate Hours
CI	3
LI	4
SW	1
SL	1
Total	9

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO4.1. Students are able to produce Hybrid seed of rabi cereals, pulses.</p> <p>SO4.2. Students are able to produce Hybrid seed of rabi Oilseeds, fodder crops and cash crops.</p> <p>SO4.3. Students are able to produce Hybrid seed of rabi Vegetable and horticultural crops.</p>	<p>1. Visit to seed production plots.</p> <p>2. Visit to AICRP plots of different field crops.</p>	<p>Unit 4. Hybrid seed production technology</p> <p>1. Hybrid seed production technology of rabi cereals, pulses.</p> <p>2. Hybrid seed production technology of rabi Oilseeds, fodder crops and cash crops.</p> <p>3. Hybrid seed production technology of rabi Vegetable and horticultural crops.</p>	<p>1. Explain different hybrid seed production technique.</p>

SW-4 Suggested Sessional Work (SW):

a. Assignments:

Major breeding objectives and procedures including modern innovative approaches.

b. Mini Project:

quality (physical, chemical), nutritional.

c. Other Activities (Specify):

21AN627.5: Students will have able to explain new genetic approaches to achieve a definite ideotype of rabi crop.

Item	Approximate Hours
CI	2
LI	0
SW	1
SL	1
Total	4

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO5.1. Students are able to explain the Ideotype concept.</p> <p>SO5.2. Students are able to explain the climate resilient crop varieties for future.</p>		<p>Unit-5. Ideotype concept and climate resilient crop varieties for future.</p> <p>1 Ideotype concept.</p> <p>2 Climate resilient crop varieties for future.</p>	<p>1. Ideotype concept and climate resilient crop varieties for future.</p>

SW-5 Suggested Sessional Work (SW):

a. Assignments:

- I. Hybrid seed production technology in Rice.

b. Mini Project:

- ii. climate resilient crop varieties for future.

c. Other Activities (Specify):

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (CI)	Sessional Work (SW)	Self Learning (SI)	Total hour (CI+SW+SI)
21AN627.1: Students will have able to learn importance of wild relative to produce new varieties of rabi crops.	11	2	1	14
21AN627.2: Students will have able to learn Gene preservation method for further use to improve rabi crops.	12	2	1	15
21AN627.3 Students will have able to understand the breeding methods, objectives, and identification of resistance gene relate to Rabi crop with high yield potential against Pest and pathogen and utilization genes.	13	2	1	16
21AN627.4 Students will have able to understand about different hybrid seed production methods used in different rabi crops.	7	1	1	9
21AN627.5: Students will have able to understand new genetic approaches to achieve a definite ideotype of rabi crop.	2	1	1	4

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO 1	Centers of origin, distribution of species, wild relatives in different rabi cereals				
CO 2	Plant genetic resources, its utilization and conservation.				
CO 3	Major breeding objectives and procedures including conventional and modern innovative approaches of rabi crops.				
CO 4	Hybrid seed production technology				
CO 5	Ideotype concept and climate resilient crop varieties for future.				

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for **Crop Improvement – I (Rabi Crops)** will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Case Method
3. Group Discussion
4. Demonstration

5. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, Whatsapp, Mobile, Online sources)
6. Brainstorming
7. Smart board

Suggested Learning Resources:

(a) Books:

S. No.	Title	Author	Publisher	Edition & Year
1	Breeding of Field Crops	Chopra, V.L.	Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.	2000
2	Vol. II Medicinal and Aromatic Plant	Chaddha. K.L. and Rajendra Gupta.	Malhotra Publishing House, New Delhi.	1995
3	Advances in Plant Breeding.	Mandal, A. K., P.K. Ganguli and S.P. Banerjee.	CBS Publishers and Distributors, New Delhi	1991
4	Crop Improvement: Challenges in the Twenty-First Century.	Manjit S. Kang	International Book Distributing Co. Lucknow	2004
5	Breeding of Field Crops	Poehlman, J.M.	AVI Publishing Co. INC, East Port, Conneacticut, USA.	1987

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Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprises with different scales in area of agricultural production, process and trade	Hold a post on supply in administration and policy	Analyze and control commercial and economical process in the field of agriculture	Teach how to control and manage agricultural production	Introduce general production technologies	Teach how to implement and manage production technologies	Prepare for managerial and social responsibilities	Student will identify different underutilized variation and significance of plants breeding	Student will practice different rearing techniques used in crop production.	Student will recognize different insect pest and diseases and their	Student will apply different recent techniques in crop
21AN627.1: Students will have able to learn importance of wild relative to produce new varieties of rabi crops.	1	2	2	1	2	1	2	1	3	1	1
21AN627.2: Students will have able to learn Gene preservation method for further use to improve rabi crops.	1	1	1	2	3	2	1	1	3	2	1
21AN627.3 Students will have able to understand the breeding methods, objectives, and identification of resistance gene relate to rabi crop with high yield potential against Pest and	2	1	1	2	3	2	2	1	1	1	2

pathogen and utilization genes.											
21AN627.4 Students will have able to understand about different hybrid seed production methods used in different rabi crops.	2	1	1	1	1	2	1	3	2	1	1
21AN627.5: Students will have able to understand new genetic approaches to achieve a definite ideotype of rabi crop.	1	2	2	1	3	2	1	1	3	1	1

Course Curriculum Map: Crop Improvement –II (Rabi Crops)

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO1,2,3,4,5,6,7 PSO 1,2,3,4	21AN627.1: Students will have able to learn importance of wild relative to produce new varieties of rabi crops.	SO1.1 SO1.2 SO1.3	Handling of germplasm and segregating populations by pedigree method.	Centers of origin, distribution of species, wild relatives in different rabi cereals	1. Wild relatives in different rabi fodders and cash crops. 2. Wild relatives in different rabi cereals.
PO1,2,3,4,5,6,7 PSO 1,2,3,4	21AN627.2: Students will have able to learn Gene preservation method for further use to improve rabi crops.	SO2.1 SO2.2 SO2.3	Handling of germplasm and segregating populations by bulk method.	Plant genetic resources, its utilization and conservation.	Learn about qualitative and quantitative characters of different rabi crops.
PO1,2,3,4,5,6,7	21AN627.3 Students will have able to understand the	SO3.1 SO3.2	Handling of germplasm and	Major breeding objectives and procedures including	1. Varieties for abiotic and biotic stress

PSO 1,2,3,4	breeding methods, objectives, and identification of resistance gene relate to rabi crop with high yield potential against Pest and pathogen and utilization genes.	SO3.3	segregating populations by single seed decent method.	conventional and modern innovative approaches of rabi crops.	tolerance. 2. Procedures including conventional and modern innovative approaches.
PO1,2,3,4,5,6,7 PSO 1,2,3,4	21AN627.4 Students will have able to understand about different hybrid seed production methods used in different rabi crops.	SO4.1 SO4.2	Study of quality characters and donor parents for different characters.	Hybrid seed production technology	Explain different hybrid seed production technique.
PO1,2,3,4,5,6,7 PSO 1,2,3,4	21AN627.5: Students will have able to understand new genetic approaches to achieve a definite ideotype of rabi crop.	SO5.1 SO5.2	Visit to seed production plots. Visit to AICRP plots of different field crops.	Ideotype concept and climate resilient crop varieties for future.	Ideotype concept and climate resilient crop varieties for future.

Course Code: 21MT624

Course Title: Entrepreneurship Development and Business communication

Pre- requisite: It enables students to learn the basics of Entrepreneurship and Entrepreneurial developments which will help them to provide vision for their own Start-up.

Rationale: The student studying Entrepreneurship is an essential component of agricultural development. Entrepreneurship development in agriculture is an important way out to bring a transformation in our rural areas. The graduates are required to possess professional capabilities to deal with the concerns of sustainable development of agriculture in all its aspects. Further, there is need for agricultural graduates to possess entrepreneurship to provide a class of village-based services.

Course Outcomes:

CO-1: This course makes able to develop entrepreneurial skill competencies among the students.

CO-2: Students will understand the concept of entrepreneur and process entrepreneurship and business development plans.

CO-3: Students on various aspects of enterprise building starting from identification of business opportunities, developing business plans, strengthening entrepreneurial competencies and acquiring skills in managing a small venture.

CO-4: Understand various schemes supporting entrepreneurship, Opportunity to sharpen entrepreneurial competencies. Students will know the role and assistance by various promotional organizations. Learn about abilities that contribute to top performance. Think creative and innovative.

CO-5: Entrepreneurship will be able to create value. Students are able to create presentations and business plans that articulate and apply financial, operational, organizational, market, and sales knowledge to identify paths to value creation through 1) company formation (for-profit); 2) social innovation (nonprofit); or 3) intellectual property licensing.

Scheme of Studies:

Code	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits
			(C) CI	LI	SW	SL	Total Hours (CI+LI+SW+SL)	
Program Core (PCC)	21MT624	Entrepreneurship Development and Business communication	1	1	1	1	4	2

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

Code	Course Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ESA)
			Class/ Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar (SA)	Class Activity (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
Program Core (PCC)	21MT624	Entrepreneurship Development and Business communication	15	30	0	0	5	50	50	100

21MT624.1 To understand the basic concept of Entrepreneur, Entrepreneurship Development
Approximate Hours

Item	ApproxHrs.
CI	03
LI	02
SW	01
SL	01
Total	7

SessionOutcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
<p>SO1.1 Understand Concept of Entrepreneur</p> <p>SO1.2 Entrepreneurship</p> <p>SO1.3 SWOT Analysis</p> <p>SO1.4. Student to understand achievement motivation of entrepreneur.</p> <p>SO1.5. student to Identify qualities of entrepreneurs</p>	<p>LI 1.0 To study about Assessing entrepreneurial traits</p>	<p>1.0 Concept, meaning, definition, entrepreneurial characteristic, myths Difference between entrepreneur and manager</p> <p>1.1 role of entrepreneurs in economic growth Types of entrepreneurs</p> <p>1.2 Entrepreneurship- Concept, meaning, definition, factors responsible for entrepreneurship, Difference between entrepreneur & entrepreneurship</p> <p>1.3 Motivation & achievement motivation Concept and Definition Theories of motivation: Maslow's need hierarchy theory, McClelland need theory</p>	<p>Search about successful entrepreneur of your area and try to know about his working procedure</p>

SW-

1 Suggested Sessional Work (SW):

a. Assignments: SWOT analysis of organization

b. MiniProject:

I. Maslow's need hierarchy theory, McClelland need theory

21MT624.2To understand that Government policy and programs and institutions for entrepreneurship development,

Approximate Hours

Item	Approx Hrs.
CI	04
LI	08
SW	01
SL	01
Total	14

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning(SL)
<p>SO2.1 Student to learn Government policy and programs for Entrepreneurship Development</p> <p>SO2.2 Understand Impact of economic reforms on Agribusiness/</p> <p>SO2.3 Students learn Entrepreneurship Development process and government policy</p> <p>SO2.4. Students understand why entrepreneurs are important in Indian economy</p> <p>SO2.5 Understand various schemes supporting entrepreneurship</p>	<p>2.0. Visit of entrepreneurship development institute and entrepreneurs</p>	<p>2.0 Entrepreneurship Development Programme(EDP) Meaning, features, objectives and phases, Government policy for entrepreneurship development</p> <p>2.1 Organizations/ institutions for entrepreneurship development (i) National Institute for Entrepreneurship and Small Business Development (NIESBUD) (ii) Entrepreneurship Development Institute of India (EDII) (iii) Indian Institute of Entrepreneurship (IIE) (iv) Small Industries Development Organizations (SIDO) (v) National Institute for Micro, Small and Medium Enterprises (NIMSME) (vi) Small Industries Development Bank of India (SIDBI) (vii) National Entrepreneurship Development Board (NEDB)</p> <p>2.2 Impact of economic reforms on agribusiness/ agri-enterprises</p>	<p>Visit the Entrepreneurial industrial place to know about working procedure</p>

SW-1 Suggested Sessional Work (SW):

- a. **Assignments:** Impact of economic reforms on agribusiness
- b. **MiniProject:**
I Different kind of government policy for entrepreneur

21MT624.3. To Understand about entrepreneurial development process; business leadership skills; developing organizational skill

Approximate Hours

Item	Approx Hrs.
CI	02
LI	04
SW	01
SL	01
Total	8

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
<p>SO3.1To familiarize the students to understand with key concepts and processes in entrepreneurship and business development</p> <p>SO3.2Students understand monitoring and type of monitoring and also evaluation of business plan</p> <p>SO3.3students learn controlling supervising of organization</p> <p>SO3.4. students understand problem solving skills</p>	<p>3.0 To study aboutMonitoring and supervision</p>	<p>3.0Entrepreneurship Development process andBusiness Leadership Skills;</p> <p>3.1 Developing organizational skills (controlling, supervising, problem-solving, monitoring & evaluation)</p>	<p>Meeting with skillful persons and try to know about business idea</p>

SW-1 Suggested Sessional Work (SW):

- a. **Assignments:** Entrepreneurship Development process
- b. **MiniProject:**

21MT624.4 to understand about developing managerial skills, business leadership skills problem solving skill, supply chain management and total quality management

Approximate Hours

Item	Approx Hrs.
CI	04
LI	06
SW	01
SL	01
Total	12

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
<p>SO4.1To provide context to the processes in the form of differences between small and large firms, and the economic environment.</p> <p>SO4.2student understand conceptual, managerial and technical skill</p> <p>SO4.3To provideSupply Chain Management</p> <p>SO4.4. student Analyze environmental set up relating to small industry and small business</p>	<p>LI4.0To study Problem solving</p> <p>LI4.1Managerial skills and achievement motivation</p>	<p>4.0Conceptual, technical, human relations skills, Managerial skills possessed by an entrepreneur, Business leadership skills</p> <p>4.1Problem solving:Definition, types and steps, problem solving skills possessed by an entrepreneur</p> <p>4.2Supply Chain Management Definition, Stages, advantages and scope</p> <p>4.3Total Quality Management (TQM) Definition, need and process in small scale enterprises.</p>	<p>Visit small scale industries</p>

SW-1 Suggested Sessional Work (SW):

Assignments: Supply chain management and Total quality management.

MiniProject:

21MT624.5 To study project planning formulation and report preparation; financing of enterprise, opportunities for agri entrepreneurship and rural enterprise

Approximate Hours

Item	Approx Hrs.
CI	02
LI	08
SW	02
SL	02
Total	14

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
<p>SO5.1 Student think creative and innovative idea for entrepreneur</p> <p>SO5.2 students understand project formulation process</p> <p>SO5.3 students understand financing of enterprise opportunities in rural area</p>	<p>LI 5.0 Exercise in creativity</p> <p>LI.5.1 Time audit through planning</p> <p>LI.5.2 Identification and selection of business idea</p> <p>LI.5.3 Preparation of business plan and proposal writing</p>	<p>5.1 Project planning formulation Report preparation</p> <p>5.2 Financing of enterprise, Opportunities for Agri-entrepreneurship and rural enterprise</p>	<p>Find same scale industries and find out there working procedure</p>

SW-1 Suggested Sessional Work (SW):

a. Assignments:

b. Mini Project:

I Agriculture related project formulation

Brief of Hours suggested for the Course Outcome

CourseOutcomes	Class Lecture (Cl)	Seasonal Work (SW)	Self Learning (Sl)	Total hour (Cl+S W+Sl)
CO-1: This course makes able to develop entrepreneurial skill competencies among the students.	3+2	1	1	7
CO-2: Students will understand the concept of entrepreneur and process in entrepreneurship and business development plans	4+8	1	1	14
CO-3: Students on various aspects of enterprise building starting from identification of business opportunities, developing business plans, strengthening entrepreneurial competencies and acquiring skills in managing a small venture.	2+4	1	1	8
CO -4: Understand various schemes supporting entrepreneurship, Opportunity to sharpen entrepreneurial competencies. Students will know the role and assistance by various promotional organizations. Learn about abilities that contribute to top performance. Think creative and innovative.	4+6	1	1	12
CO -5: Entrepreneurship will be able to create value. Students are able to create presentations and business plans that articulate and apply financial, operational, organizational, market, and sales knowledge to identify paths to value creation through 1) company formation (for-profit); 2) social innovation (nonprofit); or 3) intellectual property licensing.	2+10	1	1	14
Total Hours	15+30	5	5	55

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	UnitTitles	MarksDistribution			Total Marks
		R	U	A	
CO-1	Concept of Entrepreneur	03	04	03	10
CO-2	Government policy and programs	05	05	00	10
CO-3	Entrepreneurial Development Process	03	03	04	10
CO-4	Developing Managerial skills	02	04	04	10
CO-5	Project Planning Formulation and report preparation	03	04	03	10
Total		16	20	14	50

Legend:

Text Books:				
S. No	Book Name	Author name	Publisher	Edition and Year
1.	Entrepreneurship development in India	Dr. Gupta and Dr. Srinivasan	Sultan Chand & Sons	2013
2.	Dynamics of Entrepreneurial Development and Management	Vasant Desai	Himalaya publishing House	2011
3.	Entrepreneurship development and business communication	Department of Extension Education, Jawaharlal Nehru Krishi Vishwa Vidyalaya	Department of Extension Education, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Adhartal, Jabalpur-482004, India	2021
4.	Entrepreneurship of small Scale Industries	M.W.Deshpande	Himalaya publishing House	2017
5.	The Art and Science of Entrepreneurs	D.L. Saxon and RW Smilor	Ballinger Pub Co	1986
Reference Books:				
6.	Developing Entrepreneurship- A Handbook	Venkateshwara Rao and Udai Pareek		
7.	Agriculture Business and Entrepreneurship	Raja Gopal		
8.	industrial development in Backward Regions in India	H.Sadhak		
9.	Rural Entrepreneurship A Frame Work in Development Entrepreneurship -AHandbook	Ravi J. Mathai		
10.	Practical manual			
11.	Lecture note provide by department			

Suggest Learning Resources

Suggested Instructional/Implementation Strategies:

1. ImprovedLecture
2. Tutorial
3. Case study
4. GroupDiscussion
5. RolePlay
6. Visit to entrepreneurship development institute
7. Demonstration
8. ICTBased Teaching Learning (Video Demonstration Tutorials Facebook, Twitter, Whatsapp, Mobile, Online sources)
9. Brainstorming

Course Title: Entrepreneurship Development and Business Communication

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprises with different scale in area of agricultural production, process and trade	Hold a post on supply i administration and policy	Analyze and control commercial and economical process in the field of agriculture	Teach how to control and manage agricultural production	Introduce general production technologies	Teach how to implement and manage production technologies	Prepare for managerial and social responsibilities	Student will identify different underutilized crops	Student will practice different breeding techniques used in crop production.	Student will recognize different insect pest and diseases and their symptoms of crops	Student will apply different recent techniques in crop production
21MT624.1: This course makes able to develop entrepreneurial skill competencies among the students.	1	2	2	2	2	1	1	3	1	3	1
21MT624.2: Students will understand the concept of entrepreneur and process in entrepreneurship and business development plans	2	1	1	2	2	3	2	2	1	1	2
21MT624.3: Students on various aspects of enterprise building starting from identification of business opportunities, developing business plans, strengthening entrepreneurial competencies and acquiring skills in managing a small venture.	2	1	1	2	2	2	1	2	1	1	2
21MT624.4: Understand various schemes supporting entrepreneurship, Opportunity to sharpen entrepreneurial competencies. Students will	2	2	1	1	2	1	3	2	2	1	2

know the role and assistance by various promotional organizations. Learn about abilities that contribute to top performance. Think creative and innovative.											
21MT624.5: Entrepreneurship will be able to create value. Students are able to create presentations and business plans that articulate and apply financial, operational, organizational, market, and sales knowledge to identify paths to value creation through 1) company formation (for-profit); 2) social innovation (nonprofit); or 3) intellectual property licensing.	2	2	1	2	2	1	2	2	3	2	1

Legend: 1 – Low, 2 – Medium, 3 – High

Curriculum Map: Entrepreneurship Development and Business Communication

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO 1,2,3,4 PSO 1,2,3,4,	21MT624. C .1: This course makes able to develop entrepreneurial skill competencies among the students.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	1.1 To study about Assessing entrepreneurial traits	<p>Unit-1.0. 1.0 Concept, meaning, definition, entrepreneurial characteristic, myths Difference between entrepreneur and manager. role of entrepreneurs in economic growth Types of entrepreneurs. Entrepreneurship- Concept, meaning, definition, factors responsible for entrepreneurship, Difference between entrepreneur & entrepreneurship. Motivation & achievement motivation Concept and Definition Theories of motivation: Maslow’s need hierarchy theory, McClelland need theory</p> <p>1.1, 1.2, 1.3. 1.4,</p>	1. Search about successful entrepreneur of your area and try to know about his working procedure
PO 1,2,3,4 PSO 1,2,3,4,	21MT624 C- 2: Students will understand the concept of entrepreneur and process in entrepreneurship and business development plans	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5	2.1 Visit of entrepreneurship development institute and entrepreneurs	<p>Unit-2.0 – .0Entrepreneurship Development Programme(EDP) Meaning, features, objectives and phases, Government policy for entrepreneurship development Organizations/ institutions for entrepreneurship development (i) National Institute for Entrepreneurship and Small Business Development (NIESBUD) (ii) Entrepreneurship Development Institute of India (EDII) (iii) Indian Institute of Entrepreneurship (IIE) (iv) Small Industries Development Organizations (SIDO) (v)</p>	1 Visit the Entrepreneurial industrial place to know about working procedure

				National Institute for Micro, Small and Medium Enterprises (NIMSME) (vi) Small Industries Development Bank of India (SIDBI) (vii) National Entrepreneurship Development Board (NEDB) Impact of economic reforms on agribusiness/ agri- enterprises 2.1, 2.2, 2.3.	
PO 1,2,3,4 PSO 1,2, 3,4,	21MT624 C-3: Students on various aspects of enterprise building starting from identification of business opportunities, developing business plans, strengthening entrepreneurial competencies and acquiring skills in managing a small venture.	SO3.1 SO3.2 SO3.3 SO3.4	3.1 To study about Monitoring and supervision.	Unit-3.0 .0 Entrepreneurship Development process and Business Leadership Skills; Developing organizational skills (controlling, supervising, problem-solving, monitoring & evaluation) 3.1, 3.2,	1. Meeting with skillful persons and try to know about business idea.
PO 1,2,3,4 PSO 1,2, 3,4,	21MT624 C- 4: Understand various schemes supporting entrepreneurship, Opportunity to sharpen entrepreneurial competencies. Students will know the role and assistance by various promotional organizations. Learn about abilities that contribute to top performance. Think creative and innovative.	SO4.1 SO4.2 SO4.3 SO4.4	4.1To study Problem solving 4.2Managerial skills and achievement motivation	Unit-4.0. 4.0 Conceptual, technical, human relations skills, Managerial skills possessed by an entrepreneur, Business leadership skills Problem solving: Definition, types and steps, problem solving skills possessed by an entrepreneur Supply Chain Management Definition, Stages, advantages and scope Total Quality Management (TQM) Definition, need and process in small scale enterprises 4.1, 4.2, 4.3. 4.4,	1. Visit small scale industries
PO 1,2,3,4 PSO 1,2, 3,4,	21MT624 C- 5: Entrepreneurship will be able to create value. Students are able to create presentations and business plans that articulate and apply financial, operational, organizational, market, and sales knowledge to identify paths to value creation through 1) company formation (for-profit);	SO5.1 SO5.2 SO5.3	5.1 Exercise in creativity 5.2Time audit through planning 5.3 Identification and selection of business idea 5.4 Preparation of business plan and proposal writing	Unit-5.0 Project planning formulation Report preparation Financing of enterprise, Opportunities for Agri-entrepreneurship and rural enterprise	1. Find same scale industries and find out there working procedure

	2) social innovation (nonprofit); or 3) intellectual property licensing.			5.1, 5.2,	
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Course Code: 21AN623

Course Title: Geoinformatics, Nano-technology and Precision Farming

Pre-requisite: To introduce the basic concepts of geoinformatics and nanotechnology. To create awareness about various applications of geoinformatics and nanotechnology for precision agriculture. To teach basic handling of various geoinformatics tools.

Rationale: Geoinformatics, nanotechnology, and precision farming are three distinct fields that, when integrated, offer innovative solutions in agriculture and various other sectors. Let's explore the rationale behind each of these technologies and how their convergence can revolutionize agriculture.

Course Outcomes:

21AN623.1 Student may become expert in precision farming.

21AN623.2 Students will able to acquaint with crop discrimination and yield monetering by demonstration.

21AN623.3 To get knowledge on GPS and its component with functions.

21AN623.4 Students get knowledge to choose nano technology for higher production of field crops.

21AN623.5 Students gain knowledge through use of nano technology in seed, water, fertilizer, plant protection for scaling, up farm productivity.

Scheme of Studies:

Code	Course Code	CourseTitle	Scheme of studies(Hours/Week)				TotalCredits (C)	
			CI	LI	SW	SL		Total StudyHours(CI+LI+SW+SL)
Program Core (PCC	21AN623	Geoinformatics, Nano-technology and Precision Farming	01	01	01	01	04	02

- Legend:**
- CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others,
 - LI:** Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)
 - SW:** Sessional Work (includes assignment, seminar, mini project etc.),
 - SL:** Self earning,
 - C:** Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

Code	Course Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment	Total Marks
			Class/ Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
Program Core (PCC)	21AN623	Geoinformatics, Nanotechnology and Precision Farming	16	30	0	0	05	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

21AN623.1 Student may become expert in precision farming.

ApproximateHours

Item	AppxHrs.
CI	03
LI	04
SW	01
SL	01
TOTAL	09

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO1.1To acquaint Precision agriculture concepts and techniques.</p> <p>SO1.2To familiarthe issues and concerns for Indian agriculture in precision techniques.</p> <p>SO1.3 To know the Geo-informatics</p> <p>SO1.4.To learn the use of Geo-informatics in Precision Agriculture.</p>	<p>1. Introduction to GIS software, spatial data creation and editing.</p> <p>2.Projects formulation and execution related to precision farming.</p>	<p>Unit-1 Precision agriculture: concepts and techniques; their issues and concerns for Indian agriculture; Geo-informatics-definition, concepts, tool and techniques; their use in Precision Agriculture.</p> <p>1.1 Introduction of Precision agriculture.</p> <p>1.2 Different concepts and techniques of Precision Agriculture.</p> <p>1.3 Introduction of Geo-informaticsuse of Geo-informatics in Precision Agriculture.</p>	<p>1.Study onPrecision farming in Indian Agriculture.</p>

SW-1 SuggestedSessionalWork(SW):

Assignments:

Precision agriculture: concepts and techniques.

Other Activities(Specify):Research on study of use of Precision farming in Indian Agriculture.

21AN623.2 Students will be able to acquaint with crop discrimination and yield monitoring by demonstration.

Approximate Hours

Item	AppxHrs.
CI	3
LI	6
SW	1
SL	1
TOTAL	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO1.1 Understand the Crop discrimination.</p> <p>SO1.2 Understand the Yield monitoring.</p> <p>SO1.3 Understand the fertilizer recommendation using geospatial technologies.</p> <p>SO1.4. Understand the Spatial data and their management in GIS.</p> <p>SO1.5 Understand the Remote sensing and Image processing.</p>	<p>1.Creation of thematic layers of soil fertility based on GIS.</p> <p>2.Multispectral remote sensing for soil mapping.</p> <p>3.Introduction to image processing software.</p>	<p>Unit-2 Crop discrimination and Yield monitoring, soil mapping; fertilizer recommendation using geospatial technologies; Spatial data and their management in GIS; Remote sensing concepts and application in agriculture; Image processing and interpretation.</p> <p>1.1Introduction to Crop discrimination and yield monitoring.</p> <p>1.2. Introduction and concept fertilizer recommendation using geospatial technologies.</p> <p>1.3Introduction to Remote sensing and Image processing.</p>	<p>1.Use of different Image processing software.</p>

SW-1 Suggested Sessional Work (SW):

Assignments:Introduction to Crop discrimination, Yield monitoring and soil mapping

Other Activities (Specify):

Research on study of use of remote sensing in agriculture.

21AN623.3 To get knowledge on GPS and its component with functions.

ApproximateHours

Item	AppxHrs.
CI	03
LI	04
SW	01
SL	01
TOTAL	09

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO1.1 Understand the GPS.</p> <p>SO1.2 Understand the application of GPS for Precision agriculture.</p> <p>SO1.3 Understand the crop Simulation Models and their uses for optimization of Agricultural Inputs.</p>	<p>1.Use of GPS for agricultural survey.</p> <p>2.Crop stress (biotic/abiotic) monitoring using geospatial technology.</p>	<p>Unit-3 Global positioning system (GPS), components and its functions; Introduction to crop Simulation Models and their uses for optimization of Agricultural Inputs.</p> <p>1.1 Introduction to the Global positioning system</p> <p>1.2 Function of Global positioning system</p> <p>1.3Introduction to crop Simulation models.</p>	<p>1. Study on Global positioning system (GPS), components and its functions.</p>

SW-1 Suggested Sessional Work (SW):

Assignments:

Introduction to GPS and crop Simulation models.

Other Activities (Specify):

Research on study of use of GPS in Agriculture.

21AN623.4 Students get knowledge to choose nano technology for higher production of field crops.

Approximate Hours

Item	AppxHrs.
CI	03
LI	06
SW	01
SL	01
TOTAL	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO1.1 Understand to the STCR approach</p> <p>SO1.2 Understand the application Nanotechnology in precision agriculture.</p> <p>SO1.3 Understand the introduction about nanoscale effects, nano-particles, nano-pesticides, nano-fertilizers, nano-sensors.</p>	<p>1. Formulation, characterization and applications of nanoparticles in agriculture.</p> <p>2. Creation of productivity and management zones.</p> <p>3. Fertilizers recommendations based of VRT and STCR techniques.</p>	<p>Unit-4 STCR approach for precision agriculture; Nanotechnology, definition, concepts and techniques, brief introduction about nanoscale effects, nano-, nano-pesticides, particles nano-fertilizers, nano-sensors.</p> <p>1.1 Introduction to STCR approach.</p> <p>1.2 Introduction to application Nanotechnology in precision agriculture.</p> <p>1.3. Brief introduction about nanoscale effects, nano-particles, nano-pesticides, nano-fertilizers, nano-sensors.</p>	<p>1. Study on nanoscale effects on crop production and new research on agriculture.</p>

SW-1 Suggested Sessional Work (SW):

Assignments:

Role of nanoscale effects on crop production and new research on agriculture.

Other Activities (Specify):

New Research on nano fertilizers.

21AN623.5 Students gain knowledge through use of nano technology in seed, water, fertilizer, plant protection for scaling, up farm productivity.

Approximate Hours

Item	Appx Hrs.
CI	03
LI	04
SW	01
SL	01
TOTAL	09

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO1.1 Understand to the nanotechnology.</p> <p>SO1.2 Understand the application Nano fertilizer.</p> <p>SO1.3 Understand the introduction about use of plant protection for scaling-up farm productivity.</p>	<p>1.Visual and digital interpretation of remote sensing images.</p> <p>2.Generation of spectral profiles of different objects.</p>	<p>Unit-5 Use of nanotechnology in seed, water, fertilizer, plant protection for scaling-up farm productivity.</p> <p>1.1 Introduction to nanotechnology in seed.</p> <p>1.2Introduction to nanotechnology in water.</p> <p>1.3 Introduction to nanotechnology in fertilizer, plant protection.</p>	<p>1. Study on use of nanotechnology in precision agriculture.</p>

SW-1 Suggested Sessional Work (SW):

Assignments:

Role of nanotechnology on crop production and new research on agriculture.

Other Activities (Specify):

New Research on nanotechnology in agriculture.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self Learning (Sl)	Total hour (Cl+SW+Sl)
21AN623.1 Student may become expert in precision farming.	07	01	01	09
21AN623.2 Students will able to acquaint with crop discrimination and yield monetering by demonstration.	09	01	01	11
21AN623.3 To get knowledge on GPS and its component with functions.	07	01	01	09
21AN623.4 Students get knowledge to choose nano technology for higher production of field crops.	09	01	01	11
21AN623.5 Students gain knowledge through use of nano technology in seed, water, fertilizer, plant protection for scaling, up farm productivity.	07	01	01	09
Total Hours	39	05	05	49

Suggestion for EndSemester Assessment

Suggested Specification Table (ForESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Precision agriculture their issues and concerns for Indian agriculture Geo-informatics their use in Precision Agriculture.	03	01	01	05
CO-2	Crop discrimination and Yield monitoring, Spatial data and their management in GIS; Remote sensing concepts and application in agriculture;	02	06	02	10
CO-3	Global positioning system (GPS), components and its functions; Introduction to crop Simulation Models and their uses for optimization of Agricultural Inputs.	03	07	05	15
CO-4	STCR approach for precision agriculture Nanotechnology brief introduction about nanoscale effects, nano-, nano-pesticides, particles nano-fertilizers, nano-sensors.	05	05	05	15
CO-5	Use of nanotechnology in seed, water, fertilizer, plant protection for scaling-up farm productivity	02	02	01	05
Total		11	26	13	50

Legend: R:Remember, U:Understand, A:Apply

The end of semester assessment for Geoinformatics, Nano-technology and Precision Farming Will be held with written examination of 50 marks

Note.Detailed Assessment rubric need to be prepared by the course wise teachers for about Tasks.

Teachers can also design different task sasper requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Demonstration
7. ICT Based Teaching Learning
(Video Demonstration/Tutorials CBT,
Blog, Facebook, Twitter, Whatsapp, Mobile, Online
sources)
8. Brain storming

Suggested Learning Resources:

(a) Books:

S. No.	Title	Author	Publisher	Edition & Year
1	Precision Farming: Soil Fertility and Productivity Aspects.	Krishna, K.K.	Apple Academic Press	2013.
2	An Introduction to Geoinformatics.	Srivastava, G.S.	McGraw Hill Education (India) Pvt. Ltd. , New Delhi	2014.
3	Principles of Geoinformatics.	Gupta, R.K. and Subhash Chander.	Jain Brothers, New Delhi	2008.

Curriculum Development Team

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Cos, Pos and PSOs Mapping

Course Code: 21AN623

Course Title: Geoinformatics and Nano-technology and Precision Farming

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprises with different scales in area of agricultural production, process and trade	Hold a post on supply in administration and policy	Analyze and control commercial and economical process in the field of agriculture	Teach how to control and manage agricultural production	Introduce general production technologies	Teach how to implement and manage production technologies	Prepare for managerial and social responsibilities	Student will identify different underutilized crops	Student will practice different breeding techniques used in crop production.	Student will recognize different insect pest and diseases and their symptoms of crops	Student will apply different recent techniques in crop production
21AN623.1 Student may become expert in precision farming.	1	1	2	1	2	3	2	1	1	2	2
21AN623.2 Students will able to acquaint with crop discrimination and yield monetering by demonstration.	2	1	1	1	2	2	2	2	2	2	1
21AN623.3 To get knowledge on GPS and its component with functions.	1	2	2	1	3	2	1	1	1	1	2

21AN623.4 Students get knowledge to choose nano technology for higher production of field crops.	1	2	2	1	2	3	1	1	2	1	2
21AN623.5 Students gain knowledge through use of nano technology in seed, water, fertilizer, plant protection for scaling, up farm productivity.	2	1	1	2	3	2	2	2	1	2	1

Legend: 1 – Low, 2 – Medium, 3 – High

Curriculum Map: Entrepreneurship Development and Business Communication

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO 1,2,3,4 PSO 1,2, 3, 4,	21AN623.1 Student may become expert in precision farming.	SO1.1 SO1.2 SO1.3 SO1.4	1. Introduction to GIS software, spatial data creation and editing. 2. Projects formulation and execution related to precision farming.	Unit-1 Precision agriculture: concepts and techniques; their issues and concerns for Indian agriculture; Geo-informatics- definition, concepts, tool and techniques; their use in Precision Agriculture. 1.1 Introduction of Precision agriculture. 1.2 Different concepts and techniques of Precision Agriculture. 1.3 Introduction of Geo-informaticsuse of Geo-informatics in Precision Agriculture.	1. Study onPrecision farming in Indian Agriculture.
PO 1,2,3,4 PSO 1,2, 3, 4,	21AN623.2 Students will able to acquaint with crop discrimination and yield monetering by demonstration.	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5	1. Creation of thematic layers of soil fertility based on GIS. 2. Multispectral remote sensing for soil mapping. 3. Introduction to image processing software.	Unit-2 Crop discrimination and Yield monitoring, soil mapping; fertilizer recommendation using geospatial technologies; Spatial data and their management in GIS; Remote sensing concepts and application in agriculture; Image processing and interpretation. 1.1 Introduction to Crop discrimination and yield monitoring.	1. Use of different Image processing software.

				<p>1.2. Introduction and concept fertilizer recommendation using geospatial technologies.</p> <p>1.3Introduction to Remote sensing and Image processing.</p>	
<p>PO 1,2,3,4 PSO 1,2,3,4,</p>	<p>21AN623.3 To get knowledge on GPS and its component with functions.</p>	<p>SO3.1 SO3.2 SO3.3</p>	<p>1.Use of GPS for agricultural survey.</p> <p>2.Crop stress (biotic/abiotic) monitoring using geospatial technology.</p>	<p>Unit-3 Global positioning system (GPS), components and its functions; Introduction to crop Simulation Models and their uses for optimization of Agricultural Inputs.</p> <p>1.3 Introduction to the Global positioning system</p> <p>1.4 Function of Global positioning system</p> <p>1.3Introduction to crop Simulation models.</p>	<p>1. Study on Global positioning system (GPS), components and its functions.</p>
<p>PO 1,2,3,4 PSO 1,2,3,4,</p>	<p>21AN623.4 Students get knowledge to choose nano technology for higher production of field crops.</p>	<p>SO4.1 SO4.2 SO4.3</p>	<p>1.Formulation, characterization and applications of nanoparticles in agriculture.</p> <p>2. Creation of productivity and management zones.</p> <p>3. Fertilizers recommendations based of VRT and STCR techniques.</p>	<p>Unit-4 STCR approach for precision agriculture; Nanotechnology, definition, concepts and techniques, brief introduction about nanoscale effects, nano-, nano-pesticides, particles nano-fertilizers, nano-sensors.</p> <p>1.3 Introduction to STCR approach.</p> <p>1.4 Introduction to application Nanotechnology in precision</p>	<p>1. Study on nanoscale effects on crop production and new research on agriculture.</p>

				<p>agriculture.</p> <p>1.3.Brief introduction about nanoscale effects, nano-particles, nano-pesticides, nano-fertilizers, nano-sensors.</p>	
<p>PO 1,2,3,4 PSO 1,2,3,4,</p>	<p>21AN623.5 Students gain knowledge through use of nano technology in seed, water, fertilizer, plant protection for scaling, up farm productivity.</p>	<p>SO5.1 SO5.2 SO5.3</p>	<p>1.Visual and digital interpretation of remote sensing images.</p> <p>2.Generation of spectral profiles of different objects.</p>	<p>Unit-5 Use of nanotechnology in seed, water, fertilizer, plant protection for scaling-up farm productivity.</p> <p>1.2 Introduction to nanotechnology in seed.</p> <p>1.2Introduction to nanotechnology in water.</p> <p>1.3 Introduction to nanotechnology in fertilizer, plant protection.</p>	<p>1. Study on use of nanotechnology in precision agriculture.</p>

Course Code: 21FT629

Course Title: Principles of Food Science and Nutrition

Pre-requisite: Student should have basic knowledge of chemistry, microbiology, engineering principles, and health sciences to understand food composition, processing, preservation, and their impact on human health.

Rationale: Understanding the complex interactions and compositions of food. Concepts such as density, phase change, pH, osmosis, and surface tension are fundamental to comprehending the physical and chemical properties of food, influencing its processing, preservation, and sensory qualities. Food composition and chemistry delve into the intricate makeup of nutrients like water, carbohydrates, proteins, fats, vitamins, minerals, flavors, colors, and bioactive compounds, crucial for human health and culinary applications. Food microbiology explores microbial roles in food spoilage and fermentation, impacting safety and flavor development in both fresh and processed foods.

Course Outcomes:

AE 105.1: Students understanding of fundamental principles and phenomena governing food properties and behaviors.

AE105.2: Students will gain a deep understanding of the molecular structures, functional roles, and interactions of essential nutrients and bioactive compounds in foods.

AE105.3: Students will understand the roles of bacteria, yeast, and molds in food spoilage and the production of fermented foods, preparing them to apply microbial knowledge in food safety and production settings.

AE105.4: Students will be proficient in applying various techniques including heat, low temperature, chemicals, radiation, and drying to enhance food safety and shelf life.

AE105.5: Students will comprehend how carbohydrates, fats, and proteins are metabolized for energy, enabling them to design balanced and modified diets.

Scheme of Studies:

Code	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits(C)
			CL	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Program Core (PCC)	21FT629	Principles of Food Science and Nutrition	2	0	1	1	4	2

- Legend:**
- CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),
 - LI:** Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)
 - SW:** Sessional Work (includes assignment, seminar, mini project etc.),
 - SL:** Self Learning,
 - C:** Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

Code	Course Code	Course Title	Scheme of Assessment (Marks)							End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Progressive Assessment (PRA)						Total Marks (CA+CT+SA+CAT+AT)		
			Class/Home Assignment (CA)	Mid Term-1	Mid Term-2	Class Activity any one (CAT)	Class Attendance (AT)				
Program Core (PCC)	21FT629	Engineering Principles of Food Science and Nutrition	10	15	15	5	5	50	50	100	
Total									100		

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

AE 105.1: Students understanding of fundamental principles and phenomena governing food properties and behaviors.

Approximate Hours

Item	AppX Hrs
CL	06
LI	00
SW	01
SL	01
Total	08

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
<p>SO1.1 Students will able to underrated the concept of density, phase change, pH, osmosis, surface tension, and colloidal systems in food science</p> <p>SO1.2 Students will learn and apply appropriate measurement techniques and chemical properties crucial to food processing and quality control</p> <p>SO1.3 Students will develop analytical skills to evaluate the impact of texture, stability, and sensory attributes, enhancing their ability to troubleshoot and optimize food production processes.</p> <p>SO1.4 Students will integrate theoretical knowledge into practical applications, applying concepts to real-world scenarios such as food preservation, formulation, and quality assessment.</p>		<p>Unit-1.0 Fundamentals of Food Science and Physical Properties</p> <p>1.1 Fundamental Definitions and Measurements</p> <p>1.2 Density and Phase Change</p> <p>1.3 pH and Its Importance.</p> <p>1.4 Osmosis and Its Applications</p> <p>1.5 Surface Tension and Its Effects</p> <p>1.6 Colloidal Systems in Foods</p>	<p>1. Access online modules or videos that explain each concept (definitions, measurements, density, phase change, pH, osmosis, surface tension, colloidal systems) with examples from food science.</p>

SW-1 Suggested Sessional Work (SW):

a. Assignments:

- i. Define each concept (e.g., density, pH) in the context of food science and provide examples of their application in food processing or quality control.

b. Mini Project

- i. To make a diagram of different types of chains.

c. Other activities

- i. Visit a food processing facility or research lab that specializes in food science.

AE 105.2: Students will gain a deep understanding of the molecular structures, functional roles, and interactions of essential nutrients and bioactive compounds in foods.

Approximate Hours

Item	AppX Hrs
CL	06
LI	00
SW	01
SL	01
Total	8

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO2.1 Students will gain a thorough understanding of the composition and roles of essential nutrients</p> <p>SO2.2 Students will be able to identify and explain important chemical reactions that occur during food processing</p> <p>SO2.3 Students will develop skills in analyzing and evaluating the nutritional composition of foods, enabling them to assess dietary contributions and make informed recommendations for balanced nutrition.</p> <p>SO2.4 Students will apply knowledge of food composition and chemistry to solve practical challenges in food production, preservation, and formulation, preparing them for roles in food science, nutrition, and related industries.</p>	.	<p>Unit-2 Fundamentals of Nutritional Biochemistry and Food Composition.</p> <p>2.1 Fundamental of food Nutrients (functions of essential nutrients)</p> <p>2.2 Role of water in food, including its impact on texture, preservation, and chemical reactions.</p> <p>2.3 Bioactive Compounds and Additives in food.(flavors, colors, and miscellaneous bioactive present in food)</p> <p>2.4 Chemical Reactions in Food (chemical reactions that occur during food processing, storage, and preparation.)</p> <p>2.5 Food Colorants and Flavors (chemistry of natural and synthetic food colorants and flavors)</p> <p>2.6 Nutrient Interaction and Bioavailability (nutrients interact within food matrices and influence their bioavailability and nutritional value)</p>	<p>1. Utilize online courses or resources that cover the basics of food composition and chemistry.</p>

SW-1 Suggested Sessional Work (SW):

a) Assignments:

- i) Investigate and describe important chemical reactions that occur during food processing or storage, such as lipid oxidation or Maillard reaction.

b) Mini Project

- i) Develop a new food product formulation considering the composition and chemistry principles learned.

c) Other activities

- i.) Visit a food processing facility or research lab that specializes in food science.

AE 105. 3: Students will understand the roles of bacteria, yeast, and molds in food spoilage and the production of fermented foods, preparing them to apply microbial knowledge in food safety and production settings.

Approximate Hours

Item	AppX Hrs
CL	6
LI	0
SW	1
SL	1
Total	8

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CL)	Self Learning (SL)
<p>SO3.1 Students will comprehend the roles of bacteria, yeast, and molds in food</p> <p>SO3.2 Students will explore the diversity of microorganisms in food environments and their functional roles in fermentation processes</p> <p>SO3.3 Students will learn principles of food safety and quality assurance related to microbial contamination and control</p> <p>SO3.4 students will gain hands-on experience in microbial isolation, identification, and cultivation techniques</p>		<p>Unit-3 : Food microbiology</p> <p>3.1 Introduction to Microorganisms in Food</p> <p>3.2 Role of bacteria, yeast, and molds in the spoilage of fresh and processed foods.</p> <p>3.3 Yeast and Mold Spoilage</p> <p>3.4 Principles and methods of microbial fermentation used in food production.</p> <p>3.5 Methods to Control Microbial Growth</p> <p>3.6 Detection and Enumeration of Microorganisms</p>	<p>1. Read textbooks on food microbiology to deepen understanding of microbial roles in food safety, spoilage, and fermentation processes.</p>

SW-3 Suggested Sessional Work (SW):

a. Assignments:

- i) Microbial analysis of a food sample, identifying and categorizing bacteria, yeast, or molds present.

b. Mini Projects

- i. Design and conduct an experiment to produce a fermented food product (e.g., yogurt, sauerkraut).

c. Other activities

- i. Visit a food processing facility or brewery specializing in fermented foods. Observe fermentation processes and discuss microbial roles in flavor development and product preservation.

AE 105.4: Students will be proficient in applying various techniques including heat, low temperature, chemicals, radiation, and drying to enhance food safety and shelf life

Approximate Hours

Item	AppX Hrs
CL	6
LI	0
SW	1
SL	1
Total	8

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO4.1 Students will comprehend the principles and applications of various food processing techniques</p> <p>SO4.2 Students will analyze the impact of food processing on nutritional content and bioavailability, including effects on vitamins, minerals, and macronutrients.</p> <p>SO4.3 Students will identify causes and consequences of malnutrition, encompassing both over nutrition (obesity) and under nutrition (deficiencies).</p> <p>SO4.4 Students will apply knowledge of food preservation techniques to propose effective strategies for extending shelf life, ensuring food safety, and minimizing nutrient loss.</p>		<p>Unit-4: Food Processing, Preservation, and Nutritional Health</p> <p>4.1 Principles and Methods of Food Processing and Preservation</p> <p>4.2 Heat-Based Food Processing</p> <p>4.3 Low Temperature Preservation</p> <p>4.4 Drying and Dehydration Techniques</p> <p>4.5 Food and Nutrition, Malnutrition, Nutritional Disorders</p> <p>4.6 Malnutrition and Nutritional Disorders</p>	<p>1. Utilize online courses or resources focusing on principles and methods of food processing and preservation.</p>

SW-4 Suggested Sessional Work (SW):

- a. Assignments:**
 - i. Analyze and compare the nutritional profiles of fresh and processed foods.
- b. Mini Project:**
 - i. Develop a proposal for an innovative food preservation technique (e.g., novel drying method, alternative chemical preservative)
- c. Other activities**
 - i. Perform lab experiments to demonstrate principles of food processing techniques, such as heat treatment effects on microbial load, or the impact of drying methods on food texture and shelf life.

AE 105.5: Students will comprehend how carbohydrates, fats, and proteins are metabolized for energy, enabling them to design balanced and modified diets.

Item	AppX Hrs
CI	6
LI	0
SW	1
SL	2
Total	9

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO5.1 tudents will understand the metabolic pathways for carbohydrates, fats, and proteins, including glycolysis, the Krebs cycle, and beta-oxidation.</p> <p>SO5.2 Students will be able to create balanced and modified diet plans tailored to specific health needs, life stages, or conditions.</p> <p>SO5.3 tudents will acquire skills in menu planning, considering nutritional adequacy, cultural preferences, and budget constraints.</p> <p>SO5.4 Students will explore and critically evaluate emerging trends in food science and nutrition, such as plant-based diets, functional foods, and personalized nutrition.</p>		<p>Unit 5: Advanced Nutrition and Food Science Trends</p> <p>5.1 Understanding how carbohydrates, fats, and proteins are metabolized in the body.</p> <p>5.2 Carbohydrate Metabolism & Fat Metabolism</p> <p>5.3 Principles of a balanced diet and Modifying diets to meet specific health needs</p> <p>5.4 Fundamentals of menu planning.</p> <p>5.5 New Trends in Food Science and Nutrition</p> <p>5.6 Nutritional Disorders and Malnutrition</p>	<p>1. Write a report on the glycolysis, Krebs cycle, and electron transport chain, explaining their roles in energy production from carbohydrates.</p> <p>2. Analyze a case study on a specific nutritional disorder, detailing its causes, symptoms, and management strategies.</p>

SW-5 Suggested Sessional Work (SW):

a. Assignments:

- i. Analyze the dietary modifications required for managing diabetes or another chronic condition..

b. Mini Project

- i. Develop a campaign aimed at raising awareness about the prevention and management of a specific nutritional disorder.

c. Other Activities

- i. Invite a public health nutritionist to discuss the global and local challenges of malnutrition and current efforts to address these issues.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (CL)	Laboratory Instruction (LI)	Sessional Work (SW)	Self Learning (SL)	Total hour (CL+SW+SL)
AE 105.1: Students understanding of fundamental principles and phenomena governing food properties and behaviors.	6		1	1	8
AE 105.2: Students will gain a deep understanding of the molecular structures, functional roles, and interactions of essential nutrients and bioactive compounds in foods.	6		1	1	8
AE 105.3: Students will understand the roles of bacteria, yeast, and molds in food spoilage and the production of fermented foods, preparing them to apply microbial knowledge in food safety and production settings.	6		1	1	8
AE 105.4: Students will be proficient in applying various techniques including heat, low temperature, chemicals, radiation, and drying to enhance food safety and shelf life	6		1	1	8
AE 105.5: Students will comprehend how carbohydrates, fats, and proteins are metabolized for energy, enabling them to design balanced and modified diets	6		1	2	9
Total Hours	30		5	6	41

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Fundamentals of Food Science and Physical Properties	01	04	04	9
CO-2	Fundamentals of Nutritional Biochemistry and Food Composition.	02	04	04	10
CO-3	Food microbiology	2	04	05	11
CO-4	Food Processing, Preservation, and Nutritional Health	02	08	05	15
CO-5	Advanced Nutrition and Food Science Trends	03	02	-	05
Total		10	22	18	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for principles of food science and nutrition will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Visit to food plant
7. Demonstration
8. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, Whatsapp, Mobile, Online sources)
9. Brainstorming

Suggested Learning Resources:

(a) Books:

S. No.	Title	Author	Publisher	Edition & Year
1	Text Book of Food Science	B. Srilakshmi	New age international (P) limited, publisher, New Delhi	2010
2	Text Book of Community Nutrition	S. Sehgal, S. and R.S. Raghuvanshi	ICAR Publication	2007
3	Text Book of Food. Storage and Preservation	V. Khaddar	Kalyani Publishers, New Delhi.	1999
4	Advanced Textbook on Food and Nutrition	M. Swaminathan	Bappco, the Bangalore Press and Publishing Co. Ltd. Bangalore	1993
5	https://elearning.icar.gov.in/eLearningCoursesLibrary.aspx?CoursesType=UG			
6	Lecture note provided by Dept. of Agril. Engineering, AKS University, Satna.			
7				

Curriculum Development Team

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Cos, POs and PSOs Mapping

Course Title: B.Sc. (Hons.) Agriculture

Course Code:

Course Title: Principles of Food Science and Nutrition

Course Outcomes	Program Outcome							Program Specific Outcome			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO 3	PSO 4
	Manage agricultural enterprises with different scales in area of agricultural production, process and trade	Hold a post on supply in administration and policy	Analyze and control commercial and economical process in the field of agriculture	Teach how to control and manage agricultural production	Introduce general production technologies	Teach how to implement and manage production technologies	Prepare for managerial and social responsibilities	Student will identify different underutilized crops	Student will practice different breeding techniques used in crop production.	Student will recognize different insect pest and diseases and their symptoms of crops	Student will apply different recent techniques in crop production
AE 105.1: Students understanding of fundamental principles and phenomena governing food properties and behaviors.	1	1	1	1	2	1	2	2	3	3	3
AE 105.2: Students will gain a deep understanding of the molecular structures, functional roles, and interactions of essential nutrients and bioactive compounds in foods.	1	1	2	1	1	3	2	3	2	2	1
AE 105.3: Students will understand the roles of bacteria, yeast, and molds in food spoilage and the production of fermented foods, preparing them to apply microbial knowledge in food safety and production settings..	2	1	1	1	3	2	2	1	1	3	2

AE 105.4: Students will be proficient in applying various techniques including heat, low temperature, chemicals, radiation, and drying to enhance food safety and shelf life.	2	2	1	1	1	2	3	3	3	3	2
AE 105.5: Students will comprehend how carbohydrates, fats, and proteins are metabolized for energy, enabling them to design balanced and modified diets	1	1	1	1	2	2	1	3	3	1	3

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
PO1,2,3,4,5,6,7 PSO 1,2,3,4	CO-1: Students understanding of fundamental principles and phenomena governing food properties and behaviors.	SO1.1 SO1.2 SO1.3 SO1.4		Unit-1.0 Fundamentals of Food Science and Physical Properties 1.1,1.2,1.3,1.4,1.5,1.6	As Mentioned along with the concern units
PO1,2,3,4,5,6,7 PSO 1,2,3,4	CO 2 : Students will gain a deep understanding of the molecular structures, functional roles, and interactions of essential nutrients and bioactive compounds in foods.	SO2.1 SO2.2 SO2.3 SO2.4		Unit-2 Fundamentals of Nutritional Biochemistry and Food Composition. 2.1, 2.2, 2.3, 2.4, 2.5, 2.6	
PO1,2,3,4,5,6,7 PSO 1,2,3,4	CO3 : Students will understand the roles of bacteria, yeast, and molds in food spoilage and the production of fermented foods, preparing them to apply microbial knowledge in food safety and production settings.	SO3.1 SO3.2 SO3.3 SO3.4		Unit-3 : Food microbiology 3.1, 3.2,3.3,3.4,3.5,3.6	
PO1,2,3,4,5,6,7 PSO 1,2,3,4	CO 4: Students will be proficient in applying various techniques including heat, low temperature, chemicals, radiation, and drying to enhance food safety and shelf life.	SO4.1 SO4.2 SO4.3 SO4.4		Unit-4 : Food Processing, Preservation, and Nutritional Health 4.1, 4.2,4.3,4.4,4.5,4.6,4	
PO1,2,3,4,5,6,7 PSO 1,2,3,4	CO 5: Students will comprehend how carbohydrates, fats, and proteins are metabolized for energy, enabling them to design balanced and modified diets	SO5.1 SO5.2 SO5.3 SO5.4		Unit 5: Advanced Nutrition and Food Science Trends 5.1,5.2,5.3,5.4,5.5,5.6	

Course Code: 21BT621

Course Title: Fundamentals of Plant Biochemistry and Biotechnology

Pre-requisite:

Rationale: Foundational understanding of basic biology and chemistry. Students are expected to have completed introductory courses in subjects such as plant biology, biochemistry, and molecular biology. A strong background in these fundamental sciences provides the necessary groundwork for grasping the complexities of plant biochemistry and biotechnology in an agricultural context.

Course Outcomes:

CO1_21BT621.01 To acquaint knowledge on the applications and scope of biochemistry, classification, composition, properties, structural formula, occurrence, of carbohydrates. reducing and non-reducing sugar.

CO2_21BT621.02 To gain basic knowledge of structure properties of biomolecules lipids and proteins

CO3_21BT621.03 To provide comprehensive understanding of classification, nomenclature and action of enzymes. To gain basic knowledge of structure of nucleic acids

CO4_21BT621.04 Synthesis pathways of biomolecules and regulations and basics of plant tissue culture.

CO5_21BT621.05 To understand the techniques, concepts and applications of plant biotechnology and various recombinant methods

Scheme of Studies

Code	Course Code	Course Title	Scheme of Studies (Hours/Week)					Total Credit (C)
			CI	LI	SW	SL	Total Study Hours	
Program Core (PCC)	21BT621 Program Core (PCC)	Fundamentals of Plant Biochemistry and Biotechnology	02	01	01	01	5	03

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and

Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment

Code	Course Code	Course Title	Scheme of Assessment (Marks)							End Semester Assessment (ESA)	Total Marks (PRA + ESA)
			Progressive Assessment (PRA)						Total Marks (CA+CT+SA+CAT+AT)		
			Class/Home Assignment 5 number 3 marks each (CA)	Classes Test 2 (2 best out of 3) 10 marks each (CT)	Seminars	Class Activity any one (CAT)	Class Attendance (AT)				
Program Core (PCC)	21BT631	Fundamentals of Plant Biochemistry and Biotechnology	15	20	5	5	5	50	50	100	

Course-Curriculum Detailing:

This course syllabus is to provide in-depth knowledge of important biomolecules of life (carbohydrates, lipids, proteins, nucleic acids. To learn basics of enzymes and their industrial uses. To impart knowledge on basic and applied aspects of plant biotechnology and biotechnological techniques.

21BT631.01: Importance of Biochemistry, structure and properties of carbohydrates**Approximate Hours**

Item	Appx Hrs
CI	05
LI	10
SW	02
SL	01
Total	18

Session Outcomes (SOs)	Laboratory Instructions (LI)	Classroom Instructions (CI)	Self-Learning (SL)
SO1.1 To draw inference and establish relationship between Biochemistry as a subject and Agriculture.	1. To prepare the buffer at required pH.	Unit – I: About biochemistry, its use and role in agriculture. Introduction to carbohydrates.	Learn about different types of glycosidic linkage.
SO1.2 Relate the presence and importance of Carbohydrates	2. To identify sugar by performing Molish Test in Sugar sample (Glucose, Fructose).	1.1 To acquaint knowledge on the applications and scope of biochemistry. Water and its properties. pH and Buffers.	Structure and properties of different polysaccharides.
SO1.3 Explain and classify carbohydrates	3. To estimate reducing sugar using Fehling Test.	1.2 Occurrence of carbohydrates.	
SO1.4 Interpret and determine the properties of carbohydrates	4. To determine the ketose sugar by performing Saliwanoff Test.	1.3 Classification and composition of carbohydrates.	
SO1.5 Demonstrate, compare and analyse difference between reducing and non-reducing sugar.		1.4 Properties and structural formula, carbohydrates.	
		1.5 Reducing and non-reducing sugar.	

Suggested Sessional Work I

1. Structural formula of different types of glycosidic linkage.
2. Structure and properties of important polysachharides.

21BT631.02: Structure and properties of lipids and proteins

Approximate Hours

Item	Appx Hrs
CI	06
LI	2
SW	01
SL	00
Total	09

Session Outcomes (SOs)	Laboratory Instructions (LI)	Classroom Instructions (CI)	Self-Learning (SL)
<p>SO2.1 What are lipids and compare different class of lipids</p> <p>SO2.2 Interpret fatty acids as lipids</p> <p>SO2.3 Explain and understand different types of lipids.</p> <p>SO2.4 What are lipids and compare different class of lipids</p> <p>SO2.5 Interpret and determine the properties of proteins</p> <p>SO2.6 Identify the Structure of protein</p>	<p>1. To determine the protein in protein samples by Biurate Test.</p>	<p>Unit – II: Structure and properties of lipids and proteins as biomolecules</p> <p>2.1 Lipid: Importance and classification;</p> <p>2.2 Structures and properties of fatty acids;</p> <p>2.3 Storage lipids and membrane lipids.</p> <p>2.4 Proteins: Importance of proteins and classification;</p> <p>2.5 Structures, titration and zwitterions nature of amino acids;</p> <p>2.6 Structural organization of proteins.</p>	

Suggested Sessional Work II

1. Assignment: Spectroscopical application of biuret test for protein estimation in a sample.

21BT631.03: Enzyme and its action. Structure and properties of nucleic acid

Approximate Hours

Item	Appx Hrs
CI	05
LI	2
SW	01
SL	04
Total	12

Session Outcomes (SOs)	Laboratory Instructions (LI)	Classroom Instructions (CI)	Self-Learning (SL)
<p>SO3.1 Explain the nature, properties and classification of enzymes.</p> <p>SO3.2 Interpret the mechanism of enzyme action and factors that affect enzyme action</p> <p>SO3.3 Identify mechanism of enzyme action</p> <p>SO3.4 Recall explain nucleotides</p> <p>SO3.5 Outline different types of nucleic acid.</p>	<p>1. Immobilization of enzyme from germinated wheat by Gel entrapment method.</p>	<p>Unit – III: Enzyme and its action. Structure and properties of nucleic acid</p> <p>3.1 Enzymes: General properties and Classification</p> <p>3.2 Mechanism of action; Michaelis & Menten and Line Weaver Burk equation & plots</p> <p>3.3 Introduction to allosteric enzymes.</p> <p>3.4 Nucleic acids: Importance and classification; Structure of Nucleotides,</p> <p>3.5 A, B & Z DNA, RNA: Types and Secondary & Tertiary structure.</p>	<p>Occurrence of various types of lipids and its significance</p> <p>Overview of structure of amino acids and classification of amino acids.</p>

Suggested Sessional Work III

Mini Project: Working model of Enzyme Substrate Interaction.

21BT631.04: Biochemical processes and plant tissue culture

Approximate Hours

Item	Appx Hrs
CI	07
LI	06
SW	02
SL	01
Total	16

Session Outcomes (SOs)	Laboratory Instructions (LI)	Classroom Instructions (CI)	Self-Learning (SL)
<p>SO 4.1 Explain the breakdown of glucose during energy production</p> <p>SO 4.2 Explain further steps in energy production and concept of gluconeogenesis</p> <p>SO4.3 Explain the breakdown of lipid for energy production</p> <p>SO4.4 Infer the anabolic process of fatty acids</p> <p>SO4.5 Describe the application of biotechnology in agriculture and introduction to plant tissue culture</p> <p>SO4.6 Discover the technique of special culture types.</p> <p>SO4.7 Discover the technique of special culture types.</p>	<p>1. Preparation of stock solutions of MS (Murashige & Skoog) medium and plant growth regulator stocks.</p> <p>2. To culture of explant in invitro condition.</p>	<p>Unit IV: Carbohydrate and lipid metabolism and plant tissue culture</p> <p>4.1 Metabolism of carbohydrates Glycolysis.</p> <p>4.2 TCA cycle, Electron transport chain. Glyoxylate cycle</p> <p>4.3 Metabolism of lipids: Beta oxidation,</p> <p>4.4 Biosynthesis of fatty acids.</p> <p>4.5 Concepts and applications of plant biotechnology: Scope, cell suspension culture, callus culture,</p> <p>4.6 Organ culture, embryo culture,</p> <p>4.7 Anther culture, pollen culture and ovule culture and their applications</p>	<p>De differentiation and redifferentiation</p>

Suggested Sessional Work IV

Assignment: Chronological chart in development of plant tissue culture.

21BT631.05: Biotechnological methods and techniques

Approximate Hours

Item	Appx Hrs
CI	07
LI	10
SW	01
SL	06
Total	24

Session Outcomes (SOs)	Laboratory Instructions (LI)	Classroom Instructions (CI)	Self-Learning (SL)
<p>SO 5.1 Production method of artificial seed.</p> <p>SO 5.2 Application of plant tissue culture method.</p> <p>SO 5.3 Application of plant tissue culture method.</p> <p>SO 5.4 Familiarization with recombinant DNA technology</p> <p>SO 5.5 Application of biotechnology in producing transgenics</p> <p>SO 5.6 Familiarization with techniques in biotechnology</p> <p>SO 5.7 Application of biotechnology in plant breeding</p>	<p>1. Isolation of Plant genomic DNA by CTAB method.</p> <p>2. To check DNA quality by Agarose Gel electrophoresis.</p> <p>3. To estimate the chlorophyll pigment in Plant sample (Spinach) by Chromatography method.</p>	<p>Unit V: Biotechnological methods and techniques used in biotechnology</p> <p>5.1 Micro-propagation methods; organogenesis and embryogenesis, Synthetic seeds and their significance; Embryo rescue and its significance;</p> <p>5.2 Somatic hybridization and cybrids;</p> <p>5.3 Soma clonal variation and its use in crop improvement; cryo-preservation;</p> <p>5.4 Introduction to recombinant DNA methods: physical (Gene gun method), chemical (PEG mediated) and Agrobacterium mediated gene transfer methods;</p> <p>5.5 Transgenics and its importance in crop improvement;</p> <p>5.6 PCR techniques and its applications; RFLP, RAPD, SSR;</p>	<p>Dot blot technique</p> <p>Electrophoresis</p> <p>Blotting techniques</p>

		5.7 Marker Assisted Breeding in crop improvement; Biotechnology regulations.	
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Suggested Sessional Work V

Assignment: Identify crop improvement strategy using biotechnological techniques.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class ecture (CL)	Sessional Work (SW)	Self- Learning (SL)	Total hour (CL+SW+SL)
21BT631.01: Importance of Biochemistry, structure and properties of carbohydrates	5+10	2	1	18
21BT631.02: Structure and properties of lipids and proteins	6+2	1	0	9
21BT631.03: Enzyme and its action. Structure and properties of nucleic acid	5+2	1	4	12
21BT631.04: Biochemical processes and plant tissue culture	7+6	2	1	16
21BT631.05: Biotechnological methods and techniques	7+10	1	6	24
Total Hours	30+30	7	12	79

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO1	Importance of Biochemistry, structure and properties of carbohydrates	6	4	0	10
CO2	Structure and properties of lipids and proteins	0	6	4	10
CO3	Enzyme and its action. Structure and properties of nucleic acid	0	6	4	10
CO4	Biochemical processes and plant tissue culture	0	4	6	10
CO5	Biotechnological methods and techniques	2	4	4	10
Total		8	24	18	50

Legend: **R: Remember,** **U: Understand,** **A: Apply**

Suggested Learning Resources:

Sl. No.	Title	Author	Publisher	Edition & Year
1	Plant Biochemistry	V. Arun Kumar, N. Senthil Kumar and K. Siva Kumar	APH Publishing Corporation, New Delhi.	2010
2	Biotechnology-Expanding Horizons	B.D. Singh	Kalyani Publishers	2014
3	Principles and Techniques of Biochemistry and Molecular Biology	Keith Wilson and John Walker	Cambridge University Press	7th Edition, 2010
4	A Textbook of Biotechnology	R.C. Dubey	S. Chand Publishing Company, New Delhi	Revised Edition, 2014
5	Lehninger Principles of Biochemistry	Albert Lehninger, David Nelson and Michael Cox,	Macmillan Publishers.	Seventh Edition, 2017

Cos, Pos and PSOs Mapping

Course Code: 21BT621

Course Title: Fundamentals of Plant Biochemistry and Biotechnology

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprises with different scales in area of agricultural production, process and trade	Hold a post on supply administration and policy	Analyze and control commercial and economical process in the field of agriculture	Teach how to control and manage agricultural production	Introduce general production technologies	Teach how to implement and manage production technologies	Prepare for managerial and social responsibilities	Student will identify different underutilized crops	Student will practice different breeding techniques used in crop production.	Student will recognize different insect pest and diseases and their symptoms of crops	Student will apply different recent techniques in crop production
21BT631.01: Importance of Biochemistry, structure and properties of carbohydrates	1	2	1	2	2	1	2	3	3	2	2
21BT631.02: Structure and properties of lipids and proteins	1	2	1	2	3	2	2	3	3	2	2
21BT631.03: Enzyme and its action. Structure and properties of nucleic	1	2	1	2	1	2	2	3	3	2	2

acid											
21BT631.04: Biochemical processes and plant tissue culture	1	2	1	2	2	3	12	3	3	2	2
21BT631.05: Biotechnological methods and techniques	1	2	1	2	2	2	3	3	3	2	2

Legend: 1 – Low, 2 – Medium, 3 – High

Curriculum map

Pos & PSOs	Cos No. & Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
PO1,2,3,4,5,6,7 PSO 1,2,3,4	CO1_21BT621.01 To acquaint knowledge on the applications and scope of biochemistry, classification, composition, properties, structural formula, occurrence, of carbohydrates. reducing and non –reducing sugar.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	To prepare the buffer at required pH. To identify sugar by performing Molish Test in Sugar sample (Glucose, Fructose). To estimate reducing sugar using Fehling Test. To perform Benedict’s test for the estimation of monosaccharides. To determine the ketose sugar by performing Seliwanoff Test.	To acquaint knowledge on the applications and scope of biochemistry. Water and its properties. pH and Buffers. Occurrence of carbohydrates. Classification and composition of carbohydrates. Properties and structural formula, carbohydrates. Reducing and non –reducing sugar. 1.1, 1.2, 1.3, 1.4, 1.5	Learn about different types of glycosidic linkage. Structure and properties of different polysaccharides.
PO1,2,3,4,5,6,7 PSO 1,2,3,4	CO2_21BT621.02 To gain basic knowledge of structure properties of	SO2.1 SO2.2 SO2.3	To determine the protein in protein samples by Biurate Test. To estimate protein by Bradford’s	2.1 Lipid: Importance and classification; 2.2 Structures and properties of	

	biomolecules lipids and proteins	SO2.4 SO2.5 SO2.6	method To detect the presence of lipid in sample	fatty acids; 2.3 Storage lipids and membrane lipids. 2.4 Proteins: Importance of proteins and classification; 2.5 Structures, titration and zwitterions nature of amino acids; 2.6 Structural organization of proteins. 2.1, 2.2, 2.3, 2.4, 2.5, 2.6	
PO1,2,3,4,5,6,7 PSO 1,2,3,4	CO3_21BT621.03 To provide comprehensive understanding of classification, nomenclature and action of enzymes. To gain basic knowledge of structure of nucleic acids	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5	Immobilization of enzyme from germinated wheat by Gel entrapment method.	3.1 Enzymes: General properties and Classification 3.2 Mechanism of action; Michaelis & Menten and Line Weaver Burk equation & plots 3.3 Introduction to allosteric enzymes. 3.4 Nucleic acids: Importance and classification; Structure of Nucleotides, 3.5 A, B & Z DNA, RNA: Types and Secondary & Tertiary structure. 3.1, 3.2, 3.3, 3.4, 3.5	Occurrence of various types of lipids and its significance Overview of structure of amino acids and classification of amino acids.
PO1,2,3,4,5,6,7 PSO 1,2,3,4	CO4_21BT621.04 Synthesis pathways of biomolecules and regulations and basics of plant tissue culture.	SO 4.1 SO 4.2 SO4.3 SO4.4 SO4.5 SO4.6	Preparation of stock solutions of MS (Murashige & Skoog) medium and plant growth regulator stocks. Isolation of single cell and perform single cell culture. To culture of explant in invitro condition.	4.1 Metabolism of carbohydrates Glycolysis. 4.2 TCA cycle, Electron transport chain. Glyoxylate cycle 4.3 Metabolism of lipids: Beta oxidation, 4.4 Biosynthesis of fatty acids. 4.5 Concepts and applications of plant biotechnology: Scope, cell suspension culture, callus culture, 4.6 Organ culture, embryo culture,	De differentiation and redifferentiation

		SO4.7		4.7 Anther culture, pollen culture and ovule culture and their applications 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7	
PO1,2,3,4,5,6,7 PSO 1,2,3,4	CO5_21BT621.05 To understand the techniques, concepts and applications of plant biotechnology and various recombinant methods	SO 5.1 SO 5.2 SO 5.3 SO 5.4 SO 5.5 SO 5.6 SO 5.7	Isolation of Plant genomic DNA by CTAB method. To check DNA quality by Agarose Gel electrophoresis. To estimate the chlorophyll pigment in Plant sample (Spinach) by Chromatography method.	Micro-propagation methods; organogenesis and embryogenesis, Synthetic seeds and their significance; Embryo rescue and its significance; Somatic hybridization and cybrids; Soma clonal variation and its use in crop improvement; cryo-preservation; Introduction to recombinant DNA methods: physical (Gene gun method), chemical (PEG mediated) and Agrobacterium mediated gene transfer methods; Transgenics and its importance in crop improvement; PCR techniques and its applications; RFLP, RAPD, SSR; Marker Assisted Breeding in crop improvement; Biotechnology regulations. 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7	

Course Code: 21AN623

Course Title: Geoinformatics, Nano-technology and Precision Farming

Pre-requisite: To introduce the basic concepts of geoinformatics and nanotechnology. To create awareness about various applications of geoinformatics and nanotechnology for precision agriculture. To teach basic handling of various geoinformatics tools.

Rationale: Geoinformatics, nanotechnology, and precision farming are three distinct fields that, when integrated, offer innovative solutions in agriculture and various other sectors. Let's explore the rationale behind each of these technologies and how their convergence can revolutionize agriculture.

Course Outcomes:

21AN623.1 Student may become expert in precision farming.

21AN623.2 Students will able to acquaint with crop discrimination and yield monetering by demonstration.

21AN623.3 To get knowledge on GPS and its component with functions.

21AN623.4 Students get knowledge to choose nano technology for higher production of field crops.

21AN623.5 Students gain knowledge through use of nano technology in seed, water, fertilizer, plant protection for scaling, up farm productivity.

Scheme of Studies:

Code	Course Code	CourseTitle	Scheme of studies(Hours/Week)				TotalCredits (C)	
			CI	LI	SW	SL		Total StudyHours(CI+LI+SW+SL)
Program Core (PCC	21AN623	Geoinformatics, Nano-technology and Precision Farming	01	01	01	01	04	02

- Legend:**
- CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others,
 - LI:** Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)
 - SW:** Sessional Work (includes assignment, seminar, mini project etc.),
 - SL:** Self earning,
 - C:** Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

Code	Course Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment	Total Marks
			Class/ Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
Program Core (PCC)	21AN623	Geoinformatics, Nanotechnology and Precision Farming	16	30	0	0	05	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

21AN623.1 Student may become expert in precision farming.

ApproximateHours

Item	AppxHrs.
CI	03
LI	04
SW	01
SL	01
TOTAL	09

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO1.1To acquaint Precision agriculture concepts and techniques.</p> <p>SO1.2To familiarthe issues and concerns for Indian agriculture in precision techniques.</p> <p>SO1.3 To know the Geo-informatics</p> <p>SO1.4.To learn the use of Geo-informatics in Precision Agriculture.</p>	<p>1. Introduction to GIS software, spatial data creation and editing.</p> <p>2.Projects formulation and execution related to precision farming.</p>	<p>Unit-1 Precision agriculture: concepts and techniques; their issues and concerns for Indian agriculture; Geo-informatics-definition, concepts, tool and techniques; their use in Precision Agriculture.</p> <p>1.1 Introduction of Precision agriculture.</p> <p>1.2 Different concepts and techniques of Precision Agriculture.</p> <p>1.3 Introduction of Geo-informaticsuse of Geo-informatics in Precision Agriculture.</p>	<p>1.Study onPrecision farming in Indian Agriculture.</p>

SW-1 SuggestedSessionalWork(SW):

Assignments:

Precision agriculture: concepts and techniques.

Other Activities(Specify):Research on study of use of Precision farming in Indian Agriculture.

21AN623.2 Students will be able to acquaint with crop discrimination and yield monitoring by demonstration.

Approximate Hours

Item	AppxHrs.
CI	3
LI	6
SW	1
SL	1
TOTAL	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO1.1 Understand the Crop discrimination.</p> <p>SO1.2 Understand the Yield monitoring.</p> <p>SO1.3 Understand the fertilizer recommendation using geospatial technologies.</p> <p>SO1.4. Understand the Spatial data and their management in GIS.</p> <p>SO1.5 Understand the Remote sensing and Image processing.</p>	<p>1.Creation of thematic layers of soil fertility based on GIS.</p> <p>2.Multispectral remote sensing for soil mapping.</p> <p>3.Introduction to image processing software.</p>	<p>Unit-2 Crop discrimination and Yield monitoring, soil mapping; fertilizer recommendation using geospatial technologies; Spatial data and their management in GIS; Remote sensing concepts and application in agriculture; Image processing and interpretation.</p> <p>1.1Introduction to Crop discrimination and yield monitoring.</p> <p>1.2. Introduction and concept fertilizer recommendation using geospatial technologies.</p> <p>1.3Introduction to Remote sensing and Image processing.</p>	<p>1.Use of different Image processing software.</p>

SW-1 Suggested Sessional Work (SW):

Assignments:Introduction to Crop discrimination, Yield monitoring and soil mapping

Other Activities (Specify):

Research on study of use of remote sensing in agriculture.

21AN623.3 To get knowledge on GPS and its component with functions.

ApproximateHours

Item	AppxHrs.
CI	03
LI	04
SW	01
SL	01
TOTAL	09

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO1.1 Understand the GPS.</p> <p>SO1.2 Understand the application of GPS for Precision agriculture.</p> <p>SO1.3 Understand the crop Simulation Models and their uses for optimization of Agricultural Inputs.</p>	<p>1.Use of GPS for agricultural survey.</p> <p>2.Crop stress (biotic/abiotic) monitoring using geospatial technology.</p>	<p>Unit-3 Global positioning system (GPS), components and its functions; Introduction to crop Simulation Models and their uses for optimization of Agricultural Inputs.</p> <p>1.1 Introduction to the Global positioning system</p> <p>1.2 Function of Global positioning system</p> <p>1.3Introduction to crop Simulation models.</p>	<p>1. Study on Global positioning system (GPS), components and its functions.</p>

SW-1 Suggested Sessional Work (SW):

Assignments:

Introduction to GPS and crop Simulation models.

Other Activities (Specify):

Research on study of use of GPS in Agriculture.

21AN623.4 Students get knowledge to choose nano technology for higher production of field crops.

Approximate Hours

Item	AppxHrs.
CI	03
LI	06
SW	01
SL	01
TOTAL	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO1.1 Understand to the STCR approach</p> <p>SO1.2 Understand the application Nanotechnology in precision agriculture.</p> <p>SO1.3 Understand the introduction about nanoscale effects, nano-particles, nano-pesticides, nano-fertilizers, nano-sensors.</p>	<p>1. Formulation, characterization and applications of nanoparticles in agriculture.</p> <p>2. Creation of productivity and management zones.</p> <p>3. Fertilizers recommendations based of VRT and STCR techniques.</p>	<p>Unit-4 STCR approach for precision agriculture; Nanotechnology, definition, concepts and techniques, brief introduction about nanoscale effects, nano-, nano-pesticides, particles nano-fertilizers, nano-sensors.</p> <p>1.1 Introduction to STCR approach.</p> <p>1.2 Introduction to application Nanotechnology in precision agriculture.</p> <p>1.3. Brief introduction about nanoscale effects, nano-particles, nano-pesticides, nano-fertilizers, nano-sensors.</p>	<p>1. Study on nanoscale effects on crop production and new research on agriculture.</p>

SW-1 Suggested Sessional Work (SW):

Assignments:

Role of nanoscale effects on crop production and new research on agriculture.

Other Activities (Specify):

New Research on nano fertilizers.

21AN623.5 Students gain knowledge through use of nano technology in seed, water, fertilizer, plant protection for scaling, up farm productivity.

Approximate Hours

Item	Appx Hrs.
CI	03
LI	04
SW	01
SL	01
TOTAL	09

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO1.1 Understand to the nanotechnology.</p> <p>SO1.2 Understand the application Nano fertilizer.</p> <p>SO1.3 Understand the introduction about use of plant protection for scaling-up farm productivity.</p>	<p>1.Visual and digital interpretation of remote sensing images.</p> <p>2.Generation of spectral profiles of different objects.</p>	<p>Unit-5 Use of nanotechnology in seed, water, fertilizer, plant protection for scaling-up farm productivity.</p> <p>1.1 Introduction to nanotechnology in seed.</p> <p>1.2Introduction to nanotechnology in water.</p> <p>1.3 Introduction to nanotechnology in fertilizer, plant protection.</p>	<p>1. Study on use of nanotechnology in precision agriculture.</p>

SW-1 Suggested Sessional Work (SW):

Assignments:

Role of nanotechnology on crop production and new research on agriculture.

Other Activities (Specify):

New Research on nanotechnology in agriculture.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self Learning (Sl)	Total hour (Cl+SW+Sl)
21AN623.1 Student may become expert in precision farming.	07	01	01	09
21AN623.2 Students will able to acquaint with crop discrimination and yield monetering by demonstration.	09	01	01	11
21AN623.3 To get knowledge on GPS and its component with functions.	07	01	01	09
21AN623.4 Students get knowledge to choose nano technology for higher production of field crops.	09	01	01	11
21AN623.5 Students gain knowledge through use of nano technology in seed, water, fertilizer, plant protection for scaling, up farm productivity.	07	01	01	09
Total Hours	39	05	05	49

Suggestion for EndSemester Assessment

Suggested Specification Table (ForESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Precision agriculture their issues and concerns for Indian agriculture Geo-informatics their use in Precision Agriculture.	03	01	01	05
CO-2	Crop discrimination and Yield monitoring, Spatial data and their management in GIS; Remote sensing concepts and application in agriculture;	02	06	02	10
CO-3	Global positioning system (GPS), components and its functions; Introduction to crop Simulation Models and their uses for optimization of Agricultural Inputs.	03	07	05	15
CO-4	STCR approach for precision agriculture Nanotechnology brief introduction about nanoscale effects, nano-, nano-pesticides, particles nano-fertilizers, nano-sensors.	05	05	05	15
CO-5	Use of nanotechnology in seed, water, fertilizer, plant protection for scaling-up farm productivity	02	02	01	05
Total		11	26	13	50

Legend: R:Remember, U:Understand, A:Apply

The end of semester assessment for Geoinformatics, Nano-technology and Precision Farming Will be held with written examination of 50 marks

Note.Detailed Assessment rubric need to be prepared by the course wise teachers for about Tasks.

Teachers can also design different task sasper requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Demonstration
7. ICT Based Teaching Learning
(Video Demonstration/Tutorials CBT,
Blog, Facebook, Twitter, Whatsapp, Mobile, Online
sources)
8. Brain storming

Suggested Learning Resources:

(a) Books:

S. No.	Title	Author	Publisher	Edition & Year
1	Precision Farming: Soil Fertility and Productivity Aspects.	Krishna, K.K.	Apple Academic Press	2013.
2	An Introduction to Geoinformatics.	Srivastava, G.S.	McGraw Hill Education (India) Pvt. Ltd. , New Delhi	2014.
3	Principles of Geoinformatics.	Gupta, R.K. and Subhash Chander.	Jain Brothers, New Delhi	2008.

Curriculum Development Team

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Cos, Pos and PSOs Mapping

Course Code: 21AN623

Course Title: Geoinformatics and Nano-technology and Precision Farming

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprises with different scales in area of agricultural production, process and trade	Hold a post on supply in administration and policy	Analyze and control commercial and economical process in the field of agriculture	Teach how to control and manage agricultural production	Introduce general production technologies	Teach how to implement and manage production technologies	Prepare for managerial and social responsibilities	Student will identify different underutilized crops	Student will practice different breeding techniques used in crop production.	Student will recognize different insect pest and diseases and their symptoms of crops	Student will apply different recent techniques in crop production
21AN623.1 Student may become expert in precision farming.	1	1	2	1	2	3	2	1	1	2	2
21AN623.2 Students will able to acquaint with crop discrimination and yield monetering by demonstration.	2	1	1	1	2	2	2	2	2	2	1
21AN623.3 To get knowledge on GPS and its component with functions.	1	2	2	1	3	2	1	1	1	1	2

21AN623.4 Students get knowledge to choose nano technology for higher production of field crops.	1	2	2	1	2	3	1	1	2	1	2
21AN623.5 Students gain knowledge through use of nano technology in seed, water, fertilizer, plant protection for scaling, up farm productivity.	2	1	1	2	3	2	2	2	1	2	1

Legend: 1 – Low, 2 – Medium, 3 – High

Curriculum Map: Entrepreneurship Development and Business Communication

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO 1,2,3,4 PSO 1,2, 3, 4,	21AN623.1 Student may become expert in precision farming.	SO1.1 SO1.2 SO1.3 SO1.4	<p>1. Introduction to GIS software, spatial data creation and editing.</p> <p>2.Projects formulation and execution related to precision farming.</p>	<p>Unit-1 Precision agriculture: concepts and techniques; their issues and concerns for Indian agriculture; Geo-informatics- definition, concepts, tool and techniques; their use in Precision Agriculture.</p> <p>1.1 Introduction of Precision agriculture.</p> <p>1.2 Different concepts and techniques of Precision Agriculture.</p> <p>1.3 Introduction of Geo-informaticsuse of Geo-informatics in Precision Agriculture.</p>	1. Study onPrecision farming in Indian Agriculture.
PO 1,2,3,4 PSO 1,2, 3, 4,	21AN623.2 Students will able to acquaint with crop discrimination and yield monetering by demonstration.	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5	<p>1.Creation of thematic layers of soil fertility based on GIS.</p> <p>2.Multispectral remote sensing for soil mapping.</p> <p>3.Introduction to image processing software.</p>	<p>Unit-2 Crop discrimination and Yield monitoring, soil mapping; fertilizer recommendation using geospatial technologies; Spatial data and their management in GIS; Remote sensing concepts and application in agriculture; Image processing and interpretation.</p> <p>1.1Introduction to Crop discrimination and yield monitoring.</p>	1. Use of different Image processing software.

				<p>1.2. Introduction and concept fertilizer recommendation using geospatial technologies.</p> <p>1.3Introduction to Remote sensing and Image processing.</p>	
<p>PO 1,2,3,4 PSO 1,2,3,4,</p>	<p>21AN623.3 To get knowledge on GPS and its component with functions.</p>	<p>SO3.1 SO3.2 SO3.3</p>	<p>1.Use of GPS for agricultural survey.</p> <p>2.Crop stress (biotic/abiotic) monitoring using geospatial technology.</p>	<p>Unit-3 Global positioning system (GPS), components and its functions; Introduction to crop Simulation Models and their uses for optimization of Agricultural Inputs.</p> <p>1.3 Introduction to the Global positioning system</p> <p>1.4 Function of Global positioning system</p> <p>1.3Introduction to crop Simulation models.</p>	<p>1. Study on Global positioning system (GPS), components and its functions.</p>
<p>PO 1,2,3,4 PSO 1,2,3,4,</p>	<p>21AN623.4 Students get knowledge to choose nano technology for higher production of field crops.</p>	<p>SO4.1 SO4.2 SO4.3</p>	<p>1.Formulation, characterization and applications of nanoparticles in agriculture.</p> <p>2. Creation of productivity and management zones.</p> <p>3. Fertilizers recommendations based of VRT and STCR techniques.</p>	<p>Unit-4 STCR approach for precision agriculture; Nanotechnology, definition, concepts and techniques, brief introduction about nanoscale effects, nano-, nano-pesticides, particles nano-fertilizers, nano-sensors.</p> <p>1.3 Introduction to STCR approach.</p> <p>1.4 Introduction to application Nanotechnology in precision</p>	<p>1. Study on nanoscale effects on crop production and new research on agriculture.</p>

				<p>agriculture.</p> <p>1.3.Brief introduction about nanoscale effects, nano-particles, nano-pesticides, nano-fertilizers, nano-sensors.</p>	
<p>PO 1,2,3,4 PSO 1,2,3,4,</p>	<p>21AN623.5 Students gain knowledge through use of nano technology in seed, water, fertilizer, plant protection for scaling, up farm productivity.</p>	<p>SO5.1 SO5.2 SO5.3</p>	<p>1.Visual and digital interpretation of remote sensing images.</p> <p>2.Generation of spectral profiles of different objects.</p>	<p>Unit-5 Use of nanotechnology in seed, water, fertilizer, plant protection for scaling-up farm productivity.</p> <p>1.2 Introduction to nanotechnology in seed.</p> <p>1.2Introduction to nanotechnology in water.</p> <p>1.3 Introduction to nanotechnology in fertilizer, plant protection.</p>	<p>1. Study on use of nanotechnology in precision agriculture.</p>

Course code: 21EN626

Course Title: Management of Beneficial Insects

Pre-requisite: Student should have basic knowledge of insects their structure, function, behavior, evolution, diversity, and effect on agricultural production, as well as on people and animals and different methods of their control.

Rationale: The student studying importance of insect pest and disease, their different Categories, how we control their population and their effect on crops and positive and negative effect of different insect and disease control methods on environment.

Course Outcome:

21EN626.1.: As an entrepreneur, students can pursue apiculture, sericulture, and lac culture based on their agroclimatic zone.

21EN626.2: Acquire Knowledge of commercial methods of rearing, equipment, seasonal management, insect pest and disease and important species for commercial use of honey bee.

21EN626.3: Learn about silk culture equipment, recurring techniques, and troubleshooting during culturing.

21EN626.4: Acquire knowledge of identification of different lac insects their distribution, host and market value of their byproducts.

21EN626.5: Acquire knowledge of identification of different bio control agents (Predator, Parasite and Parasitoids) and their use for sustainable pest management.

Scheme of Studies:

Code	Course Code	Course Title	Scheme of studies(Hours/Week)				Total Study Hours (CI+LI+SW+SL)	Total Credits (C)
			CI	LI	SW	SL		
Program Core (PCC)	Course code: 21EN626	Management of Beneficial Insects	1	1	1	1	5	2

Legend: CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

Code	Course Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CA T+AT)		
Program Core (PCC)	21EN626	Management of Beneficial Insects.	15	20	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

21EN626.1.: As an entrepreneur, students can pursue apiculture, sericulture, and lac culture based on their agroclimatic zone.

Approximate Hours

Item	AppX Hrs
CI	03
LI	04
SW	01
SL	01
Total	09

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO1.1 Understand Beneficial Insects Importance</p> <p>SO1.2 Understand Beekeeping and pollinators</p> <p>SO1.3 Understand commercial methods of rearing, equipment used.</p> <p>SO1.4 Understand seasonal management of Honey bee.</p> <p>SO1.5. Understand bee enemies and disease.</p>	<p>LI 1.1 Honey bee species, castes of bees.</p> <p>LI 1.2 Beekeeping appliances and seasonal management.</p>	<p>Unit-1.0: Beneficial Insects Importance, and Beekeeping:</p> <p>1.1 Importance of beneficial Insects.</p> <p>1.2 Beekeeping and different pollinators.</p> <p>1.3 Bee biology.</p> <p>1.4 Commercial methods of rearing.</p> <p>1.5 Equipment used in rearing.</p> <p>1.6 Seasonal management of Honey bee.</p> <p>1.7 Bee enemies and disease.</p>	<p>1.1 Importance of beekeeping and their management practices.</p>

SW-1 Suggested Sessional Work (SW):

Assignments: Seasonal management of Honey bee.

Mini Project:

Flow diagram of Equipment used in rearing.

Other Activities(Specify):

Identification of different castes of honey bees and practical handling of bee frame

21EN626.2: Acquire Knowledge of commercial methods of rearing, equipment, seasonal management, insect pest and disease and important species for commercial use of honey bee.

Approximate Hours

Item	AppX Hrs
CI	03
LI	04
SW	1
SL	1
Total	09

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
<p>SO2.1 Understand Bee pasturage.</p> <p>SO2.2 Understand bee foraging and communication.</p> <p>SO2.3 Understand Insect pests of honey bee.</p> <p>SO2.4 Understand diseases of honey bee.</p> <p>SO2.5. Understand Role of pollinators in cross pollinated plants.</p>	<p>LI 2.1 Bee pasturage, bee foraging and communication.</p> <p>LI 2.1 Bee enemies and disease.</p>	<p>Unit-2.0: Bee pasturage and other pollinators:</p> <p>2.1 Bee pasturage.</p> <p>2.2 Bee foraging.</p> <p>2.3 Bee communication.</p> <p>2.4 Insect pests of honey bee. diseases of honey bee.</p> <p>2.5 Role of different pollinators in cross pollinated plants.</p>	<p>1. Bee communication Pattern and sign.</p>

SW-1 Suggested Sessional Work (SW):

Assignments: Role of different pollinators in cross pollinated plants.

Mini Project: Insect pests and disease of honey bee.

Other Activities (Specify)

Demonstration of Pollen collection method and different cells in frames and frame separation method.

21EN626.3: Learn about silk culture equipment, recurring techniques, and troubleshooting during culturing.

Approximate Hours

Item	AppX Hrs
CI	03
LI	06
SW	01
SL	01
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning(SL)
<p>SO3.1 Understand silkworms spp., voltinism and biology of silkworm.</p> <p>SO3.2 Understand Mulberry cultivation, and methods of harvesting and preservation of leaves.</p> <p>SO3.3 Understand Rearing, mounting and harvesting of cocoons.</p> <p>SO3.4 Understand Pest and diseases of silkworm, management</p> <p>SO3.5. rearing appliances of mulberry silkworm and methods of disinfection.</p>	<p>LI 3.1 Types of silkworm.</p> <p>LI 3.2 Voltinism and biology of silkworm.</p> <p>LI 3.3 Mulberry cultivation, mulberry varieties and methods of harvesting and preservation of leaves.</p>	<p>Unit-3.0: Sericulture and Moriculture:</p> <p>3.1Types of silkworm</p> <p>3.2Voltinism and biology of silkworm.</p> <p>3.3 Mulberry cultivation, their different varieties</p> <p>3.4 Methods of harvesting and preservation of leaves</p> <p>3.5 Rearing, mounting and harvesting of cocoons.</p> <p>3.6 Pest and diseases of silkworm and their management</p> <p>3.7 Rearing appliances of mulberry silkworm</p> <p>3.8 Different disinfection methods for rearing appliance of Silkworm</p>	<p>1. Types of silkworm</p> <p>1.2 Voltinism and biology of silkworm Methods of control and its advantages and disadvantages.</p>

SW-1 Suggested Sessional Work (SW):

Assignments: Rearing appliances of mulberry silkworm. Different disinfection methods for rearing appliance of Silkworm

Mini Project:

Pest and diseases of silkworm and their management

Other Activities (Specify):

Demonstration of sericulture unit and learning on reeling

21EN626.4: Acquire knowledge of identification of different lac insects their distribution, host and market value of their byproducts.

Approximate Hours

Item	Appx Hrs
CI	03
LI	04
SW	1
SL	1
Total	09

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO4.1 Understand species of lac insect and its host plant.</p> <p>SO4.2 Understand lac insect morphology and biology.</p> <p>SO4.3 Understand lac production – seed lac, button lac, shellac, lac-products.</p> <p>SO4.4 Knowledge of economic value of lac’s byproducts</p> <p>SO4.5 Identification of major parasitoids and predators.</p>	<p>LI 4.1 Species of lac insect, host plant identification.</p> <p>LI 4.2 Visit to research and training institutions devoted to beekeeping, sericulture, lac culture and natural enemies.</p>	<p>Unit-4.0: Rearing of lac insect, their enemies and their management:</p> <p>4.1 Species of lac insect and its host plant.</p> <p>4.2 Concept morphology and biology of lac insect.</p> <p>4.3 lac production – seed lac, button lac and shellac.</p> <p>4.4 Different lac- products.</p> <p>4.5 Identification of major parasitoids and predators of lac insect.</p>	<p>1. Species of lac insect and their economic importance.</p>

SW-1 Suggested Sessional Work (SW):

Assignments: lac production – seed lac, button lac and shellac.

Mini Project: Identification of major parasitoids and predators of lac insect.

Other Activities(Specify): Visit to Lac culture farm and identification of lac cells.

21EN626.5: Acquire knowledge of identification of different bio control agents (Predator, Parasite and Parasitoids) and their use for sustainable pest management.

Approximate Hours

Item	AppX Hrs
CI	03
LI	06
SW	01
SL	01
Total	11

Session Outcomes (SOs)	Laboratory Instruction(LI)	Class room Instruction(CI)	Self-Learning (SL)
<p>SO5.1: Understand Mass multiplication techniques of predators of insect.</p> <p>SO5.2 Understand Mass multiplication techniques of predators of weeds.</p> <p>SO5.3 Understand Important species of pollinator.</p> <p>SO5.4 Understand scavengers with their importance.</p>	<p>LI 5.1 Identification of other important pollinators.</p> <p>LI 5.2 Weed killers and scavengers.</p> <p>LI 5.3 Identification and techniques for mass multiplication of natural enemies.</p>	<p>Unit-5.0: Mass multiplication techniques of predators of insect and weed:</p> <p>5.1 Insect orders bearing predators and parasitoids.</p> <p>5.2 Mass multiplication techniques of predators and parasitoids of weeds.</p> <p>5.3 Important species of pollinators and its importance.</p> <p>5.4 Important species of weed killers and its importance.</p> <p>5.5 Important species of scavengers and its importance</p>	<p>1. Important species of pollinators and its importance.</p> <p>2. Important species of weed killers and its importance.</p>

SW-1 Suggested Sessional Work (SW):

Assignments: Mass multiplication techniques of predators and parasitoids of weeds.

Mini Project: Insect orders bearing predators and parasitoids.

Other Activities (Specify): Identification of various insect pollinators, scavengers and weed killers insects of nearby area /agriculture field.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Laboratory instruction (LI)	Sessional Work (SW)	Self Learning (Sl)	Total hour (Cl+LI+SW+Sl)
21EN626.1.: As an entrepreneur, students can pursue apiculture, sericulture, and lac culture based on their agroclimatic zone.	03	04	01	01	09
21EN626.2: Acquire Knowledge of commercial methods of rearing, equipment, seasonal management, insect pest and disease and important species for commercial use of honey bee.	03	04	01	01	09
21EN626.3: Learn about silk culture equipment, recurring techniques, and troubleshooting during culturing.	03	06	01	01	11
21EN626.4: Acquire knowledge of identification of different lac insects their distribution, host and market value of their byproducts.	03	04	01	01	09
21EN626.5: Acquire knowledge of identification of different bio control agents (Predator, Parasite and Parasitoids) and their use for sustainable pest management.	03	06	01	01	11
Total Hours	15	24	05	05	49

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Beneficial Insects Importance, and Beekeeping	03	04	03	10
CO-2	Bee pasturage and other pollinators	04	03	03	10
CO-3	Sericulture and Moriculture	04	03	03	10
CO-4	Rearing of lac insect, their enemies and their management	04	03	03	10
CO-5	Mass multiplication techniques of predators of insect and weeds	03	04	03	10
Total		18	17	15	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Introduction to Portland cement will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Case Method
3. Group Discussion
4. Role Play
5. Visit to Field
6. Demonstration/Dissection
7. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, Whatsapp, Mobile, Online sources)
8. Brainstorming

Suggested Learning Resources:**(a) Books:**

S. No.	Title	Author	Publisher	Edition & Year
1	Beneficial Insects	David V Alford	CRC Press	2019
2	Pollinators of Native Plants: Attract, Observe and Identify Pollinators and Beneficial Insects with Native Plants.	Heather N. Holm..	Pollination Press LLC	2014
3	Elements of Economic Entomology	B.V. David & V.V. Ramamurthy	Brillion Publishing	1975
4	Textbook of Applied Entomology Vol 2 insects of Economic Importance	K.P. Shrivastva	Kalyani Publishers	2013
5	Practical Manual			
6	Lecture note provided by Dept. of Entomology, AKS University, Satna.			

Cos, Pos and PSOs Mapping
Course Code: 21EN626
Course Title: Management of Beneficial Insects

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprises with different scales in area of agricultural production, process and trade.	Hold a post on supply administration and policy	Analyze and control commercial and economical process in the field of agriculture	Teach how to control and manage agricultural production	Introduce general production technologies	Teach how to implement and manage production technologies	Prepare for managerial and social responsibilities	Student will identify different underutilized crops	Student will practice different breeding techniques used in crop production.	Student will recognize different insect pest and diseases and their symptoms of crops	Student will apply different recent techniques in crop production
21EN626.1.: As an entrepreneur, students can pursue apiculture, sericulture, and lac culture based on their agroclimatic zone.	2	1	1	2	2	3	2	2	3	2	1
21EN626.2: Acquire Knowledge of commercial methods of rearing, equipment, seasonal management, insect pest and disease and important species for commercial use of honey bee.	1	2	2	2	1	2	2	1	1	2	3
21EN626.3: Learn about silk culture equipment, recurring techniques, and troubleshooting during culturing.	2	2	3	3	2	3	2	1	1	2	1
21EN626.4: Acquire knowledge of identification of different lac insects their distribution, host and market value of their byproducts.	1	2	2	3	3	2	2	2	2	1	1
21EN626.5: Acquire knowledge of identification of different bio control agents (Predator, Parasite and Parasitoids) and their use for sustainable pest management.	1	2	2	3	2	1	2	1	1	2	2

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map: Management of Beneficial Insects

Pos & PSOs	Cos No. & Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
PO1,2,3,4,5,6,7 PSO 1,2,3,4	1.: As an entrepreneur, students can pursue apiculture, sericulture, and lac culture based on their agroclimatic zone.	SO 1.1 SO 1.2 SO 1.3 SO 1.4 SO 1.5	1. Honey bee species, castes of bees. 2 Beekeeping appliances and seasonal management	Importance of beneficial Insects. Beekeeping and different pollinators, Bee biology. 1.1, 1.2, 1.3	Importance of beekeeping and their management practices
PO1,2,3,4,5,6,7 PSO 1,2,3,4	.2: Acquire Knowledge of commercial methods of rearing, equipment, seasonal management, insect pest and disease and important species for commercial use of honey bee.	SO 2.1 SO 2.2 SO 2.3 SO 2.4 SO 2.5	1. Bee pasturage, bee foraging and communication. 2. Bee enemies and disease.	Bee pasturage.Bee foraging,Bee communication, Insect pests of honey bee, diseases of honey bee. Role of different pollinators in cross pollinated plants. 2.1,2.2,2.3	Bee communication Pattern and sign
PO1,2,3,4,5,6,7 PSO 1,2,3,4	3: Learn about silk culture equipment, recurring techniques, and troubleshooting during culturing.	SO 3.1 SO 3.2 SO 3.3 SO 3.4 SO 3.5	3.1 Types of silkworm. 3.2 Voltinism and biology of silkworm. 3.3 Mulberry cultivation, mulberry varieties and methods of harvesting and preservation	Types of silkworm,Voltinism and biology of silkworm,Mulberry cultivation, their different varieties, Methods of harvesting and preservation of leaves,Rearing, mounting and harvesting of cocoons, Pest and diseases of silkworm and their management, Rearing appliances of mulberry silkworm,Different disinfection methods for rearing appliance of Silkworm. 3.1,3.2,3.3	Types of silkworm Voltinism and biology of silkworm Methods of control and its advantages and disadvantages.l
PO1,2,3,4,5,6,7 PSO 1,2,3,4	4: Acquire knowledge of identification of different lac insects their distribution, host and market value of their byproducts.	SO 4.1 SO 4.2 SO 4.3 SO 4.4 SO 4.5	4.1 Species of lac insect, host plant identification. 4.2 Visit to research and training institutions devoted to beekeeping, sericulture, lac culture and natural enemies.	Species of lac insect and its host plant, Concept morphology and biology of lac insect, lac production – seed lac, button lac and shellac,Different lac-products, Identification of major parasitoids and predators of lac insect. 4.1,4.2,4.3	Species of lac insect and their economic importance.
PO1,2,3,4,5,6,7	5: Acquire knowledge of identification of different bio	SO 5.1	5.1 Identification of	Insect orders bearing predators and	Important species of pollinators and

PSO 1,2,3,4	control agents (Predator, Parasite and Parasitoids) and their use for sustainable pest management.	SO 5.2 SO 5.3 SO 5.4	other important pollinators. 5.2 Weed killers and scavengers. 5.3 Identification and techniques for mass multiplication of natural enemies.	parasitoids. Mass multiplication techniques of predators and parasitoids of weeds. Important species of pollinators and its importance, Important species of weed killers and its importance. 5.1,5.2,5.3	its importance. Important species of weed killers and its importance
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Course Name - Practical Crop Production-II (Rabi Crops)

Course Code- 21AN380

Pre-requisite: practical knowledge of crop production is not only imperative but essential With a view to Enhance production of particular crop.

Rationale: practical knowledge is the only solution for desired production for any particular crops.

Course outcome

21AN380.1 Student will able to become expert identify the Rabi Crops.

21AN380.2 Students will acquaint with underline the field preparation, seed treatment, seed inoculation, and nursery management etc.

21AN380.3 Student will have knowledge about seed production technology of Rabi Crops.

21AN380.4 Students of UG Agronomy will become expert to review the integrated nutrient, insect- pest and disease management technology.

21AN380.5 Student will able to become expert for preparation of balance sheet and estimate the cost of cultivation of Rabi crops.

Legend: **CI:** Classroom Instruction(Includes different instructional strategies i.e. Lecture(L)and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, miniproject etc.),

SL:Self Learning,

C:Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Code	Course Code	Course Title	Scheme of Assessment (Marks)					End Semester Assessment (ESA)	Total Marks (PRA + ESA)
			Progressive Assessment (PRA)						
			Class/Home Assignment 5 number3 markseach(CA)	Class Test 2 (2 bestout of3) 10 marks	Seminars	Class Activity one (CAT)	Class Attendance (AT)		

				each(CT)						
Program Core (PCC)	21AN380	Practical Crop Production-II (Rabi Crops)							100	100

Scheme of Studies

Code	Course Code	Course Title	Scheme of Studies (Hours/Week)					Total Study Hours	Total Credit (C)
			CI	LI	SW	SL			
Program Core (PCC)	21AN380	Practical Crop Production-II (Rabi Crops)	00	2	00	00	2	01	

Course-Curriculum Detailing:

Practical

Crop planning, raising field crops in multiple cropping systems: Field preparation, seed, treatment, nursery raising, sowing, nutrient, water and weed management and management of insect-pests diseases of crops, harvesting, threshing, drying winnowing, storage and marketing of produce. The emphasis will be given to seed production, mechanization, resource conservation and integrated nutrient, insect-pest and disease management technologies. Preparation of balance sheet including cost of cultivation, net returns per student as well as per team of 8-10 students.

Practical Crop Production-II (Rabi Crops)

Approximate Hours

Item	Appx Hrs
CI	00
LI	24
SW	00
SL	00
Total	24

Session Outcomes (SOs)	Laboratory Instructions (LI)	Classroom Instructions (CI)	Self-Learning (SL)
SO.L1 Raising field crops in multiple cropping systems: SO.L2 seed, treatment, nursery raising, sowing of Crops SO.L3 To know the deficiency symptom. SO.L4 Critical stages of Crops SO.L5 Describe the insect and disease. SO.L6 Describe about harvesting. SO.L7 Describe about threshing. SO.L8 Discover handling techniques of drying and winnowing SO.L9 Identify the handling of crop for seed production SO.L10 Discover the seed grader for grading of seed	L1. Crop planning, raising field crops in multiple cropping systems: L2. : Field preparation, seed, treatment, nursery raising, sowing, L3. Nutrient management of Paddy L4. Water and weed management of Rabi Crops L5. management of insect-pests diseases of Rabi Crops L6 harvesting of Rabi Crops L7. Threshing of Rabi Crops L8. drying winnowing, storage and marketing of produce L9. . The emphasis will be given to seed production, L10. mechanization, resource conservation L11. integrated nutrient, insect-pest and disease management technologies. L12. Preparation of balance sheet including cost of cultivation, net returns		

SO.L11 Identify the use of lab instruments	per student as well as per team of 8-10 students.		
SO.L12 Cost of cultivation, Grossreturn and B:C Ratio			

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution				Total Marks
		R	U	A		
CO 1	Student will able to become expert identify the Rabi crops.	10	5	5		20
CO 2	Students will acquaint with underline the field preparation, seed treatment, seed inoculation, and nursery management etc.	10	5	5		20
CO 3	Student will have knowledge about seed production technology of Rabi crops..	10	5	5		20
CO 4	Students of UG Agronomy will become expert to review the integrated nutrient, insect- pest and disease management technology.	10	5	5		20
CO 5	Student will able to become expert for preparation of balance sheet and estimate the cost of cultivation of Rabi crops..	10	5	5		20
	Total					100

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Introduction to Practical Crop Production II (Rabi Crop) will be held with written examination of 100 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks.

Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Visit to Field Work
7. Demonstration
8. ICT Based Teaching Learning
9. Brainstorming

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (CI)	Laboratory Instruction (LI)	Sessional Work (SW)	Self Learning (SI)	Total hour (CI+LI+SW+SI)
<p>21AN380.1 Student will able to become expert identify the Rabi Crops.</p> <p>21AN380.2 Students will acquaint with underline the field preparation, seed treatment, seed inoculation, and nursery management etc.</p> <p>21AN380.3 Student will have knowledge about seed production technology of Rabi Crops.</p> <p>21AN380.4 Students of UG Agronomy will become expert to review the integrated nutrient, insect- pest and disease management technology.</p> <p>21AN380.5 Student will able to become expert for preparation of balance sheet and estimate the cost of cultivation of Rabi crops.</p>	00	24	00	00	24
Total Hours	00	24	00	00	24

Suggested Learning Resources: (a) Books :

S. No.	Title	Author	Publisher	Edition & Year
1.	Manures and Fertilizers	Yawalkar, K.S., Agarwal, J.P. and Bokde, S.	Agri-Horticultural Publishing House, Nagpur.	10th edition 2008
2.	Principles and Practices of Agronomy Agrobios (India), Jodhpur.	Balasubramaniyan, P. and Palaniappan, S.P.	Agrobios (India), Jodhpur.	2016
3.	Principles of Agronomy	Reddy, S. R.,	Kalyani Publishers, Ludhiana	5 th edition 2016
4.	Principles and Practices of Agronomy	Singh, S.S. and Singh, Rajesh	Kalyani Publishers, New Delhi,	5 th edition 2015

Curriculum Development Team

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Cos, Pos and PSOs Mapping

Course Code: 21AN677

Course Title: Practical Crop Production – II (Rabi Crops)

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprise with different scales in area of agricultural production, process and trade	Hold a post on supply i administration and policy	Analyze and control commercial and economical process in the field of agriculture	Teach how to control and manage agricultural production	Introduce general production technologies	Teach how to implement and manage production technologies	Prepare for managerial and social responsibilities	Student will identify different underutilized crops	Student will practice different breeding techniques used in crop production.	Student will recognize different insect pest and diseases and their symptoms of crops	Student will apply different recent techniques in crop production
21AN380.1 Student will able to become expert identify the Rabi Crops	2	3	1	1	2	3	2	2	2	2	3
21AN380.2 Students will acquaint with underline the field preparation, seed treatment, seed inoculation, and nursery management etc.	2	3	1	1	1	2	2	2	2	2	3

21AN380.3 Student will have knowledge about seed production technology of Rabi Crops.											
21AN380.4 Students of UG Agronomy will become expert to review the integrated nutrient, insect- pest and disease management technology.	2	3	3	1	2	1	3	1	2	2	2
21AN380.5 Student will able to become expert for preparation of balance sheet and estimate the cost of cultivation of Rabi crops.	2	3	1	1	3	2	2	2	2	2	3

Legend: 1 – Low, 2 – Medium, 3 – High

Curriculum Map: Practical Crop Production-II (Rabi Crops) 21AN380

Pos & PSOs	Cos No. & Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
PO1,2,3,4,5,6,7 PSO 1,2,3,4	<p>1 Student will able to become expert identify the Rabi Crops.</p> <p>2 Students will acquaint with underline the field preparation, seed treatment, seed inoculation, and nursery management etc.</p> <p>3 Student will have knowledge about seed production technology of Rabi Crops.</p> <p>4 Students of UG Agronomy will become expert to review the integrated nutrient, insect- pest and disease management technology.</p> <p>5 Student will able to become expert for preparation of balance sheet and estimate the cost of cultivation of Rabi crops.</p>	<p>SO 1.1</p> <p>SO 1.2</p> <p>SO 1.3</p> <p>SO 1.4</p> <p>SO 1.5</p> <p>SO 1.6</p> <p>SO 1.7</p> <p>SO 1.8</p> <p>SO 1.9</p> <p>SO 1.10</p> <p>SO 1.11</p> <p>SO 1.12</p>	<p>L1. Crop planning, raising field crops in multiple cropping systems: L2. : Field preparation, seed, treatment, nursery raising, sowing, L3. Nutrient management of Paddy L4. Water and weed management of Rabi Crops L5. management of insect-pests diseases of Rabi Crops L6 harvesting of Rabi Crops L7. Threshing of Rabi Crops L8. drying winnowing, storage and marketing of produce L9. . The emphasis will be given to seed production, L10. mechanization, resource conservation L11. integrated nutrient, insect-pest and disease management technologies. L12. Preparation of balance sheet including cost of cultivation, net returns per student as well as per team of 8-10 students.</p>		

Course Code: 21HO625

Course Title: Post Harvest management and value addition of fruits and vegetables.

Pre-requisite: Student should have basic knowledge of Post Harvest technology to be implemented for fruits and vegetables.

Rationale: The students studying Post Harvest management of Fruits and vegetables should possess foundational understanding about the technology to be employed in proper manner to check the Post Harvest losses in fruits and vegetables. This encompasses familiarity with the traditional and recent technology to be applied to check the Post Harvest losses of Horticultural produce. Additionally, students ought to acquire fundamental insights into Various Processing, Packaging and transport methods to be implemented for checking the Additionally they understand the Value addition of fruits and vegetables.

Course Outcomes:

21HO625.1: Understand the importance of Post Harvest processing of fruits and vegetables, extent and possible causes of post Harvest losses.

21HO625.2: Acquired the knowledge of free harvest factors affecting post harvest quality. Concepts of maturity and ripening including respiration concept.

21HO625.3: Interpret harvesting, handling, storage and value addition of fruits and vegetables .

21HO625.4: Familiarize with different principles and methods of preservation and preserved food items as jam, jelly etc.

21HO625.5: Comprehend the concepts of preservation from tomato produce, different methods of drying and dehydration including packaging

Scheme of Studies:

Code	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits(C)
			CI	LI	SW	SL	Total Study Hours(CI+LI+S W+SL)	
Program Core (PCC)	21HO625	PHM & Value addition of fruits and vegetables.	1	1	1	1	4	2

- Legend:** **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

Code	Course Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA + ESA)
			Class/Home Assignment number 5 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
Program Core (PCC)	21HO625	PHM & Value addition of fruits and vegetables	15	30	0	0	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion

21HO625.1: Apply the knowledge of Post Harvest management in terms of its definition, importance, processing, extent and possible causes of post Harvest losses.

Approximate Hours

Item	AppX Hrs
CI	03
LI	04
SW	02
SL	01
Total	10

Session Outcomes(SOs)	Laboratory Instruction(LI)	Classroom Instruction(CI)	Self Learning(SL)
<p>SO1.1 Understand Introduction of Post Harvest management and it's definition, extent and possible causes of post Harvest losses.</p> <p>SO1.2 Ability to Understand Pre-Harvest factors affecting post harvest quality, Maturity, ripening respiration and different factors associated with them</p> <p>SO1.3 Understand about the Harvesting, Storage and value addition concepts.</p> <p>SO1.4 To understand Principles and methods of preservation, it's concepts and standards.</p>	<p>Unit 1. Packaging Concepts</p> <p>1.1 Types of Packaging</p> <p>1.2 Applications of different Packaging materials.</p>	<p>Unit-1 Post Harvest Processing.</p> <p>1.1 Definition and importance of Post Harvest processing of fruits and vegetables.</p> <p>1.2 Extent and possible causes of post Harvest losses.</p> <p>1.3 Remedies to overcome post Harvest causes.</p>	<p>1. Definition and basic concepts of Post Harvest management.</p> <p>2. Various cause of Post Harvest losses.</p>

SW-1 Suggested Sessional Work (SW):

Assignments:

i. Preparation of Chart of various packaging materials.

a. Mini Project:

Propagating structures including Polyhouses and Net houses.

Preparation of chart showing post Harvest losses in fruits and vegetables.

21HO625.2: Ability to Understand Pre- Harvest factors affecting post harvest quality, maturity, ripening and different concepts of Respiration.

Approximate Hours

Item	AppX Hrs
CI	03
LI	04
SW	01
SL	02
Total	10

Session Outcomes (SOs)	Laboratory Instruction(LI)	Classroom Instruction(CI)	Self-Learning(SL)
<p>SO2.1 Understand the various pre-harvest factors responsible for Post Harvest losses in fruits and vegetables.</p> <p>SO2.2 Understand about the Post Harvest quality.</p> <p>SO2.3 Understand the Maturity and Ripening concepts including various changes.</p> <p>SO2.4 Understand about the respiration concept.</p> <p>SO2.5. Understand about different changes occurring during respiration in fruits and vegetables.</p>	<p>Unit 2. Value addition in Fruits.</p> <p>2.1 Practice of Mango Jam preparation.</p> <p>2.2 Practice of Apple jam preparation.</p>	<p>Unit-2 Pre- Harvest factors affecting post harvest quality.</p> <p>2.1 Learn the concepts of Pre - harvest factors affecting post harvest quality.</p> <p>2.2 Maturity, ripening and changes occurring during ripening.</p> <p>2.3 Respiration and Factors affecting the respiration rate.</p>	<p>1 Different ripening methods.</p> <p>2.Respiration and its Factors.</p>

SW-2 Suggested Seasonal Work(SW):

a. Assignments:

Preparation of Chart showing Different factors responsible for Post Harvest losses.

21HO625.3 Ability to understand the concepts of Harvesting, Storage and Value addition.

Approximate Hours

Item	AppX Hrs
CI	03
LI	00
SW	01
SL	01
Total	05

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO3.1 Understand about Harvesting and field harvesting.</p> <p>SO3.2 Determine the concepts of various storage systems.</p> <p>SO3.3 Applications of value addition.</p>		<p>Unit 3- Harvesting and field harvesting, Storage and value addition concepts.</p> <p>3.1 Definition of Harvesting and field harvesting including it's importance.</p> <p>3.2 Meaning of Storage and different types of storage as ZECC, Cold storage etc.</p> <p>3.3 Value addition concepts.</p>	<p>1 Harvesting.</p> <p>2. Storage systems.</p>

SW-3 Suggested Sessional Work (SW):

a. Assignments:

Preparation of Chart showing Different Storage systems.

21HO625.4: Understand the concepts of Principles and methods of preservation.

Approximate Hours

Item	AppX Hrs
CI	03
LI	02
SW	03
SL	01
Total	09

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO4.1 Understand about Principles of preservation.</p> <p>SO4.2 Understand about Methods of preservation.</p> <p>SO4.3 Understand about Intermediate moisture food as Jam,jelly etc.Concepts of candy , Fermented and non fermented beverages.</p>	<p>Unit 4.0 Intermediate food preparation.</p> <p>4.1Preparation of Guava jelly preparation of Mango Jam.</p>	<p>Unit-4.0 : Principles and, methods of preservation, Concepts and standards of fermented and non fermented beverages.</p> <p>4.1 Introduction about different Principles of preservation.</p> <p>4.2 Different methods of preservation.</p> <p>4.3 Different methods of intermediate moisture food as jam,jelly, marmalade,preserve and candy.</p> <p>4.4 Concepts and standards of fermented and non fermented beverages.</p>	<p>1.Different methods of preservation and it's Principles.</p> <p>2 Steps for making different types of products as jelly,jam etc.</p>

SW-4SuggestedSessionalWork (SW):

- a. Assignments:**
 - i. Preparation of Chart showing Mango Jam and Guava jelly.
- b. MiniProjects:**
 - i. Preparation of chart showing different principles and methods of preservation.
- e. Other Activities (Specify):**
 - i. Visit to CommercialHi -Tech Nursery /Orchard.

21HO625.5: Understand the concept of Tomato products, Drying and dehydration Osmotic Drying and canning.

Approximate Hours

Item	AppX Hrs
CI	03
LI	04
SW	01
SL	01
Total	09

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO5.1 Understand the concepts of Tomato products.</p> <p>SO5.2 Drying and dehydration of fruits and vegetables.</p> <p>SO5.3 Understand the osmotic Drying and canning.</p>	<p>Unit 5 Tomato products</p> <p>5.1 Practice of Tomato katechup preparation.</p> <p>5.2Practice of Tomato sauce preparation.</p>	<p>Unit5 Tomato products Drying and dehydration, Osmotic Drying and canning.</p> <p>5.1 Tomato products as Sauce and Ketchup preparation</p> <p>5.2 Concepts of drying and dehydration.</p> <p>5.3.Osmotic drying and canning.</p>	<p>1. Identify the different steps for Tomato products.</p> <p>2. Principles of Osmotic Drying and canning.</p>

SW-5 Suggested Sessional Work (SW):

Assignments:

- a. Preparation of Chart showing different steps for Tomato sauce and Katechup.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self Learning (Sl)	Total hour (Cl+SW+Sl)
21HO221.1: Apply the knowledge of Post Harvest management in terms of its definition, importance , processing, extent and possible causes of post Harvest losses	3	2	1	6
21HO221.2: Ability to Understand Pre- Harvest factors affecting post harvest quality, maturity, ripening and different concepts of Respiration	3	1	2	6
21HO221.3: Ability to understand the concepts of Harvesting, Storage and Value addition .	3	1	1	5
21HO221.4: Understand the concepts of Principles and methods of preservation.	3	3	1	7
21HO221.5: Understand the concept of Tomato products, Drying and dehydration Osmotic Drying and canning .	3	1	1	5
Total Hours	15	8	6	29

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Apply the knowledge of Post Harvest management in terms of its definition, importance , processing, extent and possible causes of post Harvest losses	03	02	01	06
CO-2	Ability to Understand Pre- Harvest factors affecting post harvest quality, maturity, ripening and different concepts of Respiration	02	03	05	10
CO-3	Ability to understand the concepts of Harvesting, Storage and Value addition	03	04	05	12
CO-4	Understand the concepts of Principles and methods of preservation	2	5	05	12
CO-5	Understand the concept of Tomato products, Drying and dehydration Osmotic Drying and canning	01	4	5	10
Total		15	15	18	50

Legend: R:Remember, U:Understand, A: Apply

The end of semester assessment for Fundamental of Horticulture will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Demonstration
7. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, Whatsapp, Mobile, Online sources)

8. Brainstorming
Suggested Learning Resources

Sl. No.	Title	Author	Publisher	Edition & Year
1	Post Harvest Technology of Flowers and Ornamentals Plants	Battacharjee, S. K. and De, L. C	Pointer Publisher	2005
2	Handbook on Post Harvest management of Fruits and vegetables	Jacob John, P A	Daya Publishing House, Delhi	2008
3	Food Preservation & Processing	Manoranjan, K and Sangita, S	Kalyani Publications, New Delhi	1996
4	Post Harvest Physiology and Storage of Tropical and Sub-tropical Fruits	Mitra, S. K.	CAB International	1997
5	Principles of Fruit Preservation	Morris, T. N.	Biotech Books, Delhi	2006

Cos, POs and PSOs Mapping

Course Title: Post Harvest management and value addition of fruits and vegetables

Course Code: 21HO625

Course Outcomes	Programme Outcomes				Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PSO 1	PSO 2	PSO-3	PSO-4
	Students will demonstrate a strong understanding of core principles of agricultural sciences	Students will be proficient in applying scientific principles and techniques to solve real world problems in agriculture	Students will be competent in using modern agricultural technologies and tools, GIS to optimize agricultural productivity and sustainability.	Students will be able to communicate effectively in written, oral, and visual formats to convey agricultural concepts, research findings, and recommendations to diverse stakeholders	Student will identify different underutilized crops	Student will practice different breeding techniques used in crop production.	Student will recognize different insect pest and diseases and their symptoms	Student will apply different recent techniques in crop production
1. Understand the importance of Post Harvest processing of fruits and vegetables, extent and possible causes of post Harvest losses..	2	2	2	3	2	2	3	2
2. Acquired the knowledge of free harvest factors affecting post harvest quality. Concepts of maturity and ripening including respiration concept.	2	2	2	2	1	1	3	3
3. Interpret harvesting, handling, storage and value addition of fruits and vegetables...	3	3	1	3	1	1	2	3
4. Familiarize with different principles and methods of preservation and preserved food items as jam, jelly etc	3	2	3	2	1	1	3	3

5. Comprehend the concepts of preservation from tomato produce, different methods of drying and dehydration including packaging	3	2	1	1	2	1	3	3
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Legend: 1 – Low, 2 – Medium, 3 – High

Curriculum Map: Post Harvest management and value addition of fruits and vegetables

POs & PSO s No.	COs No. & Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
1,2,3,4,5,6,7 O 1,2, 3, 4	HO625.1: Understand the importance of Post Harvest processing of fruits and vegetables, extent and possible causes of post Harvest losses.	SO1.1 SO1.2 SO1.3 SO1.4	it 1. Packaging Concepts 1.1 Types of Packaging Applications of different Packaging materials.	Unit-1 Post Harvest Processing. 1.1, 1.2, 1.3	1. Definition and basic concepts of Post Harvest management 2. Various cause of Post Harvest losses.
1,2,3,4,5,6,7 O 1,2, 3, 4	21HO625.2: Acquired the knowledge of free harvest factors affecting post harvest quality. Concepts of maturity and ripening including respiration concept.	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5	it 2. Value addition in Fruits. Practice of Mango Jam preparation. Practice of Apple jam preparation.	Unit-2 Pre-Harvest factors affecting post harvest quality. 2.2, 2.2, 2.3	1 Different ripening methods. 2.Respiration and its Factors.
1,2,3,4,5,6,7 O 1,2, 3, 4	HO625.3: Interpret harvesting, handling, storage and value addition of fruits and vegetables .	SO3.1 SO3.2 SO3.3		Unit 3- Harvesting and field harvesting, Storage and value	1Harvesting. 2. Storage systems.

				addition concepts. 3.1, 3.2, 3.3	
1,2,3,4,5,6,7 O 1,2, 3, 4	HO625.4: Familiarize with different principles and methods of preservation and preserved food items as jam, jelly etc.	SO4.1 SO4.2 SO4.3	Unit 4.0 Intermediate food preparation. 4.1 Preparation of Guava jelly preparation of Mango Jam.	Unit-4.0 : Principles and, methods of preservation, Concepts and standards of fermented and non fermented beverages. 4.1, 4.2, 4.3, 4.4	1. Different methods of preservation and its Principles. 2 Steps for making different types of products as jelly, jam etc.
1,2,3,4,5,6,7 O 1,2, 3, 4	AE428.5: Material handling equipment; conveyer and elevators, their principle, working and selection	SO5.1	1. Field visit to seed processing plant	Unit5: Material handling equipment; conveyer and elevators, their principle, working and selection 5.1, 5.2, 5.3	1. Identify the role of material handling equipments. 2. Difference between conveyer and elevators.

Course Code: 21AN628

Course Title: Principles of Organic Farming

Pre-requisite: Student should have basic knowledge of organic farming system, concept of sustainable agriculture. Organic farming, principles and its scope in India; Initiatives taken by Government (central/state), NGOs and other organizations for promotion of organic agriculture.

Rationale: The students should be acquainted with the knowledge of organic farming systems and patterns refer to the types and farming system. They are involved in sustainable agriculture as they to maintain soil fertility and physical condition too and to prevent pests and diseases further the also maintain the ecological balance, and ensure efficient use of resources such as water and nutrients. This field of study and practice is driven by several key factors and considerations: Safety, Sustainability, Innovation and technology, Economic efficiency.

Course Outcomes:

21AN628.1 Students acquaint will familiar with the knowledge in organic farming as well as about the organic production technology for pushing up the field through organic farming.

21AN628.2 Student will able to acquaint with the modern knowledge about, certification, labelling and accreditation procedure for organic farming.

21AN628.3 To recall knowledge on Initiatives taken by Government (central/state), NGOs and other organizations for promotion of organic agriculture

21AN628.4 To get knowledge on marketing, export potential of organic products and different processing techniques of agricultural waste products as NADED, FYM, Vermicompost etc.

21AN628.5 To demonstrate different integrated farming systems among the students

Scheme of Studies:

Code	Course Code	Course Title	Scheme of studies (Hours/Week)				Total Study Hours (CI+LI+SW+SL)	Total Credits (C)
			CI	LI	SW	SL		
Program Core (PCC)	21AN628	Principles of Organic Farming	3	1	1	1	6	2

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

Code	Course Code		Course Title	Scheme of Assessment (Marks)							
				Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ESA)
				Class/HOME Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
Program Core (PCC)	21AN628		Principles of Organic Farming	15	20	5	5	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

21AN628.1 Students acquaint will familiar with the knowledge in organic farming as well as about the organic production technology for pushing up the field through organic farming.

Item	Appx Hrs.
CI	5
LI	3
SW	1
SL	2
Total	11

Session Outcomes(SOs)	Laboratory Instruction(LI)	Classroom Instruction(CI)	Self-Learning(SL)
<p>SO1.1 Understand the Organic farming systems.</p> <p>SO1.2 Understand the principles and its scope of organic farming.</p> <p>SO1.3 Understand the taken by Government (central/state), NGOs.</p> <p>SO1.4 Understand the other organizations for promotion of organic agriculture.</p>	<p>1- Visit of organic farms to study the various components and their utilization.</p> <p>2- Preparation of enrich compost.</p> <p>3- VC</p>	<p>Unit-1. Organic farming, principles and its scope in India; Initiatives taken by Government (central/state), NGOs and other organizations for promotion of organic agriculture.</p> <p>1.1 Introduction to organic farming system and its benefit.</p> <p>1.1 Indices and principles and its scope of organic farming.</p> <p>1.3 Introduction then taken by Government (central/state), NGOs.</p> <p>1.4 Explain the soil And water management in cropping systems</p> <p>1.5 introduction to assessment of land use.</p>	<p>1. Organic farming system and know the importance of cropping system and management of resources.</p> <p>2. The assessment of land use according to the crop.</p>

SW-1 Suggested Sessional Work (SW):

Assignments:

What is Organic farming systems? definition, indices and its importance and physical resources and its management.

a. Other Activities (Specify):

Research on most suitable organic farming systems for the Satna Region.

21AN628.2 Student will able to acquaint with the modern knowledge about, certification, labelling and accreditation procedure for organic farming.

Item	Appx Hrs.
CI	06
LI	1
SW	2
SL	1
Total	10

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO2.1 Understand the Concept of sustainability in organic farming systems and farming systems.</p> <p>SO2.2 Understand the scope and Objectives organic farming systems and farming systems</p> <p>SO2.3 Understand the production Organic nutrient resources.</p> <p>SO2.4. Understand the fortification.</p> <p>SO2.5 Understand the soil and water management in organic farming system</p>	<p>1- Bio-fertilizers/bio-inoculants and their quality analysis.</p>	<p>Unit-2 Organic ecosystem and their concepts; Organic nutrient resources and its fortification; Restrictions to nutrient use in organic farming.</p> <p>2.1 Introduction to Concept of sustainability in cropping systems and farming systems.</p> <p>2.2 Scope and Objectives of organic farming systems and farming systems.</p> <p>2.3 production potential under Organic nutrient resources.</p> <p>2.4 Production potential under multiple cropping.</p> <p>2.5 Production potential under fortification.</p> <p>2.6 Introduction to organic farming and its advantages.</p>	<p>1. Concept of organic farming systems and farming systems. in satna region.</p>

SW-1 Suggested Sessional Work (SW):

Assignments:

Concept of sustainability in cropping systems and farming systems, scope and Objectives production potential under different cropping system.

b. Other Activities (Specify):

Research on most suitable organic farming for the Satna Region.

21AN628.3 To recall knowledge on Initiatives taken by Government (central/state), NGOs and other organizations for promotion of organic agriculture.

Item	Appx Hrs.
CI	06
LI	2
SW	1
SL	1
Total	10

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO3.1 Understand the Choice of crops and varieties in organic farming.</p> <p>SO3.2 Understand the allelopathic effects of weed on crop, weed on crop and crop on weed.</p> <p>SO3.3 Understand the Fundamentals of insect, pest management.</p> <p>SO3.4 Understand the role of disease and weed management under organic mode of production.</p> <p>SO3.5 Understand the research need on sustainable agriculture.</p>	<p>1- Indigenous technology knowledge (ITK) for nutrient, insect, pest disease and weed management.</p> <p>2-Cost of organic production system.</p>	<p>Unit-3 Choice of crops and varieties in organic farming; Fundamentals of insect, pest, disease and weed management under organic mode of production.</p> <p>3.1Introduction to Choice of crops and varieties in organic farming.</p> <p>3.2Introduction to allelopathic and its effects on crop.</p> <p>3.3Introduction to fundamentalof insect, pest management.</p> <p>3.4Multi-storied cropping and yield stability in intercropping</p> <p>3.5Role of disease and weed management under organic mode of production.</p> <p>3.6New research need on sustainable agriculture and new innovation on sustainable agriculture.</p>	<p>1.Study of insect, pest, disease and weed management under organic mode of production in Sustainable agriculture.</p>

SW-1 Suggested Sessional Work (SW):

Assignments:

Role of non-monetary Inputs and low cost technologies; research need on sustainable agriculture

c. Other Activities (Specify):

New Research on sustainable agriculture.

21AN628.4 To get knowledge on marketing, export potential of organic products and different processing techniques of agricultural waste products as NADED, FYM, Vermicompost etc.

Approximate Hours

Item	Appx Hrs.
CI	04
LI	2
SW	1
SL	1
Total	8

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO4.1 Understand NPOP for sustainability.</p> <p>SO4.2 Understand the organic farming and role of organic farming to maintain soil Fertility.</p> <p>SO4.3 Understand the NPOP Certification process</p> <p>SO4.4. Understand the fertilizer Use in intensive organic farmingsystem.</p> <p>SO4.5 Understand the advanced nutritional tools for big data analysisand interpretation.</p>	<p>1- Cost of organic production system.</p> <p>2- Postharvest management.</p>	<p>Unit-4 Operational structure of NPOP. Certification process and standards of organic farming.</p> <p>4.1Introduction to NPOP for sustainability.</p> <p>4.2organic farming and role of organic farming to maintain soil Fertility.</p> <p>4.3 Introduction to organicfarming and its role in sustainable agriculture and to maintain soil Fertility</p> <p>4.4 Introduction to management of crop residue and nutrient use efficiency.</p>	<p>1. Study on crop diversification and importance of organic farming for the sustainable agriculture.</p>

SW-1 Suggested Sessional Work (SW):

Assignments:

- d.** Operational structure of NPOP, Certification process and standards of organic farming

Other Activities (Specify):

Research on structure of NPOP

21AN628.5 To demonstrate different integrated farming systems among the students.

Approximate Hours

Item	Appx Hrs.
CI	04
LI	1
SW	1
SL	1
Total	7

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO5.1 Understand the Processing of organic farming.</p> <p>SO5.2 Understand the leveling of organic farming.</p> <p>SO5.3 Understand the marketing and export of organic farming.</p> <p>SO5.4. Understand the economic considerations and viability, marketing of organic products.</p>	<p>1-Quality aspect, grading, packaging and handling.</p>	<p>Unit-5 Processing, leveling, economic considerations and viability, marketing and export potential of organic products.</p> <p>5.1Introduction to Processing of organic farming.</p> <p>5.2. 1Introduction the leveling of organic farming.</p> <p>5.3 Introduction marketing and export of organic farming.</p> <p>5.4 Introduction to the economicconsiderations and viability, marketing of organic products.</p>	<p>1. Study on Processing, leveling, economic considerations and viability, marketing and export potential of organic products.</p>

SW-1 Suggested Sessional Work (SW):

Assignments: Processing, leveling, economic considerations and viability, marketing and export potential of organic products

e. Other Activities (Specify):

Study on Processing, leveling, economic considerations and viability, marketing and export of organic materials.

Cos, Pos and PSOs Mapping
Course Code: 21AN628
Course Title: Principles of Organic Farming

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprises with different scales in area of agricultural production, process and trade	Hold a post on supply administration and policy	Analyze and control commercial and economical process in the field of agriculture	Teach how to control and manage agricultural production	Introduce general production technologies	Teach how to implement and manage production technologies	Prepare for managerial and social responsibilities	Student will identify different underutilized crops	Student will practice different breeding techniques used in crop production.	Student will recognize different insect pest and diseases and their symptoms of crops	Student will apply different recent techniques in crop production
21AN628.1 Students acquaint will familiar with the knowledge in organic farming as well as about the organic production technology for pushing up the field through organic farming.	2	2	1	1	2	2	3	2	2	1	2
21AN628.2 Student will able to acquaint with the modern knowledge about, certification, labelling and accreditation procedure for organic farming.	2	2	1	2	2	1	2	2	1	1	2
21AN628.3 To recall knowledge on Initiatives taken by Government (central/state), NGOs and other organizations for promotion of organic agriculture	1	2	2	1	2	3	2	1	2	2	1
21AN628.4 To get knowledge on	1	2	2	3	2	3	2	2	2	1	1

marketing, export potential of organic products and different processing techniques of agricultural waste products as NADED, FYM, Vermicompost etc.											
21AN628.5 To demonstrate different integrated farming systems among the students	2	1	2	2	2	2	2	1	1	2	2

Legend: 1 – Low, 2 – Medium, 3 – High

Curriculum Map: Principles of Organic Farming 21AN628

Pos & PSOs	Cos No. & Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
PO1,2,3,4,5,6,7 PSO 1,2,3,4	Students acquaint will familiar with the knowledge in organic farming as well as about the organic production technology for pushing up the field through organic farming.	SO 1.1 SO 1.2 SO 1.3 SO 1.4	1- Visit of organic farms to study the various components and their utilization. 2- Preparation of enrich compost. 3. VC	Organic farming, principles and its scope in India; Initiatives taken by Government (central/state), NGOs and other organizations for promotion of organic agriculture. 1.1, 1.2, 1.3,1.4, 1.5	Organic farming system and know the importance of cropping system and management of resources. The assessment of land use according to the crop.
PO1,2,3,4,5,6,7 PSO 1,2,3,4	Student will able to acquaint with the modern knowledge about, certification, labelling and accreditation procedure for organic farming.	SO 1.1 SO 1.2 SO 1.3 SO 1.4 SO 1.5	Bio-fertilizers/bio- inoculants and their quality analysis.	Organic ecosystem and their concepts; Organic nutrient resources and its fortification; Restrictions to nutrient use in organic farming. 1.1, 1.2, 1.3,1.4, 1.5, 1.6	Concept of organic farming systems and farming systems. in satna region.
PO1,2,3,4,5,6,7 PSO 1,2,3,4	To recall knowledge on Initiatives taken by Government (central/state), NGOs and other organizations for promotion of	SO 1.1 SO 1.2 SO 1.3 SO 4.4 SO 4.5	Measurement of albedo and sunshine duration. Computation of Radiation Intensity using BSS	Choice of crops and varieties in organic farming; Fundamentals of insect, pest, disease and weed management under organic mode of production. 1.1, 1.2, 1.3,1.4, 1.5, 1.6	Study of insect, pest, disease and weed management under organic mode of production in

	organic agriculture				Sustainable agriculture.
PO1,2,3,4,5,6,7 PSO 1,2,3,4	To get knowledge on marketing, export potential of organic products and different processing techniques of agricultural waste products as NADED, FYM, Vermicompost etc.	SO 1.1 SO 1.2 SO 1.3 SO 4.4 SO 4.5	Cost of organic production system. Post harvest management	Operational structure of NPOP. Certification process and standards of organic farming. 1.1, 1.2, 1.3, 1.4	1. Study on crop diversification and importance of organic farming for the sustainable agriculture.
PO1,2,3,4,5,6,7 PSO 1,2,3,4	To demonstrate different integrated farming systems among the students	SO 1.1 SO 1.2 SO 1.3 SO 4.4	Quality aspect, grading, packaging and handling	Processing, leveling, economic considerations and viability, marketing and export potential of organic products. 1.1, 1.2, 1.3, 1.4	Study on Processing, leveling, economic considerations and viability, marketing and export potential of organic products

Semester-VII
(RAWE & AIA)

Course Code: 21 AG771

Course Title : RAWE & AIA

Pre- requisite: The Rural Agricultural Work Experience (RAWE) provides exposure to agricultural students to the natural setting of the village situations, work with the farm families, identify their problems and make use of various extension tools for transferring the latest agricultural technologies.

Rationale: Orientation on organizational structure of Research Institute Provide an opportunity to understand the rural and urban setting KVK/ Industry/ NGOs/ similar organizations. In relation to Agriculture and allied sectors and familiarize with socio-economic Impart diagnostic and remedial knowledge to the students conditions of the agriculture stakeholders/farmers and their problems. Develop communication skills during data collection and relevant to real field situations through practical training. Develop confidence and competence to solve agricultural problems. Extension works and ability to solve the problems in agriculture and forestry. Engage students with on-going extension and rural development Inspiring for report preparation of experiential work. Programmes and develop capabilities for enterprise management and encourage entrepreneurship and self-employment..

Course Outcomes:

CO-1: The students were given rigorous orientation and familiarization on various issues and problems expected on farmers' field and hence gain competence and confidence for solving problems related to agriculture and allied sciences. It has been implemented in adopted villages under the supervision of scientists

CO-2: The Rural Agricultural Work Experience (RAWE) provides exposure to agricultural students to the natural setting of the village situations. Work with the farm families, identify their problems and make use of various extension tools for transferring the latest agricultural technologies

CO-3: The students also get opportunity to study the various on-going schemes related to agriculture and rural development and participate in their implementation.

CO -4: students will aware about basic learning skill about plant protection, and there management

CO -5: The students also gained first-hand information on industries during attachment with identified Agri-based industries.

CO -6: Students summarized the program and prepare RAWE & AIA report

Scheme of Studies:

Code	Course Code	Course Title	Scheme studies(Hours/Week)				Total Study Hours (CI+LI+SW+SL)	Total Credits (C)
			CI	LI	SW	SL		
Program Core (PCC)	21AG771	General orientation on campus training	1	0	1	2	18	1
Program Core (PCC)	21AG772	Village Attachment	0	8	1	2	243	8
Program Core (PCC)	21AG773	Unit attachment in university KVK/Research station	0	5	1	2	153	5
Program Core (PCC)	21AG774	Plant Clinic	0	2	1	2	63	2
Program Core (PCC)	21AG775	Agro-Industrial Attachment	0	3	1	2	93	3
Program Core (PCC)	21AG776	Project Report Preparation, Presentation and Evaluation	0	1	1	2	33	1

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial

(T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning, **C:**Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

Code	Course Code	Course Title	Scheme of Assessment (Marks)							End Semester Assessment	Total Marks (PRA+ESA)
			Progressive Assessment (PRA)						Total Marks (CA+CT+SA+CAT+AT)		
			Class/ Home Assignment number 3 each (CA)	Class Test 2 (2 best out of 3) 5 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)				
Program Core (PCC)	21AG771	General orientation on campus training							50	50	
Program Core (PCC)	21AG772	Village Attachment							400	400	
Program Core (PCC)	21AG773	Unit attachment in university KVK/Research station							250	250	
Program Core (PCC)	21AG774	Plant Clinic							100	100	
Program Core (PCC)	21AG775	Agro-Industrial Attachment							150	150	
Program Core (PCC)	21AG776	Project Report Preparation, Presentation and Evaluation							50	50	

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

UNIT -01(RAWE & AIA)

21AG771 : To know about basics of RAWE & AIA by General orientation and on campus training.

Approximate Hours

Item	Approx Hrs.
CI	15
LI	0
SW	1
SL	2
Total	18

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
So1 students understand about different interventions of RAWE&AIA programme		UNIT 1.0 General orientation and on campus training by different agriculture faculties in various subjects.	Different interventions at village

SW-1 Suggested Sessional Work (SW):

- a. *Assignments:*
- b. Mini Project:
 - i. **Make a project report about general orientation**

UNIT -02 (RAWE & AIA)

21AG772 : Students will get applied knowledge about village with the particular intervention as Village attachment.

Approximate Hours

Item	Approx Hrs.
CI	0
LI	240
SW	1
SL	2
Total	243

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO 1 Learn the situation of living and farming of allotted farmers.	LI 2.0 Village attachment LI 2.1 interaction with allotted farmers		Visit the Village to know the about village and farmer activities with the guidance of farmers.

SW-1 Suggested Sessional Work (SW):

- c. *Assignments:*
- d. Mini Project:
 - i. **Make a project report about survey of village,**

UNIT -03(RAWE & AIA)

21AG773 :Students will get applied knowledge about university/collage, KVK/Research station.

Approximate Hours

Item	Approx x Hrs.
CI	0
LI	150
SW	1
SL	2
Total	153

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO1 learn about different skills and technologies related to agriculture.	LI 3.0 Remedial knowledge about KVK/NGOs/ similar organizations. in relation to Agriculture and allied sectors and familiarize with socio-economic status.		Visit the KVK/NGOs/ similar organizations to know their working procedure.

SW-1 Suggested Sessional Work (SW):

e. Assignments:

f. Mini Project:

Make a project report about Visit of the KVK/ NGOs/ similar organizations to know their working procedure .

UNIT -04(RAWE & AIA)

21AG774 : To know about basics of RAWE & AIA by plant clinic.

Approximate Hours

Item	Approx Hrs.
CI	00
LI	60
SW	1
SL	2
Total	63

Session Outcomes(SOs)	Laboratory Instruction(LI)	Class room Instruction(CI)	Self Learning(SL)
So1 students understand about plant protection. Disease, insect, and its management.	LI 4.0 student will applicable knowledge about insect disease management		Disease and insect identification and its managements

SW-1 Suggested Sessional Work (SW):

g. *Assignments:*

h. Mini Project:

i. **Make a project report about general orientation**

UNIT -05
(RAWE & AIA)

21AG775 :Students will get applied knowledge about programmes and develop capabilities for enterprise management and encourage entrepreneurship and self-employment by training with Agro-based industries.

Approximate Hours

Item	Approx Hrs.
CI	0
LI	90
SW	1
SL	1
Total	93

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO1 trained and motivated to start business related to agriculture and developed selves as entrepreneur	<p>LI 5.0 Students will get applied knowledge about Agro- industries</p> <p>5.1 Engage students with Agro-based industries.</p>		Visit the allotted Agro-based industries and similar organizations.

SW-1 Suggested Sessional Work (SW):

- i. Assignments:*
- j. Mini Project:**
Make a project report about to Agro-based industries.

UNIT -06
(RAWE & AIA)

21AG776: Students will understand and prepare about project report preparation, presentation and evaluation.

Approximate Hours

Item	Approx Hrs.
CI	0
LI	30
SW	1
SL	1
Total	33

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO1 prepared RAWE and AIA report	LI 6.0 Inspiring for report preparation of experiential work and build presentation skill.		Prepare project report and make a preparation for presentation.

SW-1 Suggested Sessional Work (SW):

k. Assignments:

l. Mini Project

Prepare RAWE report and combined all interventions.

Course Outcomes	Class Lecture (CI)	Laboratory Instruction (LI)	Sessional Work (SW)	Self Learning (SI)	Total hour (CI+SW+SI)
CO-1: The students were given rigorous orientation and familiarization on various issues and problems expected on farmers' field and hence gain competence and confidence for solving problems related to agriculture and allied sciences. It has been implemented in adopted villages under the supervision of scientists	15	0	1	2	18
CO-2: The Rural Agricultural Work Experience (RAWE) provides exposure to agricultural students to the natural setting of the village situations. Work with the farm families, identify their problems and make use of various extension tools for transferring the latest agricultural technologies	0	240	1	2	243
CO-3: The students also get opportunity to study the various on-going schemes related to agriculture and rural development and participate in their implementation.	0	150	1	2	153
CO -4: students will aware about basic learning skill about plant protection, and there management	0	60	1	2	63
CO -5: The students also gained first-hand information on industries during attachment with identified Agri-based industries.	0	90	1	2	93
CO -6: Students summarized the program and prepare RAWE & AIA report	0	30	1	2	33
Total Hours	15	570	5	10	600

Suggested Learning Resources:

RAWE and AIA Manual given by the department

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	General orientation	15	20	15	50
CO-2	Village attachment	140	150	110	400
CO-3	KVK training	70	80	100	250
CO-4	Plant clinic	30	40	30	100
CO-5	Agro Industrial attachment	50	60	40	150
CO-6	Project report Preparation	15	15	20	50
Total		320	365	315	1000

Legend: R: Remember, U: Understand, A: Apply

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks.

Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

Improved Lecture

Tutorial Group Discussion

ICT Based Teaching Learning (Video Demonstration/Tutorials CBT,Blog, Facebook, Twitter, Whatsapp , Mobile, Online sources)

Brain storming

Elective Course

Course Code: 21AG431B

Course Title : Agriculture journalism

Pre- requisite: Journalism is that part of social activity, which is concerned, with the dissemination of news and views about the society .Journalism is the systematic and reliable dissemination of public information, public opinion and public entertainment by modern mass media of communication. Students will able to understand agricultural journalism.
Students will understand newspapers and magazines as communication media. Students will able to understand writing the story: organizing the material, treatment of the story.

Rationale: Journalism is the systematic and reliable dissemination of public information, public opinion and public entertainment by modern mass media of communication. Students will able to understand agricultural journalism.
Students will understand newspapers and magazines as communication media. Build understanding about writing the story organizing the material, treatment of the story.

Course Outcomes:

CO-1: understand the character of Journalism and its part as social activity, which is concerned, with the dissemination of news and views about the society.

CO-2: Students will able to understand agricultural journalism news paper and magazine as communication media and will aware about different type of newspaper and about how reader has a role on it.

CO-3: Students will understand that how to write news with proper style and part of story. And major things which students will know that from where students can gather story for writing.

CO-4 Students will aware about proper source from where students can collect the news like, by interviewing, events, also will learn about that how to make it as readable and its treatment for reader.

CO-5 students will familiarize with illustrating agriculture story, about photographs, chart, graph, for having good skill about writing caption and editorials mechanics, and proof reading.

Scheme of Studies:

Code	Course Code	Course Title	Scheme of studies(Hours/Week)				Total Study Hours (CI+LI+SW+SL)	Total Credits (C)
			C I	LI	SW	SL		
Program Core (PCC)	21AG431B	Agriculture journalism	2	1	1	1	5	3

Legend:

CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

Code	Course Code	Course Title	Scheme of Assessment (Marks)							End Semester Assessment	Total Marks
			Progressive Assessment (PRA)						Total Marks		
			Class/ Home Assignment number 5 mark each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	(CA+CT+SA+CAT+AT)			
Program Core (PCC)	21AG431B	Agriculture journalism	15	30	0	0	5	50	50	100	

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

21AG431B.1 Agricultural Journalism and how it differs from other type of journalism. And understand about interviewing technique, and agriculture events covering.

Approximate Hours

Item	Approx Hrs.
CI	3
LI	4
SW	1
SL	1
Total	09

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (S L)
<p>SO.1.1 Students will able to understand that Journalism is the systematic and reliable dissemination of public information</p> <p>SO.1.2 Public opinion and public entertainment by modern mass media of communication. Students will able to understand agricultural Journalist.</p> <p>SO.1.3- Students will get applied knowledge about interviewing practices.</p> <p>SO.1.4-studnets will be take part in various events for Covering agricultural events</p>	<p>1.1 To study about practice in interviewing.</p> <p>1.2 to study about covering agricultural events.</p>	<p>UNIT1.1Agricultural Journalism: The nature and scope of agricultural journalism characteristics</p> <p>1.2 Agricultural Journalism and training of the agricultural journalist,</p> <p>1.3 How agricultural journalism is similar to and different from other types of journalism.</p>	<p>1. Meet the agriculture journalist of find out the nature and scope of journalism.</p>

SW-1 Suggested Sessional Work (SW):

a. Assignments:

Find the role of agriculture journalist.

b. Mini Project: collect the cutouts of different short of newspaper and submit it.

Other activities (specify)

Students will take part in agriculture events to cover the whole events.

21AG431B.2 To know about basics of Newspapers and magazines as communication media and about abstracting.

Approximate Hours

Item	Approx Hrs.
CI	4
LI	2
SW	1
SL	1
Total	8

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO.2.1 Students will able to understand that Journalism is and its role in media communication</p> <p>SO.2.2 students able to know about character of newspaper and magazine.</p> <p>SO.2.3 students able to understand about different type of newspaper and their content</p> <p>SO.2.4 students will aware about national and international wire service.</p> <p>SO.2.5 aware about abstract writing for story writing</p>	<p>2.1 To study about Abstracting stories from research and scientific materials and from wire services</p>	<p>UNIT2.1 Newspapers and magazines as communication media</p> <p>2.2 Characteristics kinds and functions of newspapers</p> <p>2.3 About magazines, characteristics of newspaper and magazine readers.</p> <p>2.4 Form and content of newspapers and magazines:</p>	<p>Read all kinds of agriculture story and their writing style.</p>

SW-1 Suggested Sessional Work (SW):

c. Assignments:

d. Mini Project: collect the famous local newspaper and agriculture magazines

Other activities (specify)

21AG431B.2 To know about Style and language of newspapers and magazines, agricultural stories and gathering agriculture information. And agricultural stories also about artwork

Approximate Hours

Item	Approx Hrs.
CI	7
LI	6
SW	1
SL	1
Total	14

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO.3.1 Students will able to understand different part of newspaper</p> <p>SO.3.2 students able to know about agriculture story.</p> <p>SO.3.3 students able to understand about structure agriculture story</p> <p>SO.3.3 Different type of agriculture information for the agriculture story.</p> <p>SO.3.4 Students will get applied knowledge about writing agriculture story.</p> <p>SO.3.5 Students will understand about that how to select perfect picture for mentioning agriculture story</p>	<p>3.1To study about writing news story.</p> <p>3.2 To study about writing magazine story</p> <p>3.3 To study about writing success story</p>	<p>UNIT 3.1 Style and language of newspapers and magazines</p> <p>3.2Parts of newspapers and magazines.</p> <p>3.3The agricultural story:</p> <p>3.4Types of agricultural stories,</p> <p>3.5subject matter of the agricultural story</p> <p>3.6 Structure of the agricultural story.</p> <p>3.7 Gathering agricultural information.</p>	<p>1.0 Read all kinds of newspapers and magazines in library, at home also.</p> <p>2.0 Collect the picture for writing agriculture story.</p>

SW-1 Suggested Sessional Work (SW):

e. Assignments:

Writing different types of agricultural stories..

f. Mini Project:

Other activities (specify)

1.0 Read different type agriculture success story in library

21AG431B.4 To know about sources of agricultural information and writing the story and about editing.

Approximate Hours

Item	Approx Hrs.
CI	5
LI	10
SW	1
SL	1
Total	17

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO.4.1 Students will be able to understand Sources of agricultural information</p> <p>SO.4.2 students will be aware about scientific way of news</p> <p>SO.4.3 Students will understand newspapers and magazines as communication media.</p> <p>SO.4.4 Students will be able to understand writing the story: organizing the material, treatment of the story.</p> <p>SO.4.5 Students will get applied knowledge about Editing of news for writing</p> <p>SO.4.6 students will know about proof reading technique for different form of news.</p>	<p>4.1 To study about Practice in editing</p> <p>4.2 to study about practice in copy reading,</p> <p>4.3 to study about headline and title writing,</p> <p>4.4 To study about proofreading, layout.</p> <p>4.5 To study about selecting picture and art work for the agriculture story</p>	<p>UNIT 4.1 Sources of agricultural information, interviews,</p> <p>4.2 coverage of events, abstracting from</p> <p>4.3 Research and scientific materials, wire services, other agricultural news sources.</p> <p>4.4 Writing the story: Organizing the material, treatment of the story,</p> <p>4.5 Writing the news lead and the body, readability measures.</p>	<p>Try to write success story of farmers and treatment of these story by scientific ways</p> <p>Practice of proof reading</p>

SW-1 Suggested Sessional Work (SW):

g. Assignments:

h. Mini Project:

Other activities (specify)

1.0 Practice in editing, copy reading, headline and title writing,

21AG431B.5 Illustrating agricultural stories and editorial mechanics and knowing about readability formula. and office visit

Approximate Hours

Item	Approx Hrs.
CI	5
LI	6
SW	1
SL	1
Total	13

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO 5.1 Students will able to understand use of photographs for news story</p> <p>SO.5.2 students will get applied knowledge about art work for news writing</p> <p>SO 5.3 Students will aware about proof writing</p> <p>SO5.4 Build understanding about newspapers and magazines</p> <p>SO.5.5 Students will get applied knowledge about readability</p> <p>SO 5.6 students will visit newsroom to get applied knowledge about publishing procedure</p>	<p>5.1 Testing copy with a readability formula.</p> <p>5.2 Visit to a publishing office.</p> <p>5.3 To study about script writing for radio and television</p>	<p>UNIT 5.1 Illustrating agricultural stories</p> <p>5.2 Use of photographs, use of artwork (graphs, charts, maps, etc.)</p> <p>5.3 writing the captions.</p> <p>5.4 Editorial mechanics Copy reading headline</p> <p>5.5 title writing, proofreading, lay outing.</p>	<p>Build the confidence by proof reading.</p>

SW-1 Suggested Sessional Work (SW):

- i. Assignments:*
- j.** Mini Project: collect the different type of photographs and make a compile project file.

Other activities (specify)

1.0 write the news story by own way.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lectue (CI)	Laboratory Instruction (LI)	Self Learning (SI)	Session alWork (SW)	Total hour (CI+SW+S l +LI))
CO-1: understand the character of Journalism and its part as social activity, which is concerned, with the dissemination of news and views about the society.	3	4	1	1	9
CO-2: Students will able to understand agricultural journalism news paper and magazine as communication media and will aware about different type of newspaper and about how reader has a role on it.	4	2	1	1	8
CO-3: Students will understand that how to write news with proper style and part of story. And major things which students will know that from where students can gather story for writing.	7	6	1	1	15
CO-4: Students will aware about proper source from where students can collect the news like, by interviewing, events, also will learn about that how to make it as readable and its treatment for reader.	5	10	1	1	17
CO-5 : students will familiarize with illustrating agriculture story, about photographs, chart, graph , for having good skill about writing caption and editorials mechanics, and proof reading.	5	6	1	1	13
Total Hours	24	28	5	5	62

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Understand the character of Journalism and its part as social activity, which is concerned, with the dissemination of news and views about the society.	03	04	03	10
CO-2	.Students will able to understand agricultural journalism news paper and magazine as communication media and will aware about different type of newspaper and about how reader has a role on it.	03	05	02	10
CO-3	Students will understand that how to write news with proper style and part of story. And major things which students will know that from where students can gather story for writing.	02	04	04	10
CO-4	Students will aware about proper source from where students can collect the news like, by interviewing, events, also will learn about that how to make it as readable and its treatment for reader.	03	03	04	10
CO-5	students will familiarize with illustrating agriculture story, about photographs, chart, graph , for having good skill about writing caption and editorials mechanics, and proof reading.	04	03	03	10
Total		15	19	16	50

Legend: R: Remember, U: Understand, A: Apply

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Study
4. Group Discussion
5. Role Play
6. Visit to publication office
7. Demonstration
8. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT,Blog, Facebook,Twitter, Whatsapp, Mobile, Online sources)
9. Brainstorming

Suggested Learning Resources:

(a) Books :

S. No.	Title	Author	Publisher	Edition & Year
1	Mass communication and agriculture journalism	Dr.S.K. Tyagi	Rama publishing house merath	2014
2	Extension education and information system	Dr.Jitendra chouhan	Isha publication Agra .	1996

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Cos, Pos and PSOs Mapping

Course Code: 21AG431B

Course Title: Agriculture journalism

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprises with different scales in area of agricultural production, process and trade	Hold a post on supply i administration and policy	Analyze and control commercial and economical process in the field of agriculture	Teach how to control and manage agricultural production	Introduce general production technologies	Teach how to implement and manage production technologies	Prepare for managerial and social responsibilities	Student will identify different underutilized crops	Student will practice different breeding techniques used in crop production.	Student will recognize different insect pest and diseases and their symptoms of crops	Student will apply different recent techniques in crop production
CO-1: understand the character of Journalism and its part as social activity, which is concerned, with the dissemination of news and views about the society.	2	2	1	1	2	2	3	2	2	1	2
CO-2: Students will be able to understand agricultural journalism news paper and magazine as communication media and will be aware about different types of newspaper and about how a reader has a role in it.	2	2	1	2	2	1	2	2	1	1	2

CO-3: Students will understand that how to write news with proper style and part of story. And major things which students will know that from where students can gather story for writing.	1	2	2	1	2	3	2	1	2	2	1
CO-4 Students will aware about proper source from where students can collect the news like, by interviewing, events, also will learn about that how to make it as readable and its treatment for reader.	1	2	2	3	2	3	2	2	2	1	1
CO-5 students will familiarize with illustrating agriculture story, about photographs, chart, graph , for having good skill about writing caption and editorials mechanics, and proof reading.	2	1	2	2	2	2	2	1	1	2	2

Legend: 1 – Low, 2 – Medium, 3 – High

Curriculum Map: Agriculture journalism

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO 1,2,3,4 PSO 1,2,3,4,	21AG431B C1: understand the character of Journalism and its part as social activity, which is concerned, with the dissemination of news and views about the society.	SO1.1 SO1.2 SO1.3 SO1.4	1.0 To study about practice in interviewing. 1.1 To study about covering agricultural events	Unit-1.0. Agricultural Journalism: The nature and scope of agricultural journalism characteristics Agricultural Journalism and training of the agricultural journalist, how agricultural journalism is similar to and different from other types of journalism. 1.1, 1.2, 1.3.,	1. Meet the agriculture journalist of find out the nature and scope of journalism
PO 1,2,3,4 PSO 1,2,3,4,	21AG431B C-2: Students will able to understand agricultural journalism newspaper and magazine as communication media and will aware about different type of newspaper and about how reader has a role on it.	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5	2.1 To study about Abstracting stories from research and scientific materials and from wire services	Unit-2.0 UNIT2.0 Newspapers and magazines as communication media Characteristics kinds and functions of newspapers About magazines, characteristics of newspaper and magazine readers. Form and content of newspapers and magazines: 2.1, 2.2, 2.3. 2.4,	1 Read all kinds of agriculture story and their writing style
PO 1,2,3,4 PSO 1,2,3,4,	21AG431B C-3: Students will understand that how to write news with proper style and part of story. And major things which students will know that from where students can gather story for writing.	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5	3.1 To study about writing news story. 3.2 To study about writing magazine story 3.3 To study about writing success story.	Unit-3.0 Style and language of newspapers and magazines Parts of newspapers and magazines. The agricultural story: Types of agricultural stories, subject matter of the agricultural story Structure of the agricultural story. Gathering agricultural	1. Read all kinds of newspapers and magazines in library, at home also. 2. Collect the picture for

				information. 3.1, 3.2, 3.3, 3.4, 3.5,3.6,3.7	writing agriculture story.
PO 1,2,3,4 PSO 1,2, 3,4,	21AG431B C-4 Students will aware about proper source from where students can collect the news like, by interviewing, events, also will learn about that how to make it as readable and its treatment for reader.	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5 SO4.6	4.0 To study about Practice in editing 4.1 to study about practice in copy reading, 4.2 to study about headline and title writing, 4.3To study about proofreading, lay outing. 4.4To study about selecting picture and art work for the agriculture story	Unit-4.0. Sources of agricultural information, interviews, coverage of events, abstracting from Research and scientific materials, wire services, other agricultural news sources. Writing the story: Organizing the material, treatment of the story, Writing the news lead and the body, readability measures. 4.1, 4.2, 4.3. 4.4,4.5	1. Try to write success story of farmers and treatment of these story by scientific ways 2. Practice of proof reading
PO 1,2,3,4 PSO 1,2, 3,4,	21AG431B C -5 students will familiarize with illustrating agriculture story, about photographs, chart, graph, for having good skill about writing caption and editorials mechanics, and proof reading.	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5 SO5.6	5.1 Testing copy with a readability formula. 5.2 Visit to a publishing office. 5.3To study about script writing for radio and television	Unit-5.0 Illustrating agricultural stories. Use of photographs, use of artwork (graphs, charts, maps, etc.) writing the captions. Editorial mechanics Copy reading headline and title writing, proofreading, lay outing. 5.1, 5.2, 5.3,5.4.5.5	1 Build the confidence by proof reading

Course Code:- 21AB630-B

Course Title: -Agri Business Management

Pre requisite: -Student should have basic knowledge of basic concepts of Agri business management.

Rationale: - Applied Subject-Agri business management is the express through at analyzing the agribusiness concepts and importance of agribusiness in agriculture. Up-to-date information on Institutional arrangement, procedures to set up agro based industries. We aware about the financial management and capital management and their importance in agribusiness. All be able to evaluate the impact of Project Management and Project Appraisal and evaluation techniques policy.

Course Outcomes:

1. Define the agribusiness concepts and importance of agribusiness in agriculture.
2. Express about Institutional arrangement, procedures to set up agro based industries.
3. Interpret about the Organization staffing, directing and motivation. Ordering, leading, supervision, communications, control and its analysis.
4. Analyze the financial management and capital management and their importance in agribusiness.
5. Evaluate the impact of Project Management and Project Appraisal and evaluation techniques policy.

Scheme of studies

Code	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			C1	LI	SW	SL	Total Study Hours (CI+LI+SW+S L)	
Program Core (PCC)	21AB630-B	Agri Business Management	02	01	02	01	06	03

Legend: CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Code	Course Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ESA)
			Class/ Home Assignment number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
Program Core (PCC)	21AB 630-B	Agri Business Management	15	30	00	00	5	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

21AB630-B CO-1 Define the agribusiness concepts and importance of agribusiness in agriculture

Approximate Hours

Item	Appx hrs
C 1	06
LI	01
SW	01
SL	01
Total	09

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO1.1- Brief introduce about the Agri business management</p> <p>SO1.2 - Define the basic concept of Agribusiness management</p> <p>SO1.3 - Describe the Importance of agribusiness</p> <p>SO1.4-Discussion the features of Agribusiness Management</p> <p>SO1.5 Describe the different types of agro based industries</p>	<p>LE1.1 – Study of agri-input markets: Seed, fertilizers, pesticides.</p> <p>2- Study of output markets: grains, fruits, vegetables, flowers.</p>	<p>Unit-1.0-Transformation of agriculture into agribusiness, various stakeholders and components of agribusiness systems. Importance of agribusiness in the Indian economy and New Agricultural Policy. Distinctive features of Agribusiness Management: Importance and needs of agro-based industries, Classification of industries and types of agro based industries.</p> <p>1.1-Concept of transformation of agriculture.</p> <p>1.2-Stakeholders and components of agribusiness systems</p> <p>1.3- Importance of agribusiness</p> <p>1.4-Features of Agribusiness Management</p> <p>1.5- Importance and needs of agro-based industries</p> <p>1.6- Types of agro based industries</p>	<p>1.1- Prepare the assignment</p>

SW-1 Suggested Sessional Work (SW):

- a. Assignments:**
- b. Mini Project: -**
- c. Other Activities (Specify):-**

21AB630-B CO-2: Express about Institutional arrangement, procedures to set up agro based industries.

Approximate Hours

Item	Appx Hrs
C 1	05
LI	01
SW	01
SL	02
Total	09

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO2. – Introduce of Institutional arrangement</p> <p>SO2. – Learned about the procedures to set up agro based industries</p> <p>SO3.- Briefing about the Constraints in establishing agro-based industries.</p> <p>SO4.- Discuss about the agri-value chain system</p> <p>SO5.–Describe the linkages of primary and support activities.</p>	<p>LE2.1- Study of product markets, retails trade commodity trading, and value added products.</p> <p>2.2 -Study of financing institutions- Cooperative, Commercial banks, RRBs, Agribusiness Finance Limited, NABARD.</p>	<p>Unit-2.0-Institutional arrangement, procedures to set up agro based industries. Constraints in establishing agro-based industries. Agri-value chain: Understanding primary and support activities and their linkages.</p> <p>2.1 – Institutional arrangement</p> <p>2.2- procedures to set up agro based industries</p> <p>2.3 Constraints in establishing agro-based industries.</p> <p>2.4 Agri-value chain</p> <p>2.5linkages of primary and support activities.</p>	<p>2.1 – Prepare the assignment</p>

SW-1 Suggested Sessional Work (SW):

a. Assignments:

b. Mini Project:

c. Other Activities (Specify):

21AB630-B CO-3: Interpret about the Organization staffing, directing and motivation. Ordering, leading, supervision, communications, control and its analysis.

Approximate Hours

Item	Appx hrs
C 1	07
LI	02
SW	02
SL	01
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO3.1 – Discuss to the Roles & activities of Management functions</p> <p>SO3.2 –Determine the PEST & SWOT analysis</p> <p>SO3.3- Knowledge About the urpose or mission, goals or objectives, Strategies, polices procedures</p> <p>SO3.4- Discuss the Components of a business plan</p> <p>SO3.5– Describe the Organization staffing, directing and motivation, leading, supervision, communications, control</p>	<p>3.1 Preparations of projects and Feasibility reports for agribusiness entrepreneur.</p> <p>3.2Appraisal/evaluation techniques of identifying viable project- Non-discounting techniques.</p>	<p>Unit-3.0 Business environment: PEST & SWOT analysis. Management functions: Roles & activities, Organization culture. Planning, meaning, definition, types of plans. Purpose or mission, goals or objectives, Strategies, polices procedures, rules, programs and budget. Components of a business plan, Steps in planning and implementation. Organization staffing, directing and motivation. Ordering, leading, supervision, communications, control.</p> <p>3.1- PEST & SWOT analysis</p> <p>3.2- Management functions</p> <p>3.3- types of plans</p> <p>3.4- Purpose or mission, goals or objectives</p> <p>3.5- Strategies, polices procedures</p> <p>3.6- Components of a business plan</p> <p>3.7- Ordering, leading, supervision, communications, control</p>	<p>3.1 Prepare the assignment</p>

SW-1 Suggested Sessional Work (SW):

a. Assignments:

b. Mini Project:

c. Other Activities (Specify):

21AB630-B CO-4: Analyze the financial management and capital management and their importance in agribusiness.

Approximate Hours

Item	App X Hrs
CI	06
LI	02
SW	02
SL	01
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO4.1 –Define the Capital Management and Financial management</p> <p>SO4.2 - Apply the concept of financial statements and their importance</p> <p>SO4.3- Known the concept of Segmentation, targeting & positioning</p> <p>SO4.4- Marketing mix and marketing strategies</p> <p>SO4.5– Product Life Cycle</p>	<p>4.1 - Case study of agro-based industries.</p> <p>4.2-Trend and growth rate of prices of agricultural commodities</p>	<p>Capital Management and Financial management of Agribusiness. Financial statements and their importance. Marketing Management: Segmentation, targeting & positioning. Marketing mix and marketing strategies. Consumer behaviour analysis, Product Life Cycle (PLC). Sales & Distribution Management</p> <p>4.1- Capital Management</p> <p>4.2- Financial management</p> <p>4.3- Financial statements and their importance</p> <p>4.4- Marketing mix and marketing strategies</p> <p>4.5 Consumer behaviour analysis</p> <p>4.6- Product Life Cycle</p>	<p>1.1- Prepare the assignment</p>

SW-1 Suggested Sessional Work (SW):

- a. Assignments:** Prepare the assignment on Group decision making, team building and developing collaboration
- b. Mini Project:**
- c. Other Activities (Specify):**

21AB630-B CO-5: Evaluate the impact of Project Management and Project Appraisal and evaluation techniques policy.

Approximate Hours

Item	Appx hrs
CI	06
LI	02
SW	02
SL	02
Total	12

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO1.1 –Identify the various pricing methods</p> <p>SO1.2- Identify the different phases of project cycle</p> <p>SO1.3- Discuss the Project Appraisal and evaluation techniques</p> <p>SO 1.4 Discuss the financial concepts applied to the agro-based industries</p> <p>SO1.5- Describe the Project Appraisal and evaluation techniques</p>	<p>5.1- Net present worth technique for selection of viable project.</p> <p>5.2-Internal rate of return.</p>	<p>5.0 Pricing policy, various pricing methods. Project Management definition, project cycle, identification, formulation, appraisal, implementation, monitoring and evaluation. Project Appraisal and evaluation techniques.</p> <p>5.1- Price policy</p> <p>5.2- Project Management</p> <p>5.3- project life cycle</p> <p>5.4- Price policy</p> <p>5.5- Project Appraisal</p> <p>5.6- Evaluation techniques</p>	<p>1.1-Prepare the assignment</p>

SW-1 Suggested Sessional Work (SW):

- a. Assignments:** Prepare the assignment on individual or organizational behaviors
- b. Mini Project:** Prepare a project report of different function of management used in any case study
- c. Other Activities (Specify):**

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (C I)	Laboratory Lecture (L I)	Sessional Work (SW)	Self Learning (S I)	Total hour (C I + L I + SW + S I)
01: Define the agribusiness concepts and importance of agribusiness in agriculture.	06	01	01	01	09
02: Express about Institutional arrangement, procedures to set up agro based industries.	05	01	01	02	09
03: Interpret about the Organization staffing, directing and motivation. Ordering, leading, supervision, communications, control and its analysis.	07	02	02	01	12
04: Analyze the financial management and capital management and their importance in agribusiness.	06	02	02	01	11
05: Evaluate the impact of Project Management and Project Appraisal and evaluation techniques policy	06	02	02	02	12
Total Hours	30	08	08	07	53

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit title	Marks Distribution			Total Marks
		R	U	A	
CO-1	Define the importance of agribusiness in agriculture.	02	02	02	06
CO-2	Elaborate the procedures to set up agro based industries.	02	03	03	08
CO-3	Apply the fundamentals of Ordering, leading, supervision, communications, control and its analysis	02	04	04	10
CO-4	Apply the capital management and their importance in agribusiness.	03	04	05	12
CO-5	Evaluate the Project Appraisal and evaluation techniques policy	04	05	05	14
	Total	13	18	19	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Agricultural Marketing, Trade and Prices will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Demonstration
7. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, Whatsapp, Mobile, Online sources)
8. Brainstorming

Suggested Learning Resources:

S. No.	Title	Author	Publisher	Edition & Year
01	Fundamentals of Agribusiness Management	G. L. Meena, S. S. Burark, D. C. Pant and Rajesh Sharma	Agrotech Publishing Academy, Udaipur	2017 1st Addition
02	Agribusiness & Farm Management at a Glance	L.L. Somani and G. L. Meena	Agrotech Publishing Academy, Udaipur	2017. First edition
03	Principles and Practices of Marketing in India	Mamoria, C. B., Joshi, R. L. and Mulla, N. I. v	Kitab Mahal, Allahabad	06 th Edition 2005

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Cos, Pos and PSOs Mapping
Course Code: 21AB630-B
Course Title: Agri Business Management

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprise with different scales in area of agricultural production, process and trade	Hold a post on supply i dministration and policy	Analyze and control commercial and economical process in the field of agriculture	Teach how to control and manage agricultural production	Introduce general production technologies	Teach how to implement and manage production technologies	Prepare for managerial and social responsibilities	Student will identify different underutilized crops	Student will practice different breeding techniques used in crop production.	Student will recognize different insect pest and diseases and their symptoms of crops	Student will apply different recent techniques in crop production
1. Define the agribusiness concepts and importance of agribusiness in agriculture.	2	2	1	1	2	2	3	2	2	1	2
2. Express about Institutional arrangement, procedures to set up agro based industries.	2	2	1	2	2	1	2	2	1	1	3
3. Interpret about the Organization staffing, directing and motivation. Ordering, leading, supervision, communications, control and its analysis.	1	2	2	1	2	3	2	1	1	2	1
4. Analyze the financial management and capital	1	3	2	2	2	3	2	2	2	2	1

management and their importance in agribusiness.											
5. Evaluate the impact of Project Management and Project Appraisal and evaluation techniques policy.	2	1	3	2	2	2	2	1	1	2	3

Legend: 1 – Low, 2 – Medium, 3 – High

Curriculum Mapping

Pos & PSOs	Cos No. & Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
PO1,2,3,4 PSO 1,2,3,4	1. Define the agribusiness concepts and importance of agribusiness in agriculture.	SO 1.1 SO 1.2 SO 1.3 SO 1.4	1.1– Study of agri-input markets: Seed, fertilizers, pesticides. 1.2- Study of output markets: grains, fruits, vegetables, flowers.	Transformation of agriculture into agribusiness, various stakeholders and components of agribusiness systems. Importance of agribusiness in the Indian economy and New Agricultural Policy. Distinctive features of Agribusiness Management: Importance and needs of agro-based industries, Classification of industries and types of agro based industries. 1.1, 1.2, 1.3,1.4, 1.5.1.6	1.1 -Prepare the assignment

PO1,2,3,4 PSO 1,2,3,4	2. Express about Institutional arrangement, procedures to set up agro based industries.	SO 2.1 SO 2.2 SO 2.3 SO 2.4 SO 2.5	2.1. Study of product markets, retails trade commodity trading, and value added products. 2.2. Study of financing institutions- Cooperative, Commercial banks, RRBs, Agribusiness Finance Limited, NABARD.	Institutional arrangement, procedures to set up agro based industries. Constraints in establishing agro-based industries. Agri-value chain: Understanding primary and support activities and their linkages. 2.1, 2.2, 2.3,2.4, 2.5	1.1-Prepare the assignment
PO1,2,3,4 PSO 1,2,3,4	3. Interpret about the Organization staffing, directing and motivation. Ordering, leading, supervision, communications, control and its analysis.	SO 3.1 SO 3.2 SO 3.3 SO 3.4 SO 3.5	3.1 Preparations of projects and Feasibility reports for agribusiness entrepreneur. 3.2 Appraisal/evaluation techniques of identifying viable project- Non-discounting techniques.	Business environment: PEST & SWOT analysis. Management functions: Roles & activities, Organization culture. Planning, meaning, definition, types of plans. Purpose or mission, goals or objectives, Strategies, polices procedures, rules, programs and budget. Components of a business plan, Steps in planning and implementation. Organization staffing, directing and motivation. Ordering, leading, supervision, communications, control. 3.1,3.2, 3.3,3.4, 3.5, 3.6,3.7	1.1-Prepare the assignment
PO1,2,3,4 PSO 1,2,3,4	4. Analyze the financial management and capital management and their importance in agribusiness.	SO 4.1 SO 4.2 SO 4.3 SO 4.4	4.1 - Case study of agro-based industries. 4.2-Trend and growth rate of prices of agricultural commodities	Capital Management and Financial management of Agribusiness. Financial statements and their importance. Marketing Management: Segmentation, targeting & positioning. Marketing mix and marketing strategies. Consumer behaviour analysis, Product Life Cycle	1.1-Prepare the assignment

		SO 4.5		(PLC). Sales & Distribution Management 4.1, 4.2, 4.3, 4.4,4.5,4.6	
PO1,2,3,4 PSO 1,2,3,4	5. Evaluate the impact of Project Management and Project Appraisal and evaluation techniques policy.	SO 5.1 SO 5.2 SO 5.3 SO 5.4 SO 5.5	5.1- Net present worth technique for selection of viable project. 5.2-Internal rate of return.	Pricing policy, various pricing methods. Project Management definition, project cycle, identification, formulation, appraisal, implementation, monitoring and evaluation. Project Appraisal and evaluation techniques. 5.1, 5.2, 5.3, 5.4,5.5,5.6	1.1-Prepare the assignment

Course Code:**Course Title:** Biopesticides & Biofertilizers**Pre- requisite:** Student should have basic knowledge of Fundamentals of Plant Pathology, microbiology & secondary metabolites**Rationale:** Use of agrochemicals is hazardous to plants, animals and environment and they have no longer life. Biopesticides and biofertilizers are sustainable, toxic residue free and environment friendly. Biopesticides and biofertilizers are also a part for balanced ecosystem.**Course Outcomes:****CO1** Describe about the importance of biofertilizers and biopesticides and their types.**CO2** Demonstrate skills of isolation and purification of biopesticides and biofertilizers.**CO3** Demonstrate skills on culture and mass production of biopesticides and biofertilizers.**CO4** Ability to distinguish the types of most effective biopesticides and biofertilizers.**CO5** Assess the quality control of biopesticides and biofertilizers.**Scheme of Studies:**

Code	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			CI	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Program Core (PCC)		Biopesticides & Biofertilizers	2	1	1	1	6	3

Legend:**CI:** Classroom Instruction (Includes different instructional strategies i.e., Lecture (L) and Tutorial (T) and others),**LI:** Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)**SW:** Sessional Work (includes assignment, seminar, mini project etc.),**SL:** Self Learning, **C:** Credits.**Note:** SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.**Scheme of Assessment:****Theory**

Code	Course Code	Course Title	Scheme of Assessment (Marks)						
			Progressive Assessment (PRA)					End Semester Assessment (ESA)	Total Marks (PRA+ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2, 15 marks each (CT)	Semin a r one (SA)	Activit y any one (CAT)	Class Atten dance (AT)		
Program Core (PCC)		Biopesticides & Biofertilizers		30	-	-		50	100

Course-Curriculum Detailing: This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional

Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

21HO426 .1: Describe about the importance of biofertilizers and biopesticides and their types

Approximate Hours

Item	Appx. Hrs
CI	6
LI	6
SW	1
SL	1
Total	14

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
<p>SO1.1 Understand the importance of biopesticides & their isolation</p> <p>SO1.2 Recognize the biopesticides</p> <p>SO1.3 Describe the botanicals</p> <p>SO1.4 Understand the use of biorationals</p>	<ul style="list-style-type: none"> Isolation and purification of important fungal biopesticides: Trichoderma, Beauveria bassiana, Metarhizium enisopliae etc. Isolation and purification of important bacterial biopesticides Pseudomonas, Bacillus, etc. and its production. Identification of important botanicals. 	<p>Unit-1 History and concept of biopesticides. Importance, scope and potential of biopesticide. Definitions, concepts and classification of biopesticides viz. pathogen, botanical pesticides, and biorationals. Botanicals and their uses</p> <p>1.1 History and concept of biopesticides</p> <p>1.2 Importance, scope and potential of biopesticide</p> <p>1.3 Definitions, concepts of biopesticides</p> <p>1.4 Classification of biopesticides viz. pathogen, botanical pesticides, and biorationals.</p> <p>1.5 Classification of biopesticide,s biorationals.</p> <p>1.6 Botanicals and their uses</p>	<p>1 Use of plant part for botanicals</p>

SW-1 Suggested Sessional Work (SW):

a) Assignments:

- i) Pheromones and their uses, allomones and their uses and enlist insect growth regulators

21HO426 .2: Demonstrate skills of isolation and purification of biopesticides and biofertilizers.

Approximate Hours

Item	Appx Hrs
CI	06
LI	6
SW	1
SL	1
Total	14

Session outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
<p>SO2.1 Explain mass production technology of biopesticides</p> <p>SO2.2 Demonstrate the mass production technology of biopesticides</p> <p>SO2.3 Correlate the quality control parameters of biopesticides</p> <p>SO2.4 Determine the impediments in production and use of biopesticides</p>	<p>1. Visit to biopesticide laboratory in nearby area.</p> <p>2. Field visit to explore naturally infected cadavers.</p> <p>3. Identification of entomopathogenic entities in field condition.</p> <p>4. Quality control of biopesticides</p>	<p>Unit-2 Mass production technology of bio-pesticides. Virulence, pathogenicity and symptoms of entomopathogenic pathogens and nematodes. Methods of application of biopesticides. Methods of quality control and Techniques of biopesticides. Impediments and limitation in production and use of biopesticide.</p> <p>2.1 Mass production technology of bio-pesticides seed and seedling rot and mosaic, of soybean</p> <p>2.2 Virulence, pathogenicity and symptoms of entomopathogenic pathogens & nematodes</p> <p>2.3 Virulence, pathogenicity and symptoms of entomopathogenic pathogens & nematodes</p> <p>2.4 Methods of application of biopesticides</p> <p>2.5 Methods of quality control and Techniques of biopesticides</p> <p>2.6 Impediments and limitation in production and use of biopesticide.</p>	<p>1 Symptoms caused by entomopathogenic pathogens</p>

SW-2 Suggested Sessional Work (SW):

a) Assignments:

- i) Mode of action of entomopathogenic pathogens

21HO426.3: Demonstrate skills on culture and mass production of biopesticides and biofertilizers

Approximate Hours

Item	Appx. Hrs
CI	06
LI	6
SW	1
SL	1
Total	14

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
<p>SO3.1 Describe characteristic features of biofertilizers</p> <p>SO3.2 Practice to identify and isolation of bacterial biofertilizers</p> <p>SO3.3 Illustrate microscopic characters of the fungal biofertilizers</p> <p>SO3.4 Develop mother culture of biofertilizers for mass production</p>	<ul style="list-style-type: none"> • Isolation and purification of Azospirillum, Azotobacter, • Isolation and purification of Rhizobium, P-solubilizers • Isolation and purification of cyanobacteria 	<p>Unit-3 Biofertilizers - Introduction, status and scope. Structure and characteristic features of bacterial biofertilizers- <i>Azospirillum</i>, <i>Azotobacter</i>, <i>Bacillus</i>, <i>Pseudomonas</i>, <i>Rhizobium</i> and <i>Frankia</i>; Cynobacterial biofertilizers- <i>Anabaena</i>, <i>Nostoc</i>, Hapalosiphon and fungal biofertilizers- AM mycorrhiza and ectomycorrhiza</p> <p>3.1 Biofertilizers – Introduction</p> <p>3.2 Status and scope of biofertilizers</p> <p>3.3 Structure and characteristic features of bacterial biofertilizers- <i>Azospirillum</i>, <i>Azotobacter</i>, <i>Bacillus</i>, <i>Pseudomonas</i></p> <p>3.4 Structure and characteristic features of bacterial biofertilizers- <i>Rhizobium</i> and <i>Frankia</i></p> <p>3.5 Cynobacterial biofertilizers- <i>Anabaena</i>, <i>Nostoc</i>, Hapalosiphon</p> <p>3.6 fungal biofertilizers- AM mycorrhiza and ectomycorrhiza</p>	<p>1 Crop vis use of biofertilizers</p>

SW-3 Suggested Sessional Work (SW):

a) Assignments:

- i) Causal organisms and their descriptions

21HO426.4: Ability to distinguish the types of most effective biopesticides and biofertilizers

Approximate Hours

Item	Appx Hrs
CI	06
LI	6
SW	1
SL	1
Total	14

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
<p>SO4.1 Select the strain of biofertilizers</p> <p>SO4.2 Describe the mechanism of nitrogen fixation</p> <p>SO4.3 Evaluate the efficiency of biofertilizers</p> <p>SO4.4 Experiment of mass production of biofertilizers</p>	<ul style="list-style-type: none"> • Mass multiplication and inoculums production of biofertilizers. • Isolation of AM fungi -Wet sieving method and sucrose gradient method. • Mass production of AM inoculants 	<p>Unit-4 Nitrogen fixation -Free living and symbiotic nitrogen fixation. Mechanism of phosphate solubilization and phosphate mobilization, K solubilization. Production technology: Strain selection, sterilization, Growth and fermentation, mass production of carrier based and liquid biofertilizers.</p> <p>4.1 Nitrogen fixation -Free living and symbiotic nitrogen fixation.</p> <p>4.2 Mechanism of phosphate solubilization and phosphate mobilization</p> <p>4.3 Mechanism of K solubilization.</p> <p>4.4 Production technology: Strain selection, sterilization,</p> <p>4.5 Production technology: Growth and fermentation</p> <p>4.6 Mass production of carrier based and liquid biofertilizers.</p>	<p>1 Biofertilizers suitable for different crops</p>

SW-4 Suggested Sessional Work (SW):

a) Assignments:

- i) Strain selection, growth, mechanism of potassium solubilization

21HO426.5: Assess the quality control of biopesticides and biofertilizers.

Approximate Hours

Item	Appx Hrs
CI	06
LI	6
SW	1
SL	1
Total	14

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
<p>SO5.1 Apply FCO specifications in mass production of biofertilizers</p> <p>SO5.2 Identify the methods of application of biofertilizers</p> <p>SO5.3 Evaluate the quality of biofertilizers</p> <p>SO5.4 Solve the impediments related to biofertilizers</p>	<ul style="list-style-type: none"> • Mass multiplication and inoculums production of biofertilizers. • Isolation of AM fungi -Wet sieving method and sucrose gradient method. • Mass production of AM inoculants. 	<p>Unit-5 FCO specifications and quality control of biofertilizers. Application technology for seeds, seedlings, tubers, sets etc. Biofertilizers -Storage, shelf life, quality control and marketing. Factors influencing the efficacy of biofertilizers.</p> <p>5.1 FCO specifications and quality control of biofertilizers</p> <p>5.2 Application technology for seeds, seedlings, tubers, sets etc.</p> <p>5.3 Biofertilizers -Storage, shelf life,</p> <p>5.4 Quality control and marketing</p> <p>5.5 Factors influencing the efficacy of biofertilizers</p> <p>5.6 Factors influencing the efficacy of biofertilizers</p>	1 FCO specifications

SW-5 Suggested Sessional Work (SW):

a) Assignments:

- i) Marketing, Storage and shelf life of biofertilizers

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (C)	Lab (LI)	Sessional Work (SW)	Self Learning (SI)	Total hour (CI+SW+SI)
1: Describe about the importance of biofertilizers and biopesticides and their types.	06	6	1	1	14
2: Demonstrate skills of isolation and purification of biopesticides and biofertilizers.	06	6	1	1	14
3: Demonstrate skills of isolation and purification of biopesticides and biofertilizers.	05	6	1	1	13
4: Ability to distinguish the types of most effective biopesticides and biofertilizers.	06	6	1	1	14
5: Assess the quality control of biopesticides and biofertilizers.	07	6	1	1	15
Total Hours	30	30	05	05	70

Suggested Learning Resources:

(a) Books:

S. No.	Title	Author	Publisher	Edition & Year
1	Handbook of Microbial Biofertilizers	Mahendra Rai	Food Products Press, New York, London	2005 5th Ed.
2	Biofertilizers and Biopesticides.	Krishnendu Acharya, Surjit Sen and Manjula Rai	Techno World, Kolkata (W.B.)	2019.
3	Biofertilizers and Biopesticides in Sustainable Agriculture.	B. D. Kaushik, Deepak Kumar and Md. Shamim.	Apple Academic Press.	2021.

Curriculum Development Team

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Cos, POs and PSOs Mapping

Course Title: Biopesticides & Biofertilizers

Course Code: 21AG529-B

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprise with different scales in area of agricultural production,	Hold a post on supply administration and policy	Analyze and control commercial and economical process in the field of agriculture	Teach how to control and manage agricultural production	Introduce general production technologies	Teach how to implement and manage production technologies	Prepare for managerial and social responsibilities	Student will identify different underutilized crops	Student will practice different breeding techniques used in crop production.	Student will recognize different insect pest and diseases and their symptoms of crops	Student will apply different recent techniques in crop production
1: Describe about the importance of biofertilizers and biopesticides and their types.	2	2	1	1	2	2	3	2	2	1	2
2: Demonstrate skills of isolation and purification of biopesticides and biofertilizers.		2	1	2	2	1	2	2	1	1	3
3: Demonstrate skills on culture and mass production of biopesticides and biofertilizers	1	2	2	1	2	3	2	1	1	1	1
4: Ability to distinguish the types of most effective biopesticides and biofertilizers.	1	3	2	1	2	2	2	2	2	2	1

5: Assess the quality control of biopesticides and biofertilizers.	1	1	1	2	2	1	2	1	1	2	31
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Legend: 1 – Low, 2 – Medium, 3 – High

Curriculum Map: Biopesticides & Biofertilizers

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self- Learning (SL)
POs 1,2,3,4,5,6,7 PSOs 1,2,3,4	1: Describe about the importance of biofertilizers and biopesticides and their types.	SO 1.1 SO 1.2 SO 1.3 SO 1.4	<ul style="list-style-type: none"> Isolation and purification of important fungal biopesticides: <i>Trichoderma</i>, <i>Beauveria bassiana</i>, <i>Metarhizium enisopliae</i> etc. Isolation and purification of important bacterial biopesticides <i>Pseudomonas</i>, <i>Bacillus</i>, etc. and its production. Identification of important botanicals. 	History and concept of biopesticides. Importance, scope and potential of biopesticide. Definitions, concepts and classification of biopesticides viz. pathogen, botanical pesticides, and biorationals. Botanicals and their uses 1.1,1.2,1.3,1.4,1.5,1.6	1. Use of plant part for botanicals
POs 1,2,3,4,5,6,7 PSOs 1,2,3,4	2: Demonstrate skills of isolation and purification of biopesticides and biofertilizers.	SO 2.1 SO 2.2 SO 2.3 SO 2.4	<ul style="list-style-type: none"> Visit to biopesticide laboratory in nearby area. Field visit to explore naturally infected cadavers. Identification of entomopathogenic entities in field condition. Quality control of biopesticides 	Mass production technology of bio-pesticides. Virulence, pathogenicity and symptoms of entomopathogenic pathogens and nematodes. Methods of application of biopesticides. Methods of quality control and Techniques of biopesticides. Impediments and limitation in production and use of biopesticide. 2.1,2.2,2.3,2.4,2.5,2.6	1. Symptoms caused by entomopathogenic pathogens
POs 1,2,3,4,,5,6,7 PSOs 1,2,3,4	3: Demonstrate skills of isolation and purification of biopesticides and biofertilizers.	SO 3.1 SO 3.2 SO 3.3 SO 3.4	<ul style="list-style-type: none"> Isolation and purification of <i>Azospirillum</i>, <i>Azotobacter</i>, Isolation and purification of <i>Rhizobium</i>, P-solubilizers Isolation and purification of cyanobacteria 	Biofertilizers - Introduction, status and scope. Structure and characteristic features of bacterial biofertilizers- <i>Azospirillum</i> , <i>Azotobacter</i> , <i>Bacillus</i> , <i>Pseudomonas</i> , <i>Rhizobium</i> and <i>Frankia</i> ; Cynobacterial biofertilizers- <i>Anabaena</i> , <i>Nostoc</i> ,	1 Crop vis use of biofertilizers

				Hapalosiphon and fungal biofertilizers- AM mycorrhiza and ectomycorrhiza 3.1,3.2,3.3,3.4,3.5,3.6	
POs 1,2,3,4,5,6,7 PSOs 1,2,3,4	4: Ability to distinguish the types of most effective biopesticides and biofertilizers.	SO 4.1 SO 4.2 SO 4.3 SO 4.4	<ul style="list-style-type: none"> • Mass multiplication and inoculums production of biofertilizers. • Isolation of AM fungi -Wet sieving method and sucrose gradient method. • Mass production of AM inoculants. 	Nitrogen fixation -Free living and symbiotic nitrogen fixation. Mechanism of phosphate solubilization and phosphate mobilization, K solubilization. Production technology: Strain selection, sterilization, Growth and fermentation, mass production of carrier based and liquid biofertilizers. 4.1,4.2,4.3,4.4,4.5,4.6	1 Biofertilizers suitable for different crops
POs 1,2,3,4,5,6,7 PSOs 1,2,3,4	5: Assess the quality control of biopesticides and biofertilizers.	SO 5.1 SO 5.2 SO 5.3 SO 5.4	<ul style="list-style-type: none"> • Mass multiplication and inoculums production of biofertilizers. • Isolation of AM fungi -Wet sieving method and sucrose gradient method. • Mass production of AM inoculants. 	FCO specifications and quality control of biofertilizers. Application technology for seeds, seedlings, tubers, sets etc. Biofertilizers -Storage, shelf life, quality control and marketing. Factors influencing the efficacy of biofertilizers. 5.1,5.2,5.3,5.4,5.5,5.6	1 FCO specifications

Course Code: 21AG529

Course Title: Weed Management

Pre-requisite: Student should have basic knowledge weed management is an essential aspect of agriculture and landscaping to ensure the optimal growth of desired plants and crops.

Rationale: The students should be acquainted with the knowledge of Weed management is crucial for several reasons, and its rationale extends to various aspects of agriculture, horticulture, and land management. They are involved in crop production as they to maintain soil productivity and to prevent pests and diseases. further the also maintain the ecological balance, and ensure efficient use of resources such as water and nutrients.

Course Outcomes:

21AG529.1 Students will be acquainted about why to undertake environmental weed control.

21AG529.2 Students will be acquainted about different approaches of weed management

21AG529.3 Students may acquire knowledge about allelopathic effect towards weed control

21AG529.4 Students will be acquainted about harmful and beneficial effects of weeds in Agriculture.

21AG529.5 Students will be acquainted planning for weed management and weed management processes.

Scheme of Studies:

Code	Course Code	Course Title	Scheme of studies(Hours/Week)				Total Credits (C)	
			CI	LI	SW	SL		Total Study Hours(CI+LI+SW+SL)
Program Core (PCC)	21AG529	Weed Management	3	1	1	1	6	3

Legend:

CI:Classroom Instruction (Includes different instructional strategies i.e. Lecture(L) and Tutorial (T) and others,

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini projectetc.),

SL: Self learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

Code	Course Code	Course Title	Scheme of Assessment (Marks)							End Semester Assessment	Total Marks
			Progressive Assessment (PRA)						Total Marks		
			Class/ Home Assignmen t 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Semi nar one (SA)	Class Activ ity any one (CA T)	Class Attendance (AT)	(CA+CT+SA+C AT+AT)			
Program Core (PCC)	21A G529	Weed Management	15	20	5	5	5	50	50	100	

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self-Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

21AG529.1 Students will be acquainted about why to undertake environmental weed control.

Approximate Hours

Item	AppxHrs.
CI	6
LI	4
SW	1
SL	2
Total	13

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO1.1 Understand the weed.</p> <p>SO1.2 Understand the characteristics of weeds.</p> <p>SO1.3 Understand the harmful and beneficial effects on ecosystem.</p> <p>SO1.4 Classification, reproduction and dissemination of weeds.</p>	<p>1. Techniques of weed preservation.</p> <p>2. Weed identification and their losses study.</p>	<p>Unit-1 Introduction to weeds, characteristics of weeds their harmful and beneficial effects on ecosystem. Classification, reproduction and dissemination of weeds.</p> <p>1.1 Introduction of weeds.</p> <p>1.2 Different characteristics of weeds.</p> <p>1.3 Harmful effects of weeds.</p> <p>1.4 Beneficial effects of weeds.</p> <p>1.5 Different classification, reproduction of weeds.</p> <p>1.6 Dissemination of weeds.</p>	<p>1. Introduction and identification of different crop weed.</p> <p>2. Identification some beneficial and harmful effect of weed.</p>

SW-1 Suggested Sessional Work (SW):

Assignments:

What is weed? Their identification, harmful and beneficial effect and method of reproduction.

Other Activities (Specify):

Preparing a plant for mounting Commensurate with the need to identify the specimen, it is essential to include in a herbarium sheet as much of the plant as possible (e.g., roots, flowers, stems, leaves etc).

21AG529.2 Students will be acquainted about different approaches of weed management.

Approximate Hours

Item	Appx Hrs.
CI	6
LI	4
SW	1
SL	1
Total	12

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO1.1 Understand the Herbicide ad weedicide.</p> <p>SO1.2 Understand the Herbicide classification</p> <p>SO1.3 Understand the concept of adjuvant and surfactant.</p> <p>SO1.4. Understand the herbicide formulation and their use.</p> <p>SO1.5 Understand the introduction to mode of action of herbicides and selectivity.</p>	<p>1. Study of herbicide formulations.</p> <p>2. Study of mixture of herbicide.</p>	<p>Unit-2 Herbicide classification, concept of adjuvant, surfactant, herbicide formulation and their use. Introduction to mode of action of herbicides and selectivity.</p> <p>1.1 Introduction to Concept of Herbicide.</p> <p>1.2 Different Herbicide classification.</p> <p>1.3. Introduction and concept of adjuvant.</p> <p>1.4 Introduction and concept of surfactant.</p> <p>1.5 Introduction to different mode of action of herbicides.</p> <p>1.6 Introduction to herbicide selectivity.</p>	<p>1. Use of different Herbicide, their trade and chemical name.</p>

SW-1 Suggested Sessional Work (SW):

Assignments:

Introduction to mode of action of herbicides and Herbicide classification.

Other Activities (Specify):

Research on study of use of different herbicide in field crop.

21AG529.3 Students may acquire knowledge about allelopathic effect towards weed control

Approximate Hours

Item	AppxHrs.
CI	6
LI	4
SW	1
SL	1
Total	12

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO1.1 Understand the Allelopathy.</p> <p>SO1.2 Understand the application of allelopathy for weed management.</p> <p>SO1.3 Understand the Bioherbicides.</p> <p>SO1.4. Understand the different types of Bioherbicides.</p> <p>SO1.5 Understand the different types of Bioherbicides available in market.</p>	<p>1.Biology of important weeds.</p> <p>2.Calculations of weed control efficiency and weed index.</p>	<p>Unit-3 Allelopathy and its application for weed management. Bioherbicides and their application in agriculture.</p> <p>1.1 Introduction to allelopathy.</p> <p>1.2 Introduction to application of allelopathy for weed management.</p> <p>1.3.Introduction to bioherbicides.</p> <p>1.4. Role of organic farming of bioherbicide.</p> <p>1.5Role of bioherbicide of different crop.</p> <p>1.6 New research need on bioherbicide for sustainable agriculture.</p>	<p>1. Study on allelopathic effect on crop and new research on sustainable agriculture.</p>

SW-1 Suggested Sessional Work (SW):

Assignments:

Role of Allelopathy and Bioherbicides on sustainable agriculture

Other Activities(Specify):

New Research on Allelopathy and Bioherbicides for sustainable agriculture.

21AG529.4 Students will be acquainted about harmful and beneficial effects of weeds in Agriculture.

Approximate Hours

Item	Appx Hrs.
CI	6
LI	4
SW	1
SL	1
Total	12

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO1.1 Understand Commercial herbicide mixture.</p> <p>SO1.2 Understand the different herbicide mixture and their utility in agriculture.</p> <p>SO1.3 Understand the Herbicide compatibility.</p> <p>SO1.4. Understand the Herbicide compatibility with agrochemicals.</p> <p>SO1.5 Understand use of different agrochemicals.</p>	<p>1. Study of methods of herbicide application, spraying equipments.</p> <p>2.Herbicide and agrochemicals study.</p>	<p>Unit-4 Concept of herbicide mixture and utility in agriculture. Herbicide compatibility with agrochemicals and their application.</p> <p>1.1Introduction to Commercial herbicide mixture.</p> <p>1.2. Introduction to different herbicide mixture and their utility in agriculture.</p> <p>1.3.Introduction to Herbicide compatibility.</p> <p>1.4 Introduction to Herbicide compatibility with agrochemicals.</p> <p>1.5 Identification of different agrochemicals.</p> <p>1.6Introduction to different agrochemicals using in weed managements.</p>	<p>1.Study on crop herbicide mixture and herbicide compatibility with agrochemicals.</p>

SW-1 Suggested Sessional Work (SW):

Assignments:

herbicide mixture and utility in agriculture. Herbicide compatibility with other agrochemicals.

Other Activities (Specify):

Research on herbicide use efficiency.

21AG529.5 Students will be acquainted planning for weed management and weed management processes.

Approximate Hours

Item	Appx Hrs.
CI	6
LI	4
SW	1
SL	1
Total	12

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO1.1 Understand the integration of herbicides.</p> <p>SO1.2 Understand the weed management.</p> <p>SO1.3 Understand the nonchemical methods of weed management.</p> <p>SO1.4. Understand herbicide resistance and its management.</p>	<p>1. Shift of weed flora study in long term experiments.</p> <p>2. Calculations of herbicide doses.</p>	<p>Unit-5 Integration of herbicides with nonchemical methods of weed management. Herbicide Resistance and its management.</p> <p>1.1 Integration of herbicides.</p> <p>1.2. Introduction weed management.</p> <p>1.3 Introduction different method of weed management.</p> <p>1.4 Introduction to the nonchemical methods of weed management.</p> <p>1.5 Introduction to herbicide resistance and its management.</p> <p>1.6 Introduction to management herbicide resistance.</p>	<p>1. Study on different non chemical methods of weed management.</p>

SW-1 Suggested Sessional Work (SW):

Assignments: Understand the nonchemical methods of weed management and herbicide resistance.

Other Activities (Specify):

Study on time and methods of herbicide spray and their role in sustainability.

Suggested Learning Resources:*(a) Books:*

S. No.	Title	Author	Publisher	Edition & Year
1	Weed Management ,.	Saraswat, V.N., Bhan, V.M. and Yaduraju, N.T.	ICAR, New Delhi	2003.
2	Weed Management: Principles and Practices	Gupta, O.P	(2nd Ed.), Agribios (India), Jodhpur.	. 2015
3	Weed Science : Basics and Applications	Das, T.K.	Jain Brothers, New-Delhi	2008.

Curriculum Development Team

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Cos, Pos and PSOs Mapping

21AG529

Weed Management

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprises with different scales in area of agricultural production,	Hold a post on supply in administration and policy	Analyze and control commercial and economical process in the field of agriculture	Teach how to control and manage agricultural production	Introduce general production technologies	Teach how to implement and manage production technologies	Prepare for managerial and social responsibilities	Student will identify different underutilize crops	Student will practice different breeding techniques used in crop production.	Student will recognize different insect pest and diseases and their symptoms of crops	Student will apply different recent techniques in crop production
21AG529.1 Students will be acquainted about why to undertake environmental weed control.	1	3	2	1	2	1	2	2	1	1	2
21AG529.2 Students will be acquainted about	1	2	1	1	2	2	3	2	3	1	1

different approaches of weed management											
21AG529.3 Students may acquire knowledge about allelopathic effect towards weed control	2	1	1	3	2	2	1	2	1	1	2
21AG529.4 Students will be acquainted about harmful and beneficial effects of weeds in Agriculture. .	1	1	2	3	2	1	2	2	1	1	1
21AG529.5 Students will be acquainted planning for weed management and weed management processes.	1	1	1	2	1	2	3	2	1	3	1

Legend: 1 – Low, 2 – Medium, 3 – High

Curriculum Map: Weed Management 21AG529

Pos & PSOs	Cos No. & Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
PO1,2,3,4,5,6,7 PSO 1,2,3,4	Students will be acquainted about why to undertake environmental weed control.	SO 1.1 SO 1.2 SO 1.3 SO 1.4	1. Techniques of weed preservation. 2. Weed identification and their losses study	Introduction to weeds, characteristics of weeds their harmful and beneficial effects on ecosystem. Classification, reproduction and dissemination of weeds. 1.1, 1.2, 1.3, 1.4, 1.5, 1.6	1. Introduction and identification of different crop weed. 2. Identification some beneficial and harmful effect of weed.
PO1,2,3,4,5,6,7 PSO 1,2,3,4	Students will be acquainted about different approaches of weed management	SO 2.1 SO 2.2 SO 2.3 SO 2.4 SO 2.5	1. Study of herbicide formulations. 2. Study of mixture of herbicide.	Soil and climatic conditions prevalent in rainfed areas; Soil and water conservation Techniques. 2.1,2.2, 2.3, 2.4, 2.5, 2.6	1. Use of different Herbicide, their trade and chemical name.
PO1,2,3,4,5,6,7 PSO 1,2,3,4	Students may acquire knowledge about allelopathic effect towards weed control	SO 3.1 SO 3.2 SO 3.3 SO 3.4 SO 3.5	1. Biology of important weeds. 2. Calculations of weed control efficiency and weed index	Allelopathy and its application for weed management. Bioherbicides and their application in agriculture 3.1, 3.2, 3.3, 3.4, 3.5, 3.6	Study on allelopathic effect on crop and new research on sustainable agriculture.
PO1,2,3,4,5,6,7 PSO 1,2,3,4	Students will be acquainted about harmful and beneficial effects of weeds in Agriculture.	SO 4.1 SO 4.2 SO 4.3 SO 4.4 SO 4.5	1. Study of methods of herbicide application, spraying equipments. 2. Herbicide and agrochemicals study	Concept of herbicide mixture and utility in agriculture. Herbicide compatibility with agrochemicals and their application. 4.1, 4.2, 4.3, 4.4, 4.5, 4.6	Study on crop herbicide mixture and herbicide compatibility with agrochemicals.

PO1,2,3,4,5,6,7 PSO 1,2,3,4	Students will be acquainted planning for weed management and weed management processes.	SO 5.1 SO 5.2 SO 5.3 SO 5.4	1. Shift of weed flora study in long term experiments. 2. Calculations of herbicide doses.	Integration of herbicides with nonchemical methods of weed management. Herbicide Resistance and its management. 5.1, 5.2, 5.3, 5.4, 5.5, 5.6	Study on different non chemical methods of weed management.
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Course Code: 21HO630-C
Course Title : Hi-Tech Horticulture
Pre- requisite: Student should have basic knowledge of modern, advanced and high-tech horticultural science.

Rationale: The students studying hi- tech horticulture should possess advanced and recent modernized techniques, which are being implemented in improvement of horticultural crops. In addition to this all the protected structures, micro propagation techniques, micro irrigation and precision farming were well understood by the students for enhancing the advanced horticulture.

Course Outcomes:

21HO630-C.1: Apply the knowledge of Hi tech Horticulture in terms of its definition , importance/scope and advantages

21HO630-C.2: Ability to Understand Modern Horticultural practices such as basic principles of Irrigation methods, Various Micro-Propagation techniques /methods including Fertilizer application, Canopy management and high density orcharding

21HO630-C.3: Ability to understand the concepts of precision farming, Remote sensing and Geographical information system.

21HO630-C.4: Understand the concepts of Differential Geo-Positioning system (DGPS), Variable rate applicator (VRA) and application of Precision farming in Horticultural crops.

21HO630-C.5: Understand the concept of Mechanized harvesting of produce.

Scheme of Studies:

Code	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits(C)
			CI	LI	SW	SL	Total Study Hours(CI+LI+SW+SL)	
Program Core (PCC)	21HO630-C	Hi-Tech Horticulture	1	1	1	1	4	2

Legend:

CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

Code	Course Code	Course Title	Scheme of Assessment (Marks)							End Semester Assessment (ESA)	Total Marks (PRA+ESA)
			Progressive Assessment (PRA)						Total Marks (CA+CT+SA+CAT+A)		
			Class/H ome Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Semi nar one (SA)	Clas s Acti vity any one (CA T)	Class Attendan ce (AT)				
Progra m Core (PCC)	21HO6 30-C	HTH	15	30	0	0	5	50	50	100	

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Session al Work (SW), and Self Learning (SL). As the course progresses, students should show case their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

21HO630-C.1:Apply the knowledge of Hi tech Horticulture in terms of its definition, importance/scope and advantages.

Approximate Hours

Item	AppX Hrs
CI	03
LI	06
SW	02
SL	01
Total	14

Session Out comes(SOs)	Laboratory Instruction(LI)	Classroom Instruction (CI)	Self Learning (SL)
<p>SO1.1 Understand Introduction of Hi Tech Horticulture.</p> <p>SO1.2 Ability to understand the importance of Hi-Tech Horticulture.</p> <p>SO1.3 Understand about the Nursery management and mechanization in Hi-tech Horticulture.</p> <p>SO1.4 To understand the micro- propagation of different Horticultural crops, Advances as modern field preparation and planting methods.</p> <p>SO1.5 Understand about Protected cultivation of Horticultural crops.</p>	<p>1.1 Types of Polyhouses and it's advantages.</p> <p>1.2 Types of Net houses and it's a advantages.</p> <p>1.3 Micro propagation techniques and Protected cultivation.</p>	<p>Unit-1.0 Hi Tech Horticulture</p> <p>1.1 Definition and importance of Hi -Tech Horticulture</p> <p>1.2 Nursery management and mechanization in Hi-tech H Orticulture, Micro-Propagation of Horticultural crops.</p> <p>1.3 Modern field preparation and planting methods, Advantage of Protected cultivation, controlled conditions, methods and techniques in Hi-Tech Horticulture.</p>	<p>1. Definition and basic concepts of Hi- Tech Horticulture.</p> <p>2. Various types of Polyhouses and Net houses.</p>

SW-1 Suggested Sessional Work (SW):

a. Assignments:

- i. Preparation of Chart of various Hi- Tech Horticulture

b. Mini Project:

- i. Propagating structures including Polyhouses and Net houses.
- ii. Prepare chart of modern field preparation and planting methods.

21HO630-C.2: Ability to Understand Modern Horticultural practices such as basic principles of Irrigation methods, Various Micro-Propagation techniques /methods including Fertilizer application, Canopy management and high density orcharding.

Approximate Hours

Item	AppX Hrs
CI	03
LI	04
SW	02
SL	01
Total	10

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
<p>SO2.1 Understand the various micro propagation methods in Horticulture crops.</p> <p>SO2.2 Types of different propagation structures.</p> <p>SO2.3 Understand the principle and methods of irrigation</p> <p>SO2.4 Understand about the concepts of fertilizer application.</p> <p>SO2.5. Understand about Canopy management and high density orcharding.</p>	<p>2.1 Practice of Irrigation methods.</p> <p>2.2 Practice of fertilizer scheduling.</p>	<p>Unit-2 Irrigation systems/Methods, micro irrigation systems and it's components, Fertilizer scheduling based on EC and pH.</p> <p>2.1 Learn the irrigation methods/Systems and it's components including micro irrigation systems.</p> <p>2.2 Fertilizer scheduling based on EC and pH.</p> <p>2.3 Principle and methods of Canopy management and high density orcharding.</p>	<p>1. Methods of Canopy management.</p> <p>2. Methods of irrigation and fertilizer scheduling.</p>

SW-2 Suggested Seasonal Work (SW):

a. Assignments:

- i. Preparation of Chart showing Different Irrigation and fertilizer application methods.

21HO630-C.3: Ability to understand the concepts of precision farming, Remote sensing and Geographical information system.

Approximate Hours

Item	AppX Hrs
CI	03
LI	0
SW	02
SL	01
Total	6

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
<p>SO3.1 Understand about precision farming and it's components.</p> <p>SO3.2 Determine the concepts of Remote sensing.</p> <p>SO3.3 Applications of Geographical Information systems.</p>	.	<p>Unit3- Precision farming Remote sensing and Geographical information system (GIS).</p> <p>3.1 Definition of Precision farming and it's components.</p> <p>3.2 Meaning of Remote sensing and it's application.</p> <p>3.3 Meaning and importance of Geographical Information systems.</p>	<p>1. Definition of Precision farming.</p> <p>2. Concepts of remote sensing and GIS.</p>

SW-3 Suggested Sessional Work (SW):

a. Assignments:

- i. Preparation of Chart showing Different remote sensing, Precision farming and GIS.

21HO630-C 1.4: Understand the concepts of Differential Geo-Positioning system (DGPS), Variable rate applicator (VRA) and application of Precision farming in Horticultural crops.

Item	AppX Hrs
CI	03
LI	05
SW	02
SL	01
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
<p>SO4.1 Understand about Differential Geo-Positioning system (DGPS).</p> <p>SO4.2 Understand about Variable rate applicator (VRA).</p> <p>SO4.3 Understand about application of Precision farming in Horticultural crops.</p>		<p>Unit-4.0: Differential Geo-Positioning system (DGPS), Variable rate applicator (VRA) and application of Precision farming in Horticultural crops.</p> <p>4.1 Introduction about Differential Geo-Positioning system (DGPS) .</p> <p>4.2 Different variable rate applicator(VRA).</p> <p>4.3 Application of precision farming in Horticultural crops.</p>	<p>i. Preparation of well labelled diagram of DGPS, Variable rate applicator and showing role of Precision farming in Horticultural crops.</p>

SW-4 Suggested Sessional Work(SW):

- a. Assignments:**
 - i. Preparation of Chart showing DGPS and VRA.
- b. MiniProjects:**
 - i. Preparation of chart of precision farming showing role in Horticultural crops.
- c. Other Activities (Specify):**
 - i. Visit to Commercial Hi -Tech Nursery /Orchard.

21HO630-C.5: Understand the concept of Mechanized harvesting of produce.

Approximate Hours

Item	AppX Hrs
CI	03
LI	02
SW	02
SL	01
Total	08

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
<p>SO5.1 Understand the Concepts of Harvesting of Horticultural produce.</p> <p>SO5.2 Methods of Mechanized harvesting of Horticultural produce.</p> <p>SO5.3 Understand the calculation of Maturity -indices-types of Horticultural crops.</p>	Practices of Mechanized harvesting of Horticultural produce.	<p>Unit5: Mechanized harvesting of produce.</p> <p>5.1 Importance of Mechanized harvesting of produce.</p> <p>5.2 Maturity -indices-types of Horticultural crops.</p> <p>5.3. Types of machine used in harvesting of produce.</p>	<p>1. Identify the different machines used for mechanical harvesting of produce.</p> <p>2. Types of maturity -indices-types of Horticultural crops.</p>

SW-5 Suggested Sessional Work (SW):

Assignments:

- i. Preparation of Chart showing Different maturity -indices-types of Horticultural crops.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (C)	Lab (LI)	Sessional Work (SW)	Self Learning (Sl)	Total hour (Cl+SW+Sl)
C.1: Apply the knowledge of Hi tech Horticulture in terms of its definition, importance/scope and advantages.	03	6	2	1	12
C.2: Ability to Understand Modern Horticultural practices such as basic principles of Irrigation methods, Various Micro-Propagation techniques /methods including Fertilizer application, Canopy management and high density orcharding.	03	4	2	1	10
C.3: Ability to understand the concepts of precision farming, Remote sensing and Geographical information system.	03	0	2	1	06
C.4: Understand the concepts of Differential Geo-Positioning system (DGPS), Variable rate applicator (VRA) and application of Precision farming in Horticultural crops.	03	5	2	1	11
C.5: Understand the concept of Mechanized harvesting of produce.	03	2	2	1	08
Total Hours	15	17	10	05	47

**Suggestion for End Semester Assessment
Suggested Specification Table (For ESA)**

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	C.1: Apply the knowledge of Hi tech Horticulture in term of its definition, importance/scope and advantages.	03	02	01	10
CO-2	C.2: Ability to Understand Modern Horticultural practices such as basic principles of Irrigation methods, Various Micro-Propagation techniques /methods including Fertilizer application, Canopy management and high density orcharding.	02	06	02	10
CO-3	C.3: Ability to understand the concepts of precision farming, Remote sensing and Geographical information system.	03	06	03	10
CO-4	C.4: Understand the concepts of Differential Geo-Positioning system (DGPS), Variable rate applicator (VRA) and application of Precision farming in Horticultural crops.		10	03	10
CO-5	C.5: Understand the concept of Mechanized harvesting o produce.	03	02	04	10
Total		11	26	13	50

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for **Biopesticides and Biofertilizers** will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

- i. Improved Lecture
- ii. Case study
- iii. Group Discussion
- iv. Role Play
- v. Demonstration
- vi. Brainstorming

Suggested Learning Resources:

(a) Books:

S. No.	Title	Author	Publisher	Edition & Year
1	Handbook of Microbial Biofertilizers	Mahendra Rai	Food Products Press, New York, London	2005 5th Ed.
2	Biofertilizers and Biopesticides.	Krishnendu Acharya, Surjit Sen and Manjula Rai	Techno World, Kolkata (W.B.)	2019.
3	Biofertilizers and Biopesticides in Sustainable Agriculture.	B. D. Kaushik, Deepak Kumar and Md. Shamim.	Apple Academic Press.	2021.

Curriculum Development Team

Cos, POs and PSOs Mapping
Course Title: Hi-Tech Horticulture
Course Code: 21HO630

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprise with different scales in area of agricultural production, process and trade	Hold a post on supply administration and policy	Analyze and control commercial and economical process in the field of agriculture	Teach how to control and manage agricultural production	Introduce general production technologies	Teach how to implement and manage production technologies	Prepare for managerial and social responsibilities	Student will identify different underutilized crops	Student will practice different breeding techniques used in crop production.	Student will recognize different insect pest and diseases and their symptoms of crops	Student will apply different recent techniques in crop production
1. Apply the knowledge of Hi-Tech Horticulture in terms of its definition, importance/scope and advantages..	2	2	1	1	2	2	3	2	2	1	2
2. Ability to Understand Modern Horticultural practices such as basic principles of Irrigation methods, Various Micro Propagation techniques /method including Fertilizer application Canopy management and high density orcharding	2	2	1	2	2	1	2	2	1	1	3
3. Ability to understand the	3	2	2	1	2	3	2	1	1	2	1

concepts of precision farming Remote sensing and Geographical information system...												
4. Understand the concepts of Differential Geo-Positioning system (DGPS), Variable rate applicator (VRA) and application of Precision farming in Horticultural crops..	1	3	2	3	2	2	2	2	2	2	2	1
5. Understand the concept of Mechanized harvesting of produce.	1	1	3	2	2	1	2	1	1	2	2	3

Legend: 1 – Low, 2 – Medium, 3 – High

Curriculum Map: Hi-Tech Horticulture

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4	21HO630-C.1: Apply the knowledge of Hi tech Horticulture in terms of its definition , importance/scope and advantages	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	1.1Types of Polyhouses and it's advantages. 1.2 Types of Net houses and it's a advantages. 1.3 Micro propagation techniques and Protected cultivation.	Unit-1.0Hi Tech Horticulture 1.1, 1.2, 1.3, 1.4, 1.5	1.Definition and basic concepts of Hi- Tech Horticulture. 2. Various types of Polyhouses and Net houses.

PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4	21HO630-C.2: Ability to Understand Modern Horticultural practices such as basic principles of Irrigation methods, Various Micro-Propagation techniques /methods including Fertilizer application, Canopy management and high density orcharding	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5	2.1 Practice of Irrigation methods. 2.2 Practice of fertilizer scheduling.	Unit-2 Irrigation systems/Methods, micro irrigation systems and it's components, Fertilizer scheduling based on EC and pH. 2.1, 2.2, 2.3	Methods of Canopy management. Methods of irrigation and fertilizer scheduling.
PO 1,2,3,4,5,6,7 PSO 1,2, 3,4	21HO630-C.3: Ability to understand the concepts of precision farming, Remote sensing and Geographical information system.	SO3.1 SO3.2 SO3.3		Unit3- Precision farming Remote sensing and Geographical information system (GIS). 3.1, 3.2, 3.3	1.Definition of Precision farming. 2.Concepts of remote sensing and GIS.
PO 1,2,3,4,5,6,7 PSO 1,2, 3,4	21HO630-C.4: Understand the concepts of Differential Geo-Positioning system (DGPS), Variable rate applicator (VRA) and application of Precision farming in Horticultural crops.	SO4.1 SO4.2 SO4.3		Unit-4.0 : Differential Geo-Positioning system (DGPS), Variable rate applicator (VRA) and application of Precision farming in Horticultural crops. 4.1, 4.2, 4.3	Preparation of well labelled diagram of DGPS, Variable rate applicator and showing role of Precision farming in Horticultural crops.
PO 1,2,3,4,5,6,7 PSO 1,2, 3,4	21HO630-C.5: Understand the concept of Mechanized harvesting of produce.plants	SO5.1 SO5.2 SO5.3	5.1 Practices of Mechanized harvesting of Horticultural produce.	Unit5: Mechanized harvesting of produce. 5.1, 5.2, 5.3	1. Identify the different machines used for mechanical harvesting of produce. 2. Types of maturity - indices-types of Horticultural crops.

Course Code: 21AG431-C

Course Title: Micro Propagation Technologies

Pre-requisite: Students must have general idea of reproduction in plants, viz, vegetative, asexual and sexual.

Rationale: Micropropagation, also known as tissue culture, is a plant propagation technique that involves the aseptic culture of plant cells, tissues, or organs under controlled environmental conditions. Students will learn and understand mass production of uniform plants, rapid clonal propagation, preservation of elite genotypes, disease free plant production and year-round production.

Course Outcomes:

CO1_21AG431-C.01 Student will understand basic understanding of plant tissue culture. Overview of various technologies available in it.

CO2_21AG431-C.02 Students will be aware about Stages of micropropagation, requirements and specificity of each stage

CO3_21AG431-C.03 Students will be aware of technology involved and procedural aspect about differentiation of plant organs

CO4_21AG431-C.04 Student will learn about embryo handling and process of artificial seed production

CO5_21AG431-C.05 Students will have basic understanding of secondary metabolites and their nature, how variation can be induced in plant tissue culture.

Scheme of Studies

Code	Course Code	Course Title	Scheme of Studies (Hours/Week)					Total Credit (C)
			CI	LI	SW	SL	Total Study Hours	
Program Core (PCC)	21AG431-C	Micro Propagation Technologies	02	01	01	01	5	03

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and

Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment

Code	Course Code	Course Title	Scheme of Assessment (Marks)							End Semester Assessment (ESA)	Total Marks (PRA+ESA)
			Progressive Assessment (PRA)								
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+S A+CAT+AT)			
Program Core (PCC)	21AG431-C	Micro Propagation Technologies	15	30	0	5	0	50	50	100	

Course-Curriculum Detailing:

Introduction to technologies and methods employed in micro-propagation of plants. Main objective of this subject is to learn about the tissue culture and micro propagation technology. Student will understand basic understanding of plant tissue culture. Overview of various technologies available in it. Explain the importance of micropropagation to produce superior plant types. List the methods employed in micropropagation of plants. Understand the development of complete plant through tissue culture.

CO1_21AG431-C.01 Student will understand basic understanding of plant tissue culture. Overview of various technologies available in it.

Approximate Hours

Item	Appx Hrs
CI	04
LI	04
SW	00
SL	02
Total	10

Session Outcomes (SOs)	Laboratory Instructions (LI)	Classroom Instructions (CI)	Self-Learning (SL)
<p>SO1.1 Describe the early development of plant tissue culture</p> <p>SO1.2 Recognize the Advantages and limitations of plant tissue culture</p> <p>SO1.3. Define the steps involved in plant tissue culture.</p> <p>SO1.4 How to use different parts of plant for tissue culture.</p>	<p>1. Identification and use of equipment in tissue culture Laboratory,</p> <p>2. Containers and small instruments</p>	<p>Unit I: Basic understanding of plant tissue culture</p> <p>1.1Introduction, History,</p> <p>1.2 Advantages and limitations;</p> <p>1.3Types of cultures (callus, cell)</p> <p>1.4Types of cultures (seed, embryo, organ</p>	<p>Methods of propagation in plants and its properties</p>

CO2_21AG431-C.02 Students will be aware about Stages of micropropagation, requirements and specificity of each stage

Approximate Hours	
Item	Appx Hrs
CI	07
LI	10
SW	02
SL	00
Total	19

Session Outcomes (SOs)	Laboratory Instructions (LI)	Classroom Instructions (CI)	Self-Learning (SL)
SO2.1 Interpret the stages of micropropagation	1. Nutrition media composition	Unit-2: Stages of micropropagation, 2.1 Five Stages of micropropagation as described by Murashige. Stage 0: Identification and maintenance of mother plant. 2.2 Stage 1 Setting up aseptic condition; 2.3 Stage 2 Invitro shoot initiation Axillary bud proliferation (Shoot tip and meristem culture, bud culture) 2.4 Stage 3 Invitro root generation 2.5 Stage 4 Hardening 2.6 Problems in micropropagation 2.7 Advantages and disadvantages of micropropagation	
SO2.2 Identify the methods of sterilization	2. Sterilization techniques for media		
SO2.3 Describe procedures of shoot multiplication	3. Sterilization techniques for explants		
SO2.4 Describe procedures of root multiplication	4. Preparation of stocks and working solution,		
SO2.5 Correlate the need of hardening	5. Preparation of working medium		
SO2.6 Recognize the problem during micropropagation			
SO2.7 Identify the advantages and disadvantages of micropropagation			

Suggested Sessional Work

Assignment: Search and prepare composition of various types of media used in plant tissue culture

21AG431-C.03: Development of plant parts during plant tissue culture.

Approximate Hours

Item	Appx Hrs
CI	07
LI	06
SW	02
SL	00
Total	15

Session Outcomes (SOs)	Laboratory Instructions (LI)	Classroom Instructions (CI)	Self-Learning (SL)
SO3.1 Explain the concept of organogenesis. SO3.2 Define direct organogenesis SO3.2 Define indirect organogenesis	L1. Culture setup through Seeds. L2. Shoot tip culture L3. Single node	Unit III: Development of plant parts during plant tissue culture. 3.1 General concept of organogenesis. 3.2 Direct Organogenesis 3.3 Indirect organogenesis	

21AG431-C.04: Application of plant tissue culture.

Approximate Hours

Item	Appx Hrs
CI	03
LI	04
SW	00
SL	00
Total	03

Session Outcomes (SOs)	Laboratory Instructions (LI)	Classroom Instructions (CI)	Self-Learning (SL)
SO4.1 Explain the concept of somatic embryogenesis. SO4.2 Discover the procedure of artificial seed SO4.3 Identify the procedure and importance of types of culture.	L1. Induction of somatic embryos regeneration of whole plants from different explants	Unit IV: Application of plant tissue culture 4.1 Somatic embryogenesis 4.2 Artificial seed production 4.3 cell suspension cultures	

21AG431-C.05: Application of plant tissue culture (Protoplast culture and production of secondary metabolite.

Approximate Hours

Item	Appx Hrs
CI	09
LI	00
SW	00
SL	00
Total	03

Session Outcomes (SOs)	Laboratory Instructions (LI)	Classroom Instructions (CI)	Self-Learning (SL)
<p>SO5.1 Explain the need of somatic hybridization</p> <p>SO5.2 Identify the procedure of isolation of protoplast</p> <p>SO5.3 Discover the procedure of isolation of protoplast</p> <p>SO5.4 Articulate the method of identification of desired hybrid</p> <p>SO5.5 Define secondary metabolite</p> <p>SO5.6 Explain the types of secondary metabolites</p> <p>SO5.7 Define somaclonal variation</p> <p>SO5.8 Articulate the method of identification of somaclonal variants</p> <p>5.9 Explain the concept of cryopreservation</p>		<p>Unit V: Application of plant tissue culture (Protoplast culture and production of secondary metabolite.</p> <p>5.1 Introduction to somatic hybridization</p> <p>5.2 Isolation of protoplast</p> <p>5.3 Fusion of protoplast</p> <p>5.4 Screening of fused protoplast</p> <p>5.5 Concept of secondary metabolites</p> <p>5.6 Classification of secondary metabolites</p> <p>5.7 Somaclonal variation</p> <p>5.8 Screening of Somaclonal variants</p> <p>5.9 Cryopreservation</p>	

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (CL)	Lab Instruction (LI)	Sessional Work (SW)	Self-Learning (SL)	Total hour (CL+LI+SW+SL)
CO1_21AG431-C.01 Student will understand basic understanding of plant tissue culture. Overview of various technologies available in it.	4	4	0	2	10
CO2_21AG431-C.02 Students will be aware about Stages of micropropagation, requirements and specificity of each stage	7	12	2	0	21
CO3_21AG431-C.03 Students will be aware of technology involved and procedural aspect about differentiation of plant organs	7	8	2	0	17
CO4_21AG431-C.04 Student will learn about embryo handling and process of artificial seed production	3	6	0	0	9
CO5_21AG431-C.05 Students will have basic understanding of secondary metabolites and their nature, how variation can be induced in plant tissue culture.	9	0	0	0	9
Total Hours	30	30	4	2	66

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO1	Student will understand basic understanding of plant tissue culture. Overview of various technologies available in it.	6	4	0	10
CO2	Students will be aware about Stages of micropropagation, requirements and specificity of each stage	0	6	4	10
CO3	Students will be aware of technology involved and procedural aspect about differentiation of plant organs	0	6	4	10
CO4	Student will learn about embryo handling and	4	0	6	10

	process of artificial seed production				
CO5	Students will have basic understanding of secondary metabolites and their nature, how variation can be induced in plant tissue culture.	2	4	4	10
Total		12	20	18	50

Legend: **R: Remember,** **U: Understand,** **A: Apply**

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Demonstration
6. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, Whatsapp, Mobile, Online sources)
7. Brainstorming

Suggested Learning Resources:

Sl. No.	Title	Author	Publisher	Edition & Year
1	Introduction to Plant Biotechnology	Chawala H S	Oxford & IBH, New Delhi	2000
2	Biotechnology, Expanding Horizons	Singh BD	Kalyani Publishers, New Delhi	2005
3	Shekhawat, M. S.	Plant Biotechnology, In vitro Principles, Techniques and Applications.	MJP Publishers, Chennai	2011

Curriculum Development Team:

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2. Mr. Santosh Kumar, Assistant Professor, Dept. of Biochemistry and Crop Physiology
3. Dr. Doomar Singh, Associate Professor, HoD Plant Pathology

Curriculum Mapping

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprise with different scales in area of agricultural production, process and trade	Hold a post on supply i dministration and policy	Analyze and control commercial and economical process in the field of agriculture	Teach how to control and manage agricultural production	Introduce general production technologies	Teach how to implement and manage production technologies	Prepare for managerial and social responsibilities	Student will identify different underutilized crops	Student will practice different breeding techniques used in crop production.	Student will recognize different insect pest and diseases and their symptoms of crops	Student will apply different recent techniques in crop production
1. Apply the knowledge of H tech Horticulture in terms of it definition , importance/scope and advantages..	2	2	1	1	2	2	3	2	2	1	1
2. Ability to Understand Modern Horticultural practices such as basic principles of Irrigation methods, Various Micro Propagation techniques /method including Fertilizer application Canopy management and high density orcharding	2	2	1	2	2	1	2	2	1	1	3
3. Ability to understand the concepts of precision farming Remote sensing and Geographica	3	2	2	1	2	3	3	1	1	2	1

information system...											
4. Understand the concepts of Differential Geo-Positioning system (DGPS), Variable rate applicator (VRA) and application of Precision farming in Horticultural crops..	1	3	1	3	2	2	2	3	2	2	1
5. Understand the concept of Mechanized harvesting of produce.	1	1	3	2	2	3	2	1	1	2	1

Legend: 1 – Low, 2 – Medium, 3 – High

Curriculum Map: Micro Propagation Technologies

Pos & PSOs	Cos No. & Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
PO1,2,3,4,5,6,7 PSO 1,2,3,4	CO1_21AG431-C.01 Student will understand basic understanding of plant tissue culture. Overview of various technologies available in it.	SO1.1 SO1.2 SO1.3. SO1.4	Identification and use of equipment in tissue culture Laboratory, Containers and small instruments	Introduction, History, Advantages and limitations; Types of cultures (callus, cell) Types of cultures (seed, embryo, organ 1.1, 1.2, 1.3, 1.4	Methods of propagation in plants and its properties
PO1,2,3,4,5,6,7 PSO 1,2,3,4	CO2_21AG431-C.02 Students will be aware about Stages of icropagation, requirements and	SO2.1 SO2.2 SO2.3	Nutrition media composition Sterilization techniques for media Sterilization techniques for explants	Five Stages of micropropagation as described by Murashige. Stage 0: Identification and maintenance of mother plant.Setting up aseptic condition; Invitro shoot initiation Axillary bud proliferation (Shoot tip and meristem	

	specificity of each stage	SO2.4 SO2.5 SO2.6 SO2.7	Preparation of stocks and working solution, Preparation of working medium	culture, bud culture) Invitro root generation, Hardening, Problems in micropropagation, Advantages and disadvantages of micropropagation 2.1, 2.2, 2.3, 2.4, 2.5, 2.6. 2.7	
PO1,2,3,4,5,6,7 PSO 1,2,3,4	CO3_21AG431-C.03 Students will be aware of technology involved and procedural aspect about differentiation of plant organs	SO3.1. SO3.2 SO3.2	Culture setup through Seeds. Shoot tip culture Single node	General concept of organogenesis, Direct Organogenesis, Indirect organogenesis 3.1, 3.2, 3.3	
PO1,2,3,4,5,6,7 PSO 1,2,3,4	CO4_21AG431-C.04 Student will learn about embryo handling and process of artificial seed production	SO4.1 SO4.2 SO4.3	Induction of somatic embryos regeneration of whole plants from different explants	Somatic embryogenesis, Artificial seed production, Cell suspension cultures 4.1, 4.2, 4.3	
PO1,2,3,4,5,6,7 PSO 1,2,3,4	CO5_21AG431-C.05 Students will have basic understanding of secondary metabolites and their nature, how variation can be induced in plant tissue culture.	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5 SO5.6		Introduction to somatic hybridization Isolation of protoplast, Fusion of protoplast,,Screening of fused protoplast, Concept of secondary metabolites, Classification of secondary metabolites, Somaclonal variation, Screening of Somaclonal variants, Cryopreservation 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7, 5.8, 5.9	

		SO5.7			
		SO5.8			
		SO5.9			

Module Courses

Course Code: 21AG871

Course Title: Production Technology for Bioagents and Biofertilizers

Pre-requisite: No specific pre-requisite, however, prior understanding of definitions and examples of biofertilizers and bioagents will be helpful.

Rationale: The production technology for bioagents and biofertilizer module has been structured with the aim of making the students entrepreneurship development so that they can get employment with low investment by utilizing the knowledge gained from this module.

Scheme of Studies

Code	Course Code	Course Title	Scheme of Studies (Hours/Week)					Total Study Hours	Total Credit (C)
			CI	LI	SW	SL			
Program Core (PCC)	21AG871	Production Technology for Bioagents and Biofertilizers	00	20	00	00	20	10	

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Code	Course Code	Course Title	Scheme of Assessment (Marks)						End Semester Assessment (ESA)	Total Marks (PRA+ESA)
			Progressive Assessment (PRA)							
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
Program Core (PCC)	21AG871	Production Technology for Bioagents and	0	0	0	0	0	0	100	100

		Biofertilizers								
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Course-Curriculum Detailing:

The production technology for bioagents and biofertilizers module can provide good opportunities for employment to the students. Their production does not have any harmful effect on the environment and the government is also encouraging the youth to start this industry by using their knowledge. The unselective use of synthetic chemical fertilizers and pesticides during past four decades for increasing the agricultural yield has affected soil fertility, the water retention capacity and micronutrients content in the soil. Hence, the concept of biofertilizers and bioagents is being promoted all over the world. Microbiological tools, biofertilizers, and biocontrol agents, which are bacteria and fungi capable of providing beneficial outcomes in crop plant growth and health, have been developed for several decades. Application of biofertilizers and bioagents are being advocated by the environment for sustainable agriculture.

221AG871-C.01: Production Technology for Bioagents and Biofertilizers

Approximate Hours

Item	Appx Hrs
CI	00
LI	20
SW	00
SL	00
Total	20

Session Outcomes (SOs)	Laboratory Instructions (LI)	Classroom Instructions (CI)	Self-Learning (SL)
<p>SO. LI.1- Describe the production and beneficial aspects of NPV.</p> <p>SO. LI.2: Illustrate the production procedure of PGPR and their agricultural importance.</p> <p>SO. LI.3- Articulate the procedure of <i>Metarhizium ansipoliae</i> multiplication and importance of pest control through it.</p> <p>SO. LI.4- Express the multiplication method of <i>Crysoperla carnea</i> as a predator and their agricultural importance.</p> <p>SO. LI.5- Assess the production, importance and uses of <i>Trichoderma viride</i>.</p> <p>SO. LI.6- Describe commercially production of BGA which is suitable plant growth and health .</p>	<p>LI.1: Mass multiplication technique of NPV (Nuclear Polyhedrosis Virus).</p> <p>LI.2: Production Technology of PGPR (plant-growth-promoting rhizobacteria)</p> <p>LI.3: Production Method of <i>Metarhizium ansipoliae</i></p> <p>LI.4: Production Technology of Bioagent <i>Crysoperla carnea</i> (Chrysopid predator)</p> <p>LI.5: Mass Production method of <i>Trichoderma viride</i></p> <p>LI.6: Mass production method of nitrogen fixing BGA.</p>		

<p>SO. LI.7- Acquire Knowledge of the production method of <i>Beauveria bassiana</i> as a biocontrol agent and its benefits.</p>	<p>LI.7: Production Method of <i>Beauveria bassiana</i>.</p>		
<p>SO. LI.8- Expand Knowledge of commercial production method and application of <i>Bacillus thuringiensis</i> biopesticide.</p>	<p>LI.8: Mass production of <i>Bacillus thuringiensis</i> biopesticide.</p>		
<p>SO. LI.9- Describe the production method and importance of <i>Trichogramma</i> sp.</p>	<p>LI.9: Production technology of <i>Trichogramma</i> sp.</p>		
<p>SO. LI.10- Articulate the mass culturing and beneficial outcomes of <i>Rhizobium</i> and <i>Azotobacter</i> biofertilizers.</p>	<p>LI.10: Mass production of <i>Rhizobium</i> and <i>Azotobacter</i> biofertilizers.</p>		

Brief of Hours suggested for the Course Outcome

Course Outcomes	LI	Sessional Work (SW)	Self Learning (SI)	Total hour (CI+SW+SI)
Production Technology for Bioagents and Biofertilizers	20	0	0	20

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO 1	Seed production and Technology				

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for **ELP Seed Production and Technology** will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Group Discussion
3. Demonstration
4. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, Whatsapp, Mobile, Online sources)
5. Brainstorming
6. Smart Board

Suggested Learning Resources:

Sl. No.	Title	Author	Publisher	Edition and Year
01	Biopesticides and Bioagents: Novel Tools for Pest Management	Md. Arshad Anwar	Apple Academic Press Inc.	2017
02	Biofertilizers and Biocontrol Agents for Organic Farming	Dr Reeta Khosla	Kojo Press	2017
03	Biofertilizers and Biopesticides in Sustainable Agriculture	B.D. Kaushik, Deepak Kumar, Md. Shamim	Apple Academic Press Inc.	2021
04	Biofertilizers for Sustainable Agriculture	Vinod Kumar Jain	Oxford Book Company	2010

Curriculum Mapping

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprises with different scales in area of agricultural	Hold a post on supply i administration and policy	Analyze and control commercial and economical process in the	Teach how to control and manage agricultural production	Introduce general production technologies	Teach how to implement and manage production technologies	Prepare for managerial and social responsibilities	Student will identify different underutilized crops	Student will practice different breeding techniques used in crop	Student will recognize different insect pest and diseases and their	Student will apply different recent techniques in crop
Production Technology for Bioagents and Biofertilizers	2	3	1	1	2	3	2	2	2	2	3

Course Curriculum Map: Seed Production and Technology

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4	Production Technology for Bioagents and Biofertilizers	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5 SO1.6 SO1.7 SO1.8 SO1.9 SO1.10	LI.1 LI.2 LI.3 LI.4 LI.5 LI.6 LI.7 LI.8 LI.9 LI.10	-----	-----

Course Code: 21SC877

Course Title : Agricultural Waste Management

Pre- requisite: Student should have basic knowledge of importance of organic farming for maintaining the sustainable agriculture.

Rationale: The Student learn about the various type of organic manure present and can be prepared by the farmers under organic farming. Available forms of plant essential nutrients present in the manure/ compost there by absorbed by the crop and increase the productivity. Importance, principle and role organic farming for maintaining fertility and sustainability in soil.

Course Outcomes:

- 21SC877.1: This subject will give general introduction on Organic farming and practices involved in making organic field through organic fertilizers, its classification, use and importance.
- 21SC877.2: To know about the role and importance of INM, FCO, fertilizer storage orders in packaging and marketing of organic manures.
- 21SC423.3: To learn the basic techniques used in dealing with farmers and motivate them to convert their land to organic farming.

Scheme of Studies:

Code	Course Code	Course Title	Scheme of studies(Hours/Week)				Total Credits(C)	
			CI	LI	SW	SL		Total Study Hours (CI+LI+SW+SL)
Program Core (PCC)	21AG877	Agricultural Waste Management	0	10	0	1	11	10

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop,field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C:Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback ofteacher to ensure outcome of Learning.

Scheme of Assessment:

Theory

Code	Course Code	Course Title	Scheme of Assessment (Marks)							End Semester Assessment (ESA)	Total Marks (PRA+ESA)
			Progressive Assessment (PRA)					Total Marks (CA+CT+PA+AT)			
			Class/Home Assignment 1 number 5 markseach	Class Test 2 (2 best out) 15 marks each (CT)	Seminar One (SA)	Class Attendance (AT)					
Program Core (PCC)	21AG877	Agricultural waste management	0	0	0	0	0	0	100	100	

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

21AG877: Recycle , Reduce and Reuse of Agriculture waste with its management practices

Approximate Hours

Item	AppX Hrs
CI	0
LI	20
SW	0
SL	03
Total	23

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>1.To select the particular land for preparing the compost pit for various composting methods</p> <p>2. Role and use of partially / fully decomposed cowdung in field / various composing methods .</p> <p>3. To know the use of different quantity of urban waste in particular compost to minimize the urban waste production and proper utilization</p> <p>4. To analyse the essential plant nutrient content different types of compost</p> <p>5.To know the use of worms species and ther quantity suitable for a standard size of pit.</p> <p>6. To learn the application of various quantity of compost as per the different crop parts.</p> <p>7. Proper utilization of crop residue by decomposing and maintain the ecofriendly</p> <p>1. Utilization of different type of agricultural waste for a particular type of compost.</p> <p>2. Nutrient content and preparation of kitchen</p>	<p>Agriculture waste Management:</p> <p>1. Recent techniques involved /evolved in preparing the different types of compost from agricultural waste.</p> <p>2.Techniques used in managing the Farm waste through NADEP method of compost , its importance , properties and precautions measured .</p> <p>3. Strategies involved in preparing Bangalore method of Compost from Agricultural waste</p> <p>4. Strategies involved in managing agricultural waste, green manuring functions</p> <p>1. Process involved in preparation the vermicompost with its importance, dose of application in different crops and precaution measure</p> <p>6.Preparation of Indore method of compost , its importance , advantages and precaution measures</p> <p>7. Utilization of farm waste (straw and husk) from rice and wheat production.</p>		<p>1 Knowledge of agricultural and non agricultural biodegradable materials</p> <p>2. To Know about the biodegradable rural and urban waste materials</p> <p>3. Enlist the name of useful decomposable macro and microorganisms used during decomposition or waste</p>

waste (Horticultural waste) 3. Application of various combination of microbes in easy decomposition of hard agri waste products	8. preparation of biogas plant and its importance use and nutrient content in it 9.Preparation of compost through Horticultural waste and its importance, nutrient content and application dose in various crop 10.Analysis of domestic (biodegradable) waste by using of waste decomposer		
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SW-1 Suggested Sessional Work (SW):

a. *Assignments:*

- Preparation of a report on the above topics regarding agricultural waste .

b. **Mini Project:**

- Prepare chart of different organic manures

Other Activities (Specify): NA

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Laboratory Instruction (LI)	Sessional Work (SW)	Self Learning (SI)	Total hour (Cl+SW+SI)
21AG877: Recycle , Reduce and Reuse of Agriculture waste with its management practices	8	0	2	1	9
Total Hours	40	0	10	6	46

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Agricultural Waste Management	01	01	03	05
Total		01	01	03	05

Legend: R:Remember, U:Understand, A: Apply

The end of semester assessment for Agricultural Waste Management will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Demonstration
7. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, Whatsapp, Mobile, Online sources)
8. Brainstorming

Suggested Learning Resources:

(a) Books :

S. No.	Title	Author	Publisher	Edition & Year
1	Agriculture Waste Management and Bioresource: The Circular Economy Perspective.	Suruchi Singh, Pardeep Singh, Anu Sharma, Moharana Choudhury	John Wiley & Sons books.	2022
2	Agricultural Waste Management: Problems, Processes, and Approaches	Raymond C. Loehr	Environmental Science	1974
3	Agriculture and Waste Management for Sustainable Future	Asoke Kumar Sannigrahi	New India Publishing agency	2011
4	Fundamental of Agriculture	Arun Ktyan	Kushal Publication and distributors, Varanasi	Edited 2016
5	Organic farming	Dr.T. D Pandey, Sagar Anand Pandey and Dr. R. B. Tiwari	Kushal Publication and distributors, Varanasi	Edited 2016

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Cos, Pos and PSOs Mapping

Course Code: 21AG877

Course Title: Agricultural Waste Management

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprises with different scales in area of	Hold a post on supply in administration and policy	Analyze and control commercial and economical process in the field of	Teach how to control and manage agricultural production	Introduce general production technologies	Teach how to implement and manage production technologies	Prepare for managerial and social responsibilities	Student will identify different underutilize crops	Student will practice different breeding techniques used in crop production.	Student will recognize different insect pests and diseases and their symptoms of crops	Student will apply different recent techniques in crop production
21SC877.1: This subject will give general introduction on Organic farming and practices involved in making organic field through organic fertilizers, its classification, use and importance. 21SC877.2: To know about the role and importance of INM, FCO, fertilizer storage orders in packaging and marketing of organic manures.	1	1	1	3	2	1	2	3	3	2	1
21SC423.3: To learn the basic techniques used in dealing with farmers and motivate them to convert their land to organic farming.	1	1	1	3	1	2	3	3	1	1	1

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map: 21AG877: Agricultural Waste Management

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self Learning(SL)
PO 1,2,3,4,5,6,67 PSO 1,2, 3, 4	21AG877: Recycle , Reduce and Reuse of Agriculture waste with its management practices	SOs: 1.1, SOs:1.2, SOs:1.3	LI:1.1, LI:1.2, LI:1.3, LI:1.4, LI:1.5, LI:1.6, LI:1.7, LI:1.8, LI:1.9, LI:1.10, LI:1.11, LI:1.12, LI:1.13, LI:1.14, LI:1.15	-	As mentioned in page number 2 to 6

Course Code: 21AG880

Course-Dairy Technology

Pre-requisite: Student should have Cleared 7th Semester

Rational: The syllabus of this course gives the expected Project Report achievements both at the course and session levels where students to through the various modes of instructions like Laboratory Instruction (LI), and self Learning (SL), with the progression of course students are expected to show case their mastery of session out comes (SO's), impacting in the overall achievement of course outcomes (CO's) upon the courses conclusion.

Course Outcome:

CO-1: Preparation of frozen dairy product, Flavored Yogurt and its packaging for marketing

CO-2: Preparation of Condensed, clotted and fermented Dairy Product and making Khoa based Sweet.

CO-3: Preparation of flavored milk, cream separation and their processing.

CO-4: Quality tests for milk , ghee and processing methods of milk.

CO-5: Preparation & grading of Butter. Increase the shelf life of dairy milk product.

Scheme of Studies:

Code	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			CI	LI	SW	SL	Total Study Hours CI+LI+SW+SL	
Program Core (PCC)	21AG879	Dairy Technology	0	10	0	0	10	10

Legend:

CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others), **LI:**

Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies), **SW:** Sessional Work (includes assignment, seminar, mini project etc.), **SL:** Self Learning, **C:**

Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Code	Course Code	Course Title	Scheme of Assessment (Marks)							End Semester Assessment (ESA)	Total Marks (PRA+ESA)
			Progressive Assessment (PRA)								
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+AT)			
Program Core (PCC)	21AG879	Dairy Technology	0	0	0	0	0	0	100	100	

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

Course Outcome (CT21AG8801.1): Preparation of frozen dairy product, Flavored Yogurt and its packaging for marketing

Approximate Hours

Item	Appx.Hrs.
CI	0
LI	10
SW	1
SL	1
Total	12

Session Out comes (SO's)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
<p>SO1.1 Understanding the Different Frozen Dairy Product.</p> <p>SO1.2 Knowledge of Frozen Dairy Product Life.</p> <p>SO1.3 Preparation of various types of Flavored Yogurt .</p>	<p>1.Study and preparation of frozen dairy product. (Ice-Cream).</p> <p>2.Study and preparation of frozen dairy product. (Rasmalai).</p> <p>3.Study and preparation of frozen dairy product. (Rabadhi).</p> <p>4. preparation of Flavored Yogurt.</p> <p>5.Yodurt packaging for marketing</p>		<p>1. Acquainting self learning over regional importance, benefits and problems related to Frozen dairy product..</p> <p>2. Understanding the benefits of frozen dairy product.</p> <p>3. Understanding the flavored Yogurt.</p>

SW-1 Suggested Seasonal Work(SW):

a. Assignments: Nil..

b. Mini Project: 1.Flow diagram of making frozen dairy products with special reference to ice cream and rasmalai.
2.Manufacturing of western fermented milk products : Yogurt.

CT 21AG8801.2 : Preparation of Condensed, clotted and fermented Dairy Product and making Khoa based Sweet.

Approximate Hours

Item	Appx.hrs.
CI	0
LI	10
SW	1
SL	1
Total	12

Sessional Outcomes (SO's)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO2.1 To know about preparation of dairy product like paneer, ghee, khoa and Buttermilk.</p> <p>SO2.2 Preparation of shrikhand.</p> <p>SO2.3 Prepared of khoa based mango berfi.</p>	<p>1. Preparation of Dairy Product khoa.</p> <p>2. Preparation of Dairy Product paneer .</p> <p>3. Preparation of Dairy Product ghee.</p> <p>4. Preparation of Dairy Product cheena .</p> <p>5. Khoa Based Sweets.</p>		<p>i.Learn About the annual quantity of milk for the khoa preparation during last decade.</p> <p>ii. Understanding the different types of dairy products and their annual production.</p>

SW-2 Suggested Sessional Work (SW):

- a. **Assignments:** Nil
- b. **Mini Project:**
 1. Different equipments, utensils and bio agents involve in manufacturing / preparation of dairy product like paneer, ghee, khoa and buttermilk.
 2. Precautions while making different dairy products with special reference to condensed, clotted and fermented milk products.

CT 21AG8801.3: Preparation of flavored milk, cream separation and their processing.

Approximate Hours

Item	Appx. Hrs.
CI	0
LI	10
SW	1
SL	1
Total	12

Seasonal Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
<p>SO3.1 Understanding the different type of flavored in milk.</p> <p>SO3.2 Discuss about cream processing.</p>	<p>1. Preparation of chocolate flavored Milk Product.</p> <p>2. Preparation of keshar flavored Milk Product.</p> <p>3. Preparation of pista flavored Milk Product.</p> <p>4. Developments in Cream Separation.</p> <p>5. Developments in Cream Processing.</p>		<p>i.Learning about the flavored milk :methods and its keeping quality.</p> <p>ii.Understating the cream separation and different parts of cream separater machines,</p>

SW-3 Suggested Sessional Work (SW):

a. Assignments:Nil

b. Mini Project:

1. Composition , different types and ingredients used in making flavored milk products.
2. Pprinciples of Cream Separation & Processing.

CT 21AG8801.4: Quality tests for milk , ghee and processing methods of milk.

Approximate Hours

Item	Appx. Hrs
CI	0
LI	06
SW	1
SL	1
Total	08

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO4.1Understanding the quality tests for milk & ghee.</p> <p>SO4.2 knowledge of processing methods of milk.</p>	<p>1.Quality tests for milk.</p> <p>2.Quality tests for ghee</p> <p>3. Processing methods of milk.</p>		<p>1.Understanding of milk processing in milk plants.</p> <p>2.Knowing the quality tests of milk & ghee along with ISI specifications for different states in India.</p>

SW-4Suggested Sessional Work (SW):

a.Assignments:Nil

b. Mini Project:1. Different Quality tests for milk & ghee in lab and field conditions.

2. Flow diagrams for quality testing, collection, chilling, pasteurization and packaging of milk in milk plants.

CT 21AG8801.5: Preparation & grading of Butter. Increase the shelf life of dairy milk product.

Approximate Hours

Item	Appx. Hrs
CI	0
LI	10
SW	1
SL	1
Total	12

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO5.1 Understanding the quality tests for Butter.</p> <p>SO5.2 knowledge of milk product shelf life of increases.</p>	<ol style="list-style-type: none"> 1. Preparation of Butter. 2. Grading of Butter. 3. Increase the shelf life of milk. 4. Increase the shelf life of Butter. 5. Increase the shelf life of khoa. 		<ol style="list-style-type: none"> 1. Understanding of Freezing milk in milk plants to increase the shelf life. 2. Knowing the quality tests of butter along with ISI specifications for different states in India.

SW-5 Suggested Sessional Work (SW):

a. Assignments: Nil

b. Mini Project: 1. Different grading of Butter in lab and field conditions.

2. Flow diagrams for quality testing, collection, chilling, pasteurization and packaging of milk in milk plants.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (CL)	Laboratory Instruction (LI)	Sessional Work (SW)	Self Learning (SL)	Total hour (CL+SW+SL)
CO-1: Production of fat rich dairy products like butter, ghee etc. scope of microbes in dairy industry Microbiology of different dairy products. Students will learn about basic principles of food storage , processing and nanotechnology.	0	10	1	1	12
CO-2: Students will learn about spoilage cost due to microorganisms in processed foods. Students will learn marketing techniques for milk and milk products	0	10	1	1	12
CO-3: Manufacturing of different types of ice creams and frozen deserts along with quality testing. Students will learn about various equipments present in advanced dairy. Students will learn Concept of dairy byproducts manufacturing.	0	10	1	1	12
CO -4: Chemical Analysis tests for milk and milk products. learning about cream separation, pasteurization , homogenization of milk	0	06	1	1	08
CO -5: Concept of various packaging material used in Dairy Industry made clear. Practical for microbial testing of dairy products Microbial Growth process and products. Food quality safety, and testing basing on standards	0	10	1	1	12
Total Hours	00	46	5	5	56

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Preparation of frozen dairy product, Flavored Yogurt and its packaging for marketing.	04	05	2	11
CO-2	Preparation of Condensed, clotted and fermented Dairy Product and making Khoa based Sweet.	03	05	2	10
CO-3	Preparation of flavored milk, cream separation and their processing.	04	05	-	09
CO-4	Quality tests for milk , ghee and processing methods of milk.	03	05	2	10
CO-5	Preparation & grading of Butter. Increase the shelf life of dairy milk product.	03	07	-	10
Total		17	27	06	50

Legend: **R: Remember, U: Understand, A: Apply**

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks.

Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Visit to Animal & Poultry Unit
6. Demonstration
7. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, Whatsapp, Mobile, Online sources)
8. Brainstorming

Suggested Learning Resources:

(a) Books :

S. No.	Title	Author	Publisher	Edition & Year
1	Milk, Milk Processing & Human Nutrition.	Dr. Indrajeet Jauhar, Dr. Ramji Gupta	Rama Publishing House.	2013
2	Milk & Its Properties.	S.M. Srivastava	Kalyani Publishers	2014
3	Animal Husbandry & Dairy Science.	Jagdish Prasad	Kalyani Publishers	3 rd Edition, 2001
4	Fundamentals Of Dairy Technology (Theory & Practice)	N.S. Rathore	Himanshu Publications	2008

Curriculum Development Team:

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Curriculum Mapping

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprises with different scales in area of agricultural production, process and trade	Hold a post on supply in administration and policy	Analyze and control commercial and economical process in the field of agriculture	Teach how to control and manage agricultural production	Introduce general production technologies	Teach how to implement and manage production technologies	Prepare for managerial and social responsibilities	Student will identify different underutilized crops	Student will practice different breeding techniques used in crop production.	Student will recognize different insect pest and diseases and their symptoms of crops	Student will apply different recent techniques in crop production
Preparation of frozen dairy product, Flavored Yogurt and its packaging for marketing.	1	1	1	1	2	1	2	3	3	2	1
Preparation of Condensed, clotted and fermented Dairy Product and making Khoa based Sweet.	2	3	4	1	2	2	1	3	2	1	1
Preparation of flavored milk, cream separation and their processing.	2	3	2	1	1	2	2	1	1	2	3
Quality tests for milk , ghee and processing methods of milk.	1	2	3	2	1	1	1	2	2	1	3
Preparation & grading of Butter. Increase the shelf life of dairy milk product.	2	3	3	2	1	2	1	3	2	1	1

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map: Dairy Technology

Pos & PSOs	Cos No. & Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
PO1,2,3,4,5,6,7 PSO 1,2,3,4	CO-1: Preparation of frozen dairy product, Flavored Yogurt and its packaging for marketing	SO 1.1 SO 1.2 SO 1.3	1.Study and preparation of frozen dairy product. (Ice-Cream). 2.Study and preparation of frozen dairy product. (Rasmalai). 3.Study and preparation of frozen dairy product. (Rabadhi). 4. preparation of Flavored Yogurt. 5.Yodurt packaging for marketing		1. Acquainting self learning over regional importance, benefits and problems related to Frozen dairy product.. 2. Understanding the benefits of frozen dairy product. 3. Understanding the flavored Yogurt.
PO1,2,3,4,5,6,7 PSO 1,2,3,4	CO-2: Preparation of Condensed, clotted and fermented Dairy Product and making Khoa based Sweet.	SO 2.1 SO 2.2 SO 2.3	1.Preparation of Dairy Product khoa. 2.Preparation of Dairy Product paneer . 3.Preparation of Dairy Product ghee. 4.Preparation of Dairy Product cheena . 5.Khoa Based Sweets.		1. Learn About the annual quantity of milk for the khoa preparation during last decade. 2. Understanding the different types of dairy products and their annual production.
PO1,2,3,4,5,6,7 PSO 1,2,3,4	CO-3: Preparation of flavored milk, cream separation and their processing.	SO 3.1 SO 3.2	1.Preparation of chocolate flavored Milk Product. 2.Preparation of keshar flavored Milk Product. 3.Preparation of pista flavored Milk Product. 4.Developments in Cream Separation. 5.Developments in Cream Processing.		1.Learning about the flavored milk :methods and its keeping quality. 2. Understating the creamseparation and different parts of cream separater machines.
PO1,2,3,4,5,6,7	CO-4: Quality tests	SO 4.1	1.Quality tests for milk .		1.Understanding of milk

PSO 1,2,3,4	for milk , ghee and processing methods of milk.	SO 4.2	. 2.Quality tests for ghee . 3. Processing methods of milk.		processing in milk plants. 2.Knowing the quality tests of milk & ghee along with ISI specifications for different states in India
PO1,2,3,4,5,6,7 PSO 1,2,3,4	CO-5: Preparation & grading of Butter. Increase the shelf life of dairy milk product.	SO 5.1 SO 5.2	1.Preparation of Butter. 2.Grading of Butter. 3.Increase the shelf life of milk. 4.Increase the shelf life of Butter. 5.Increase the shelf life of khoa.		1.Understanding of Freezing milk in milk plants to increase the shelf life. 2.Knowing the quality tests of butter along with ISI specifications for different states in India repare the assignment

Course Code: 21AG873

Course Title: Floriculture and Landscaping

Pre-requisite: Student should have basic understanding of beautification of piece of land by using the basic knowledge of Floriculture and landscaping and creativity.

Rationale: The students studying landscaping should illustrates the knowledge of landscaping, gardening and its components, care and maintenance of ornamental plants, different propagation techniques and planting scheme of ornamental plants..

Scheme of Studies

Code	Course Code	Course Title	Scheme of Studies (Hours/Week)					Total Credit (C)
			CI	LI	SW	SL	Total Study Hours	
Program Core (PCC)	21AG873	Floriculture and Landscaping	00	20	00	00	20	10

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and

Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Code	Course Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA + ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
(PCC)	21AG 873	Floriculture and Landscaping	0	0	0	0	0	0	100	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

21AG431-C.01: Floriculture and Landscaping

Approximate Hours

Item	Appx Hrs
CI	00
LI	20
SW	03
SL	02
Total	25

Session Outcomes (SOs)	Laboratory Instructions (LI)	Classroom Instructions (CI)	Self-Learning (SL)
<p>SO1.1 Familiarization with principles and practices of landscaping and ornamental gardening</p> <p>SO1.2 Observing students and knowledge about the principles of landscaping</p> <p>SO1.3 To elaborate the knowledge about special types of gardens</p> <p>SO1.4 Illustrate the students about different components of garden</p> <p>SO1.5 Create Knowledge about the selection, propagation and planting scheme of different ornamental plants</p> <p>SO1.6 Understand about the different propagation techniques of ornamental plants.</p> <p>SO1.7 Knowledge about care maintenance of ornamental plants.</p> <p>SO1.8 Apply knowledge about different propagation and planting scheme of annuals.</p> <p>SO1.9 Illustrate the student about the planting, care and maintenance of different components of gardens like palms, cacti, succulents, ferns and grasses.</p> <p>SO1.10 Understand the selection , and arrangements of different potting plants</p>	<ol style="list-style-type: none"> 1. Identification of tools and implements used in landscape design 2. Layout of formal and Informal style of gardens 3. Designing of sunken garden, rock garden, terrace garden, conservatory and lathe house 4. Identification of trees and shrubs. 5. Propagation of trees and shrubs. 6. Potting and repotting 7. Training and pruning of plants for special effects 8. Identification of annuals and pot plants. 9. Propagation of annuals and pot plants. 10. Identification and description of annuals and pot plants 		<ol style="list-style-type: none"> 1. Identification of different species of annuals, palm, ferns and grasses 2. Know about the uses of different living components of gardens in different landscape projects.

Suggested Learning Resources:

- i. Enlist the different ornamental crop varieties grown under different bioasthetic zones
- ii. Learn about the post-harvest handling and management of horticultural crops to maintain quality and prolong shelf life

b. MiniProjects:

- i. Make a landscape plan for your home town

Suggested Learning Resources

Sl. No.	Title	Author	Publisher	Edition & Year
1	Ornamental Plants and Garden Design in Tropics and subtropics	Bose, T	Vol-2 sets Daya	2003
2	Economic Analysis of Agricultural Projects	Gittinger, J.P,	John Hopkins University Press.	1984
3	Marketing Management	Kotler, Philip	Prentice Hall of India, New Delhi	1999
4	Agribusiness & Farm Management at a Glance, Vol-2, Basic & Applied Fundamentals	L.L. Somani and G. L. Meena	Agrotech Publishing Academy, Udaipur	2017
5	Principles and Practices of Marketing in India	Mamoria, C. B., Joshi, R. L. and Mulla, N	Kitab Mahal, Allahabad	2005

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprises with different scales in area of agricultural production, process and trade	Hold a post on supply in administration and policy	Analyze and control commercial and economical process in the field of agriculture	Teach how to control and manage agricultural production	Introduce general production technologies	Teach how to implement and manage production technologies	Prepare for managerial and social responsibilities	Student will identify different underutilized crops	Student will practice different breeding techniques used in crop production.	Student will recognize different insect pest and diseases and their symptoms of crops	Student will apply different recent techniques in crop production
21AG431-C.01: Floriculture and Landscaping	1	1	1	1	2	1	2	3	3	2	1

Legend: 1 – Low, 2 – Medium, 3 – High

Course Code: 21AG876
Course Title : Food Processing
Pre- requisite: Student should have basic knowledge of Agriculture Science, Food Science, Food Microbiology, Food Biochemistry, Unit operation of Food Processing and Nutritional Profile of all edible plants (Raw Food). knowledge of basic terminology applied in food processing.

Rationale: The Students will acquire the knowledge about various food processing methods and storage practices of agricultural produce along with the Practices of value addition of agricultural produce and reducing the post harvest losses of cereal, pulses, oil seed, plantation crop, fruits and vegetable crop. This component will improve the operational skill of students for the development of nutritious and safe food products, Storage practices and food packaging.It will improve the basic understanding of students about food processing method applied in Micro,Small and Medium (MSME) food processing industries.

Course Outcomes:

- CO-1: To acquire the knowledge about fundamental of food processing and value added food products.
- CO-2 To Study the various traditional and modern methods of food processing and shelf life improvement of agricultural produce
- CO-3: Problem identification and report writing of post harvest losses along with the processed food product development to resolve the problem.

Scheme of Studies:

Code	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits(C)
			CI	LI	SW	SL	Total Study Hours(CI+LI+S W+SL)	
Program Core(PCC)	21AG876	Food Processing	0	10	1	1	12	10

Legend

- **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L)and Tutorial (T) and others),
- **LI:** Laboratory Instruction (Includes Practical performances in laboratory workshop,field or other locations using different instructional strategies)
- **SW:** Sessional Work (includes assignment, seminar, mini project etc.),
- **SL:** Self Learning,
- **C:** Credits.

Note: Sessional Work will be accomplished by the project report writing of problem associated with the control of post harvest losses of agricultural produce and processed food product development.

Theory

Code	Course Code	Course Title	Scheme of Assessment (Marks)				
			Progressive Assessment		End Semester Practical Assessment (ESPA)	End Semester Exam (ESE)	Total Marks (SA1+SA2+ESPA+ESE)
			SA 1	SA2			
Program Core(PCC)	21AG876	Food Processing	00	00	100 (Viva-Voce and Project Report Evaluation)	00	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

21AG877.1: To acquire the knowledge about fundamental of food processing and value added food products..

Approximate Hours

Item	Approximate Hour
CI	0
LI	10
SW	1
SL	1
Total	12

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
1– Understanding about the structure and morphology and chemical composition of different food crop 2- To acquire the knowledge about food industry and objective of food processing 3- Acquire the knowledge about various value added food products.	1-Identification of cereal, pulses, oil seed, spices, plantation crop, fruits and vegetables) 2-Visit of local food industry 3-Preparation of detailed draft report on food industrial visit 4-Problem identification 5-Summarize the report		1 -To study the history and evolution of food processing

SW-1 Suggested Sessional Work (SW):

- a. Assignments:
- b. Mini Project:
- c. Other Activities (Specify):

Note:

21AG877.2 To Study the various traditional and modern methods of food processing and shelf life improvement of agricultural produce

Approximate Hours

Item	Approximate Hour
CI	0
LI	4
SW	1
SL	1
Total	6

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
1– Acquire the knowledge about thermal and mechanical method of food processing 2-Learning about various laboratory techniques to assess the shelf life of food products	1-Demonstration of various food processing machinery and equipments used for cereal, pulses, oil seed, spices, plantation crop, fruits and vegetables 2-Operational practice of food processing machinery and equipment		1 -To study various food processing machinery

SW-1 Suggested Sessional Work (SW):

- d. Assignments:
- e. Mini Project:
- f. Other Activities (Specify):

Note:

21AG877.3 Problem identification and report writing of post harvest losses along with the processed food product development to resolve the problem.

Approximate Hours

Item	Approximate Hour
CI	0
LI	4
SW	1
SL	1
Total	6

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
1- To acknowledge the problem related with post harvest losses of crop 2- Industrial skill development for production and quality control of food products	1-Report writing with the below stated objectives- <ul style="list-style-type: none"> ➤ 1-Introduction ➤ 2-Review of literature ➤ 3-Materials and method ➤ 4-Result and Discussion ➤ 5-Summary and conclusion 2-Presentation of assigned project work		1 –Review of literature

SW-1 Suggested Sessional Work (SW):

- g. Assignments:
- h. Mini Project:
- i. Other Activities (Specify):

Note:

Brief Hours suggested for the course outcomes

Course Outcomes	Class Lecture (CL)	Lab Instructions (LI)	Sessional Work (SW)	Self Learning (SL)	Total Hours (CL+ LI + SW + SL)
CO-1: To acquire the knowledge about fundamental of food processing and value added food products.		10	1	1	12
CO-2 To Study the various traditional and modern methods of food processing and shelf life improvement of agricultural produce		4	1	1	6
CO-3: Problem identification and report writing of post harvest losses along with the processed food product development to resolve the problem.		4	1	1	6
Total Hours		18	3	3	24

Suggestion for End Semester Practical Assessment Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1: To acquire knowledge of fundamental processing and value of food products.	1-Identification of cereal, pulses, oil seed, spices, plantation crop, fruits and vegetables) 2-Visit of local food industry 3-Preparation of detailed draft report on food industrial visit 4-Problem identification 5-Summarize the report	10	10	20	40
CO-2 To Study the various traditional and modern methods of food processing and shelf life improvement of agricultural produce	1-Demonstration of various food processing machinery and equipments used for cereal, pulses, oil seed, spices, plantation crop, fruits and vegetables 2-Operational practice of food processing machinery and equipment	5	5	10	20
CO-3: P identification and writing of post losses along with processed food development to resolve problem.	1-Report writing with the below stated objectives- ➤ 1-Introduction ➤ 2-Review of literature ➤ 3-Materials and method ➤ 4-Result and Discussion ➤ 5-Summary and conclusion 2-Presentation of assigned project work	10	10	20	40
Total					100

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for Processing Technology of Fruits and Vegetables will be held with written examination of 50 marks.

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment. Suggested Instructional/Implementation Strategies:

1. Improved Lecture and Tutorial
2. Case Method
3. Group Discussion and Role Play
4. Visit to food plant
5. Demonstration
6. ICT Based Teaching Learning
7. Brainstorming

Suggested Learning Resources

Books:

S. No.	Title	Author	Publisher	Edition & Year
1	Preservation of Fruits and Vegetables	Girdhari Lal, G.S. Siddappa and G.L. Tandon	ICAR, New Delhi	1959
2	Post Harvest Technology of Fruits and Vegetables	P.H. Pandey	Saroj Prakashan, Allahabad	1997
3	Fruit & Vegetable Preservation: Principles and Practices	R.P. Srivastava and Sanjeev Kumar	International Book Distribution Co., Delhi	3 rd Ed., 2002
4	Fruit and Vegetables: Harvest, Handling and Storage	A.K. Thompson	Blackwell Publishing Ltd., Oxford, UK	2 nd Ed., 2003

CO, Pos and PSOs Mapping

Course Title: B.Sc.(Ag) H

Course Code:

Course Title: Food Processing

Course Outcomes	Program Specific outcome							Program Specific			
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	1	2	3	4
	Manage agricultural enterprises with different scales in area of agricultural	Hold a post on supply in administration and policy	Analyze and control commercial and economical process in the field of agriculture	Teach how to control and manage agricultural production	Introduce general production technologies	Teach how to implement and manage production technologies	Prepare for managerial and social responsibilities	The ability to apply technical & engineering knowledge for production and quality of food manufacturing	Ability to understand the day to plant operational problems of food manufacturing and food packaging	Ability to understand the latest food manufacturing technology.	Ability to use the research based innovative knowledge for SDGs
CO:1	3	3	3	3	3	3	1	3	3	3	3
CO:2	3	3	3	3	3	3	1	3	3	3	3
CO-3	3	3	3	3	3	3	1	2	2	2	2

Legend: 1 – Low, 2 – Medium, 3 – High

POs & PSOs No.	COs No.& Titles	SOs No.	LI	Classroom Instruction(CI)	Self Learning
PO 1 to 12 and PSO 1 to 4	CO-1: To acquire knowledge about funda of food processing and added food products.	SOs 1-3	5		
PO 1 to 12 and PSO 1 to 4	CO-2 To Study the various traditional and modern methods of food processing and shelf life improvement of agricultural produce	SOs 1-3	3		
PO 1 to 12 and PSO 1 to 4	CO-3: Problem identification and report writing of post harvest losses along with the processed food product development to resolve the problem.	SOs 1-2	2		

Curriculum Development Team

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Legend:1–Low,2–Medium,3–High

Course Code: 21AG873

Course Title: Mushroom Cultivation Technology

Pre-requisite: No specific pre-requisite, however, prior understanding of fungi will be helpful.

Rationale: Mushroom cultivation offers a promising avenue for entrepreneurship, requiring minimal space and initial investment. This module is specially designed for developing entrepreneurship ability. Students may select this as livelihood source.

Scheme of Studies

Code	Course Code	Course Title	Scheme of Studies (Hours/Week)					Total Credit (C)
			CI	LI	SW	SL	Total Study Hours	
Program Core (PCC)	21AG873	Mushroom Cultivation Technology	00	20	00	00	20	10

Legend: **CI:** Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and

Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.),

SL: Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Code	Course Code	Course Title	Scheme of Assessment (Marks)							End Semester Assessment (ESA)	Total Marks (PRA + ESA)
			Progressive Assessment (PRA)						Total Marks (CA+CT+SA+CAT+AT)		
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one	Class Activity any one (CA T)	Class Attendance (AT)				
Program Core (PCC)	21AG 873	Mushroom Cultivation Technology	0	0	0	0	0	0	100	100	

Course-Curriculum Detailing:

Mushroom cultivation offers a promising avenue for entrepreneurship, requiring minimal space and initial investment. This module is specially designed for developing entrepreneurship ability. Learners can tap into the growing demand for organic, nutritious mushrooms. With a short cultivation cycle, it provides quick returns and a sustainable business model. The versatility of mushrooms allows for diverse product offerings, from fresh produce to value-added products like powders and extracts. Entrepreneurs can capitalize on health-conscious consumer trends and establish themselves in the agribusiness sector. Moreover, the low environmental impact of mushroom cultivation aligns with eco-friendly practices, appealing to a broad market and contributing to a more resilient and sustainable entrepreneurial venture.

21AG431-C.01: Mushroom Cultivation Technology

Approximate Hours

Item	Appx Hrs
CI	00
LI	20
SW	00
SL	00
Total	20

Session Outcomes (SOs)	Laboratory Instructions (LI)	Classroom Instructions (CI)	Self-Learning (SL)
So.L1-Differentiate and identification of mushroom	Mushroom Cultivation Technology		
So.L2- Illustrate the development of facility.	L1 Mushroom: General characteristic identification and distinction between poisonous and non poisonous mushroom.		
So.L3- Articulate the procedure of spawn production .	L2 Facility setup		
So.L4- Recognize the marketing potential of spawn.	L3 Spawn Production		
So.L5- Identify the Requirement for mushroom production.	L4 Marketing Opportunities and SCM		
So.L6-Discover the method of composting.	L5 Raw materials required for mushroom production		
So.L7-Design the base for growing mushroom.	L6 Short and Long term composting		
So.L8- Describe the production and management of button mushroom.	L7 Bed preparation and Bag preparation		
So.L9-Describe the production and management of oyster mushroom.	L8 Production technology of Button Mushroom		
So.L9-Describe the production and management of oyster mushroom.	L9 Production technology of Oyster Mushroom		
So.L10- Recognize the marketing and SCM of mushroom products.	L10 Value addition and marketing strategy of mushroom .		

Suggested Learning Resources:

Sl. No.	Title	Author	Publisher	Edition and Year
01	The Mushroom Cultivator: A Practical Guide to Growing Mushrooms at Home	Paul Stamets and J.S. Chilton	Agarikon Press	2015

Curriculum Mapping

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprises with different scales in area of production	Hold a post on supply and demand administration and policy	Analyze and control commercial and economical process in the agricultural sector	Teach how to control and manage agricultural production	Introduce general production technologies	Teach how to implement and manage production technologies	Prepare for managerial and social responsibilities	Student will identify different underutilized crops	Student will practice different breeding techniques used in crop	Student will recognize different insect pest and diseases and their	Student will apply different recent techniques in crop
CO1.21AG873.01	1	1	1	2	1	3	2	2	1	2	1

Legend: 1 – Low, 2 – Medium, 3 – High

Course Code: 21AG878

Course Title: Organic Production Technology

Pre- requisite: Organic farming shall contribute beneficially to the ecosystem. The certification programme shall set standards/procedures for a minimum percentage of the farm area to facilitate biodiversity and nature conservation.

Rationale: Organic farming which is a holistic production management system that promotes and enhances agro-ecosystem health, including biodiversity, biological cycles, and soil biological activity is hence important. Many studies have shown that organic farming methods can produce even higher yields than conventional methods. Significant difference in soil health indicators such as nitrogen mineralization potential and microbial abundance and diversity, which were higher in the organic farms can also be seen. The increased soil health in organic farms also resulted in considerably lower insect and disease incidence. The emphasis on small-scale integrated farming systems has the potential to revitalize rural areas and their economies.

Course Outcomes:

- 1.Refinement of students acquired knowledge and understanding on commercial production of crop through organic.
- 2.To promote professional skills and knowledge through meaningful hands-on experience
- 3.Capacity building for designing and development of ecological sustainable and economical profitable agri business model(s) on organic production.

Scheme of Studies:

Code	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits(C)
			CI	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Program Core (PCC)	21AG878	Organic Production Technology	0	10	0	1	11	10

Legend:

CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other

locations using different instructional strategies)

SW: Sessional Work (includes assignment, seminar, mini project etc.)

SL: Self Learning,

C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment

Code	Course Code	Course Title	Scheme of Assessment (Marks)							End Semester Assessment (ESA)	Total Marks (PRA + ESA)
			Progressive Assessment (PRA)						Total Marks (CA+CT+SA+CAT+A)		
			Class/Home Assignment number 5 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)				
Program Core (PCC)	21AG878	Organic Production Technology	0	0	0	0	0	0	100	100	

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

ELP: Refinement of students acquired knowledge and understanding on Organic Production Technology

Approximate Hours

Item	Approximate Hours
CI	0
LI	20
SW	3
SL	2
Total	25

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO1. Understanding of effect of KSB on Growth and yield of barley.</p> <p>SO2. The students need a thorough understanding of PSB level on growth and yield Maize.</p> <p>SO3. Understand the effect of nutrient management through FYM application and KSB (potassium solubilizing bacteria) on yield of Black Gram (<i>Vigna mungo</i> L.)</p> <p>SO4. Imbibe the skills for making NADEP Compost.</p> <p>SO5. To increase the nutrient use efficiency of Green Gram through KSB culture.</p> <p>SO6. Develop required skills Organic Production Technology in relation to Barley.</p> <p>SO7 Students need to develop different organic source of nutrient management in linseed crop.</p> <p>SO8 Understanding about organic production technology for Green Gram under</p>	<p>1. Effect of foliar spray of Potassium Solubilizing Bacteria (KSB Growth and Yield of Barley) on</p> <p>2. Effects of PSB level on growth and yield Maize</p> <p>3. Effect of nutrient management through FYM application and KSB (potassium solubilizing bacteria) on yield of Black Gram (<i>Vigna mungo</i> L.)</p> <p>4. Organic Production Technology Green Gram through NADEP Compost</p> <p>5. Organic Production Technology for Green Gram under application of KSB culture</p> <p>6. Organic Production Technology in relation to Barley (<i>Hordeum vulgare</i> L.)</p> <p>7. Effect of PSB levels on growth and yield of linseed.</p> <p>8. Organic Production Technology for Green Gram under application of KSB culture</p> <p>9. Effect and nutrient management</p>		<p>1. Vermicompost production technology.</p> <p>2. Nutrient management of different organic source.</p>

application of KSB culture. SO9 To learn the profitably and effectively nutrient management through vermicompost and PSB in different pulse crop. SO10 Understanding about nutrient management through foliar spray.	through vermicompost and application PSB on yield of Mung bean (<i>Vigna radiata</i> L.) 10. Effect of foliar spray of Potassium Solubilizing Bacteria.		
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SW-1 Suggested Sessional Work (SW):

a. Assignments:

1. Students can get reliable information on the needs of organic product by various markets and also the prices of produce.

b. Mini Project:

1. Preparation of a report on the above topics regarding organic production technology.

c. Other Activities (Specify):

1. To attract consumer and create public awareness exhibition cum sale of organic produce.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (CI)	Laboratory Instruction (LI)	Sessional Work (SW)	Self Learning (SI)	Total hour (CI+ LI +SW+SI)
1.Refinement of students acquired knowledge and understanding on commercial production of crop through organic. 2.To promote professional skills and knowledge through meaningful hands-on experience 3.Capacity building for designing and development of ecological sustainable and economical profitable agri business model(s) on organic production.	00	20	03	02	25
Total Hours	00	20	03	02	25

Suggested Learning Resources:

(a) Books:

S. No.	Title	Author	Publisher	Edition & Year
1	Modern Techniques of Raising Field Crops	Oxford & IBH Publishing Co., New Delhi.	Chhidda Singh, Prem Singh and, Rajbir Singh	2003
2	Crop Management Under Irrigated and Rainfed Conditions.	Kalyani Publishers, New Delhi	S.S. Singh	1998
3	Modern Concepts and Advance Principles in Crop Production.	Agro bios (India), Jodhpur	S.C. Panda2012	2012
4	A Handbook of Organic Farming	Arun K Sharma	Agro bios (India) Ltd., Jodhpur	2002
5	Sustainable Agriculture	Rajeev K Shukla	Surbhee Publications, Jaipur	2004
6	Lecture note provided by Dept. of Faculty of agriculture science and technology, AKS University, Satna.			

Curriculum Development Team

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Cos, Pos and PSOs Mapping

Course Code: 21AG878

Course Title: Organic Production Technology

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprises with	Hold a position in supply administration	Analyze and control commercial	Teach how to control and manage	Introduce general production	Teach how to implement and manage	Prepare for managerial and social	Student will identify different	Student will practice different	Student will recognize different	Student will apply different recent
1. Refinement of students acquired knowledge and understanding on commercial production of crop through organic.	1	1	1	3				3	3	2	1
2. To promote professional skills and knowledge through meaningful hands-on experience	1	3	3	3				3	1	1	1
3. Capacity building for designing and	1	3	3	3				1	3	3	3

development of ecological sustainable and economical profitable agri business model(s) on organic production.											
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Legend: 1 – Low, 2 – Medium, 3 – High

Curriculum Map: Organic Production Technology (21AG878)

Pos & PSOs	Cos No. & Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
<p>PO 1,2,3,4 PSO 1,2,3,4</p>	<p>1.Refinement of students acquired knowledge and understanding on commercial production of crop through organic.</p> <p>2.To promote professional skills and knowledge through meaningful hands-on experience</p> <p>3.Capacity building for designing and development of ecological sustainable and economical profitable agri business model(s) on organic production.</p>	<p>SO 1.1</p> <p>SO 1.2</p> <p>SO 1.3</p> <p>SO 1.4</p> <p>SO 1.5</p> <p>SO 1.6</p> <p>SO 1.7</p> <p>SO 1.8</p> <p>SO 1.9</p> <p>SO 1.10</p>	<p>1. Effect of foliar spray of Potassium Solubilizing Bacteria (KSB Growth and Yield of Barley) on</p> <p>2. Effects of PSB level on growth and yield Maize</p> <p>3. Effect of nutrient management through FYM application and KSB (potassium solubilizing bacteria) on yield of Black Gram (<i>Vigna mungo</i> L.)</p> <p>4. Organic Production Technology Green Gram through NADEP Compost</p> <p>5. Organic Production Technology for Green Gram under application of KSB culture</p> <p>6. Organic Production Technology in relation to Barley (<i>Hordeum vulgare</i> L.)</p> <p>7. Effect of PSB levels on growth and</p>		<p>1.Vermicompost production technology.</p> <p>2. Nutrient management of different organic source.</p>

			<p>yield of linseed.</p> <p>8. Organic Production Technology for Green Gram under application of KSB culture</p> <p>9. Effect and nutrient management through vermicompost and application PSB on yield of Mung bean (<i>Vigna radiata</i> L.)</p> <p>10. Effect of foliar spray of Potassium Solubilizing Bacteria.</p>	
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Course Code: 21AG879

Course- ELP on Poultry Production Technology

Pre-requisite: Student should have Cleared 7th Semester

Rational: The syllabus of this course gives the expected Project Reports achievements both at the course and session levels where students to through the various modes of instructions like Laboratory Instruction (LI), and self Learning (SL). With the progression of course students are expected to show case their mastery of session out comes (SO's), impacting in the overall achievement of course outcomes (CO's) upon the courses conclusion.

Course Outcome:

CO-1: Students able to know about the importance and contribution of poultry in meat sector in India as well as whole world.

CO-2: After completion of this course students were able to recognized different characteristics Indian and foreign breeds of chicken.

CO-3: This course helps the students about different aspects of poultry such as its management of chicks, broiler and layer, their feeding and water requirement and feed manufacturing.

CO -4: This course gives information about various environmental conditions and different equipment used to maintain those conditions.

Scheme of Studies:

Code	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			CI	LI	SW	SL	Total Study Hours CI+LI+SW+SL	
Program Core (PCC)	21AG879	ELP on Poultry Production Technology	0	10	0	0	10	10

Legend:

CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others), **LI:** Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies), **SW:** Sessional Work (includes assignment, seminar, mini project etc.), **SL:** Self Learning, **C:** Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Code	Course Code	Course Title	Scheme of Assessment (Marks)							End Semester Assessment (ESA)	Total Marks (PRA+ESA)
			Progressive Assessment (PRA)								
			Class/ Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+AT)			
Program Core (PCC)	21AG879	ELP on Poultry Production Technology	0	0	0	0	0	0	100	100	

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

CO-1: Students able to know about the importance and contribution of poultry in meat sector in India as well as whole world.

Approximate Hours

Item	Appx.Hrs.
CI	0
LI	04
SW	1
SL	1
Total	6

Session Out comes (SO's)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
<p>SO1.1 Understanding the Different size of egg.</p> <p>SO1.2 Knowledge of Egg Nutrient.</p>	<p>1.Quality testing of egg using different internal and external parameters.</p> <p>2.Composition and nutritive value of eggs.</p>		<p>1. Importance, benefits and problems related to egg storage and transportation.</p> <p>2. Understanding the nutritional importance of of eggs of commercial layers and deshi layer birds.</p>

SW-1 Suggested Seasonal Work(SW):

a. Assignments: Nil..

b. Mini Project: 1.Description of various methods of quality testing of egg for hatching purposes.

CO-2: After completion of this course students were able to recognized different characteristics Indian and foreign breeds of chicken.

Approximate Hours

Item	Appx.hrs.
CI	0
LI	04
SW	1
SL	1
Total	06

Sessional Outcomes (SO's)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO2.1 To know about preservation of eggs. SO2.2 To learn about shelf-life of egg.	1. Various ways for the preservation of eggs. 2.Principles of egg preservation with special reference to prolonging shelf life.		i.Learn about the Increases the shelf- life of egg. ii.Understanding the different size of egg.

SW-2 Suggested Sessional Work (SW):

- a. **Assignments:** Nil
- b. **Mini Project:** 1. Various factors responsible for the poor quality of eggs and way to prevent losses in egg quality.

CO-3: Helps the students about different aspects of poultry such as its management of chicks, broiler and layer, their feeding and water requirement and feed manufacturing

Approximate Hours

Item	Appx. Hrs.
CI	0
LI	04
SW	1
SL	1
Total	06

Seasonal Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO3.1 Understanding the internal parts of chicken. SO3.2 Discuss about Cut-up parts and Sensory evaluation of chicken.	1. Methods of stunning, slaughtering and dissecting various edible organs of chicken. 2. Various cut parts and sensory evaluation of chicken meat.		i. Learning about the internal body parts of chicken. ii. Understanding the sensory evaluation of various breeds of chicken.

SW-3 Suggested Sessional Work (SW):

a. Assignments: Nil

b. Mini Project: 1. Flow diagram of handling , stunning and dissecting internal organs of fowl with special emphasis on dissecting equipments and sensory evaluation of different meat parts.

CO-04 This course gives information about various environmental conditions and different equipment used to maintain those conditions.

Approximate Hours

Item	Appx. Hrs
CI	0
LI	04
SW	1
SL	1
Total	06

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO4.1 Understanding the incubation, hatching & brooding. SO4.2 Knowledge of different breeds of chicken .	1. Operating procedures for incubator cum Hatcher machine along with important precautions before and after setting of eggs. 2. Classification of chicken breeds with their specific requirements for feeds, water, housing and sanitations.		1. Understanding the hatching and brooding of chicken eggs by broody hens.. 2. Knowledge on differences between natural and artificial incubation of eggs.

SW-4 Suggested Sessional Work (SW):

a. Assignments: Nil

b. Mini Project: 1. A detail requirements of physical factors like temperature , humidity, ventilation turning and gaseous exchanges for incubation of eggs.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (CL)	Laboratory Instruction (LI)	Sessional Work (SW)	Self Learning (SL)	Total hour (CL+SW+SL)
CO-1: Students able to know about the importance and contribution of poultry in meat sector in India as well as whole world.	0	04	1	1	06
CO-2: After completion of this course students were able to recognized different characteristics Indian and foreign breeds of chicken.	0	04	1	1	06
CO-3: This course helps the students about different aspects of poultry such as its management of chicks, broiler and layer, their feeding and water requirement and feed manufacturing.	0	04	1	1	06
CO -4: This course gives information about various environmental conditions and different equipment used to maintain those conditions.	0	04	1	1	06
Total Hours	00	16	4	4	24

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO-1	Students able to know about the importance and contribution of poultry in meat sector in India as well as whole world.	04	07	2	13
CO-2	After completion of this course students were able to recognized different characteristics Indian and foreign breeds of chicken.	03	07	3	13
CO-3	This course helps the students about different aspects of poultry such as its management of chicks, broiler and layer, their feeding and water requirement and feed manufacturing.	04	07	-	11
CO-4	This course gives information about various environmental conditions and different equipment used to maintain those conditions.	03	08	2	13
Total		14	29	07	50

Legend: R: Remember, U: Understand, A: Apply

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Visit to Animal & Poultry Unit
6. Demonstration
7. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT,Blog, Facebook,Twitter, Whatsapp, Mobile, Online sources)
8. Brainstorming

Suggested Learning Resources:

(a) Books :

S. No.	Title	Author	Publisher	Edition & Year
1	Poultry Science & practice.	Nilotpal Ghosh	CBS Publishers	2015
2	Poultry Production & management.	Dr. Digvijai Singh, Shilendra Kumar Singh.	Rama Publishing house.	2021

Curriculum Development Team:

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Curriculum Mapping

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprises with different scales in area of	Hold a post on supply i	Analyze and control commercial and	each how to control and manage agricultural production	Introduce general production technologies	Teach how to implement and manage production technologies	prepare for managerial and social responsibilities	Student will identify different underutilized	Student will practice different breeding	Student will recognize different insect pest and	Student will apply different recent
CO-1: Students able to know about the importance and contribution of poultry in meat sector in India as well as whole world.	2	3	1	1	2	3	2	2	2	2	3
CO-2: After completion of this course students were able to recognized	2	3	1	1	2	1	2	1	2	3	2

different characteristics Indian and foreign breeds of chicken.											
CO-3: This course helps the students about different aspects of poultry such as its management of chicks, broiler and layer, their feeding and water requirement and feed manufacturing.	2	1	1	2	2	1	2	2	2	3	2
CO -4: This course gives information about various environmental conditions and different equipment used to maintain those conditions.	3	2	3	1	2	1	2	3	2	1	1

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map: Poultry Production Technology

Pos & PSOs	Cos No. & Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
PO1,2,3,4 PSO 1,2,3,4	CO-1: Students able to know about the importance and contribution of poultry in meat sector in India as well as whole world.	SO 1.1 SO 1.2 SO 1.3	1. Quality testing of egg using different internal and external parameters. 2. Composition and nutritive value of eggs		1. Importance, benefits and problems related to egg storage and transportation. 2. Understanding the nutritional importance of eggs of commercial layers and deshi layer birds.
PO1,2,3,4 PSO 1,2,3,4	CO-2: After completion of this course students were able to recognize different characteristics Indian and foreign breeds of chicken.	SO 2.1 SO 2.2 SO 2.3	1. Various ways for the preservation of eggs. 2. Principles of egg preservation with special reference to prolonging shelf life.		1. Learn about the Increases the shelf- life of egg. 2. Understanding the different size of egg.
PO1,2,3,4 PSO 1,2,3,4	CO-3: This course helps the students about different aspects of poultry	SO 3.1 SO 3.2	1. Methods of stunning, slaughtering and dissecting various edible organs of chicken. 2. Various cut parts and		1. Learning about the internal body parts of chicken. 2. Understanding

	such as its management of chicks, broiler and layer, their feeding and water requirement and feed manufacturing.		sensory evaluation of chicken meat.		the sensory evaluation of various breeds of chicken.
PO1,2,3,4 PSO 1,2,3,4	CO -4: This course gives information about various environmental conditions and different equipment used to maintain those conditions.	SO 4.1 SO 4.2	1.Operating procedures for incubator cum Hatcher machine along with important precautions before and after setting of eggs. 2.Classification of chicken breeds with their specific requirements for feeds, water, housing and sanitations.		1.Understanding the hatching and brooding of chicken eggs by broody hens.. 2.Knowledge on differences between natural and artificial incubation of eggs.

Course Code: 21AG872

Course Title: Seed Production and Technology

Pre-requisite: To improve seed production skill, students are additionally being trained in seed production, seed quality assessment, seed treatment, seed storage, and seed marketing.

Rationale: ELP in Seed Production and Technology is flourishing with main the motto of learning and earning while actually undertaking the given task. During this program, Experiential Learning is provided to students in different fields like seed production, seed processing, seed packaging and seed marketing for different classes of seed.

Course Outcomes:

21AG872.1 Refinement of students acquired knowledge and understanding on commercial seed production of self and pollinated crops, seed quality assessment, seed processing, seed treatment, seed packaging and seed marketing.

Scheme of Studies:

Code	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits(C)
			CI	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Program Core (PCC)	21AG872	Seed Production and Technology	0	10	0	0	10	10

Legend:

CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others), **LI:** Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies), **SW:** Sessional Work (includes assignment, seminar, mini project etc.), **SL:** Self Learning, **C:** Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment

Code	Course Code	Course Title	Scheme of Assessment (Marks)								
			Progressive Assessment (PRA)							End Semester Assessment (ESA)	Total Marks (PRA+ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Seminar one (SA)	Class Activity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)			
Program Core (PCC)	21AG872	Seed Production and Technology	0	0	0	0	0	0	100	100	

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

21AG872.1 Refinement of students acquired knowledge and understanding on commercial seed production of self and pollinated crops, seed quality assessment, seed processing, seed treatment, seed packaging and seed marketing.

Approximate Hours

Item	Approximate Hours
CI	0
LI	20
SW	0
SL	0
Total	20

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO1. Students are able to produce Foundation and certified seed of self pollinated crops</p> <p>SO2. Students are able to produce Foundation and certified seed of cross pollinated crops.</p> <p>SO3. Students are able to apply minimum seed certification, field inspection, and minimum field standards for determination of seed quality.</p> <p>SO4. Students are able to seed production and maintenance of nucleus and breeder seed.</p> <p>SO5. Students are able to assessment of seed quality of different classes of seed.</p> <p>SO6. Students are able to apply seed processing techniques.</p> <p>SO7. Students are able to protocols for seed treatments for different seed and soil born diseases.</p> <p>SO8. Students are able to apply seed storage techniques and seed packing practices for different classes of seed.</p> <p>SO9. Students are able to understand seed marketing procedures and different marketing channels</p> <p>SO10. Students are able to understand seed act and their amendments.</p>	<p>Seed production and Technology</p> <p>1. Foundation and certified seed production of self pollinated crops</p> <p>2. Foundation and certified seed production of cross pollinated crops</p> <p>3. Field inspection, Minimum seed certification and field standards for determination of seed quality.</p> <p>4. Seed production and maintenance of nucleus and breeder seed.</p> <p>5. Assessment of seed quality of different classes of seed.</p> <p>6. Seed processing techniques.</p> <p>7. Protocols for seed treatments for different seed and soil born diseases.</p> <p>8. Seed storage techniques and seed packing practices for different classes of seed.</p> <p>9. Seed marketing procedures and different marketing channels</p> <p>10. Seed act and their amendments.</p>		

SW-1 Suggested Sessional Work (SW):

a. Assignments:

b. Mini Project:

1. Seed production in different crops seed quality assessment, seed processing, seed treatment, seed packaging and seed marketing.

c. Other Activities (Specify):

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self Learning (Sl)	Total hour (Cl+SW+Sl)
21AG872.1 Refinement of students acquired knowledge and understanding on commercial seed production of self and pollinated crops, seed quality assessment, seed processing, seed treatment, seed packaging and seed marketing.	20	0	0	20

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
CO 1	Seed production and Technology				

Legend: R: Remember, U: Understand, A: Apply

The end of semester assessment for **ELP Seed Production and Technology** will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Group Discussion
3. Demonstration
4. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, Whatsapp, Mobile, Online sources)
5. Brainstorming
6. Smart Board

Suggested Learning Resources:**(a) Books:**

S. No.	Title	Author	Publisher	Edition & Year
1	Seed Technology	Agarwal, R.L.	Oxford & IBH Publishing Co. Delhi	1991
2	Seed Technology	Agarwal, P.K.	ICAR, New Delhi	1999
3	Seed Science and Technology	Subir Sen and Nabinanda Ghosh.	Kalyani Publishers. New Delhi	1999
4	Beej Pradyogiki	Maloo, S.R., Intodia, S.K. and Pratap Singh.	Agrotech Publishing Academy.	2008
5	Seed Technology.	A.K. Joshi and B.D. Singh.	Kalyani Publishers, New Delhi.	2005
6	Seed Technology In The Tropics	Mackay D B	Scientific Publishers	2013
7	Seed Science and Technology	K. Vanangamudi	New India Publishing Agency	2014
8	Field Inspection Manual and Minimum Seed Certification Standards	Anonymous	NSC Publication, New Delhi	1965

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Curriculum Mapping

Course Outcomes	Programme Outcomes							Programme Specific Outcomes			
	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO-7	PSO 1	PSO 2	PSO-3	PSO-4
	Manage agricultural enterprises with different scales in area	Hold a post on supply i dministration and policy	Analyze and control commercial and economical process in the	Teach how to control and manage agricultural production	Introduce general production technologies	Teach how to implement and manage production technologies	Prepare for managerial and social responsibilities	Student will identify different underutilized crops	Student will practice different breeding techniques used in crop	Student will recognize different insect pest and diseases and their	Student will apply different recent techniques in crop
21AG872.1 Refinement of students acquired knowledge and understanding on commercial seed production of self and pollinated crops, seed quality assessment, seed processing,	2	3	1	1	2	3	2	2	2	2	3

seed treatment, seed packaging and seed marketing.											
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Legend: 1- Low,2 – Medium, 3- High

Course Curriculum Map: Seed Production and Technology

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4	21AG872.1 Refinement of students acquired knowledge and understanding on commercial seed production of self and pollinated crops, seed quality assessment, seed processing, seed treatment, seed packaging and seed marketing.	SO1.1	1 Foundation and certified seed production of self pollinated crops	Seed production and Technology	As mentioned in page number