Curriculum Book

and

Assessment and Evaluation Scheme

based on

Outcome Based Education (OBE)

in Master of Science (Agriculture) In Agronomy

2 Years 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 and Technology Department of Agronomy

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HOD HEAD Department of Agronomy AKS University, Satna

*** Warner

Dean Agriculture

Faculty of Agri. Sci. & Tech AKS University, Satna (M.P.) Beeliopade

Vice chancellor





Department of Agronomy Faculty of Agriculture Science and Technology Curriculum &Syllabus of Agronomy program (Revised as on 01 August 2023)

Forwarding

I am delighted to observe the updated curriculum of the Department of Agronomy for M.sc Ag in Agronomy Program, which seamlessly integrates the most recent trends and corporate affairs in the field of Agronomy and adheres to the guide lines set forth by ICAR The revised curriculum also thoughtfully incorporates the directives of NEP-2020.

The alignment of course outcomes (COs), Programme Outcome (POs) and Programme specific outcomes (PSOs) has been intricately executed, aligning perfectly with the requisites of NEP-2020 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 MBA program for implementation in the upcoming session.

ER. Anant Soni Pro Chancellor &Chairman AKS University, Satna

01August 2023



Department of Agronomy Faculty of Agriculture Science and Technology Curriculum &Syllabus of Agronomy program (Revised as on 01August2023

From the Desk of the Vice-Chancellor

AKS University is currently undergoing a process to revamp its curriculum into an outcome based approach, with the aim of enhancing the teaching and learning process. The foundation of quality of quality education lies in the implementation of a curriculum that aligns with both societal and industrial needs, focusing on relevant outcomes. This entails dedicated and inspire Faculty members, as well as impactful industry internships.



Hence, it is of utmost importance to begin this endeavor by crafting an outcome-based curriculum in collaboration with academia and industry experts. This curriculum design should be informed by the latest technological advancements, market demands, the guidelines outlined in the National Education Policy (NEP) of 2020, and sustainable goals.

In the curriculum, I am pleased to observe that the Agronomy 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.

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 PG Restructuring 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.

01August2023

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



AKS University Satna

Department of Agronomy Faculty of Agriculture Science and Technology Curriculum &Syllabus of Agronomy program (Revised as on 01August2023)

Preface

As part of our commitment to ongoing enhancement, the department of agriculture consistently reviews and updates its M.Sc. (Ag.) Agronomy programme 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 M.Sc.(Ag.) Agronomy programme 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 Restructured and Revised Syllabi of Post-graduate Programmes 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 Faculty of Agriculture Science & Technology AKS University,Satna

01August 2023



AKS University Faculty of Agriculture Science and Technology Department of Agronomy

Introduction

The faculty of Agricultural Science and Technology at AKS University has been a pioneer in promoting agricultural education and research. Among its various departments, the department of Agronomy holds a significant position. Established in 2014, this department has played a crucial role in advancing the field of Agronomy through its dedicated focus on teaching, research, and extension activities.

At the heart of its existence is the commitment to imparting knowledge and skills to students pursuing agricultural sciences. The Department of Agronomy offers comprehensive academic programs that equip students with the theoretical foundations and practical expertise required for successful careers. Through rigorous coursework and hands-on training, students gain insights into crop production systems, soil management techniques, weed control strategies, and sustainable farming practices.

The Department of Agronomy at AKS University stands as a testament to its unwavering commitment to advancing agricultural sciences. As it continues to evolve with changing times, the department remains dedicated to nurturing future generations of skilled agronomists who will contribute towards global food security and sustainable farming practices.

Vision –

Enhance the knowledge about the innovative technology for increasing the crop production and boost up the Indian economy. Promoting the responsible, ethical use and management of air, water, soil, plant and animal resources including sustainability in agricultural practices are vision of department of agronomy.

Mission

M-1: The mission of the department of agronomy is to advance understanding of the biology of agronomical crops and their interactions with soil. The faculty focuses on all aspects of the production technology of various crops.

M-2:The department provides experiential educational and research opportunities to prepare the next generation of scientists and global citizens to be competent in resolving the complex challenges of the 21st century and in providing a healthy and secure food supply while protecting our environment.

M-3: In order to become a dynamic and effective future leader in agronomy, one must develop an interdisciplinary global perspective. The department aims to strengthen the economy and quality of life for society by developing human resources, technologies, and products.

M-4: it is our aim to be a world leader in research, teaching, and extension involving plant health while serving the changing needs of society, the environment, and the university.



Faculty of Agriculture Science and Technology Department of Agronomy

PROGRAM EDUCATIONAL OBJECTIVES (PEO)

PEO-1

Imparting subject-related knowledge along with developing a connection between practical solutions and theory

PEO-2

Generate knowledge through training in cognitive, affective, and psychomotor, which are necessary for productive research in a selected area of crop agronomy

PEO-3

To enhance visibility and impact of post graduate programs in agricultural sciences and students will be trained various pathways for manifesting their objectives in carrier of the students.

PEO-4

Ability to obtain impact of professional activities in agriculture for improvement of socioeconomic condition of the farmers.

PEO5:

To become a face among the farming community through providing support in advance cropproduction technologies.

PROGRAM OUTCOMES (POs)

PO-1

Specific knowledge of various branches of agronomy will be made specialized and to provide knowledge dissemination regarding various technique of farming and farming system in India.

PO-2

Wide knowledge in the concerning subject which will improve the farmers condition through student's contributions.

PO-3

Detailed knowledge regarding package and practices soil fertilizer and water management of productive crop aspects.

PO-4

Use appropriate scientific methods collaboration with statistics along with evaluation which will proved to decision in various part of agriculture.

PO-5

Detailed knowledge of cultivation practices, soil, fertilizers, water management and plant protection economic associated with farming enterprises.

PO-6

Create, select and apply an appropriate techniques, resources and modern it tools in improvement of agronomical package and practices.

PO-7

Student will apply various statistical methods to analyze their master research work

PO-8

Student will apply basic concepts in laboratory techniques during their research work

PO-9

Understand the impact of the professional expert solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development in Agriculture.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO-1

Enable to recognize and examine the relationships between inputs and outputs in their agricultural field to make effective and profitable decisions. To understand the mechanics of agri Entrepreneurship.

PSO-2

Acquainting with basic concepts theories and terminology of Agronomy.

PSO-3

To undertake teaching research and extension activates along with administrative and consultancy services.

PSO- 4

Apply research and expertise in resolving the problems of existing farm in the periphery of universities.

PSO- 5

To understand and analyze the current issues that are occurring in local and global agriculture and how they will affect futuristic agriculture

PEO	M1	M2	M3	M4
PEO1	2	3	3	3
PEO2	2	3	2	3
PEO3	1	2	2	3
PEO4	2	2	3	3
PEO4	1	2	3	2
PEO5	3	2	3	1

Consistency/Mapping of PEOs with Mission of the Department

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

GENERAL COURSE STRUCTURE & THEME

1. Definition of Credit

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

2. Range of Credits:

In the light of the fact that a typical Model Two-year Post Graduate degree program in Agricultural has about 74 credits, the total number of credits proposed for the Two-year M.Sc. Ag Agronomy is kept as PG Restructuring Committee for ICAR considering NEP-20 and NAAC guidelines.

Components of the Curriculum

Sl No	Course Component	Total Credits	Percentage of total credits in the Program
1	Program Core (PCC)	22	29.73
2	Minor courses (PEC)	09	12.16
3	Supporting Courses (PSC)	07	9.46
4	Research Project(s) (PRC)	15	20.27
5	Industrial Training/Internships (ISC)	00	0.00
6	Seminar (SC)	16	21.62
	Total Credit		
6	Any other (PlSpecify)Non-Credit(NC)	05	6.76
7	Entrepreneurship (EC)	00	00
	Total Non-Credit	74	100

(Program curriculum grouping based on course components)

General Course Structure and Credit Distribution Curriculum of M.Sc Ag Agronomy

Semester -I		Semester -II		
Course Title	Credit	Course Title	Credit	
Major Courses		Major Courses		
1. Modern Concept In Crop Production	3+0+0=03	1. Principles and Practices of weed Management	2+0+1 = 03	
2. Principles And Practices Of Soil Fertilityand Nutrient Management	2+0+1=03	2. Principles and Practices of Water Management	2+0+1 = 03	
3. Agronomy Of Major Cereals And Pulses.	2+0+0 = 02	3. Principles and Practices Of Organic Farming	2+0+1=03	
4. Cropping System and sustainable Agriculture	2+0+0 = 02	4. Dryland farming and Watershed Management	2+0+1=03	
Minor Courses		Minor courses		
5. Soil Biology and Biochemistry	2+0+1 = 03	5. Principles Of Plant Physiology	2+0+1 = 03	
6. Soil, Water and Air Pollution	2+0+1 = 03			
Supporting Courses		Supporting Courses		
7. Statistical Methods in Applied Science	3+0+1=04	6. Experimentaldesign	2+0+1 = 03	
Non-Credit Compulsory Courses		Non-Credit Compulsory Courses		
8. Library And Information Services	0+1+0=01	7. Intellectual Property And Its Management In Agriculture	1+0+0 = 01	
9. Technical Writing and Communications Skills	0+1+0=01	8.Basic Concepts In Laboratory Techniques	0+0+1 = 01	

Total Credit	22	Total Credit	20
Semester -III	·	Semester -IV	
Course Title	Credit	Course Title	Credit
Research			
Master's Research	0+15=15	Master's Research seminar	0+15=15
Master's Seminar	0+1=1		
Non-Credit Compulsory	y Courses		
Agricultural Research, Research	1+0=1		
Ethics and Rural Development			
Programmes			
Total Credit	17	Total Credit	15

- 1. Program Core (PCC)
- 2. Supporting Courses (PSC)
- 3. Research Project(s) (PRC)
- 4. Industrial Training/Internships (ISC)
- 5. Seminar (SC)
- 6. Any other (Pl Specify) Non-Credit (NC)
- 7. Entrepreneurship (EC)

Total Credit: 74

Course code and definition:

- L = Lecture
- **T** = **Tutorial**
- **P** = **Practical**
- C = Credit

Course level coding scheme:

- 1. **Professional core courses** = PCC
- 2. **Professional elective =**PEC
- 3. Supporting Courses =PSC
- 4. Research Project(s) =PRC
- 5. Industrial Training/Internships =ISC

- 6. **Seminar** =SC
- 7. Any other (PlSpecify) Non-Credit = NC
- 8. **Entrepreneurship** =EC

Three-digit number used as suffix with the Course Code for identifying the level of the course. Digit at five hundred's place signifies the year in which course is offered. e.g. 501,502 etc. for course code.

Category-wise Courses PROFESSIONAL CORE COURSES [PCC] / Major Course (Total 20)

Sl.	Code No.	Subject	Semester	Credits
1	Agron501	Modern Concept in Crop Production	Ι	3+0+0=3
2	Agron502	Principles And Practices Of Soil Fertility and Nutrient Management	Ι	2+0+1=3
3	Agron506	Agronomy Of Major Cereals and Pulses.	Ι	2+0+0=2
4	Agron511	Cropping System and Sustainable Agriculture	Ι	2+0+0=2
5	Agron 503	Principles and Practices Of Weed Management	II	2+1+0=3
6	Agron 504	Principles and Practices Of Water Management	II	2+1+0=3
7	Agron 513	Principles and Practices Of Organic Farming	II	2+1+0=3
8	Agron 512	Dryland Farming and Watershed Management	II	2+1+0=3
		Total Credit		22

PROFESSIONAL ELECTIVE = PEC/ Minor course (Total 08)

Sl.	Code No.	Subject	Semester	Credits
1	Soil 506	Soil Biology and Biochemistry	Ι	2+0+1 = 3
2	Soil 508	Soil, Water and Air Pollution	Ι	2+0+1 = 3
3	APP 501	Principles of Plant Physiology	II	2+0+1 = 3
		Total Credit		9

SUPPORTING COURSES = PSC (Total 06)

Sl.	Code No.	Subject	Semester	Credits
1	STAT 502	Statistical Methods in Applied Science	Ι	3+0+1 = 4
2	STAT 511	Experimental Design	II	2+0+1=3
		Total Credit		07

RESEARCH PROJECT(S) =PRC (Total 30)

Sl.	Code No.	Subject	Semester	Credits
01	Agron 599	Master's Research	III	0+0+15 = 15
		Total Credit		15

SEMINAR =SC(Total 01)

Sl.	Code No.	Subject	Semester	Credits
01	Agron 591	Master's Seminar	III	1+0+0 = 1
02	Agron 599	Master's Research Seminar	IV	0+0+15 = 15
		Total Credit		16

ANY OTHER (PL SPECIFY) NON-CREDIT =NC (Total 05)

Sl.	Code No.	Subject	Semester	Credits
01	PGS 501	Library and information services	Ι	0+0+1 = 1
02	PGS 502	Technical writing and communications	Ι	0+0+1 = 1
		skills		
03	PGS-503	Intellectual property and its management in agriculture	II	1+0+0 = 1
04	PGS 504	Basic concepts in laboratory techniques	II	0+0+1 = 1
05	PGS 505	Agricultural Research, Research Ethics and	III	1 + 0 + 0 = 1
		Rural Development programmes		
		Total Credit		05

Induction Program

Induction program for students 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:

- i Physical activity
- ii Creative Arts
- iii Universal Human Values
- iv Literary
- v Proficiency Modules
- vi Lectures by Eminent People
- vii Visits to local Areas
- viii Familiarization to Dept./Branch & Innovations

Mandatory Visits/ Workshop/Expert Lectures:

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

Evaluation Scheme:

1. For Theory Courses:

- I. The Weightage of Internal assessment is 50% and
- II. 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.

2.- For Practical Courses:

- I. The Weightage of Internal assessment is 50% and
- II. 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.

3. 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	L	Т	Р	Total Hour	Total Credit
Semester -I	16	00	06	22	22
Semester -II	13	00	07	20	20
Semester -III	02	00	15	17	17
Semester -IV	00	00	15	15	15
Total	31	00	43	74	74

Semester wise Brief of total Credits and Teaching Hours



Faculty of Agriculture Science and Technology

Department of Agronomy

2 year / 4 Semester Curriculum Structure Total Credit (2 year / 4 Semester Course) **74** Semester wise Structure Curriculum

(L= Lecture, T= Tutorial, P= Practical & H = Hours per week)

S.N.	Category	Code	Course Title		Т	Р	Total H	Credits
			MajorCourses					
1	PCC	Agron 501	Modern concept in crop production	3	0	0	3	3(3+0)
2	PCC	Agron 502	Principles and practices of soil Fertility and nutrient management	2	0	1	3	3(2+1)
3	PCC	Agron 506	Agronomy of major cereals and pulses.	2	0	0	2	2(2+0)
4	PCC	Agron 511	Cropping system and sustainable agriculture	2	0	0	2	2(2+0)
			Total				10	10(9+1)
MinorCourses								
5	PEC	Soil 506	Soil Biology and Biochemistry	2	0	1	3	3(2+1)
	PEC	Soil 508	Soil, Water and Air Pollution	2	0	1	3	3(2+1)
			Total				6	6(4+2)
			Supporting Courses					
6	PSC	STAT502	Statistical methods in applied Science	3	0	1	4	4(3+1)
			Total				4	4(3+1)
		·	Non-Credit Compulsory Courses					
7	NC	PGS502	TechnicalWriting and communication skill		0	1	1	1(0+1)
8	NC	PGS501	Library and in formation services	0	0	1	1	1(0+1)
			Total				2	2(0+2)
			Grand Total	16	00	06	22	22(16+6)

SEMESTER-1



Faculty of Agriculture Science and Technology

Department of Agronomy Semester wise Structure Curriculum

(L= Lecture, T= Tutorial, P= Practical & H = Hours per week)

SLAILSTLA								
S.N.	Category	Code	Course Title	L	Т	Р	Total H	Credits
			MajorCourses					
1	PCC	Agron 503	Principles and Practices Of Weed Management	2	0	1	3	3(2+1)
2	PCC	Agron 504	Principles and Practices Of Water Management		0	1	3	3(2+1)
3	PCC	Agron 513	Principles and Practices Of Organic Farming	2	0	1	3	3(2+1)
4	PCC	Agron 512	Dryland Farming and Watershed Management	2	0	1	3	3(2+1)
			Total	8	0	4	12	12(8+4)
			Minor Courses					
5	PEC	APP 501	Principles of Plant Physiology	2	0	1	3	3(2+1)
			Total	2	0	1	3	3(2+1)
			Supporting Courses					
6	PSC	STAT511	Experimental design	2	0	1	3	3(2+1)
			Total	2	0	1	3	3(2+1)
			Non-Credit Compulsory Cour	ses				
7	NC	PGS503	Intellectual Property and Its management in Agriculture	1	0	0	1	1(1+0)
8	NC	PGS504	Basic Concepts in Laboratory Techniques	0	0	1	1	1(0+1)
			Total	1	0	1	2	2(1+1)
			Grand Total	13	00	07	20	20(13+7)

SEMESTER-II



Faculty of Agriculture Science and Technology

Department of Agronomy Semester wise Structure Curriculum (L= Lecture, T= Tutorial, P= Practical & H = Hours per week)

SEMESTER-III

S.N.	Category	Code	Course Title	L	Т	Р	Total H	Credits
			Research /Project work / S	Seminal	ſ			
1	PRC	Agron 591	Master's Seminar	0	00	15	15	15(0+15)
2	SC	Agron 599	Master's Research	1	00	00	01	1(1+0)
			Seminar					
			Total	1	00	15	16	16(1+15)
			Non-Credit Compulsory C	ourses				
3	NC	PGS 505	Agricultural Research,	1	0	0	1	1(1+0)
			Research Ethics and Rural					
			Development					
			Programmes					
			Total	01			1	1(1+0)
			Grand Total	02	00	15	17	17 (2+15)



Faculty of Agriculture Science and Technology Department of Agronomy

Semester wise Structure Curriculum (L= Lecture, T= Tutorial, P= Practical & H = Hours per week) SEMESTER-IV

S.N.	Category	Code	Course Title		Т	Р	Total H	Credits
1	SC	Agron 599	Master's Research Seminar		00	15	15	15(0+15)
			Total	00	00	15	15	15(0+15)
			Grand Total					74 (31+43)



Faculty of Agriculture Science and technology Department of Agronomy Curriculum of M.Sc Ag Agronomy Program

Course Code: Course Title:	Agron - 501 (3+0) Modern Concept in Crop Production
Pre-requisite:	Before start of course classes student required sound knowledge in respect of basic principles of agronomy, precession farming and natural farming hypothesis for the purpose of increasing crop production to fulfil the supply of food.
Rationale:	This course has impact to increase the knowledge of PG students of agronomy by which they will become as master towards adopting modern crop production techniques for enhance the
Outcomes :	crop productivity with ceo-menary environment.
Outcomes.	Agron 501.1 Impart the modern concepts of crop production including tillage, optimization of plant growth population and planting geometry.
	Agro 501.2 Discuss about growth regulators and their role in agriculture with plant nutrition and disease tolerance in field crop.
	Agro 501.3 Implementation and recognition of organic farming with the concept of ideal plant types.
	Agro 501.4 Describe the impact of latest crop management practices on crop productivity and resource use efficiency.
	Agro 501.5 Analyzing the crop growth analysis along with crop modelling in precision farming.

Scheme of Studies:

Board of Study	Course			Scheme of studies (Hours/Week)						
	Code	Course Title	Cl	LI	SW	SI	Total Study	Credits		
							Hours(CI+LI+SW+SL)	(C)		
Program core (SDGS)	AGRO 501	Modern concept in crop production	3	0	1	1	5	3		

Legend: CI: Class room Instructions (Includes different instructional strategies i.e. Lecture(L), Tutorial (T)and others),

LI: Laboratory Instruction (Includes Practical performance sin 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 out come of Learning.

Scheme of Assessment: Theory

Incory										
			Scheme of A	Assessment (Marks)					
			Progressive	e Assessment	(PRA)				End	
	G	G	Class/Hom e	Class Test	Semi nar	Class Activit	Class	Total	Semester Assessmen	
Board of	Course	Course	Assignment	2 (2 hast out	one	y any	Attendan	Marks	t	Total Marks
Study	Code		5 number 3 marks each (CA)	(2 best out of 3)10 marks each (CT)	(SA)	one (CAT)	ce (AT)	(CA+CT+ SA+CAT+ AT)	(ESA)	ESA)
Program core (SDGS)	AGRO 501	Modern concept in crop producti on	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), Sessional Work (SW), and Self-Learning (SL). Which students are familiar through various mode of instruction .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.

Agro- 501.1 Students will acquaint familiar with the knowledge of Cropping systems physical resources, soil and water management in cropping systems.

Approximate Hours

Item	Appx Hrs.
CI	05
LI	00
SW	01
SL	01
Total	07

Session Out comes	Laboratory	Classroom Instruction	Self-Learning
(SOs)	Instruction	(CI)	(SL)
	(LI)		
SO1.1 SO1.1To brought		Unit-1 .Crop growth analysis in	
knowledge in crop		relation to environment agro-	o Gain knowledge about N-
production technology in		ecological zones of India	yield inverse law
relation to crop growth &		1.1. Give introductory remark	The assessment of crop growth
development		in crop production	analysis
-			Prepare a map of crop zone of
SO1.2 To gain knowledge about		1.2 Introduce students about	M.P.
crop zones of M.P.		crop growth	
*		1.3 To obtain best efforts in	
SO1.3 To impart subject back		relation to precision	
ground		farming	
SO1.4. To understand different		1.4 To explain in details	
agro-ecological zones of		information about A.E. Zones	
India		1.5 Factor affecting crop	
		growth &	
		development	
		*	

SW-1 Suggested Sessional Work (SW):

Assignments: Enlist in detail- Agro- ecological zones of India, Agro climatic zones.

a. Other Activities(Specify): Field activities

Agron501.2 students will able to acquaints knowledge about Concept of sustainability agriculture and modern crop production technology.

Approximate Hours						
Item	AppxHrs.					
CI	05					
LI	00					
SW	03					
SL	02					
Total	10					

Session Out comes	Laboratory	Classroom Instruction	Self-
(SOs)	Instruction	(CI)	Learning
	(LI)		(SL)
SO1.1 Student know very well		Unit-2 Quantitative agro biological	1. How to prove
about biological plough.		principles and inverse yield nitrogen	the law of
SO1.2 knowledge gain about		law mischerlich yield equation. Its	diminishing
baul unit		interpretation and applicability,	return
SO1.3 Understand the law of		Baule unit.	2.Prepare a
diminishing return		1.1 To teach the details of modern	report with
SO1.4 .Express the inverse yield		crop production technology	suitable
N Law & its applicability		1.2 Introduction of biological plough crops	figure.
SO1.5 . Deals mischerlich law to		& its practices.	3. Details study
understand the phosphorus		1.3 Study of inverse yield N law.	of biological
availability.		1.4 Details instruction about use of Baul	plough
		unit.	

equation		

SW-1 Suggested Sessional Work (SW):

Assignments: Prepare a suitable figure to indicate the biological plough technique

b. Other Activities (Specify): Research on most suitable modern crop production technology

Agron501.3 students will able to identify the interactions and interpretation under different scientific method.

Approximate Hours

Item	AppxHrs.
CI	05
LI	00
SW	01
SL	01
Total	07

Session Outcomes	Laboratory	Classroom Instruction	Self-Learning
(SOs)	Instruction	(CI)	(SL)
	(LI)		
 SO1.1 Student will become to gain knowledge about lodging in cereals and its facts. SO1.2 Knowledge about physiology of grain yield in cereals. 		Unit-3 Effect of lodging in cereals; physiology of grain yield in cereals; optimization of plant population and planting geometry in relation to different resources, concept of ideal plant type and crop modeling for desired crop yield. Objectives: To teach the details of lodging, plant geometry and concept of plant types for higher yield.	 To prepare lodging strategies Prepare a chart for modern crop production technology. To find out the heat level of
 SO1.3 Students acquired knowledge in relation to plant population and geometry SO1.4.Express the concept of ideal plant type SO1.5 Deals difference between crop modeling and ideal plant type for desired crop yield 		 1.1 Introduction of lodging 1.2 Study of crop physiology terms. 1.3 Study of difference between plant population and plant geometry 1.4 Crop modeling for enhance crop productivity. 1.5 Details instruction about resource generation by natural farming 	best level of study individually

SW-1 Suggested Sessional Work(SW):

Assignments: To prepare a chart for modern crop production technology with principles and practices for the purpose of sustainable yield

c. Other Activities(Specify): New research work assigned for students to develop innovation

Agron501.4 students will able to acquaints knowledge for crop production technology, measure for control of crop lodging

Approximate Hours								
Item	Appx Hrs.							
CI	05							
LI	00							
SW	01							
SL	01							
Total	07							

Session Outcomes	Laboratory	Classroom Instruction	Self-Learning
(SOs)	Instruction	(CI)	(SL)
	(LI)		
 SO1.1 Students will become to know Scientific principles of crop production SO1.2 Student acquired knowledge about crop response function SO1.3 Understand the concept of soil plant relations SO1.4.Express knowledge about use of growth harmonic and 		 Unit-4 Scientific principles of crop production; crop response production functions; concept of soil plant relations; yield and environmental stress, use of growth hormones and regulators for better adaptation in stressed condition. 1.1 To Teach the Scientific principles of crop production 1.2 To study of concept of soil plant relations 1.3 Introductory information brought to amongst the students use of growth hormones 1.4 Detail information acquired to students for batter of growth and concept of soil plant relations 	 Student advice to detail study soil plant water relationship Prepare report on crop response production function Student directed to make a chart for Scientific principles of crop production
hormones and regulators SO1.5 Student acquainted knowledge in relation to yield and environmental stress and concept of soil plant relations		better adoption of growth regulators. 1.5 Detail knowledge in relation to yield and environmental stress	

SW-1 Suggested Sessional Work(SW):

Assignments: What is crop production technology, definition of agronomy and its importance, detail information about production functions?

d. Other Activities (Specify): Detail study of soil plant water relationship

Agro501.5PG students will become expert in crop production technology and use of plant growth regulators and their role in crop production.

Approximate Hours

Item	Appx Hrs.
CI	05
LI	00
SW	01
SL	01
Total	07

Session outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
 SO1.1 Knowledge brought to the students in respect of integrated farming system SO1.2 Students will become to know very well about organic farming, and resource conservation technology 		Unit-5- Integrated farming systems, organic farming, and resource conservation technology including modern concept of tillage dry farming determining the nutrient needs for yield potentiality of crop plants, concept of balance nutrition and integrated nutrient management; precision agriculture. Modem crop production concepts: soil less cultivation, Aeroponic, Hydroponic, Robotic and terrace farming. use of GIS, GPS and remote sensing in modem agriculture, precision farming and	 Prepare a list Integrated farming systems Detail study of WHT. To get and prepare a project about concept of balance nutrition
SO1.3 Student know the constraints of dry farming and WHTSO1.4. They understand as a familiar precision		 protected agriculture. 1.1 Introduce about integrated farming system. 1.2 Study in details tillage and nutrient need of corp. 1.3 Detail instruction about different cultivation technique 	
agriculture e.g. GIS, GPS and remote sensing SO1.5. Students will become to know protected agriculture		1.4 Introductory information in regard to remote sensing and use of drown technology1.5 Detail in protected agriculture	

SW-1 Suggested Sessional Work(SW):

Assignments: Integrated farming systems as a project report, organic farming technology including modern concept of tillage

e. Other Activities (Specify): Use of remote sensing, drown technology besides knowledge gain in regards of GIS and GPS etc.

Brief of Hours suggested for the Course Outcome

					-
Course Outcomes	Class	Laboratory	Sessional	Self	Total
	Lectu	Instruction	Work	Learning	hour
	re	(LI)	(SW)	(Sl)	(Cl+LI+
	(Cl)				SW+Sl)
Agro 501 Impart the modern concepts of crop production including tillage, optimization of plant growth population and planting geometry	.05	00	01	01	07
Agro 501.2 Discuss about growth regulators and their role in agriculture with plant nutrition and disease tolerance in field crop.	05	00	03	02	10
Agro 501.3 Implementation and recognition of organic farming with the concept of ideal plant types	05	00	01	01	07
Agro 501.4 Describe the impact of latest crop manageme practices on crop productivity and resource use efficiency.	05	00	01	01	07
Agro 501.5 Analyzing the crop growth analysis along with crop modelling in precision farming.	05	00	01	01	07
Total Hours	25	00	07	06	38

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

СО	Unit Titles		Marks I	Total	
		R	U	Α	Marks
CO-1	Crop growth analysis in relation to environment agro- ecological zones of India	07	02	02	11
CO-2	Quantitative agro biological principles and inverse yield nitrogen law mischerlich yield equation. Its interpretation and applicability, Baule unit.	05	02	02	09
CO-3	Effect of lodging in cereals; physiology of grain yield in cereals; concept of ideal plant type and crop modelling for desired crop yield.	07	02	02	11

CO-4	Scientific principles of crop production yield and environmental stress, use of growth hormones and regulators for better adaptation in stressed condition.	05	02	02	9
CO-5	Integrated farming systems, modern concept of tillage use of GIS, GPS and remote sensing in modem agriculture, precision farming and protected agriculture.	07	02	01	10
Total		31	10	09	50

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

The end of semester assessment for Modern Concept in Crop Production 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 sapper requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

- 1. Improved Lecture
- 2. Tutorial
- 3. Case Method
- 4. Group Discussion
- 5. Role Play
- 6. Visitto cement 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	a)Books:			
S. No.	Title	Author	Publisher	Edition &Year
1	Principles and practices of agronnomy.	Balasubramaniya n p & palaniappan sp.	Agronbios	2001.
2	Reddy sr	Principles of crop production.	Kalyani publ	2000
3	Principles and practices of agronnomy	Singh ss	Kalyani publ	2006.

Curriculum Development Team

- 1. Dr. T.Singh, Professor and Head Agronomy AKS University
- 2. Dr V.D Dwivedi , Professor Agronomy AKS University
- 3. Dr H.S. Kushwaha Professor Agronomy MGCGVV Chitrakoot satna M.P
- 4. Dr. D. P Chaturv4edi ,Assistant Professor,Dept. Of Agronomy AKS University
- 5. Dr. Pankaj Bagri, Assistant Professor, Dept. Of Agronomy AKS University
- 6. Mr. Amit Singh Tiwari , Assistant Professor, Dept. Of Agronomy AKS University
- 7. Mr. Sanjay Lillhare, Assistant Professor, Dept. Of Agronomy AKS University
- 8. Ms. Prachi Singh, Teaching Associate, Dept. Of Agronomy AKS University
- 9. Ms. Prachi Awadhiya, Teaching Associate, Dept. Of Agronomy AKS University

Course	Program Outcomes Program Specific Outcome													
Outcomes	PO1	PO2	PO3	PO	PO5	PO6	PO7	PO8	PO9	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
				4										
	Specific	Wide	Detailed	Use	Detail	Create	Student	Student	Understa	Enable to	Acquaintin	То	Apply	То
	knowledg	knowle	knowled	appr	ed	, select	will	will apply	nd the	recognize	g with	undertake	researc	underst
	e of	dge in	ge	opri	know	and	apply	basic	impact of	and	basic	teaching	h and	and and
	various	the	regardin	ate	ledge	apply	various	concepts	the	examine	concepts	research	experti	analyze
	branches	concer	g	scie	of	an	statistic	in	professio	the	theories	and	se in	the
	of	ning	package	ntifi	cultiv	approp	al	laboratory	nal expert	relationshi	and	extension	resolvi	current
	agronomy	subject	and	с	ation	riate	method	techniques	solutions	ps	terminolog	activates	ng the	issues
	will be	which	practice	met	practi	techni	s to	during	in	between	y of	along with	proble	that are
	made	will	s soil	hod	ces,	ques,	analyze	their	societal	inputs and	Agronomy.	administrat	ms of	occurrin
	specialize	improv	fertilizer	S	soil,	resour	their	research	and	outputs in		ive and	existin	g in
	d and to	e the	and	coll	fertili	ces	master	work	environm	their		consultanc	g farm	local
	provide	farmers	water	abor	zers,	and	researc		ental	agricultur		y services.	in the	and
	knowledg	conditi	manage	atio	water	moder	h work		contexts,	al field to			periph	global
	e	on	ment of	n	mana	n it			and	make			ery of	agricult
	disseminat	throug	producti	with	geme	tools			demonstr	effective			univer	ure and
	ion	h	ve crop	stati	nt and	in			ate the	and			sities.	how
	regarding	student	aspects.	stics	plant	impro			knowledg	profitable				they
	various	's		alon	prote	vemen			e of, and	decisions.				will
	technique	contrib		g	ction	t of			need for	То				affect
	of farming	utions.		with	econo	agrono			sustainabl	understan				futuristi
	and			eval	mic	mical			e	d the				с
	farming			uati	associ	packag			developm	mechanics				agricult
	system in			on	ated	e and			ent in	of agri				ure
	India			whi	with	practic			Agricultu	Entrepren				
				ch	farmi	es.			re.	eurship.				
				w1ll	ng									
				prov	enter									
				ed	prises									

Cos, POs and PSOs Mapping Course Code:-Agron- 501 Course Title: - Modern concept in crop Production

				to deci sion in vari ous part of agri cult ure										
CO1-Impart the modern concepts of crop production including tillage, optimization of plant growth population and planting geometry.	3	2	3	1	3	3	1	1	3	3	1	2	3	1
CO2 Discuss about growth regulators and their role in agriculture with plant nutrition and disease tolerance in field crop.	3	3	3	1	3	3	1	1	3	3	1	3	2	1

CO3 Implementatio n and recognition of organic farming with the concept of ideal plant types.	3	2	1	3	2	3	1	1	3	3	2	2	1	2
CO 4 Describe he impact of atest crop management practices on crop productivity and resource use efficiency.	3	2	1	3	1	3	1	1	1	3	1	3	2	1
CO5 Analyzing the crop growth analysis along with crop modelling in precision farming.	3	1	2	3	1	3	1	1	1	2	3	1	1	1

Legend: 1 – Low, 2 – Medium, 3 – High

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction(LI)	Classroom Instruction (CI)	Self Learning (SL)
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO1-Impart the modern concepts of crop production including tillage, optimization of plant growth population and planting geometry.	SO1.1 SO1.2 SO1.3 SO1.4		Unit-1 .Crop growth analysis in relation to environment agro- ecological zones of India 1.1, 1.2,1.3,1.4,1.5.	As mentioned in page number
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO2 Discuss about growth regulators and their role in agriculture with plant nutrition and disease tolerance in field crop.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5		Unit-2 Quantitative agro biological principles and inverse yield nitrogen law mischerlich yield equation. Its interpretation and applicability, Baule unit 1.1, 1.2,1.3,1.4,1.5	As mentioned in page number
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO3 Implementation and recognition of organic farming with the concept of ideal plant types.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5		Unit-3 Effect of lodging in cereals; physiology of grain yield in cereals; optimization of plant population and planting geometry in relation to different resources, concept of ideal plant type and crop modeling for desired crop yield. 1.1, 1.2,1.3,1.4,1.5	As mentioned in page number
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO 4 Describe the impact of latest crop management practices on crop productivity and resource use efficiency.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5		Unit 4 Scientific principles of crop production; crop response production functions; concept of soil plant relations; yield and environmental stress, use of growth hormones and regulators for better adaptation in stressed condition. 1.1, 1.2,1.3,1.4 1.5	As mentioned in page number
PO 1,2,3,4,5,6 7,8,9,10,11,12	CO5 Analyzing the crop growth analysis along with crop	SO1.1 SO1.2		Unit 5 Integrated farming systems, organic farming, and resource conservation	As mentioned in page number

Course Curriculum Map: Modern concept in crop Production

	modelling in precision	SO1.3	technology including modern concept of
PSO 1,2, 3, 4, 5	farming.	SO1.4	tillage dry farming determining the nutrient
		801.5	needs for yield potentiality of crop plants,
		0010	concept of balance nutrition and
			integrated nutrient management; precision
			agriculture.
			Modem crop production concepts: soil less
			cultivation, Aeroponic, Hydroponic,
			Robotic and terrace farming. use of GIS,
			GPS and remote sensing in modem
			agriculture, precision farming and protected
			agriculture.
			1.1, 1.2, 1.3, 1.4 1.5



AKS University Faculty of Agriculture Science and technology Department of Agronomy Curriculum of M.Sc.(Ag)Agronomy Program

Course Code:	Agron -501
CourseTitle:	Principles And Practices Of Soil Fertility and Nutrient
Pre-requisite:	Management Student should have basic knowledge of soil fertility and nutrient management, Principles, and concept of sustainable agriculture. Organic farming system and Nutrient use efficiency and fertility status in the soil.
Rationale:	The students should be acquainted with the knowledge of soil fertility and nutrient management. 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:

Agron501.1To impart knowledge of fertilizer and nutrient and nutrients status of PGstudents.

Agron501.2To acquaint skillness towards application of organic manures for pushing up the production in natural farming

Agron501.3 Student of PG will able to acquire knowledge in increasing nutrients use efficiency by observing economical aspects. To get knowledge on sustainable agricultural practices such as organic farming.

Agron501.4 To judge the fertility status in the soil by students.

Agron501.5 To categorize the fertilizers in different groups as per availability of nutrients elements e.g. single, double and multiple nutrients container.

SchemeofStudies:

Board					Sche	TotalCred			
ofStud y	Cours e	CourseTitle	Cl	LI	SW	SL	Total StudyHours(CI+ L	its (C)	
	Code						I+SW+SL)		
Program Core (SDGs)	AGRO- 501	Principles and PracticesofSoil Fertility and Nutrient Management	3	1	1	1	6	3	

 Legend:
 CI:ClassroomInstruction(Includesdifferentinstructionalstrategiesi.e.Lecture(L)andTutorial (T)andothers),

 LI:LaboratoryInstruction(IncludesPracticalperformancesinlaboratoryworkshop,fieldorotherlocatio

nsusing different instructional strategies) SW:SessionalWork(includesassignment, seminar, miniprojectetc.), SL:SelfLearning,

C: Credits.

Note: SW&SLhastobeplannedandperformedunderthecontinuousguidanceandfeedbackof teachertoensureoutcome of Learning.

SchemeofAssessment:

Theory

			SchemeofAssessment(Marks)									
Boardof Study					End Semeste	Total Mark						
	Cou seC ode	CourseTitl e	Class/ Home Assig nment 5num ber3 marks	ClassT est2 (2 bestout Of3) 10mar kseach (CT)	Semina rone (SA)	Clas sAct ivity anyo ne	Class Attendance (AT)	TotalMarks (CA+CT+SA+C	r Assessm ent	(PRA		
			each(CA)			(CAT)		AT+AT)	(ESA)	+ ESA)		
Progra m Core (SDGs)	Agro- 501	Principle s and Practices of Soil Fertility and Nutrient Manage ment	15	20	5	5	5	50	50	100		

Course-CurriculumDetailing:

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.

Agron 501.1 To impart knowledge of fertilizer and nutrient and nutrients status of PG students.

ApproximateHours

Item	Appx Hrs.
Cl	4
LI	4
SW	1
SL	2
Total	11

SessionOutcomes (SOs)	Laboratory Instruction	ClassroomInstruction (CI)	Self- Learning		
	(LI)	()	(SL)		
SO1.1 Understand the soil fertility	1. Determination	Unit-1. Soil fertility and	1. Soil fertility		
and productivity.	of soil pH and	productivity - factors affecting;	and productivity -		
SO1.2 Understand the Soil	SOILEC	features of good soil management;	factors affecting		
Fertility and management system.	of soil organic C	problems of supply and	features of goodsoil		
	or som organie e	availability of nutrients; relation	management.		
SO1.3Understandthe Relationship between nutrient supply and crop growth.SO1.4Understand the organic farming.		 growth; organic farming – basic concepts and definitions. 1.1 Introduction to soil fertility and productivity and its factors affecting. 1.2 Indices and its features of good soil management. 1.3 Introduction relationship between nutrient supply and crop growth. Like nutrient upply all major and micro nutrients. 	2. Organic farming-basic concepts and definitions.		
		1.4 Explain the organic farming and its definition and concept.			

SW-1SuggestedSessionalWork(SW): Assignments What is Soil fertility and productivity? definition, in dices and its importance and its management in soil fertility and nutrient status.

a. OtherActivities(Specify):

Research on study soil analysis of physical chemical and biological properties for the Satna Region.

Agron511.2 To acquaint skillness towards application of organic manures for pushing up the production in natural farming.

ApproximateHours

Item	AppxHrs.
Cl	6
LI	2
SW	1
SL	1
Total	12

	SessionOutcomes (SOs)	Session((S	SessionOutcomes (SOs)	Laboratory Instruction (LI)	ClassroomInstruction (CI)	Self- Learning (SL)
SOL.10nderstand the Criteria of essential nutrients and its their functions.Determination of available in, p, k and s ofUnit-2 Criteria of essential plant nutrients - their functions, nutrient deficiency symptoms; plant nutrients.1.Conceptof Sustainability in soil fertility and nutrients.SOL2 Understand the classification and nutrient deficiency symptoms under major and micro nutrients. SOL3 Understand the Transformation and dynamics of major plant nutrients in the soil Like Carbon, hydrogen and oxygen are mainly obtained from water and air.1.1 Introduction to Concept and Criteria of essential nutrients sustainability in Soil Fertility and Nutrient Management.1.2 Scope and Objectives of Soil Fertility and Nutrient Management 	SO1.1Understand the Criteria of essential nutrients and its their functions. SO1.2 Understand the classification and nutrient deficiency symptoms under major and micro nutrients. SO1.3 Understand the Transformation and dynamics of major plant nutrients in the soil Like Carbon, hydrogen and oxygen are mainly obtained from water and air. SO1.4.Understandthe Transformation like Nitrogen, Phosphorus, Potassium etc. SO1.5Understandthesoiland water management	O1.1 Understand ssential nutrients inctions. O1.2 Understand lassification and r eficiency sympto- nd micro nutrient. Inderstand the transformation an hajor plant nutrier ike Carbon, hydro re mainly obtaine ir. O1.4 .Understand transformation lik hosphorus, Potase O1.5 Understandt hanagement	O1.1Understand the Criteria of ssential nutrients and its their unctions. O1.2 Understand the assification and nutrient eficiency symptoms under major nd micro nutrients. SO1.3 inderstand the ransformation and dynamics of uajor plant nutrients in the soil ike Carbon, hydrogen and oxygen re mainly obtained from water and r. O1.4.Understandthe ransformation like Nitrogen, hosphorus, Potassium etc. O1.5Understandthesoiland water anagement	Determination of available in, p, k and s of soil	 Unit-2 Criteria of essentiality of nutrients; Essential plant nutrients – their functions, nutrient deficiency symptoms; transformation and dynamics of major plant nutrients. 1.1 Introduction to Concept and Criteria of essential nutrients sustainability in Soil Fertility and Nutrient Management. 1.2 Scope and Objectives of Soil Fertility and Nutrient Management 1.3. production potential under Transformation and dynamics of major plant nutrients in the soil. 1.4 Production potential under Transformation like Nitrogen, Phosphorus, Potassium 1.5 Introduction to soil fertility and productivity and its advantages. 1.6 Mechanism of yield advantage in management of soil fertility and 	1.Conceptof Sustainability in soil fertility and nutrient management systems and farming systems.

Assignments:

Concept in Criteria of essential nutrients systems and farming systems, scope and Objectives production potential under Principles and Practices of Soil Fertility and Nutrient Management.

OtherActivities(Specify):

Research on study soil analysis of physical chemical and biological properties for the Satna Region.

Agron501.3 Student of PG will able to acquire knowledge in increasing nutrients use efficiency by observing economical aspects. To get knowledge on sustainable agricultural practices such as organic farming.

ApproximateHours

Item	AppxHrs.
Cl	6
LI	2
SW	1
SL	1
Total	10

SessionOutcome s (SOs)	Laboratory Instruction	ClassroomInstruction (CI)	Self- Learning (SL)
SO1.1Understand the Crop Diversification for sustainability SO1.2 Understand the organic farming and role of organic farming to maintain soil Fertility SO1.3Understandthecropresidue management; fertilizer use efficiency. SO1.4. Understand the organic concentrates their composition, availability, and cropresponses. SO1.5Understandtherecyclingof organic wastes and residue management.	Determination of soil organic carbon	 Unit-3 Preparation and use of farmyard manure, compost, green manures, vermicompost, iofertilizers and other organic oncentrates their composition, vailability and cropresponses; ecycling of organic wastes and esidue management. Soil less ultivation. 1.1 IntroductiontoCrop diversification. 1.2 Introduction to organic Farming and its effects on crop and soil. 1.3 Introduction to organic Farming and its role in sustainable agriculture and to maintain soil Fertility 1.4 Role of organic concentrates their composition, availability and crop responses. 1.5 Role of non-monetary Inputs and low cost technologies. 1.6 New research need on Sustainable agriculture and new innovation on sustainable agriculture. 	1.Study on allelopathic effect on crop and new research on sustainable agriculture.

Assignments:

Role of non-monetary Inputs and low cost technologies; research need on sustainable agriculture

b. OtherActivities(Specify):

NewResearchonsustainable agriculture

Agron501.4 To judge the fertility status in the soil by students.

ApproximateHours

Item	AppxHrs.
Cl	5
LI	2
SW	1
SL	1
Total	9

SessionOutcomes (SOs)	Laboratory Instruction (LI)	ClassroomInstruction (CI)	Self-Learning (SL)
 SO1.1 Understand Commercial fertilizers; composition, relative fertilizer value and cost. SO1.2Understand the different nutrients, residual effects and Fertilizer use efficiency. SO1.3Understandthecropresidue management; fertilizer use efficiency. SO1.4. Understand the fertilizer Use in intensive cropping system. SO1.5Understandtheadvanced Nutritional tools for big data analysis and interpretation. 	Determination of total n, p, k and s of soil Determination of total n,p,k, s in plant	 Unit-4 Commercial fertilizers; composition, relative fertilizer value and cost; crop response to different nutrients, residual effects and fertilizer use efficiency; agronomic, chemical and physiological, fertilizer mixtures and grades; methods of increasing fertilizer use efficiency; nutrient interactions. 1.1 IntroductiontoCommercial fertilizers. 1.2 diversification of crop and its importance for sustainability. 1.3 Introduction to organic farming and its role in Sustainable agriculture and to maintain soil Fertility 1.4 Introduction to management of crop residue and nutrient use efficiency. 1.5 The fertilizer methods of increasing fertilizer use Efficiency ; nutrient interactions. 	1.Study on crop diversification and Importance of organic farming for the sustainable agriculture.

Assignments:

Crop diversification for sustainability; role of organic matter in the maintenance of soil Fertility; crop residue management; fertilizer use efficiency

c. OtherActivities(Specify):

Research on nutrient use efficiency.

Agron501.5 To categorize the fertilizers in different groups as per availability of nutrientselementse.g. single, double and multiple nutrients containers.

ApproximateHours

Item	AppxHrs.
Cl	4
LI	2
SW	1
SL	1
Total	8

SessionOutcomes	Laboratory Instruction	ClassroomInstruction (CD)	Self- Learning
(503)	(LI)		(SL)
SO1.1 Understand the Time and	Computation	Unit-5 Time and methods of	1.Study on plant
methods of manures and fertilizers	of optimum	manures and fertilizers	Time and methods of
SO1 2UnderstandthePlantfoliar	and economic	application; foliar	manures and
application and its concept	yield	Application and its concept; relative performance of	fertilizers
······································		organic and inorganic	
SO1.3Understandtheorganicand		nutrients; economics of	
inorganic nutrients		fertilizer use ;integrated	
SO1 4 Understand the plant		nutrient management ;use of	
growth use of vermicompost and		vermicompost and residue	
residue wastes in crops.		wastes in crops.	
		1.1 Time and methods of manures	
		and fertilizers	
		1.2 Introduction to Plant	
		foliar application and its	
		concept.	
		1.3 Introduction to organic and In	
		organic nutrients	
		1.4 Introduction to the plant growth	
		regulator and their	
		Role in sustainability	

Assignments: Understand the Time and methods of manures and fertilizers and their role in sustainability

d. OtherActivities(Specify):

Study on Time and methods of manures and fertilizers and their role in sustainability.

Brief of Hours suggestedf or the Course Outcome

Course Outcomes	Class Lecture (Cl)	Laboratory Instructi on (LI)	Sessiona l Work (SW)	Self Learnin g (Sl)	Totalhour (Cl+LI+SW +Sl)
Agron501.1 To impart knowledge of fertilizer and nutrient and nutrients status of PGstudents.	4	4	1	2	11
Agron501.2 To acquaint skillness towards application of organic manures for pushing up the production in natural farming	6	2	1	1	10
Agron501.3 Student of PG will able to acquire knowledge in increasing nutrients use efficiency by observing economical aspects. To get knowledge on sustainable agricultural practices such as organic farming.	6	2	1	1	10
Agron501.4 To judge the fertility status in the soil by students.	5	2	1	1	9
Agron501.5 To categorize the fertilizers in different groups as per availability of nutrients elements e.g. single, double and multiple nutrients container	4	2	1	1	8
TotalHours	25	12	5	6	48

${\small Suggestion for EndSemesterAssessment}$

CO	UnitTitles		arks Dis	tribution	Total
		R	U	Α	Marks
CO-1	Unit-1. Soil fertility and productivity - factors affecting; features of good soil management; problems of supply and availability of nutrients; relation between nutrient supply and crop growth; organic farming-basic concepts and definitions.	03	01	01	05
CO-2	Unit-2Criteria of essentiality of nutrients; Essential plant nutrients their functions, nutrient deficiency symptoms; Transformation and dynamics of major plant nutrients.	02	06	02	10
CO-3	Unit-3 Preparation and use of farmyard manure, compost, green manures, vermicompost, Biofertilizers and other organic concentrates their composition, availability and crop responses; recycling of organic wastes and residue management. Soil less cultivation.	03	07	05	15
CO-4	Unit-4 Commercial fertilizers; composition, relative fertilizer value and cost; crop response to different nutrients, residual effects and fertilizer use efficiency; agronomic, chemical and physiological, fertilizer mixtures and grades; methods of increasing fertilizer use efficiency; nutrient interactions.	-	10	05	15
CO-5	Unit-5 Time and methods of manures and fertilizers application; foliar application and its concept; relative performance of organic and inorganic nutrients; economics of fertilizer use; integrated nutrient management; use of vermicompost and residue wastes in crops.	03	02	-	05
	Total	11	26	13	50

Legend:

R:Remember,

U:Understand,

A:Apply

TheendofsemesterassessmentforPrinciplesandpracticesofsoilfertilityandnutrients management will be held with written examination of 50 marks

Note .DetailedAssessmentrubricneedtobepreparedbythecoursewiseteachersforabovetasks.

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

SuggestedInstructional/ImplementationStrategies:

- 1. ImprovedLecture
- 2. Tutorial
- 3. CaseMethod
- 4. GroupDiscussion
- 5. RolePlay
- 6. Visittofield
- 7. Demonstration
- 8. ICTBasedTeachingLearning(VideoDemonstration/TutorialsCBT, Blog,Facebook,Twitter, Whatsapp, Mobile, Online sources)
- 9. Brainstorming

Suggested LearningResources:

(a)]	Books:			
S. No.	Title	Author	Publisher	Edition& Year
1	The nature and propertiesofsoils	bradyncandweil rr	13thed.Pearson edu.	2002
2	Growthandmineral nutrition of field crops.	fageriank, baligarvcand jones ca	Marceldekker.	1991
3	Soilfertilityand fertilizers. 7th	havlinjl, beatonjd, tisdalesland nelson wl.	-	2006
4	Soil fertility managementfor sustainable agriculture	prasadrand power jf	CrcPr ess.	1997
5	Manuresand fertilizers	yawalkarks, agrawaljpandbokd e s	Agri-hortipubl.	2000

CurriculumDevelopmentTeam

- 1. Dr.T.Singh, Professor&headDept.ofAgronomy, FAST
- 2. Dr.V.D.Dwivedi, Professor, Dept. of Agronomy, FAST
- 3. Dr.H.S.Kushwah, Professor, Dept. of Agronomy, MGCGVV
- 4. Dr.D.P.Chaturvedi,AssistantProfessor,Dept.ofAgronomy,FAST
- 5. Dr.P.K.Bagri, AssistantProfessor, Dept. of Agronomy, FAST
- 6. Mr.AmitSinghTiwariAssistantProfessor,Dept.ofAgronomy,FAST
- 7. Mr.SanjayLillhare,AssistantProfessor,Dept.ofAgronomy,FAST
- 8. Mis.PrachiSinghTeaching,Associate,Dept.ofAgronomy,FAST
- 9. Mis.PrachiAwadhiya,TeachingAssociate,Dept.ofAgronomy, FAST

Cos, POs and PSOs Mapping Course Code:-Agron- 501 Course Title: -Principles and Practices of Soil Fertility and Nutrient

Course	Program O	utcomes			- 1			•	·	Program S	pecific Outco	me		
Outcomes	PO1	PO2	PO3	PO	PO5	PO6	PO7	PO8	PO9	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
				4										
	Specific knowledg e of various branches of agronomy will be made specialize d and to provide knowledg e disseminat ion regarding various technique of farming and farming system in India	Wide knowle dge in the concer ning subject which will improv e the farmers conditi on throug h student 's contrib utions.	Detailed knowled ge regardin g package and practice s soil fertilizer and water manage ment of producti ve crop aspects.	Use appr opri ate scie ntifi c met hod s coll abor atio n with stati stics alon g with eval uati on whi ch with eval uati on whi ch with stati stics alon g with eval uati on whi ch with stati on g with eval uati on whi ch with stati on g with eval uati on g with eval uati on g with stati on g with stati on g with stati on g with stati on g with stati uati on g with stati on g with stati on g with stati on g with stati on g with stati on g with stati on g with stati on g with stati on g with stati on g with stati on g with stati on g stati on g stati on g stati on g stati stat	Detail ed know ledge of cultiv ation practi ces, soil, fertili zers, water mana geme nt and plant prote ction econo mic associ ated with farmi ng enter prises	Create , select and apply an approp riate techni ques, resour ces and moder n it tools in impro vemen t of agrono mical packag e and practic es.	Student will apply various statistic al method s to analyze their master researc h work	Student will apply basic concepts in laboratory techniques during their research work	Understa nd the impact of the professio nal expert solutions in societal and environm ental contexts, and demonstr ate the knowledg e of, and need for sustainabl e developm ent in Agricultu re.	Enable to recognize and examine the relationshi ps between inputs and outputs in their agricultur al field to make effective and profitable decisions. To understan d the mechanics of agri Entrepren eurship.	Acquaintin g with basic concepts theories and terminolog y of Agronomy.	To undertake teaching research and extension activates along with administrat ive and consultanc y services.	Apply researc h and experti se in resolvi ng the proble ms of existin g farm in the periph ery of univer sities.	To underst and and analyze the current issues that are occurrin g in local and global agricult ure and how they will affect futuristi c agricult ure

CO1- To impart knowledge of fertilizer and nutrient and nutrients status of PGstudents	1	3	3	1	2	1	3	3	3	3	1	2	3	1
CO2 To acquaint skillness towards application of organic manures for pushing up the production in natural farming	3	1	3	3	1	2	1	3	3	1	1	3	2	1
CO3 Student of PG will able to acquire knowledge in increasing nutrients use efficiency by observing economical aspects. To get knowledge on sustainable agricultural practices such as organic farming.		3	3	1	2	1	3	3	1	3	2	2	1	2

CO 4 To judge the fertility status in the soil by students.	3	2	1	3	1	3	1	3	3	1	2	1	3	1	
CO5 To categorize the fertilizers in different groups as per availability of nutrients elements e.g. single, double and multiple nutrients container	3	1	2	1	3	3	1	1	2	1	3	1	3	1	3

Legend: 1 – Low, 2 – Medium, 3 – High

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction(LI)	Classroom Instruction (CI)	Self Learning (SL)
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO1- To impart knowledge of fertilizer and nutrient and nutrients status of PGstudents	SO1.1 SO1.2 SO1.3 SO1.4		Unit-1 .Soil fertility and productivity - factors affecting; featuresofgoodsoilmanagement;problemsofsupplyand availability of nutrients; relation between nutrient supply andcropgrowth;organicfarming–basicconceptsand definitions. 1.1, 1.2,1.3,1.4	As mentioned in page number
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO2 To acquaint skillness towards application of organic manures for pushing up the production in natural farming	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5		Unit-2 Criteria of essentiality ofnutrients;Essential plant nutrients-theirfunctions,nutrientdeficiencysymptoms; Transformationanddynamicsofmajorplantnutrients. 1.1, 1.2,1.3,.4,1.5	As mentioned in page number
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO3 Student of PG will able to acquire knowledge in increasing nutrients use efficiency by observing economical aspects. To get knowledge on sustainable agricultural practices such as organic farming.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5		 Unit-3Preparation and use of farmyard manure, compost, green manures, vermicompost, Biofertilizers and other organic concentrates their composition, availabilityandcropresponses;recyclingof organic wastes and residue management. Soil less cultivation. 1.1, 1.2,1.3,1.4,1.5 	As mentioned in page number
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO 4 To judge the fertility status in the soil by students.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5SO1		Unit 4 Commercial fertilizers; composition, relative fertilizer value and cost; crop response to different nutrients, residual effects and fertilizer use efficiency; agronomic, chemical and physiological, fertilizer mixtures andgrades;methodsofincreasingfertilizeruseefficiency; nutrient interactions. 1.1, 1.2,1.3,1.4 1.5	As mentioned in page number
PO 1,2,3,4,5,6 7,8,9,10,11,12	CO5 To categorize the fertilizers in different groups as	SO1.1 SO1.2 SO1.3		Unit 5 Time and methods of manures and fertilizers application; foliar application and its concept; relative	As mentioned in page number

Course Curriculum Map:Principles and Practices of Soil Fertility and Nutrient

PSO 1,2, 3, 4, 5	per availability of	SO1.4	performanceoforganicandinorganicnutrients; economics of	
	nutrients elements	SO	fertilizer use; integrated nutrient management; use of	
	e.g. single, double		vermicompost and residue wastes in crops.	
	and multiple		1.1, 1.2, 1.3, 1.4	
	nutrients container			



AKS University

Faculty of Agriculture Science and Technology

Department of Agronomy Curriculum of M.Sc Ag Agronomy Program

Course Code: Agron 506

Course Title: Agronomy of major cereals, pulses (2+0)

- **Pre-requisite:** Student should have specific knowledge of crops, cultivation practices and their management.
- **Rationale:** The students should be acquainted with the knowledge of Crops and patterns refer to the types and sequences of crops that are grown. They are involve 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:

Agron 506.1 pg students of agronomy will become expert and determine crop husbandry of cereals and pulses crops.

Agron 506.2 pg students acquire knowledge towards nutrition of crops and its quality to develop architectural characteristics.

Agron 506.3 student may become expert in processing technology of cereals and pulses to increase value.

Agron 506.4 students will able to become expert for resolving the problems of soil, water and nutrient status.

Agron 506.5 students may acquaint to examine the different new varieties of cereals and pulses

Scheme of Studies:

Catego ry of	Course Code				st	Sche tudies(Ho	me of ours/Week)	Total Cred ts
course		Course Title	Cl	LI	SW	SL	Total Study Hours(CI +LI+SW+SL)	(C)
Progra m Core (PCCs)	Agron 506	Agronomy of major cereals, pulses	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 ofteacherto ensure the outcome of Learning.

Scheme of Assessment:

Theory

						Schem	ne of Assessme	ent (Marks)		
Board of Study	Cous e Code	Course Title			End Semest	Total Mark				
			Class/ Home Assig nmen t 5 numb	Class Test 2 (2 best out of	Semi nar one	Class Activ ity any one	Class Attendance	Total Marks	er Assess ment	S
			er 3 marks each (CA)	3) 10 marks each (CT)	(SA)	(CA T)	(AT)	(CA+CT+SA+C AT+AT)	(ESA)	(PRA + ESA)
Program Core (PCC)	Agro nn 506	Agronomy of major cereals and pulses.	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.

Agron 506.1 pg students of agronomy will become expert and determine crop husbandry of cereals and pulses crops

Approximate Hours

Item	Appx Hrs.
Cl	06
LI	0
SW	1
SL	1
Total	08

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO1.1 pg students of agronomy will become expert SO1.2 Determine crop husbandry of cereals and pulses crops.		Unit 1 origin and history, area and production, classification, improved varieties, adaptability, climate, soil, water and cultural requirements, nutrition, quality components, handling and processing of the produce for maximum production of wheat, barley, oat. 1.1 origin and history, area and production, classification,	 origin and history, area and production, classification,. improved varieties, adaptability, climate, soil, water

1.2 improved varieties, adaptability.	
1.3 climate, soil, water	
1.4 cultural requirements,	
1.5 nutrition, quality components,	
1.6 handling and processing of the produce for maximum production of wheat, barley, oat.	

Assignments:

What is Cropping systems? definition, indices and its importance and physical resources and its management in cropping system.

a. Other Activities (Specify):

Agron 506.2 pg students acquire knowledge towards nutrition of crops and its quality to develop architectural characteristics.

Approximate Hours						
Item	Appx Hrs.					
Cl	06					
LI	0					
SW	2					
SL	1					
Total	09					

Session Outcomes(SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self- Learning (SL)
SO1.1 pg students acquire knowledge towards nutrition of crops SO1.2 Its quality to develop architectural characteristics.		 Unit 2 Origin and history, area and production, classification, improved varieties, adaptability, climate, soil, water and cultural requirements, nutrition, quality components, handling and processing of the produce for maximum production of rice, maize, sorghum, pearlmillet, fingermillet. 1.1 Origin and history, area and production, classification, 1.2 improved varieties, adaptability, 1.3 climate, soil, water 1.4 culturalrequirements, 1.5 nutrition quality components, 1.6 handling and processing of the produce for maximum production of rice, maize, sorghum, pearlmillet, fingermillet. 	 Origin and history, area and production, classification of rice. 2improved varieties, adaptability, climate of maize.

Assignments:

What is Cropping systems? definition, indices and its importance and physical resources and its management in cropping system.

b. Other Activities (Specify): Research on most suitable Cropping systems for the Satna Region.

Assignments:

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

c. Other Activities (Specify):

Research on most suitable intercropping for the Satna Region.

Agron 506.3 student may become expert in processing technology of cereals and pulses to increase value.

Approximate Hours								
Item	Appx Hrs.							
Cl	06							
LI	0							
SW	1							
SL	1							
Total	8							

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO1.1 Student may become expert in processing technology of cereals and pulses to increase value. SO1.2 Student may become expert in processing technology of pulses to increase		 Unit 3 Origin and history, areaand production, classification, improvedvarieties, adaptability, climate, soil, water and cultural requirements, nutrition, quality components, handling and processing of the produce for maximum production of pea, chickpea, lentil 1.1 Origin and history, area and production, 1.2 classification, improved varieties, adaptability, 1.3 climate, soil, water 1.4 cultural requirements, 1.5 nutrition, quality components, 1.6 handling and processing of the produce for maximum production of pea, chickpea, lentil 	 climate, soil, water and cultural requirement s of chickpea handling and processing of the produce for maximum production of pea

Assignments:

Role of non-monetary Inputs and low-cost technologies; research need on sustainable agriculture

d. OtherActivities(Specify):

New Research on sustainable agriculture.

Agron 506.4 Students will able to become expert for resolving the problems of soil, water and nutrient status.

Approximate Hours

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

Session Outcomes(SOs)	Laboratory	Classroom Instruction(CI)	Self-
	Instruction		Learning
	(LI)		(SL)
SO1.1 students will able to		Unit 4	1. cultural
become expert for resolving the		Origin and history, areaand	requirements,
problems of soil, water		production,	nutrition and
		classification, improved	quality
SOI.2 Students will able to		varieties, adaptability,	components of
become expert for resolving the		climate, soil, water and	pigeon pea.
problems of numeric status.		cultural requirements,	
		nutrition, quality	2.Handling and
		components, handling	processing of
		and processing of the	the produce for
		produce for maximum	maximum
		production of green	production of
		gram, black gram, pigeon	green gram,
		pea.	black gram,
		4.1 Origin and history, area	
		and production,	
		4.2 classification, improved	
		varieties, adaptability,	
		4.3 climate, soil, water	
		4.4 cultural requirements,	
		4.5 nutrition and quality	
		components,	
		4.6 handling and processing	
		of the produce for maximum	
		production of green gram,	
		black gram, pigeon pea	

Assignments:

Crop diversification for sustainability; role of organic matter in maintenance of soil Fertility; crop residue management; fertilizer use efficiency

e. Other Activities(Specify):

Research on nutrient use efficiency

Agron 506.5 Students may acquaint to examine the different new varieties of cereals and pulses.

Approxima	ate Hours
Item	Appx Hrs.
Cl	06
LI	0
SW	1
SL	1
Total	8

Session Outcomes(SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO1.1 students will able to become expert for resolving the problems of soil, waterSO1.2 Students will able to become expert for resolving the problems of nutrient status.		 Unit 4 Origin and history, area and production, classification, improved varieties, adaptability, climate, soil, water and cultural requirements, nutrition, quality components, handling and processing of the produce for maximum production of green gram, black gram, pigeon pea. 1.1 Origin and history, area and production, 1.2 classification, improved varieties, adaptability, 1.3 climate, soil, water 1.4 cultural requirements, 1.5 nutrition and quality components, 1.6 handling and processing of the produce for maximum 	 cultural requirements, nutrition and quality components of pigeon pea. Handling and processing of the produce for maximum production of green gram, black gram,

Brief of Hours suggested for the Course Outcome

Course	Class	Laboratory	Sessionl	Self-	Total hour
Outcomes	Lecture (Cl)	(LI)	work (SW)	Learnin g (Sl)	(Cl+SW+ Sl)
Agron 506.1 pg students of agronomy will become expert and determine crop husbandry of cereals andpulses crops.	5	0	1	1	08
Agron 506.2 pg students acquire knowledge towardsnutrition of crops and its quality to develop architectural characteristics.	6	0	2	1	09
Agron 506.3 student may become expert in processing technology of cereals and pulses toincrease value.	6	0	1	1	8
Agron 506.4 students will able to become expert forresolving the problems of soil, water and nutrient status.	6	0	1	1	8
Agron 506.5 students may acquaint to examine the different new varieties of cereals and pulses.	6	0	1	1	8
Total Hours	29	0	7	6	41

Suggestion for End Semester Assessment

CO	Unit Titles	Μ	Total		
		R	U	Α	Mark
CO-1	Unit 1 origin and history, area and production, classification, improved varieties, adaptability, climate, soil, water and cultural requirements, nutrition, quality components, handling and processing of the produce for maximum production of wheat, barley, oat.	08	03	02	13
CO-2	Unit 2 Origin and history, area and production, classification, improved varieties, adaptability, climate, soil, water and cultural requirements, nutrition, quality components, handling and processing of the produce for maximum production of rice, maize, sorghum, pearlmillet, fingermillet.	08	04	02	12
CO-3	Unit 3 Origin and history, area and production, classification, improved varieties, adaptability, climate, soil, water and cultural requirements, nutrition, quality components, handling and processing of the produce for maximum production of pea, chickpea, lentil	07	03	02	12
CO-4	Unit 4 Origin and history, area and production, classification, improved varieties, adaptability, climate, soil, water and cultural requirements, nutrition, quality components, handling and processing of the produce for maximum production of green gram, black gram, pigeon pea.	08	02	03	13
Total		29	12	09	50

Legend:

R: Remember,

U: Understand,

A: Apply

The end of semester assessment for Introduction to principles and practices of organic farming will beheld with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for abovetasks. 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 farm/ field
- 6. Demonstration

Suggested Learning Resourcese

	(U) DOORS.			
S. No.	Title	Author	Publisher	Edition & Year
1	Science of field crop production.	hunsigi g and krishna kr.	Oxford & ibh.	1998.
2	Advances in pulse production technology.	jeswani lm and baldev b	icar	1997
3	Seed technology.	khare d and bhale ms.	Scientific publ	2000
4	Maize production in india:	kumar ranjeet and singh np	golden grain in transition	2003

(a) Books :

Curriculum Development Team

- 1. Dr. T. Singh, Professor & head Dept. of Agronomy, FAST
- 2. Dr. V. D. Dwivedi, Professor, Dept. of Agronomy, FAST
- 3. Dr. H. S. Kushwah, Professor, Dept. of Agronomy, MGCGVV
- 4. Dr. D. P. Chaturvedi, Assistant Professor, Dept. of Agronomy, FAST
- 5. Dr. P. K. Bagri, Assistant Professor, Dept. of Agronomy, FAST
- 6. Mr. Amit Singh Tiwari Assistant Professor, Dept. of Agronomy, FAST
- 7. Mr. Sanjay Lillhare, Assistant Professor, Dept. of Agronomy, FAST
- 8. Mis. Prachi Singh Teaching, Associate, Dept. of Agronomy, FAST
- 9. Mis. Prachi Awadhiya, Teaching Associate, Dept. of Agronom

Cos, POs, and PSOs Mapping Course Code:-Agron-506 Course Title: - Agronomy Of Major Cereals, Pulses

Course	Program Ou	itcomes								Program Sp	ecific Outcom	e		
Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
	Specific	Wide	Detailed	Use	Detail	Create,	Student	Student	Understan	Enable to	Acquainting	То	Apply	То
	knowledge	knowle	knowled	appr	ed	select	will	will apply	d the	recognize	with basic	undertake	researc	understa
	of various	dge in	ge	opri	knowl	and	apply	basic	impact of	and	concepts	teaching	h and	nd and
	branches of	the	regardin	ate	edge	apply	various	concepts in	the	examine	theories and	research and	experti	analyze
	agronomy	concern	g	scie	of	an	statistic	laboratory	profession	the	terminology	extension	se in	the
	will be	ing	package	ntifi	cultiva	appropr	al	techniques	al expert	relationshi	of	activates	resolvi	current
	made	subject	and	с	tion	iate	method	during their	solutions	ps between	Agronomy.	along with	ng the	issues
	specialized	which	practices	meth	practic	techniq	s to	research	in societal	inputs and		administrati	proble	that are
	and to	will	soil	ods	es,	ues,	analyze	work	and	outputs in		ve and	ms of	occurrin
	provide	improve	fertilizer	colla	soil,	resourc	their		environme	their		consultancy	existin	g in
	knowledge	the	and	bora	fertiliz	es and	master		ntal	agricultural		services.	g farm	local and
	disseminati	farmers	water	tion	ers,	modern	research		contexts,	field to			in the	global
	on	conditio	manage	with	water	it tools	work		and	make			periphe	agricultu
	regarding	n	ment of	stati	manag	in			demonstrat	effective			ry of	re and
	various	through	producti	stics	ement	improv			e the	and			univers	how they
	technique	student'	ve crop	alon	and	ement			knowledge	profitable			ities.	will
	of farming	S	aspects.	g	plant	of			of, and	decisions.				affect
	and	contribu		with	protec	agrono			need for	То				futuristic
	farming	tions.		eval	tion	mical			sustainable	understand				agricultu
	system in			uatio	econo	packag			developme	the				re
	India			n	mic	e and			nt in	mechanics				
				whic	associ	practic			Agricultur	of agri				
				h	ated	es.			e.	Entreprene				
				will	with					urship.				
				prov	farmin									
				ed to	g									
				deci	enterp									
				sion	rises.									
				in .										
				vari										
				ous										

				part of agric ultur e										
CO1- pg students of agronomy will become expert and determine crop husbandry of cereals and pulses crops.	3	3	3	1	1	3	3	1	3	2	1	1	3	3
CO2 pg students acquire knowledge towards nutrition of crops and its quality to develop architectural characteristic s.	3	3	3	3	1	3	2	1	1	3	1	3	3	1
CO3 student may become expert in	3	2	3	1	3	1	3	3	2	1	1	2	3	2

processing technology of cereals and pulses to increase value.														
CO 4 students will able to become expert for resolving the problems of soil, water and nutrient status.	3	2	1	1	3	3	2	1	1	3	1	3	2	3
CO5 students may acquaint to examine the different new varieties of cereals and pulses.	3	2	1	1	3	1	3	1	3	2	3	3	1	1

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map: Agronomy Of Major Cereals, Pulses

POs & PSOs	COs No.& Titles	SOs No.	Laboratory	Classroom Instruction (CI)	Self Learning (SL)
No.			Instruction(LI)		
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO1- pg students of agronomy will become expert and determine crop husbandry of cereals and pulses crops.	SO1.1 SO1.2		Unit 1 origin and history, area and production, classification, improved varieties, adaptability, climate, soil, water and cultural requirements, nutrition, quality components, handling and processing of the produce for maximum production of wheat, barley, oat. 1.1,1.2,1.3,1.4,1.5,1.6.	As mentioned in page number
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO2 pg students acquire knowledge towards nutrition of crops and its quality to develop architectural characteristics.	SO1.1 SO1.2		Unit 2 Origin and history, area and production, classification, improved varieties, adaptability, climate, soil, water and cultural requirements, nutrition, quality components, handling and processing of the produce for maximum production of rice, maize, sorghum, pearlmillet, fingermillet. 1.1,1.2,1.3,1.4,1.5,1.6.	As mentioned in page number
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO3 student may become expert in processing technology of cereals and pulses to increase value.	SO1.1 SO1.2		Unit 3 Origin and history, area and production, classification, improved varieties, adaptability, climate, soil, water and cultural requirements, nutrition, quality components, handling and processing of the produce for maximum production of pea, chickpea, lentil 1.1,1.2,1.3,1.4,1.5,1.6.	As mentioned in page number

PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO 4 students will able to become expert for resolving the problems of soil, water and nutrient status.	SO1.1 SO1.2	Unit 4 Origin and history, area and production, classification, improved varieties, adaptability, climate, soil, water and cultural requirements, nutrition, quality components, handling and processing of the produce for maximum production of green gram, black gram, pigeon pea. 1.1,1.2,1.3,1.4,1.5,1.6.	
PO 1,2,3,4,5,6	CO5 students may	SO1.1	Unit 5 Origin and history, area and As mentioned in page	
7,8,9,10,11,12	acquaint to	SO1.2	production, classification, improved number	
	examine the		varieties, adaptability, climate, soil,	
PSO 1,2, 3, 4, 5	different new		water and cultural requirements,	
	varieties of cereals		nutrition, quality components, handling	
	and pulses.		and processing of the produce for	
			maximum production of green gram,	
			black gram, pigeon pea.	
			1.1,1.2,1.3,1.4,1.5,1.6.	



AKS University

Faculty of Agriculture Science and technology Department of Agronomy Curriculum of M.Sc Ag Agronomy Program

Course Code:	Agron- 511 (2+0)
Course Title:	Cropping systems and sustainable agriculture
Pre-requisite:	Student should have basic knowledge of cropping system, concept of sustainable agriculture. Farming system and its types and Nutrient use efficiency and Ideotype concept.
Rationale:	The students should be acquainted with the knowledge of Cropping systems and patterns refer to the types and sequences of crops that are grown. They are involve 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:

Agron 511.1Students acquaint will familiar with the knowledge of Cropping systems physical resources, soil and water management in cropping systems.

Agron 511.2 students will able to acquaints knowledge about Concept of sustainability in cropping systems and farming systems and types of cropping system and its advantages.

Agron 511.3 Students will able to identify the interactions and allelopathic effects; competition relations and become become expert in calculate the monetary returns

Agron 511.4Students will able to acquaint knowledge to Crop diversification, role of organic matter in maintenance of soil Fertility, crop residue management and nutrient use efficiency.

Agron 511.5PG students will become expert in Plant ideotypes for drylands plant growth regulators and their role in sustainability.

Scheme of Studies:

Category					Scheme of studies (Hours/Week)			Total Credits
of	C		Cl	LI	SW	SL	Total Study	(C)
Course	Course	Course Title					Hours(CI+LI+SW	
	Code						+ SL)	

Cropping systems and sustainable	02	0	1	1	04	2
agriculture						

- 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

						Sch	eme of Assessment	(Marks)		
					Progr	essive Asse	ssment (PRA)		End Semester Assessm	Total Marks
Board of Study	Couse Code	Course Title	Class/H ome Assignm ent 5 number	Class Test 2 (2 best out of 3) 10 marks	Seminar one	Class Activit y any one	Class Attendance	Total Marks	ent	
			3 marks each (CA)	each (CT)	(SA)	(CAT)	(AT)	(CA+CT+SA+CAT+A T)	(ESA)	(PRA+ ESA)
Program Core (SDGs)	Agron- 511	Cropping systems and sustainable agriculture	10	40				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.

Agron511.1Students acquaint will familiar with the knowledge of Cropping systems physical resources, soil and water management in cropping systems.

Approximate nours							
Item	Appx Hrs.						
Cl	05						
LI	0						
SW	1						
SL	1						
Total	07						

A -----

Session Outcomes	Laboratory	Classroom Instruction	Self-
(SOs)	Instruction	(CI)	Learning
	(LI)		(SL)
SO1.1Understand the Cropping		Unit-1.Cropping systems:	1. Cropping
systems.		definition, indices and its	system and
		importance; physical	know the
SO1.2 Understand the cropping		resources, soil	importance of
system and farming		And water management in	cropping
system. physical resources.		cropping systems;	system and
		assessment of land use.	management
SO1.3 Understand the physical			of resources.
resources like soil, water		1.1 Introduction to cropping	2. The assessment
etc.		system and its benefit.	of land use
			according to the
SO1.4 Understand the soil and		1. Indices and its importance	crop
water management in		calculate the different indices	
cropping system.			
		1.3 Introduction to physical	
		resources, soil and water.	
		1.4 Explain the soil	
		And water management	
		intercropping systems	
		1.5 introduction to assessment	
		of land use.	

SW-1 Suggested Sessional Work(SW): Assignments:

What is Cropping systems? definition, indices and its importance and physical resources and its management in cropping system.

a. Other Activities (Specify):

Research on most suitable Cropping systems for the Satna Region.

Agron511.2 students will able to acquaints knowledge about Concept of sustainability in cropping systems and farming systems and types of cropping system and its advantages.

Approximate Hours						
Item	Appx Hrs.					
Cl	08					
LI	0					
SW	2					
SL	1					
Total	11					

Laboratory	Classroom Instruction	Self-
Instruction	(CI)	Learning
(LI)		(SL)
	Unit-2Concept of sustainability in	1.Concept of
	cropping systems and farming	sustainability
	systems, scope and	intercropping
	Objectives; production potential	systems and
	under monoculture cropping,	farming systems
	multiple cropping,	in satna region.
	Alley cropping, sequential	
	cropping and intercropping,	2.Intercropping
	mechanism of yield advantage	and its advantage
	In intercropping systems.	and farmers are
		benefited from
	1.1Introduction to Concept of	intercropping.
	sustainability in cropping systems	
	and farming systems	
	1.2 Scope and Objectives of cropping	
	systems and farming systems	
	1.3. production potential under	
	monoculture cropping, multiple	
	cropping	
	1 Anno du stion not setial un dan	
	1.4production potential under	
	multiple cropping.	
	1 5production potential under Alley	
	cropping	
	cropping	
	1 6production potential under	
	sequential cropping	
	sequential eropping	
	1.7 Introduction to intercropping and	
	its advantages	
	as an intrageo.	
	1.8 Mechanism of vield advantage in	
	intercropping systems.	
	Laboratory Instruction (LI)	Laboratory Instruction (L1)Classroom Instruction (CI)Instruction (L1)Unit-2Concept of sustainability in cropping systems and farming systems, scope and

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 intercropping for the Satna Region.

Agron511.3 Students will able to identify the interactions and allelopathic effects; competition relations and become become expert in calculate the monetary return.

Approximate Hours						
Item	Appx Hrs.					
Cl	06					
LI	0					
SW	1					
SL	1					
Total	8					

Session Outcomes (SOs)	Laboratory Instruction	Classroom Instruction (CI)	Self- Learning
CO1 1 Understand the Above and	(LI)	Unit 2 Above and below ground	(SL)
below ground interactions		interactions and allelonathic	allelonathic
below ground interactions		affects: competition relations:	effect on cron
601 2 Inderstand the allelensthic		Multi storied econoring and	and new
SO1.2 Onderstand the anelopathic		wield stability in intereronning	research on
effects of weed on crop, weed on		yield stability in intercropping,	sustainable
crop and crop on weed		role of non-monetary	agriculture
		Inputs and low cost	agriculture.
SOI.3 Understand the competition		technologies; research need on	
relations between plants and		sustainable agriculture.	
Multi-storied cropping and		1 Thursday is a charge and	
yield stability in intercropping		1.1 Introduction to above and	
		below ground interactions.	
SO1.4 . Understand the role of non-		12 Introduction to allelonathic	
monetary Inputs and low cost		1.2 Introduction to aneropathic	
technologies		and its effects on crop.	
		1.3 Introduction to competitive	
SO1.5 Understand the research need		relationship between crops	
on sustainable agriculture.		relationship between crops.	
		1.4 Multi-storied cropping and	
		vield stability in intercropping	
		yield stability in intereropping	
		1.5 Role of non-monetary	
		Inputs and low cost technologies	
		inputs and for cost teermologies.	
		1.6 New research need on	
		sustainable agriculture and new	
		innovation on sustainable	
		agriculture	
		agriculture.	

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

Agron511.4 Students will able to acquaint knowledge to Crop diversification, role of organic matter in maintenance of soil Fertility, crop residue management and nutrient use efficiency.

Approximate Hours

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

Session Outcomes (SOs)	Laboratory Instruction	Classroom Instruction (CI)	Self-Learning (SL)
SO1.1 Understand the Crop	(LI)	Unit-4 Crop diversification for	1. Study on crop
diversification for sustainability		matter in maintenance of soil	importance of organic
SO1. 2 Understand the organic		Fertility; crop residue	farming for the
farming and role of organic farming		efficiency and concept of	sustainable agriculture.
to maintain son retunty		fertilizer Use in intensive	
SO1.3 Understand the crop residue management; fertilizer use efficiency.		cropping system. Advanced nutritional tools for big data analysis and interpretation.	
SO1.4 .Understand the fertilizer Use in intensive cropping system.		1.1 Introduction toCrop diversification.	
SO1.5 Understand the advanced nutritional tools for big data analysis		1.2 .diversification of crop and its importance for sustainability.	
and interpretation.		1.3 .Introduction to organic farming and its role in sustainable agriculture and to maintain soil Fertility	
		1.4 Introduction to management of crop residue and nutrient use efficiency.	
		1.5 The fertilizer Use in	
		1.6 Advanced nutritional tools	
		for big data analysis and	
		interpretation.	

SW-1 Suggested Sessional Work(SW):

Assignments:

Crop diversification for sustainability; role of organic matter in maintenance of soil Fertility; crop residue management; fertilizer use efficiency

d. Other Activities(Specify):

Research on nutrient use efficiency. .

Agron511.5PG students will become expert in Plant ideotypes for drylands plant growth regulators and their role in sustainability.

Approximate Hours

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

Session Outcomes	Laboratory	Classroom Instruction	Self-
(SOs)	Instruction	(CI)	Learning
	(LI)		(SL)
SO1.1Understand the Plant		Unit-5Plantideotypes for	1.Study on plant
ideotypes.		drylands; plant growth	ideotypes and
		regulators and their role in	growth regulators.
SO1.2Understand the Plant		sustainability.	
ideotypes for drylands agriculture.			
		1.1Introduction toPlant	
SO1.3 Understand the plant growth regulators		ideotypes.	
C		1.2.1 Introduction toPlant	
SO1.4 .Understand the plant growth regulator and their role in sustainability		ideotypes for drylands agriculture.	
		1.3 .Introduction toplant growth regulators.	
		1.4 Introduction tothe plant growth regulator and their role in sustainability	

SW-1 Suggested Sessional Work(SW):

Assignments: Plant ideotypes for drylands; plant growth regulators and their role in sustainability

e. Other Activities (Specify):

Study on plant growth regulators 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 (Sl)	Total hour (Cl+SW+Sl)
Agron511.1Students acquaint will familiar with the knowledge of Cropping systems physical resources, soil and water management in cropping systems.	05	0	01	01	07
Agron511.2 students will able to acquaints knowledge about Concept of sustainability in cropping systems and farming systems and types of cropping system and its advantages	08	0	02	01	11
Agron511.3 Students will able to identify the interactions and allelopathic effects; competition relations and become become expert in calculate the monetary returns.	06	0	01	01	08
Agron511.4 Students will able to acquaint knowledge to Crop diversification, role of organic matter in maintenance of soil Fertility, crop residue management and nutrient use efficiency	06	0	01	01	08
Agron511.5PG students will become expert in Plant ideotypes for drylands plant growth regulators and their role in sustainability	04	0	01	01	06
Total Hours	29	0	06	05	41

СО	Unit Titles		Marks Dis	tribution	Total
		R	U	A	Marks
CO-1	Cropping systems physical resources, soil and water management in cropping systems; assessment of land use	03	01	01	05
CO-2	Concept of sustainability in cropping systems and farming systems production potential under monoculture cropping, multiple cropping, Alley cropping, sequential cropping and intercropping, mechanism of yield advantage In intercropping systems.	02	06	02	10
CO-3	Above and below ground interactions and allelopathic effects low cost technologies; research need on sustainable agriculture.	03	07	05	15
CO-4	Crop diversification role of organic matter in maintenance of soil Fertility; fertilizer use efficiency Advanced nutritional tools for big data analysis And interpretation	05	05	05	15
CO-5	Plant ideotypes for drylands; plant growth regulators and their role in sustainability	01	02	02	05
Total		11	26	13	50

Suggested Specification Table (For ESA)

Legend: R:Remember,

U:Understand,

A:Apply

The end of semester assessment for Cropping systems and sustainable agriculture to 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 task sapper 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
- 7. Demonstration
- 8. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, Whatsapp, Mobile, Online sources)
- 9. Brainstorming.

Suggested Learning Resources:

(0	1)Books:			
S. No.	Title	Author	Publisher	Edition& Year
1	Cropping systems and sustainable agriculture.	panda sc.	Agronbios (india)	2017.
2	. Cropping systems in the tropics; principles and Management.	palaniappansp and sivaraman k.	New age.	1996
3	Cropping and farming systems.	panda sc.	Agronbios.	2003.
4	Principles of crop production.	reddy sr.	Kalyani	2000

Curriculum Development Team

- 1. Dr. T.Singh , Professor and Head Agronomy AKS University
- 2. Dr V.D Dwivedi , Professor Agronomy AKS University
- 3. Dr H.S. Kushwaha Professor Agronomy MGCGVV Chitrakoot satna M.P
- 4. Dr. D. P Chaturv4edi ,Assistant Professor,Dept. Of Agronomy AKS University
- 5. Dr. Pankaj Bagri, Assistant Professor, Dept. Of Agronomy AKS University
- 6. Mr. Amit Singh Tiwari , Assistant Professor, Dept. Of Agronomy AKS University
- 7. Mr. Sanjay Lillhare, Assistant Professor, Dept. Of Agronomy AKS University
- 8. Ms. Prachi Singh, Teaching Associate, Dept. Of Agronomy AKS University
- 9. Ms. Prachi Awadhiya, Teaching Associate, Dept. Of Agronomy AKS University

Cos, POs, and PSOs Mapping Course Code:-Agron- 511 Course Title: -Cropping Systems and Sustainable Agriculture

Course	Program Ou	tcomes				••				Program Sp	ecific Outcome	e		
Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
	Specific	Wide	Detailed	Use	Detail	Create,	Student	Student	Understan	Enable to	Acquainting	То	Apply	То
	knowledge	knowle	knowled	appr	ed	select	will	will apply	d the	recognize	with basic	undertake	researc	understa
	of various	dge in	ge	opri	knowl	and	apply	basic	impact of	and	concepts	teaching	h and	nd and
	branches of	the	regardin	ate	edge	apply	various	concepts in	the	examine	theories and	research and	experti	analyze
	agronomy	concern	g	scie	of	an	statistic	laboratory	profession	the	terminology	extension	se in	the
	will be	ing	package	ntifi	cultiva	appropr	al	techniques	al expert	relationshi	of	activates	resolvi	current
	made	subject	and	с	tion	iate	method	during their	solutions	ps between	Agronomy.	along with	ng the	issues
	specialized	which	practices	meth	practic	techniq	s to	research	in societal	inputs and		administrati	proble	that are
	and to	will	soil	ods	es,	ues,	analyze	work	and	outputs in		ve and	ms of	occurrin
	provide	improve	fertilizer	colla	soil,	resourc	their		environme	their		consultancy	existin	g in
	knowledge	the	and	bora	fertiliz	es and	master		ntal	agricultural		services.	g farm	local and
	disseminati	farmers	water	tion	ers,	modern	research		contexts,	field to			in the	global
	on	conditio	manage	with	water	it tools	work		and	make			periphe	agricultu
	regarding	n 1	ment of	stati	manag	1n			demonstrat	effective			ry of	re and
	various	through	producti	stics	ement	improv			e the	and			univers	how they
	technique	student	ve crop	alon	and	ement			knowledge	profitable			ities.	W111
	or larming	S	aspects.	g with	plant	01			ol, and	decisions.				futuriatio
	forming	tions		with	protec	agrono			need for	10 understand				
	system in	tions.		uatio	econo	nackag			developme	the				re
	India			n	mic	e and			nt in	mechanics				IC I
	muia			whic	associ	practic			Agricultur	of agri				
				h	ated	es			e	Entreprene				
				will	with	CD .				urshin				
				prov	farmin					un shirp.				
				ed to	g									
				deci	enterp									

				sion in vari ous part of agric ultur e	rises.									
CO1- Students acquaint will familiar with the knowledge ofCropping systemsphysi cal resources, soil and water management in cropping systems.	1	3	3	1	1	3	3	1	3	2	1	1	3	3
CO2 students will able to acquaints knowledge aboutConcept of sustainability in cropping systems and farming systems and	1	1	3	3	1	3	2	1	1	3	1	3	3	1

types of cropping system and its advantages.														
CO3 Students will able to identify the interactions and allelopathic effects; competition relations and become become expert in calculate the monetary returns	3	2	1	1	3	1	3	3	2	1	1	2	1	2
CO 4 Students will able to acquaint knowledge to Crop diversificatio n,role of organic matter in maintenance of soil Fertility, crop	3	2	1	1	3	3	2	1	1	3	1	3	2	3

residue management and nutrient use efficiency.														
CO5PG students will	3	2	1	1	3	1	3	1	3	2	1	1	1	1
become														
expert in														
Plant ideo														
types for dry														
lands plant														
growth														
regulators														
and their role														
in														
sustainability.														

Legend: 1 – Low, 2 – Medium, 3 – High

POs & PSOs	COs No.& Titles	SOs No.	Laboratory	Classroom Instruction (CI)	Self Learning (SL)
No.			Instruction(LI)		
PO 1,2,3,4,5,6	CO1-Students	SO1.1		Unit-1.Cropping systems: definition,	As mentioned in page
7,8,9	acquaint will	SO1.2		indices and its importance; physical	number
PSO 1,2, 3, 4, 5	familiar with the	SO1.3		resources, soil	
	knowledge of	SO1.4		And water management in cropping	
	Cropping systems			systems; assessment of land use.	
	physical resources,			1.1, 1.2, 1.3, 1.4, 1.5.	
	soil and water				
	management in				
	cropping systems.				
PO 1,2,3,4,5,6	CO2 students will	SO1.1		Unit-2 Concept of sustainability in	As mentioned in page
7,8,9	able to acquaints	SO1.2		cropping systems and farming systems,	number
	knowledge about	SO1.3		scope and	
PSO 1,2, 3, 4, 5	Concept of	SO1.4		Objectives; production potential under	
	sustainability in	SO1.5		monoculture cropping, multiple cropping,	
	cropping systems			Alley cropping, sequential cropping and	
	and farming systems			intercropping, mechanism of yield	
	and types of			advantage	
	cropping system and			In intercropping systems.	
	its advantages.			1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8	
PO 1,2,3,4,5,6	CO3Students will	SO1.1		Unit-3Above and below ground	As mentioned in page
7,8,9	able to identify the	SO1.2		interactions and allelopathic effects;	number
	interactions and	SO1.3		competition relations;	
PSO 1,2, 3, 4, 5	allelopathic effects;	SO1.4		Multi-storied cropping and yield stability	
	competition	SO1.5		in intercropping, role of non-monetary	
	relations and			Inputs and low cost technologies;	
	become become			research need on sustainable agriculture.	

Course Curriculum Map:Cropping Systems and Sustainable Agriculture

	expert in calculate the monetary returns		1.1, 1.2, 1.3, 1.4, 1.5, 1.6	
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO 4 Students will able to acquaint knowledge to Crop diversification ,role of organic matter in maintenance of soil Fertility, crop residue management and nutrient use efficiency.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	Unit 4Crop diversification for sustainability; role of organic matter in maintenance of soil Fertility; crop residue management; fertilizer use efficiency and concept of fertilizer Use in intensive cropping system. Advanced nutritional tools for big data analysis And interpretation. 1.1, 1.2,1.3,1.4 1.5, 1.6	As mentioned in page number
PO 1,2,3,4,5,6 7,8,9,10,11,12 PSO 1,2, 3, 4, 5	CO5PG students will become expert in Plant ideotypes for dry lands plant growth regulators and their role in sustainability.	SO1.1 SO1.2 SO1.3 SO1.4	Unit 5 Plant ideotypes for dry lands; plant growth regulators and their role in sustainability. 1.1, 1.2,1.3,1.4	As mentioned in page number



Faculty of Agriculture Science and technology Department of Agronomy Curriculum of M.Sc Ag Agronomy Program

Course Code:	SOIL 506
Course Title :	Soil Biology And Biochemistry
Pre- requisite:	Student should have basic knowledge of bio fertilizers and useful microorganisms available in soil help in transforming the fixed forms of nutrients. They know about the various organic waste (plant /animal/rural and urban wastes).
Rationale:	The Student learn about available soil microorganisms help in dissolving the fixed form of plant essential nutrients absorbed by the crop. Transformation and lifecycle of all essential plant nutrients. The manufacturing of various bio fertilizers available in market, their composition, combination, properties and use. Importance, principle and role organic farming with the use of consortium for maintaining fertility and sustainability in soil.

Course Outcomes:

Soil 506.1: They understand about the Diversity of microbes in soil, their ecosystem and life cycle. Soil 506.2: To relate the various interaction of soil microbes with crop and their transformation process in soil. Soil 506.3: To recollect and implement the knowledge of various methods of biodegradation of pesticides, organic wastes and their use for production of biogas,

Soil 506.4: To practices the manufacturing of various forms of organic manures, and bio fertilizers with its application use and importance in maintain soil health.

Soil 506.4: To practices the manufacturing, application of organic manure and bio fertilizers in soil

Scheme of Studies:

Course Category	Course Code	Course Title			Scl stu	Scheme of studies(Hours/Week)		
			Cl	LI	\mathbf{sw}	SL	Total Study Hours (CI+LI+SW+SL)	(C)
Progra mCore (PCC)	Soil 506	Soil Biology and Biochemistry	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 ofLearning.

Scheme of Assessment:

Theory

					Schem	e of Ass	essment (M	larks)		
			Progressive Assessment (PRA)						End Semeste r	Tota l Mark
Course Catego ry	Cous e Cod	Course Title	Class/ Home Assign ment 5	Class Test 2 (2 best out of3) 10	Sem inar one	Clas s Acti vity any	Class Attenda nce	Total Marks CA+CT+SA+C AT+AT)	nt	S
	C C		r 3 mar ks eac h (CA)	mark s each (CT)	(SA)	(C AT)	(AT)		(ESA)	(PR A+ ES A)
PCC	Soil 506	Soil Biology and Biochemi stry	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.

Soil 506.1: To classification of soil biota, its ecosystem and various interaction occurs with

Approximate Hours

Item	AppXHr
	S
Cl	05
LI	4
SW	2
SL	1
Total	12

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO1.1: It gives General introduction on bio fertilizers, its use and importance.	1.1 Determina tion of soil microbial population	Unit-1 General introduction about soil biota, its ecosystem and various interaction occurs with soil organisms	1. To know about various types of soil organisms
 SO1.2:To recall the diversity in soil microbes, there ecosystem and life cycle SO1.3 To learn the different interactions occurs between soil and soil organisms 	1.2 To estimate the Soil microbial biomass	 1.1 Classification of soil biota and its ecosystem 1.2 Classification of soil microbes 1.3 Importance of soil biota in ecosystem 1.4 Role of soil organisms 1.5 Interaction process occurs with soil organisms 	

SW-1 Suggested Sessional Work (SW):

a. Assignments:

- Enlist the classification of soil microbes
- Define soil biota its population and ecosystem
- b. MiniProject:
- c. Other Activities(Specify): NA

Soil 506.2: To learn the various interactions of soil microbes with plants.

Approximate Hours					
Item	AppXHr				
	S				
Cl	5				
LI	4				
SW	2				
SL	0				
Total	13				

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Session	Laboratory	Class room Instruction	Self
Outcomes	Instruction	(CI)	Learning
(SOs)	(LI)		(SL)
SO2.1To relate the		Unit : 2: The basic concept ,	
different types of	1. Determinati	importance and role of	
interaction of soil microbes	on of Soil	soil microbes	
with crop, there growth	enzymes		
	released by	2.1 To learn the classification of	
SO2.2To understand the	soil	soil microbes	
principle and role of soil	microbes	2.2 To understand the role of soil	
microbes		microbes in increasing soil	
	2. To Study	fertility	
SO2.3 To discriminate the	therhizosphe	2.3 To know the various enzymes	
various enzymes and	re effect in	released by the microbes	
chemicals released by the	different	2.4 To learn the various chemicals	
microbes.	crops	reactions affecting the growth	
		of microbes in soil	
		2.5 Classification of different	
		Rhizo-bacteria in soil used in	
		different crops	

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

Soil 506 .3: To understand transformation of nutrients with various interaction of soil organism and formation of humus

Α	pproximate Hours
Item	AppXHr
	S
Cl	5
LI	10
SW	2
SL	1
Total	14

Session	Laboratory Instruction	Class room	Self
Outcomes	(LI)	Instruction	Learnin
(SOs)		(CI)	g (SL)

SO3.1Tolearnthevariousprocessinvolvedduringtransformationofdifferentnutrients(macro,secondaryandmicronutrients)through	1. Measurementofimportantsoilmicrobialprocessessuchasammonification,nitrification, N22. Tostudythe	 Unit-3 : Transformation solubilization and mineralization of essential plant nutrient 3.1Microbial transformation of Major nutrients 	1. Making chart of available forms to essential plants
 microbial activity in soil SO3.2 To Understand and learn the nutrient cycle. SO3.3 To assess the ability to understand the Mechanisms of nutrient transport to plants, factors affecting nutrient availability to plants. 	determination of fixation of various nutrients in soil 3. To determine the process involved in S oxidation 4. Estimation of Phosphorus solubilization and mineralization 5. Estimation of micro nutrients solubilization and mineralization	 3.2Microbial transformation of secondary and Micro nutrients 5.3 Role of soil organic matter and crop residue in maintaining soil fertility and productivity 5.4 Formation and components of humus 5.5 To learn the importance of humus in maintaining soil fertility 	nutrients

SW-3 Suggested Sessional Work (SW):

- a. Assignments:
 - Humus formation its classification and components
 - Transformation of soil nutrients and factor affecting each of them
- b. Other Activities(Specify): NA

Soil 506 .4: Identification, production, role, importance and use of bio pesticides, organic waste its

degradation process and manure application in various crop for sustainable agriculture

A	pproximate Hours
Item	AppXHr
	S
Cl	6
LI	8
SW	2
SL	2
Total	12

Session	Laboratory	Class room Instruction	Self
Outcome	Instruction	(CI)	Learning
s (SOs)	(LI)		(SL)

	1. Element	Unit-4: Production, role and Importance		
SO4.1 To Relate	al composition,	of various bio pesticides, degradable	1. Making	
difference between	of organic	substances and organic waste	chart of useful	
the Biodegradation of	matter	C C	bio pesticide	
pesticides,	2. Element	4.1 To learn the Production techniques	available in	
	al composition,	of biodegradable pesticides	market	
SO4.2 To Understand	functional	4.2: To know the application methods		
and learn the	groups	of biodegradable pesticides in	2.	
production and	3. To study	maintaining soil health and increase	Identification	
use of organic wastes	the	the crop yield	of different	
and manures. SO4.3 To Understand and learn the production and use of biogas plant and use of slurry in increasing the sustainability of soil	fractionation of organic matter 4. To study the fractionation of functional groups	 4.3: To understand the role of biodegradable pesticides in maintaining soil health 4.4. Role of various microbial toxins released in soil 4.5. Production, importance and use of organic waste 	organic manures and nutrient content in it	
Sustainaointy of son		4.6. Role of various biotic factors		
		involved in soil developments		

SW-4 Suggested Sessional Work (SW):

a. Assignments:

• Identification of different organic manures and nutrient content in it

b. Mini-Project

• Preparation of flow chart of identification of various bio pesticides and its application in different crop

Other Activities(Specify): NA

Soil 506.5: Role, importance , preparation and properties of various organic manure and bio fertilizer if different crop to maintain the sustainability of soil

Item	AppXHr
	S
Cl	5
LI	2
SW	2
SL	1
Total	10

Sessio n Outc omes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
--------------------------------------	-----------------------------------	--------------------------------	--------------------------

SO5.1 To know the	1.	Unit5:Application and preparation of organic	1. Enlist
Effective knowledge	Decompositio	manure and bio fertilizers in soil	the
on formation and	n of organic		different
application method	matter in soil	5.1 To learn the preparation methods of	Methods
of different types of		different bulky organic manures	of
compost, FYM,		5.2: To learn the preparation methods of	organic
Vermicomposting.		different concentrated organic manures	waste
			and bio
		5.3 Classification and preparation of various	fertilizer
SO5.2Understand		bio fertilizers	available
the procedure ,		5.4. To learn the Application method used	in market
importance, and		during supply of various bio fertilizers in	
classification of		different crops	
different Bio		1	
fertilizers		5.5 Application of different organic manure	
		and bio fertilizer in improving crop production.	

SW-5 Suggested Sessional Work (SW):

- a. Assignments:
 - Preparation Methods of different organic manure in various crops.

b. MiniProject:

c. OtherActivities(Specify): NA

SW-5 Suggested Sessional Work (SW):

- d. Assignments:
 - Preparation Methods of different organic manure in various crops.

b. MiniProject

OtherActivities(Specify): NA

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Laboratory Instruction (LI)	Sessiona l Work (SW)	Self Learnin g (Sl)	Total hour (Cl+LI+SW+Sl)
Soil 506.1: To classification of soil biota, its ecosystem and various interaction occurs with soil organisms	5	4	2	2	09
Soil 5062: To learn the various interactions of soil microbes with plants.	7	4	2	2	11
Soil 506 .3: To understand transformation of nutrients with various interaction of soil organism and formation of humus	7	10	2	1	10
Soil 5064: Identification,	6	8	2	2	10

production, role , importance and use of bio pesticides , organic waste its degradation process and manure application in various crop for sustainable agriculture					
Soil 506.5: : Role, importance , preparation and properties of various organic manure and bio fertilizer if different crop to maintain the sustainability of soil	5	2	2	1	08
Total Hours	30	30	30	8	48

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

СО	Unit	Μ	arks Dis	stribution	Total
	Titles	R	U	Α	Mark s
CO-1	General introduction about soil biota, its ecosystem and various interaction occurs with soil organisms	03	01	01	05
CO-2	The basic concept , importance and role of soil microbes	02	06	02	10
CO-3	Transformation solubilization and mineralization of essential plant nutrient	03	07	05	15
CO-4	Production, role and Importance of various bio pesticides, degradable substances and organic waste	03	07	05	15
CO-5	Application and preparation of organic manure and bio fertilizers in soil	03	02	-	05
	Total	11	26	13	50
Legend:	R:Remember, U:Understand,	A:A	pply		

The end of semester assessment for Soil Biology and Biochemistry 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.

SuggestedInstructional/ImplementationStrategies:

- 1. ImprovedLecture
- 2. Tutorial
- 3. CaseMethod
- 4. GroupDiscussion
- 5. RolePlay
- 6. Demonstration
- 7. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook,Twitter, Whatsapp, Mobile, Onlinesources)
- 8. Brainstorming

Suggested Learning Resources:

	(a) Books :			
S. No.	Title	Author	Publisher	Edition & Year
1	Introduction to Soil Microbiology	Alexander M	John Wiley & Sons	1977
2	Soil Biology	Burges A & Raw F	Academic Press	1967
3	Soil Biochemistry	McLaren AD & Peterson GH	Vol. XI. Marcel Dekker	1967
4	Soil Microbial Ecology – Applications in Agricultural and Environmental Management.	Metting FB.	ICAR, New Delhi	1993
5	Soil Biochemistry	Paul EA and Ladd JN.	Marcel Dekker	1981
6	Soil Organisms and Litter in the Tropics	Reddy MV. (Ed.).	Oxford & IBH	-
7	Plant Root System: Their Functions and Interaction with the Soil.	Russel RS	ELBS & McGraw Hill.	1977
8	Soil Biochemistry	Stotzky G &Bollag JM	Vol. VIII. Marcel Dekker	1993
9	Principles and Applications of Soil Microbiology.	Sylvia DN.	Pearson Edu	2005
10	Soil and the Environment - An Introduction	Wild A	Cambridge Univ. Press	1993
11	Fundamental of Soil Science	Indian Society of Soil Science	ISSS, National Societies Block, Pusa, New Delhi	Revised 2012
12	Soil Microbiology	SubbaRao N.S	Medtech Scientific International	Revised 2017

Curriculum Development Team

- 1. Professor G C Mishra, Director Cement Technology, AKS University
- 2. Dr.S S Tomar (Dean), Faculty of Agriculture Science and Technology, AKS University
- 3. Dr. NeerajVerma (Coordinator), Faculty of Agriculture Science and Technology, AKS University
- 4. Dr. T Singh (Head) Dept. Agronomy, FAST, AKS University
- 5. Dr. SugyataShivhare, (Head) Dept. Soil Science & Agricultural Chemistry, FAST,

AKS University

- 6. Atul Kumar Singh, Assistant Professor , Dept. Soil Science & Agricultural Chemistry, FAST, AKS University
- 7. Ku. TulikaPanigrahi, Teaching Associate, Dept. Soil Science & Agricultural Chemistry, FAST,

Course	Program	Outcom	nes							Program	Specific O	utcome		
Outcomes	PO1	PO2	PO3	PO	PO5	PO6	PO7	PO8	PO9	PSO 1	PSO 2	PSO 3	PSO	PSO 5
				4									4	
	Specific	Wide	Detail	Us	Deta	Creat	Stude	Student	Underst	Enable	Acquaint	То	Appl	То
	knowled	know	ed	e	iled	е,	nt	will	and the	to	ing with	undertak	У	unders
	ge of	ledge	knowl	app	kno	select	will	apply	impact	recogni	basic	e	resea	tand
	various	in the	edge	rop	wled	and	apply	basic	of the	ze and	concepts	teaching	rch	and
	branche	conce	regard	riat	ge	apply	vario	concepts	professi	examine	theories	research	and	analyz
	s of	rning	ing	e	of	an	us	in	onal	the	and	and	exper	e the
	agrono	subje	packa	sci	culti	appro	statist	laborato	expert	relation	terminol	extensio	tise	curren
	my will	ct	ge and	ent	vati	priate	ical	ry	solution	ships	ogy of	n	in	t
	be made	which	practic	ific	on	techn	meth	techniqu	s in	between	Agrono	activates	resol	issues
	specializ	will	es soil	me	prac	iques	ods to	es	societal	inputs	my.	along	ving	that
	ed and	impro	fertiliz	tho	tices	,	analy	during	and	and		with	the	are
	to	ve the	er and	ds	,	resou	ze	their	environ	outputs		administ	probl	occurr
	provide	farme	water	col	soil,	rces	their	research	mental	in their		rative	ems	ing in
	knowled	rs	manag	lab	fertil	and	maste	work	context	agricult		and	of	local
	ge	condi	ement	ora	izers	mode	r		s, and	ural		consulta	existi	and
	dissemi	tion	of	tio	,	rn it	resear		demons	field to		ncy	ng	global
	nation	throu	produc	n	wate	tools	ch		trate the	make		services.	farm	agricu
	regardin	gh	tive	wit	r	in	work		knowle	effectiv			in the	lture
	g .	stude	crop	h	man	ımpr			dge of,	e and			perip	and
	various	nt's	aspect	stat	age	ovem			and	profitab			hery	how
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	e of	but10		cs	t and	of			sustaina	decision			unive	W1ll
	farming	ns.		alo	plan	agron			ble	s. To			rsitie	affect
	and			ng	t	omic			develop	understa			s.	futuris
	farming			W1t	prot	al			ment in	nd the				tic .
	system			h	ectio	pack			Agrıcul	mechani				agrıcu
	in India			eva	n	age			ture.	cs of				Iture

Cos, POs and PSOs Mapping Course Code:-SOIL- 506 Course Title: - Soil Biology and Biochemistry

				lua tio n wh ich wil l pro ved to dec isio n in var iou s par t of agr icu ltur e	econ omi c asso ciate d with farm ing ente rpris es.	and practi ces.				agri Entrepr eneurshi p.				
CO1They understand about the Diversity of microbes in soil, their ecosystem and life cycle.	3	1	1	1	3	1	3	3	1	3	1	2	3	1

CO2 To relate the various interaction of soil microbes with crop and their transforma tion process in soil.	3	3	3	3	1	1	1	3	1	3	3	1	2	1
cO3To recollect and implement the knowledg e of various methods of biodegrad ation of pesticides, organ ic wastes and their use for production of biogas	3	2	5	1	1	1	3	1	3	3	2	2	1	2
CO 4 To practices the	3	1	1	1	3	1	3	3	1	3	1	3	2	1

manufacturi														
ng of														
various														
forms of														
organic														
manures,														
and bio													1	
fertilizers														
with its														
application													1	
use and														
importance														
in maintain														
soil health.														
CO5To	3	3	1	1	1	3	1	1	3	1	1	1	3	1
practices the														
manufacturi														
ng,applicatio														
n of organic														
manure and														
bio														
fertilizers in														
soil														

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map: Soil Biology and Biochemistry						
POs & PSOs	COs No.& Titles	SOs No.	Laboratory	Classroom Instruction (CI)	Self Learning (SL)	
No.			Instruction(LI)			
PO 1,2,3,4,5,6	CO1 They understand	SO1.1		Unit-1.General introduction about soil	As mentioned in	
7.8,9	about the Diversity of	SO1.2		biota, its ecosystem and various	page number	
PSO 1 2 3 4	microbes in soil, their	SO1 3		interaction occurs with soil organisms		
5	ecosystem and life cycle.	501.5		1.1, 1.2, 1.3, 1.4, 1.5.		
PO 1,2,3,4,5,6	CO2 To relate the	SO1.1		Unit-2 The basic concept , importance	As mentioned in	
7,8,9	various interaction of	SO1.2		and role of soil microbes	page number	
	soil microbes with crop	SO1.3				
PSO 1.2, 3, 4,	and their			1.1, 1.2, 1.3, 1.4, 1.5		
5	transformation process					
	1n so1l.					
DO 1 2 2 4 5 6		6011			A (* 1*	
PO 1,2,3,4,5,6	implement the	501.1		Unit-3 Transformation solubilization	As mentioned in	
7,8,9	knowledge of various	SO1.2		and mineralization of essential plant	page number	
	methods of	SO1.3			•••••	
PSO 1,2, 3, 4,	biodegradation of			1.1, 1.2,1.3,1.4,1.3		
5	pesticides					
	organic wastes and					
	their use for production of					
	biogas					
PO 1,2,3,4,5,6	CO 4 To practices the	SO1.1		Unit 4 Production, role and Importance of	As mentioned in	
7,8,9	manufacturing of various	SO1.2		various bio pesticides, degradable	page number	
PSO 1,2, 3, 4,	forms of organic	SO1.3		substances and organic waste 1.1,		
5	manures, and bio	-		1.2,1.3,1.4 1.5, 1.6		
	fertilizers with its					
	application use and					
	importance in maintain					
	soil health.					

PO 1,2,3,4,5,6 7,8,9,10,11,12 PSO 1,2, 3, 4, 5	CO5To practices the manufacturing,application of organic manure and bio fertilizers in soil	SO1.1 SO1.2	Unit 5 Application and preparation of organic manure and bio fertilizers in soil 1.1, 1.2,1.3,1.4 1.5	As mentioned in page number



AKS University Faculty of Agriculture Science and technology Department of Agronomy Curriculum of M.Sc Ag Agronomy Program

Course Code:	SOIL 508
Course Title :	Soil water and air pollution
Pre- requisite:	Student should have basic knowledge of various forms of pollutants present in soil, water and air.
Rationale:	The Student learn about the measurement of soil, water and air pollution, their optimum level. What are the norms to reduce the pollution from soil, air and water used by government in India and world for maintaining ecofriendly nature.

Course Outcomes:

- Soil 508.1: To identify the problems occur in agriculture sector regarding polluted water, air and soil their mode of occurrence and extended level
- **Soil 508.2:** To learn the Nature , sources and effect of various pollutants on fertility, production and productivity of soil and crop including human health
- Soil 508.3: Assess the forms and properties of various effluents released from Sewage and
- different industrial waste their by effect on growth of living organisms
- Soil 508.4: Classification and behavior of pesticides in soil, and their effect on soil microorganisms
- Soil 508.5: To understand the sources and behavior of released toxic substances affect in Soil, water, Air and human health
- **Soil 508.6:** To understand the sources and reclamation tactics in managing the effect of release of GH gasses contribution and pesticide on reducing Soil, plant, water and Air
- Soil 508.7: Risk assessment of polluted soil and reclamation of contaminated Soil, water,

Air and human health

Scheme of Studies:

					Sch	eme of		Total
	Course				stud	lies(Hour	s/Week)	Credi
Course	Code	Course Title	Cl	LI	S	SL	Total Study	ts (C)
Catego	cout				W		Hours	
ry							(CI+LI+SW+S	
							L)	

Progra mCore	Soil 509	Soil water and air pollution	2	2	1	1	5	3
(PCC)		air pollution						

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 ofLearning.

Scheme of Assessment:

Theory

					Schem	e of Ass	sessment (M	(arks)		
				Pr	ogressiv I	ve Asses PRA)	sment (End Semeste r Assessme	Tota l Mark
Cou rse Cat ego ry	Cous e Code	Course Title	Class/H ome Assign ment 5 number 3 mar ks eac h (CA)	Class Test 2 (2 best out of3) 10 marks each (CT)	Sem inar one (SA)	Clas s Acti vity any one (C AT)	Class Attendan ce (AT)	Total Marks CA+CT+SA+C AT+AT)	nt (ESA)	s (PR A+ ES A)
Prog ramC ore (PCC)	Soil 509	Soil, water and air pollution	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.

Soil 508 .1: Toidentify the problems occur in agriculture sector regarding polluted water, air and soil their mode of occurrence and extended level

A	Approximate Hours						
Item	AppXHrs						
Cl	4						
LI	2						
SW	2						
SL	1						
Total	09						

Session Outcomes (SOs)	Laboratory Instruction	Class room Instruction (CI)	Self Learning (SL)
SO1.1:To recall the various types of pollution and there sources SO1.2:To discriminate the different types of	1.To determine the BOD of a given water sample	 Unit-1Source of air, water and soil pollution which affect the crop production 1.1 Understand the various types and source of soil pollution 1.2 Understand the various types and source of water pollution 	1. To know about various pollutants and their sources of soil , water and air pollution
pollution occur in agricultural field, their source.		 1.3 Understand the various types and source of air pollution 1.4 Effect of soil, water and air pollution on growth and development of crop 	

SW-1 Suggested Sessional Work (SW):

a) Assignments:

Enlist the various pollutants affecting soil, water and air

b) MiniProject: NA

c) Other Activities(Specify): NA

Soil 508. .2: To learn the Nature , sources and effect of various pollutants on fertility, production and productivity of soil and crop including human health

Approximate Hours

Item	AppXHr
	S
Cl	4
LI	6
SW	2
SL	1
Total	13

Session	Laboratory	Class room	Self Learning
Outcomes	Instruction	Instruction	(SL)
(SOs)	(LI)	(CI)	
SO2.1 To assess the nature and	1. To determine the	Unit-2.0 To Study the	1.Enlist the
sources of pollutants	nitrate and	Soil, water and air	various role of
originates from agricultural	ammonium nitrogen	pollution and there	fertilizers,
field (through fertilizers and	content of a given	problems	pesticides and
pesticides)	soil, and water		herbicides in
SO2.2 To assess the nature	sample	1.1 To discuss about	increasing the
and sources of pollutants		the Soilpollution.	Soil, water and air
originates from, industrial	2.To determine the	1.2 To discuss about	pollution
area,	available	the water pollution.	
	phosphorus content	1.3 To discuss about	
	in a give soil and	the air pollution.	
SO2.3 To assess the nature	water sample	1.4 To Learn the	
and sources of pollutants		problems associated with	
originates from urban wastes	3. To determine the	agriculture, nature	
lands, acid rains.	available heavy	contaminating the soil,	
	metal content in	water and plant	
	given soil /water		
	effluents		

SW-2 Suggested Sessional Work(SW): Assignments:

1. Enlist the nature and sources of pollutants originates from urban wastes lands,

2. Factors responsible in cause of acid rains

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

Soil 508.3: Assess the forms and properties of various effluents released from Sewage and different industrial waste their by effect on growth of living organisms

A	Approximate Hours				
Item	AppXHrs				
Cl	4				
LI	6				
SW	2				
SL	1				
Total	13				

Session	Laboratory	Class room	Self
Outcom	Instruction	Instruction	Learnin
es	(LI)	(CI)	g
(SOs)			(SL)
SO3.1 Evaluate the	1. To know the	Unit-3 : To understand the	1. to know about
effect of sewage water	Sampling method and	forms and properties of	the various
on plant growth and	precaution measure	various effluents released	industries
human beings	should be taken during	from Sewage and industrial	running in your
	and sludge	3.1 To learn about Sewage	surrounding and
SO3.2 To Understand	2. To know the	effluents-their composition	their discarded
the effect of industrial	Sampling method and	3.2 To learn about industrial	material
effluents on growth and	precaution measure	effluents-their composition	
development of living	should be taken during	3.3 To understand the effect	
beings	colleting the	of Sewage &industrial	
	solid/liquid industrial	properties/ health, and	
	waste,	plant growth and human	
	3. To know the	beings.	
	Sampling method and	3.4 To understand the soll as sink for waste disposal	
	precaution measure		
	should be taken during		
	colleting polluted soils		
	and plant		

SW-3 Suggested Sessional Work (SW):

a) Assignments:

Effect of industrial effluents on growth and development of living beings

b) Other Activities(Specify): NA

Soil 508:4: Classification and behavior of pesticides in soil, and their effect on soil microorganisms

Approximate Hours	
Item	AppXHr
	S
Cl	4
LI	2
SW	2
SL	2
Total	10

Session Outco mes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO4.1 Recognize the different type of Pesticides and available nutrients. SO4.2 Relate the behavior of pesticides and available nutrients in soil with different crops	1. Management of contaminants in soil and plants to safeguard food safety	 Unit-4: Study the pesticides-their classification, and soil microorganisms. 4.1 To study the classification of Pesticides 4.2 To learn the effect of Pesticides in soil properties 4.3 To learn the effect of Pesticides on growth and development of soil microorganisms. 4.4 To understand the effect of Pesticides on growth and development of evelopment of crop 	 Making chart of useful bio pesticide available in market Identification of different banned pesticides but still supplied in market

SW-4 Suggested Sessional Work (SW):

a. Assignments:

1. Role of pesticides in affecting the population of useful microorganisms

b. Other Activities(Specify): NA

Soil 508.5: To understand the sources and behavior of released toxic substances affect in Soil, water , Air and human health

Item	AppXHr
	S
Cl	4
LI	4
SW	2
SL	1
Total	11

Session Outcomes	Laborator y Instructio	Class room Instruction (CI)	Self Learning (SL)
(50s)	n (LI)		
SO5.1 To identify the various sources and behavior of released of release of toxic substances in soil	1. Air sampling and determination of particulate matter and oxides of	Unit-5: Study the Toxic elements and there management . 5.1 To learn about different types of Toxic elements present in soil	1. Enlist the different types of toxic substances affect the soil, water and air
SO5.2 To identify the various sources and behavior of released of toxic substances in plants	sulphur 2. Visit to various industrial sites to study	5.2 To learn the different sources of Toxic elements present in soil5.3 To learn the behavior of different Toxic elements present in soil	
SO5:3. To identify the various sources and behavior of released of toxic substances in human beings	the impact of pollutants on soil and plants	5.4 Understand the effect on nutrients availability, effect on plant and human health.	

SW-5 Suggested Sessional Work (SW):

a. Assignments:

- Enlist the various sources and behavior of released of toxic substances in soil and plants
- Enlist the various sources and behavior of released of toxic substances in water
- Enlist the various sources and behavior of released of toxic substances in Air
- Enlist the various sources and behavior of released of toxic substances in human beings

b. MiniProject:

• Llist of toxic substances released from various industries affect the soil, water and air

OtherActivities(Specify): NA

Soil 508.6: To understand the sources and reclamation tactics in managing the effect of release of GH gasses contribution and pesticide on reducing Soil, plant, water and Air

Item	AppXHr
	S
Cl	5
LI	4
SW	2
SL	1

Total

1	2	
	_	

Session Outcomes	Laboratory	Class room Instruction	Self
(SOs)	Instruction (LI)	(CI)	Learning (SL)
SO6.1 To review	1. To determine	Unit .6: Study the pollution of water and	1. Enlist
on cause of Pollution of water	the other heavy	green house gasses.	the
resources and its reclamation strategies	sample 2. To determine the Heavy metals	6.1 To learn about the various ways of water Pollution resources due to leaching of nutrients and pesticides from soil.	GH Gases and their
SO6.2 To understand the	in contaminated plants sample	6.2 To learn about the various ways of water Pollution resources due to effect of pesticides in soil	contributi on in depletion
cause of release of GH gasses and its reclamation strategies		6.3 To understand the various sources responsible in emission of green house gases– carbon dioxide, methane and nitrous oxide in atmosphere	of ozone layer of earth
SO6:3. To identify the forms of pesticides affect		6.4 To know the emission of green house gases-carbon dioxide, methane and nitrous oxide6.5 To study the different practices to manage	
the soil health		both water and air pollution through leaching and emission of GHG respectively	

SW-5 Suggested Sessional Work (SW):

a) Assignments:

Identify the sources of GH gasses its contribution in affecting the ozone layer depletion

- b) MiniProject: NA
- c) OtherActivities(Specify): NA

Soil 508.7: Risk assessment of polluted soil and reclamation of contaminated Soil, water , Air and human health

Item	AppXHr		
	S		
Cl	5		
LI	6		
SW	2		
SL	1		
Total	14		
Session Outcomes	Laboratory	Class room Instruction	Self Learning
-----------------------------	-----------------------	----------------------------------	-----------------
(SOs)	Instruction	(CI)	(SL)
	(LI)		
SO7.1 To assess the	1.Estimation of	Unit-7: Study the polluted	1. To learn the
soil pollution	dissolved and	contaminated soil and water	use of
1	suspended solids in	and there management	interment and
SO7.2 To reclamation	water.	7.1 To learn about the Risk	basic
the polluted soil, and		assessment of polluted soil	computer
water	2.To determine the	7.2 Remediation/ amelioration of	knowledge in
	chemical oxygen	contaminated soil and water	operating GIS
SO7:3. To learn the	demand (COD) of a		software
use of remote	given water sample	7.3 Remediation/ amelioration of	
sensing in assessing	3. To determine the	contaminated water	
the management of	Dissolved oxvgen	7.4 To know the remote sensing	
nolluted soil and	(DO) of a given water	applications in monitoring	
water	sample		
water	r	7.5 To know the remote sensing	
		applications in management of	
		soil and water pollution.	

b. Assignments:

1. To use the remote sensing in assessing the management of polluted soil and water and locating techniques in map

b. MiniProject:

OtherActivities(Specify): NA

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)
Soil 508.1 To identify the problems occur in agriculture sector regarding polluted water, air and soil their mode of occurrence and extended level	4	2	2	1	9
Soil 508.2 To learn the Nature , sources and effect of various pollutants on fertility, production and productivity of soil and crop including human health	4	6	2	1	13
Soil 508.3 Assess the forms and properties of various effluents released from Sewage and different industrial waste their by effect on growth of living organisms	4	6	2	1	13
Soil 508.4 Classification and behavior of pesticides in soil, and their effect on	4	2	2	2	10

soil microorganisms					
Soil 508.5 To understand the sources and behavior of released toxic substances affect in Soil, water, Air and human health	4	4	2	1	11
Soil 508.6 To understand the sources and reclamation tactics in managing the effect of release of GH gasses contribution and pesticide on reducing Soil, plant, water and Air	5	4	2	1	12
Soil 508.7 Risk assessment of polluted soil and reclamation of contaminated Soil, water, Air and human health	5	6	2	1	14
Total Hours	30	30	15	8	82

Suggestion for End Semester Assessment

Suggested	Specifica	tion Table	(For	ESA)
Suggesteu	specifica		(I UI)	ப்பா

СО	Unit Titles	M Di	arks stribut	ion	Total Marks
		R	U	Α	
CO-1	Source of air, water and soil pollution which affect the crop production	03	02	02	07
CO-2	To Study the Soil, water and air pollution and there problems	02	03	03	8
СО-3	To understand the forms and properties of various effluents released from Sewage and industrial	03	03	02	8
CO-4	Study the pesticides–their classification, and soil microorganisms.	02	02	03	7
CO-5	Study the Toxic elements and there management	03	02	02	7
CO-6	Study the pollution of water and green house gases	02	02	02	6
CO-7	Study the polluted contaminated soil and water and there management	03	02	02	7
	Total	18	16	16	50
L	Legend: R:Remember, U:Und	erstand,	ا ر	A:Apply	1

The end of semester assessment for Soil Water and Air Pollution 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 semesterassessment.

 ${\it Suggested Instructional/ImplementationStrategies:}$

- 1. ImprovedLecture
 - 2. Tutorial
 - 3. CaseMethod
- 4. GroupDiscussion
- 5. RolePlay
- 6. Demonstration
- ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook,Twitter, Whatsapp, Mobile, Onlinesources)
- 8. Brainstorming

Suggested Learning Resources:

	(a) DOURS .			
S.No.	Title	Author	Publisher	Edition &
				Year
1	Soil Management and	Lal R, Kimble J,	CRC Press	1995
	Greenhouse Effect	Levine E and Stewart		
		BA.		
2	. Industrial Pollution Control	Middlebrooks EJ.	John Wiley Interscience	1979
3	Toxic Metals in Soil Plant	Ross SM.	John Wiley & Sons	-
	Systems.			
4	Environmental Pollution and	Vesilund PA and	Ann Arbor Science	1983
	Control	Pierce	Publication	
5	Fundamental of Soil Science	Indian Society of Soil	ISSS, National	Revised 2012
		Science	Societies Block, Pusa,	
			New Delhi	
6	The Nature and properties of	Nyle B Brady and Ray	Pearson Education	Revised 2013
	Soils	R Weil		

(a) Books .

Curriculum Development Team

- 1. Professor G C Mishra, Director Cement Technology, AKS University
- 2. Dr.S S Tomar (Dean), Faculty of Agriculture Science and Technology, AKS University
- 3. Dr. NeerajVerma (Coordinator), Faculty of Agriculture Science and Technology, AKS University
- 4. Dr. T Singh (Head) Dept. Agronomy, FAST, AKS University
- 5. Dr. SugyataShivhare, (Head) Dept. Soil Science & Agricultural Chemistry, FAST, AKS University
- 6. Atul Kumar Singh, Assistant Professor, Dept. Soil Science & Agricultural Chemistry, FAST, AKS University
 - 7. Ku. TulikaPanigrahi, Teaching Associate, Dept. Soil Science & Agricultural Chemistry, FAST, AKS University

Course	Program Outcomes Program Specific Outcome													
Outcomes	PO1	PO2	PO3	PO 4	PO5	PO6	PO7	PO8	PO9	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
	Specific	Wide	Detaile	Use	Detai	Create	Studen	Student	Understa	Enable to	Acquainti	То	Apply	То
	knowledg	knowl	d	app	led	,	t will	will	nd the	recogniz	ng with	undertake	resear	underst
	e of	edge	knowle	ropr	know	select	apply	apply	impact	e and	basic	teaching	ch	and
	various	in the	dge	iate	ledge	and	variou	basic	of the	examine	concepts	research	and	and
	branches	concer	regardi	scie	of	apply	S	concepts	professio	the	theories	and	expert	analyze
	of	ning	ng	ntifi	cultiv	an	statisti	in	nal	relations	and	extension	ise in	the
	agronom	subjec	packag	С	ation	appro	cal	laborator	expert	hips	terminolo	activates	resolv	current
	y will be	t	e and	met	practi	priate	metho	y	solutions	between	gy of	along	ing	issues
	made	which	practice	nod	ces,	techni	ds to	technique	in an aistal	inputs	Agronom	With	the	that are
	specialize	WIII impro	S SOII fortilizo	s coll	SOII, fortili	ques,	analyz	s during	societai	and	у.	tivo ond	proble ms of	occurri ng in
	u anu to	mpro vo tho	r and	obo	Tertin		e then mostor	rosoorah	anu	in their		consultan	nis or	
	knowledg	farmer	i allu water	rati	Zeis, water	and	resear	work	mental	agricultu		CUIISUITAII	ng	and
	e	s	manage	on	mana	moder	ch	WOIK	contexts	ral field		services	farm	global
	dissemin	conditi	ment of	wit	geme	n it	work		and	to make		services.	in the	agricult
	ation	on	product	h	nt	tools	work		demonst	effective			periph	ure and
	regarding	throug	ive	stati	and	in			rate the	and			ery of	how
	various	h	crop	stic	plant	impro			knowled	profitabl			univer	they
	technique	studen	aspects.	S	prote	veme			ge of,	e			sities.	will
	of	t's		alo	ction	nt of			and need	decisions				affect
	farming	contri		ng	econ	agron			for	. To				futurist
	and	bution		wit	omic	omica			sustaina	understa				ic
	farming	s.		h	assoc	1			ble	nd the				agricult
	system in			eval	iated	packa			develop	mechanic				ure
	India			uati	with	ge			ment in	s of agri				
				on	farmi	and			Agricult	Entrepre				
				whi	ng	practi			ure.	neurship.				

Cos, POs and PSOs Mapping Course Code:- SOIL 508 Course Title: - Soil water and Air Pollution

				ch will pro ved to deci sion in vari ous part of agri cult ure	enter prise s.	ces.								
CO-1 To identify the problems occur in agricultur e sector regarding polluted water, air and soil their mode of occurrenc e and extended level	1	3	3	1	2	1	3	3	3	3	1	2	3	1
CO-2 To learn	3	1	3	3	1	2	1	3	3	1	1	3	2	1

the Nature , sources and effect of various pollutants on fertility, productio n and productiv ity of soil and crop including human bealth														
CO-3 Assess the forms and properties of various effluents released from Sewage and	1	3	3	1	2	1	3	3	1	3	2	2	1	2
different industrial waste their by effect on growth of living organism s														

CO-4	3	2	1	3	1	3	1	3	3	1	2	1	3	1
Classifica														
tion and														
behavior														
of														
pesticides														
in soil,														
and their														
effect on														
soil														
microorg														
anisms														
СО-5 То	3	1	2	1	3	3	1	1	2	1	3	1	3	1
understan														
d the														
sources														
and														
behavior														
of														
released														
toxic														
substance														
s affect in														
Soil,														
water,														
Air and														
human														
health	2	2	2	1	2	2	1	1	2	1	2	1	2	1
CO-6 To	5	2	2	1	5	3	1	1	Z	1	5	1	3	1
understan														
d the														
sources														
and														

reclamati on tactics in managing the effect of release of GH gasses contributi on and pesticide on reducing Soil, plant, water														
and Air CO-7 Risk assessmen t of polluted soil and reclamatio n of contamina ted Soil, water, Air and human health	3	2	2	1	3	3	1	1	2	1	3	1	3	1

Legend: 1 – Low, 2 – Medium, 3 – Hig

POs & PSOs COs No.& Titles SOs No. **Classroom Instruction (CI)** Self Learning Laboratory **Instruction**(LI) **(SL)** No. Unit 1 Source of air, water and soil pollution which PO 1,2,3,4,5,6 **CO-1** To SO1.1 As mentioned in identify the affect the crop production 7,8,9 SO1.2 page number problems occur 1.1,1.2,1.3,1.4, PSO 1,2, 3, 4, 5 **SO1.3** in agriculture sector regarding polluted water, air and soil their mode of occurrence and extended level PO 1,2,3,4,5,6 CO-2 To learn **SO1.1** Unit 2 To Study the Soil, water and air As mentioned in the Nature. pollution and there problems. 7.8.9 SO1.2 page number sources and 1.1,1.2,1.3,1.4 **SO1.3** effect of PSO 1,2, 3, 4, 5 various pollutants on fertility, production and productivity of soil and crop including human health CO-3 Assess PO 1,2,3,4,5,6 SO1.1 As mentioned in Unit 3 To understand the forms and properties of various the forms and effluents released from Sewage and industrial page number 7,8,9 **SO1.2** properties of 1.1,1.2,1.3,1.4 various PSO 1,2, 3, 4, 5 effluents released from Sewage and different industrial waste

Course Curriculum Map: Soil water and Air Pollution

	their by effect on growth of living			
	organisms			
PO 1,2,3,4,5,6	CO-4	SO1.1	Unit 4 Study the pesticides-their classification, and soil	As mentioned in
7,8,9	Classification	SO1.2	microorganisms.	page number
PSO 1.2, 3, 4, 5	and behavior		1.1,1.2,1.3	
	of pesticides in			
	soil, and their			
	effect on soil			
	microorganisms			
PO 1,2,3,4,5,6	СО-5 То	SO1.1	Unit 5 Study the Toxic elements and there management	As mentioned in
7,8,9,10,11,12	understand the	SO1.2	One 5 Study the Toxic clements and there management	page number
	sources and	SO1.3	1.1,1.2,1.3,1.4	••••
PSO 1,2, 3, 4, 5	behavior of			
	released toxic			
	substances			
	allect in Soll,			
	buman bealth			
PO 1 2 3 4 5 6		SO1 1		
7 8 0 10 11 12	understand the	501.1	Unit 6 Study the pollution of water and green house	
7,8,9,10,11,12	sources and	SOI.2	gases.	
	reclamation	\$01.3		
PSO 1,2, 3, 4, 5	tactics in		1.1,1.2,1.3,1.4,1.5	
	managing the			
	effect of			
	release of GH			
	gasses			
	contribution			
	and pesticide			
	on reducing			
	Soil, plant,			
	water and Air			



AKS University

Faculty of Agriculture Science and technology Department of Agronomy Curriculum of M.Sc Ag Agronomy Program

Course Code:	STAT-502					
Course Title:	Statistical Methods for Applied Science					
Pre-requisite:	Statistical knowledge helps you use the proper methods to collect the data, employ the correct analyses, and effectively present the results. Statistics is a crucial process behind how we make discoveries in science, make decisions based on data, and make predictions.					
Rationale:	Statistical methods involved in carrying out a study include planning, designing, collecting data, analysing, drawing meaningful interpretation and reporting of the research findings. The statistical analysis gives meaning to the meaningless numbers, thereby breathing life into a lifeless data.					

Course Outcomes:

CO1 This course will help students to know the applications of Statistics and learn and apply these techniques in the agriculture field of their study.

CO2 It can be used to find the best solution to any problem be it simple or complex.

CO3 Concept of correlation, various correlation coefficients- Pearson's correlation coefficient, Spearman's rank correlation coefficient, partial correlation coefficient and Multiple correlation coefficient.

CO4 To understand the process of hypothesis testing and its significance. Testing of hypothesis using Non-Parametric tests like Median test, Runs test, U test, Kruskal Wallis test etc. and ability to use them judiciously for the testing of given data.

CO5 Apply the different sampling methods for designing and selecting a sample from a population. Compare the pairs of treatment means using different methods when null hypothesis in rejected in ANOVA.

Scheme of Studies:

Board of	Course	Course Title		Scheme of studies(Hours/Week)			Total	
Study	Code		Cl	LI	SW	SL	Total Study Hours	Credits
							(CI+LI+SW+SL)	(C)
Program	STAT-502	Statistical	2	01	02	01	6	3
Core		Methods for						
(PCC)		Science						

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

			S	cheme of As	eme of Assessment (Marks)					
			Progressive	e Assessmen	t (PRA)		End Semester Assessment	Total Mark s	
Board of Study	Course Code	Course Title	Class/Home Assignment 1 number 5 markseach (CA)	Class Test 2 (2 best out) 15 marks each (CT)	Practic al Exam	Class Attendan ce (AT)	Total Marks (CA+CT+	(ESA)	(PRA+ ESA)	
PCC	STAT-502	Statistical Methods	5	30	10	5	<u>PA+AT)</u> 50	50	100	
		for Applied								

Science				

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.

STAT-502 CO-1 Know the applications of Statistics and learn and apply these techniques in the agriculture field.

Approximate Hours				
Item	Appx. Hrs.			
CI	6			
LI	2			
SW	1			
SL	2			
Total	11			

Session Out Comes	Laboratory	Classroom Instruction	Self-Learning	
(SOs)	Instruction	(CI)	(SL)	
	(LI)			
 SO1.1 Apply laws of probability to concrete problems. SO1.2 Perform statistical inference in several circumstances and interpret the results in an applied context. 	1) To impart knowledge on Statistical concepts like Exploratory data analysis.	Unit-1.Box-plot,Descriptivestatistics,Exploratorydataanalysis,Theoryprobability,Randomvariableandmathematical	1. Prepare the assignment on Random variable and mathematical expectation.	
 SO1.3 Communicate concepts in probability and statistics using both technical and non-technical language. SO1.4 Use a statistical software package for computations with data, 		expectation. 1.1. Box-plot 1.2 Descriptive statistics 1.3 Exploratory data analysis 1.4 Theory of probability. 1.5 Random variable 1.6Mathematical expectation.		

a. Assignments: Prepare the assignment on Random variable and mathematical expectation.

b. Mini Project: -

c. Other Activities (Specify):-

STAT-502 CO-2 Find the best solution to any problem be it simple or complex.

Approximate Hours					
Item	Appx. Hrs.				
CI	6				
LI	8				
SW	1				
SL	2				
Total	17				

Session Outcomes	Laboratory	Classroom Instruction	Self-
(SOs)	Instruction	(CI)	Learnin
	(LI)		g (SL)
 SO2.1 Recognize the binomial probability distribution and apply it appropriately. SO2.2 Recognize the Poisson probability distribution and apply it appropriately. SO2.3 Recognize and understand discrete probability distribution functions, in general. SO2.4 Recognize the standard normal probability distribution and apply it appropriately. SO2.5 Compare normal probabilities by converting to the standard normal distribution. 	 Fitting of Binomial distributions. Fitting of Poisson distributions. Fitting of Negative Binomial distributions. Fitting of Normal distributions. 	 Unit-2 Discrete and continuous probability distributions, Binomial, Poisson, Negative Binomial, Normal distribution, Beta and Gamma distributions and their applications. Concept of sampling distribution: chi-square, t and F distributions. Tests of significance based on Normal, chi-square, t and F distributions. 1.1 Discrete and continuous probability distributions 1.2 Binomial, Poisson, Negative Binomial 1.3. Normal distribution, Beta and Gamma distributions and their applications 1.4 Concept of sampling distributions. 1.5 Tests of significance based on 	(SL) 1. Prepare the assignment on Binomial, Poisson, Negative Binomial, Normal distribution, Beta and Gamma distributions and their applications.
		Normal, chi-square.	
		1.0 resis of significance based on t and F distributions	
		and r distributions.	

Assignments: Prepare the assignment on Simple Problems Based on Probability. Binomial & Poisson Distributions.

a. Other Activities (Specify):

STAT-502 CO-3 Concept of correlation, various correlation coefficients- Pearson's correlation coefficient, Spearman's rank correlation coefficient, partial correlation coefficient and Multiple correlation coefficient.

	Approximate Hours				
	Item	Appx. Hrs.			
	CI	6			
	LI	6			
	SW	1			
	SL	2			
r -	Fotal	15			

Session Out Comes	Laboratory	Classroom Instruction	Self-
(508)	(LI)	(CI)	(SL)
SO3.1 Create and analyze scatter plots.SO3.2 Discuss basic ideas of linear	1- Large sample tests, testing of hypothesis	Unit-3 Definition of Correlation, Scatter Diagram. Karl Pearson's Coefficient of Correlation. Linear Regression Equations.	1.Preparetheassignment onKarlPearson'sCoefficientof
regression and correlation.	based on	1.1. Definition of Correlation	Correlation. Linear
SO3.3 Create and interpret a line of best fit.	sampling distributions	1.2 Types of Correlation1.3. Scatter Diagram1.4. Karl Pearson's Coefficient of	Equations.
SO3.4 Calculate and interpret the correlation coefficient.	~ chi square, t and F. 2- Large sample tests, testing of hypothesis based on eXact sampling distributions ~t-test. 3- Large sample tests, testing of hypothesis based on	Correlation 1.5 Definition of Regression. 1.6 . Linear Regression Equations	

exact sampling distributions ~F- test.	

Assignments: Prepare the assignment on Karl Pearson's Coefficient of Correlation. Linear Regression Equations.

b. Other Activities (Specify):

STAT-502 CO-4 understand the process of hypothesis testing and its significance. Testing of hypothesis using non-Parametric tests like Median test, runs test, U test, Kruskal Wallis test etc. and ability to use them judiciously for the testing of given data.

Approximate Hours						
Item	Appx Hrs.					
CI	6					
LI	8					
SW	1					
SL	2					
Total	17					

Session Out Comes	Laboratory	Classroom Instruction	Self-Learning			
(SOs) Instruction		(CI)	(SL)			
	(LI)					
SOU1 Conduct and interpret	1- Confidence	Unit-4 Introduction to Test	1. Prepare the			
by nothesis tests for a single	interval	of Significance, One sample	assignment on Chi-Square			
nypolities rests for a single	estimation and	& two sample test t for	Test of Independence of			
population mean, population	2- Correlation	Means, Chi-Square Test of	Attributes in 2×2			
standard deviation known.	analysis	Independence of Attributes	Contingency Table.			
SO4.2 Conduct and interpret	3- Regression	in 2×2 Contingency Table.				
hypothesis tests for a single	analysis	1.1 Introduction to Test of				
population mean, population	4- Fitting of	Significance				
	· · · · · · · · · · · · · · · · · · ·	1.2 One sample				

 standard deviation unknown. SO4.3 Describe hypothesis testing in general and in practice SO4.4 Interpret the chi-square probability distribution as the sample size changes. SO4.5 Conduct and interpret chi-square goodness-of-fit hypothesis tests. 	Linear and Quadratic Model.	 1.3 Two sample test t for Means 1.4 Definition of Chi-Square 1.5 Application of Chi-square test 1.6 Chi-Square Test of Independence of Attributes in 2 ×2 Contingency Table 	
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Assignments: Prepare the assignment on Chi-Square Test of Independence of Attributes in 2×2 Contingency Table

c. Other Activities (Specify):

STAT-502 CO-5 Apply the different sampling methods for designing and selecting a sample from a population. Compare the pairs of treatment means using different methods when null hypothesis in rejected in ANOVA.

Ap	proximate Hours
Item	Appx Hrs.
CI	6
LI	6
SW	1
SL	2
Total	15

Session Out Comes	Laboratory	Classroom Instruction	Self-		
(SOs)	Instruction	(CI)	Learning		
	(LI)		(SL)		
SO5.1 Recognize and	1- Non-parametric	1. Prepare the			
differentiate between key	tests.	of Variance, Analysis of One	assignment on		
terms.	2- ANOVA: One	Way Classification.	Introduction to		
	way	Introduction to Sampling	Analysis of		
SO5.2 Apply various types of	3- ANOVA: Two	Methods, Sampling versus	Variance, Analysis		
sampling methods to data	Way	Complete Enumeration,	of One Way		

collection.	Simple Random Sampling	Classification.
SOE 2 Create and interpret	with and without replacement,	Introduction to
frequency tables	Use of Random Number	Sampling Methods,
requercy tables.	Tables for selection of Simple	Sampling versus
	Random Sample.	Complete
	1.1 Introduction to Analysis of	Enumeration.
	Variance	
	1.2 . Analysis of One Way	
	Classification	
	1.3 . Introduction to Sampling	
	Methods	
	1.4 Sampling versus Complete	
	Enumeration	
	1.5 Simple Random Sampling	
	with and without replacement	
	1.6 Use of Random Number	
	Tables for selection of Simple	
	Random Sample.	

Assignments:

Other Activities (Specify):

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (C l)	Laborato ry Lecture (L I)	Sessional Work (SW)	Self Learning (S l)	Total hour (C l + LI+ SW +S l)
01: This course will help students	06	02	01	02	15
to know the applications of					
Statistics and learn and apply these					
techniques in the agriculture field					
of their study.					
02: It can be used to find the best	06	08	01	02	15
solution to any problem be it					
simple or complex.					
03: Concept of correlation, various	06	06	01	02	15
correlation coefficients- Pearson's					
correlation coefficient, Spearman's					
rank correlation coefficient, partial					
correlation coefficient and					
Multiple correlation coefficient.					

04: To understand the process of hypothesis testing and its significance. Testing of hypothesis	06	08	01	02	15
using Non-Parametric tests like					
Kruskal Wallis test etc. and ability					
to use them judiciously for the					
testing of given data.					
05: Apply the different sampling	06	06	01	02	15
methods for designing and					
selecting a sample from a					
population. Compare the pairs of					
treatment means using different					
methods when null hypothesis in					
rejected in ANOVA.					
Total Hours	30	30	05	10	75

Suggestion for End Semester Assessment

СО	Unit title	Μ	larks Distrib	oution	Total
		R	U	Α	Marks
CO-1	This course will help students to	02	02	02	06
	know the applications of				
	Statistics and learn and apply				
	these techniques in the				
	agriculture field of their study.				
CO-2	It can be used to find the best	02	03	03	08
	solution to any problem be it				
	simple or complex.				
CO-3	Concept of correlation, various	02	04	04	10
	correlation coefficients-				
	Pearson's correlation				
	coefficient, Spearman's rank				
	correlation coefficient, partial				

Suggested Specification Table (For ESA)

	correlationcoefficientandMultiple correlation coefficient.				
CO-4	To understand the process of hypothesis testing and its significance. Testing of hypothesis using Non- Parametric tests like Median test, Runs test, U test, Kruskal Wallis test etc. and ability to use them judiciously for the testing of given data.	03	04	05	12
CO-5	Apply the different sampling methods for designing and selecting a sample from a population. Compare the pairs of treatment means using different methods when null hypothesis in rejected in ANOVA.	04	05	05	14
	Total	13	18	19	50

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

The end of semester assessment for Statistical Methods for Applied 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:

S.	Title	Author	Publisher	Edition &
01	An Outline of Statistical Theory	Goon AM, Gupta MK & Dasgupta B.	The World Press	1977 1 st addition
02	Fundamentals of Statistics	Goon AM, Gupta MK & Dasgupta B	The World Press	1983. First edition
03	Introduction to Mathematical Statistics	Hoel PG	John Wiley	05th Edition 1971
04	An Introduction to Multivariate Statistical Analysis	T.W. Anderson	John Wiley.	3rd Edition 2009
05	Introduction to Mathematical Statistics	Robert V. Hogg, Joseph W. McKean, Allen T. Craig	Hogg	7th Edition 2012

Curriculum Development Team:

1. Professor B.B. Beohar, Director Planning, & Director Extension, A.K.S. University

2. Dr. V.K. Vishwakarma, Head Department of Agricultural Economics, FAST

3. Mr. Navneet Raj Rathore, Teaching Associate, Department of Agricultural Economics, FAST

	Course Title: - Statistical Methods for Applied Science													
Course	Program Ou	am Outcomes Program Specific Outcome												
Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
	Specific	Wide	Detailed	Use	Detail	Create,	Student	Student	Understan	Enable to	Acquainting	То	Apply	То
	knowledge	knowle	knowled	appr	ed	select	will	will apply	d the	recognize	with basic	undertake	researc	understa
	of various	dge in	ge	opri	knowl	and	apply	basic	impact of	and	concepts	teaching	h and	nd and
	branches of	the	regardin	ate	edge	apply	various	concepts in	the	examine	theories and	research and	experti	analyze
	agronomy	concern	g	scie	of	an	statistic	laboratory	profession	the	terminology	extension	se in	the
	will be	ing	package	ntifi	cultiva	appropr	al	techniques	al expert	relationshi	of	activates	resolvi	current
	made	subject	and	с	tion	iate	method	during their	solutions	ps between	Agronomy.	along with	ng the	issues
	specialized	which	practices	meth	practic	techniq	s to	research	in societal	inputs and		administrati	proble	that are
	and to	will	soil	ods	es,	ues,	analyze	work	and	outputs in		ve and	ms of	occurrin
	provide	improve	fertilizer	colla	soil,	resourc	their		environme	their		consultancy	existin	g in
	knowledge	the	and	bora	fertiliz	es and	master		ntal	agricultural		services.	g farm	local and
	disseminati	farmers	water	tion	ers,	modern	research		contexts,	field to			in the	global
	on	conditio	manage	with	water	it tools	work		and	make			periphe	agricultu
	regarding	n	ment of	stati	manag	in			demonstrat	effective			ry of	re and
	various	through	producti	stics	ement	1mprov			e the	and			univers	how they
	technique	student	ve crop	alon	and	ement			knowledge	profitable			ities.	will
	of farming	S (1	aspects.	g 	plant	10			of, and	decisions.				affect
	and	contribu		with	protec	agrono			need for	10				futuristic
	farming	tions.		eval	tion	mical			sustainable	understand				agricultu
	system in			uatio	econo	раскад			developme	machanica				re
	mula			II whice		e and			III III Agricultur	of agri				
				h	associ				Agricultur	Entropropo				
				11 will	with	<i>cs</i> .			с.	urship				
				prov	farmin					ursinp.				
				ed to	σ									
				deci	entern									
				sion	rises									
				in	11000.									
				vari										
				ous										
				part										
				of										

Cos, POs and PSOs Mapping Course Code:- STAT-502 Course Title: - Statistical Methods for Applied Sci

				agric ultur e										
CO1- This	1	2	1	1	1	3	3	3	3	3	1	2	3	3
course will														
help students														
to know the														
applications														
of Statistics														
and learn and														
apply these														
techniques in														
the														
agriculture														
field of their														
study												-		
CO2 It can	1	2	1	1	1	3	3	3	3	3	1	2	3	3
be used to														
find the best														
solution to														
solution to any problem														
solution to any problem be it simple														
solution to any problem be it simple or complex			1	1	1	2	2	2	2	2			2	-
solution to any problem be it simple or complex CO3	1	2	1	1	1	3	3	3	3	3	1	2	3	3
solution to any problem be it simple or complex CO3 Concept of	1	2	1	1	1	3	3	3	3	3	1	2	3	3
solution to any problem be it simple or complex CO3 Concept of correlation,	1	2	1	1	1	3	3	3	3	3	1	2	3	3
solution to any problem be it simple or complex CO3 Concept of correlation, various	1	2	1	1	1	3	3	3	3	3	1	2	3	3
solution to any problem be it simple or complex CO3 Concept of correlation, various correlation	1	2	1	1	1	3	3	3	3	3	1	2	3	3
solution to any problem be it simple or complex CO3 Concept of correlation, various correlation coefficients-	1	2	1	1	1	3	3	3	3	3	1	2	3	3
solution to any problem be it simple or complex CO3 Concept of correlation, various correlation coefficients- Pearson's	1	2	1	1	1	3	3	3	3	3	1	2	3	3

coefficient, Spearman's rank correlation coefficient, partial correlation coefficient and Multiple correlation coefficient.														
CO 4. To understand the process of hypothesis testing and its significance. Testing of hypothesis using Non- Parametric tests like Median test, Runs test, U test, Kruskal	1	2	1	1	1	3	3	3	3	3	1	2	3	3
Wallis test etc. and ability to use them														

for the testing	
of given data	
CO5 Apply 2 1 1 1 3 3 3 3 1 2 3	3
the different	
sampling	
methods for	
designing	
and	
selecting a	
sample from	
a population.	
Compare the	
pairs of	
treatment	
means using	
different	
methods	
when null	
nypotnesis	

POs & PSOs	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO1- This course will help students to know the applications of Statistics and learn and apply these techniques in the agriculture field of their study	SO1.1 SO1.2 SO1.3 SO1.4		Unit-1. Box-plot, Descriptive statistics, Exploratory data analysis, Theory of probability, Random variable and mathematical expectation. 1.1, 1.2, 1.3, 1.4, 1.5, 1.6	As mentioned in page number
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO2 It can be used to find the best solution to any problem be it simple or complex	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5		Unit-2 Discrete and continuous probability distributions, Binomial, Poisson, Negative Binomial, Normal distribution, Beta and Gamma distributions and their applications. Concept of sampling distribution: chi-square, t and F distributions. Tests of significance based on Normal, chi-square, t and F distributions 1.1, 1.2, 1.3, 1.4, 1.5, 1.6	As mentioned in page number
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO3 Concept of correlation, various correlation coefficients- Pearson's correlation coefficient, Spearman's rank	SO3.1 SO3.2 SO3.3		Unit-3 . Definition of Correlation, Scatter Diagram. Karl Pearson's Coefficient of Correlation. Linear Regression Equations. 1.1, 1.2,1.3,1.4,1.5,1.6	As mentioned in page number

Course Curriculum Map: Statistical Methods for Applied Science

	correlation coefficient, partial correlation coefficient and Multiple correlation coefficient.			
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO 4. To understand the process of nypothesis testing and its significance. Testing of hypothesis using Non-Parametric tests like Median test, Runs test, U test, Kruskal Wallis test etc. and ability to use them iudiciously for the testing of given data.	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5	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 1.1, 1.2,1.3,1.4 1.5,1.6	As mentioned in page number

PO 1,2,3,4,5,6	CO5 Apply the	SO5.1	Unit 5 Introduction to Analysis of As mentioned in page
7,8,9,10,11,12	different sampling	SO5.2	Variance, Analysis of One Way number
	methods for	SO5.3	Classification. Introduction to Sampling
PSO 1,2, 3, 4, 5	designing and		Methods, Sampling versus Complete
	selecting a sample		Enumeration, Simple Random Sampling
	from a population.		with and without replacement, Use of
	Compare the pairs		Random Number Tables for selection of
	of treatment means		Simple Random Sample.
	using different		1.1, 1.2, 1.3, 1.4 1.5, 1.6
	methods when null		
	hypothesis in		
	rejected in		
	ANOVA.		



Faculty of Agriculture Science and technology Department of Agronomy Curriculum of M.Sc Ag Agronomy Program

Course Code:	PGS502
Course Title: Pre- requisite:	Technical writing and communication. Understanding the principles of various technical writing including thesis, reviews, abstracts and developing communication skills through the proper use of language.
Rationale:	The basic purpose of technical writing is to convey complex information in a simple manner. It explains a topic in detail using proper abstract and citations having communication skills being accessible to a general audience.
Course Outcom	es:

- **PGS 502.1**: Learning the various form of scientific writing and implementing skills for Formulation of research based documents.
- PGS 502.2: Acquisition of technical communication skill and articulate in English (verbal as writing)

Scheme of Studies:

Board of Study	Course	Course Title	Scheme of studies(Hours/Week)					Total Credits
Study	Coue		CI	LI	SW	SL	Total Study Hours	(C)
							CI+LI+SW+SL	
Program Core (PCC)	PGS 502	Technical writing and communication.	0	15	2	4	21	0+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.

ANNX-II

Proposed examination scheme (Marking) as per the recommendation of PG re-structuring ' Committee of Agricultural Education Division, Indian Council of Agricultural Research for M. Sc. Horticulture in Vegetables science 2021-22 onwards

S.	Category of		Total			
N0.	Course/Subject	Semester End Examination (External	Mid Term exam (Internal)	Assignment (Internal)	Practical Exam (Internal)	
1	Only Theory Subject Course	50	40 (20+20)	10	-	100
2	Subject/ Course with theory and Practical	50	30 (15+15)	5 (Practical Based)	15	100
3	Subject/ Course only Practical	-	-	-	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.

PGS 502.1: Learning the various form of scientific writing and implementing skills for Formulation of research based documents.

Approximate Hours						
Item	Approximate					
	Hours					
CI	00					
LI	08					
SW	01					
SL	02					
Total	11					

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO 1.1. To understand about various form writing research documents.	Technical writing 1.1 Various form of scientific writing – thesis, technical papers, reviews, manuals etc. 1.2 Various part of thesis and		Enlisting and write description of research
SO 1.2. To understand about various technical writing approaches for scientific strengting of research documents.	 1.2 various part of thesis and research communication Title page Authorship content page Preface Introduction 		contents.
SO 1.3. To understand about editing and press reading method to avoid plagiarism.	 Review of literature Material and methods Experimental result Discussion 1.3 citations etc. 1.4 Commonly used abbreviations in the thesis and research communication . 1.5 Illustrations, photography and drawing with suitable captions pagination numbering of tables and illustrations. 		

dates in scientific write ups.	
1.7 Editing and press reading.	
1.8 Writing of review articles.	

a. Assignments:

- Various part of thesis and research communications.
- Writing of abstract, summaries, précis, citations.
- Commonly used abbreviations in the thesis and research communication .
- Write down the principal of editing and press reading.

b. Mini Project:

c. Other Activities (Specify):

PGS 50	2.2:	Acquisition	of	technical	communication	skill	and	articulate	in	English	(verbal	as
		writing)										

Арг	proximate Hours
Item	Approximate Hours
	nouis
CI	00
LI	07
SW	01
SL	02
Total	10

.

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO 2.1. To understand the types, forms, tenses clauses and their uses.	Communication skill- 1.1 Grammar (Tenses, part of speed, clauses, punctuation marks) 1.2 Error analysis (common error),		Enlisting and write the description of communication using proper language skills.

	concord, collocation,	
SO 2.2. To understand common errors, punctuation in the sentences.	phonetic, symbols and transcription.1.3 Accentual pattern: weak forms in connected	
SO 2.3. To understand part of speech or word class and their uses.	speech. 1.4 Participation in group discussion 1.5 Facing of interview.	
SO 2.4. To understand discussion in groups and interviews.	1.6 Presentation of scientific paper.	

a. Assignments:

- 1 Writing types of clauses.
- 2 Writing the sentences using correct punctuation.
- 3 Writing the types and forms of tenses.
- b. Mini Project:
- c. Other Activities (Specify):

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class	Sessional	Self	Total hour
	Lecture	Work	Learning	(Cl+SW+Sl)
	(Cl)	(SW)	(Sl)	
	0	2	1	3
PGS 502.1: Learning the various form of				
scientific writing and implementing skills				
for Formulation of research based				
documents.				
PGS 502.2: Acquisition of technical	0	2	1	3
communication skill and				

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Ma	Total		
	_	R	U	Α	_ Marks
CO 1	Technical writing	00	05	05	10
	1.1 Various form of scientific writing – thesis, technical papers, reviews, manuals etc.				
	1.2 Various part of thesis and research communication	03	03	04	10
	 Title page Authorship content page Preface Introduction Review of literature Material and methods Experimental result Discussion 1.3 citations etc. 	00	05	05	10
	1.4 Commonly used abbreviations in the thesis and research communication .	03	02	05	10
	1.5 Illustrations, photography and drawing with suitable captions	00	00	10	10
	pagination numbering of tables and illustrations.	00	05	05	10
	1.6 Writing of numbers and dates in	04	02	04	10
	scientific write ups.	03	02	05	10
------	---	----	----	----	----
	1.7 Editing and press reading				
	1.8 Writing of review articles.				
CO 2	Communication skill-				
	1.1 Grammar (Tenses, part of speed, clauses, punctuation marks)	03	02	05	10
	1.2 Error analysis (common error).	02	03	05	10
	concord, collocation, phonetic, symbols and transcription.	04	04	00	08
	1.3 Accentual pattern: weak forms in connected speech.	05	02	00	07
	1.4 Participation in group discussion	00	05	05	10
	1.5 Facing of interview.	00	05	05	10
	1.6 Presentation of scientific paper.				

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

The end of semester assessment for **Technical writing and communication** 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.	Title	Author	Publisher	Edition &
No.				Year
1	Spoken English	Barnes and Noble. Robert C. (Ed.).	Flourish Your Language	2005
2	Technical communication	Mike markel Stular A. Selber	Bedford/St. Martins, 12 th edition	2017
3	The Essentials of Technical communication	Elizabeth tebeaux sam dragga.	Oxford university press,4 th edition	2017
4	Technical writing prosess	Kieran morgan and sanja spajic	Better on paper publications, 1th edition	2015
5	Developing quality technical information	Moira Mcfadden lanyi, Deirdrelongo	IBM press 3th edition	2014

Curriculum Development Team:

- 1. Dr. S.S. Tomar, DEAN, Faculty of Agriculture Science and Technology, AKS University.
- 2. Dr. Neeraj Verma, PG Coordinator, Faculty of Agriculture Science and Technology, AKS University.
- 3. Dr. Abhishek Singh, HOD, Dept. of Horticulture, Faculty of Agriculture Science and Technology AKS University.
- 4. Dr. Bharti Sao, Assistant Professor, Dept. of Horticulture, Faculty of Agriculture Science and Technology AKS University.
- 5. Dr. B. V. Singh, Assistant Professor, Dept. of Horticulture, Faculty of Agriculture Science and Technology AKS University.
- 6. Dr. Mohni Parmar, Assistant Professor, Dept. of Horticulture, Faculty of Agriculture Science and Technology AKS University.
- 7. Dr. S. K. Chandel, Assistant Professor, Dept. of Horticulture, Faculty of Agriculture Science and Technology AKS University.

8. Mr. Ansul Asre, Teaching Associate, Dept. of Horticulture, Faculty of Agriculture Science and Technology AKS University.

Cos, POs and PSOs Mapping Course Code:- PGS 502 Course Title: - Technical writing and communication skill.

Course	Program Outcomes								Program Specific Outcome					
Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
	Specific knowledge of various branches of agronomy will be made specialized and to provide knowledge disseminati on regarding various technique of farming and farming system in India	Wide knowle dge in the concern ing subject which will improve the farmers conditio n through student' s contribu tions.	Detailed knowled ge regardin g package and practices soil fertilizer and water manage ment of producti ve crop aspects.	Use appr opri ate scie ntifi c meth ods colla bora tion with stati stics alon g with eval uatio n whic h will prov ed to	Detail ed knowl edge of cultiva tion practic es, soil, fertiliz ers, water manag ement and plant protec tion econo mic associ ated with farmin g enterp rises.	Create, select and apply an appropr iate techniq ues, resourc es and modern it tools in improv ement of agrono mical packag e and practic es.	Student will apply various statistic al method s to analyze their master research work	Student will apply basic concepts in laboratory techniques during their research work	Understan d the impact of the profession al expert solutions in societal and environme ntal contexts, and demonstrat e the knowledge of, and need for sustainable developme nt in Agricultur e.	Enable to recognize and examine the relationshi ps between inputs and outputs in their agricultural field to make effective and profitable decisions. To understand the mechanics of agri Entreprene urship.	Acquainting with basic concepts theories and terminology of Agronomy.	To undertake teaching research and extension activates along with administrati ve and consultancy services.	Apply researc h and experti se in resolvi ng the proble ms of existin g farm in the periphe ry of univers ities.	To understa nd and analyze the current issues that are occurrin g in local and global agricultu re and how they will affect futuristic agricultu re

				deci sion in vari ous part of agric ultur e										
CO1- Learning the various form of scientific writing and implementing skills for Formulation of research based documents.	1	1	1	1	3	3	1	1	1	1	3	2	3	1
CO2- Acquisition of technical communicati on skill and	1	1	1	1	3	3	1	1	1	1	3	2	3	1

articulate	in					
English						
(verbal	as					
writing)						

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map: Technical writing and communication skill

POs & PSOs	COs No.& Titles	SOs No.	Laboratory	Classroom Instruction (CI)	Self Learning
No.			Instruction(LI)		(SL)
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO1- Learning the various form of scientific writing and implementing skills for Formulation of research based documents.	SO1.1 SO1.2 SO1.3		 Unit-1. Technical writing Various form of scientific writing – thesis, technical papers, reviews, manuals etc. Various part of thesis and research communication Title page Authorship content page Preface Introduction Review of literature Material and methods Experimental result Discussion citations etc. Commonly used abbreviations in the thesis and 	As mentioned in page number

		research communication . Illustrations, photography and drawing with suitable captions pagination numbering of tables and illustrations. Writing of numbers and dates in scientific write ups. Editing and press reading . Writing of review articles 1.1,1.2,1.3,1.4,`1.5,1.6,1.7,1.8,	
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO2-Acquisition of technical communication skill and articulate in English (verbal as writing)	Communication skill-Grammar (Tenses, part of speed, clauses, punctuation marks)Error analysis (common error), concord, collocation, phonetic, symbols and transcription. Accentual pattern: weak forms in connected speech. Participation in group discussion Facing of interview. Presentation of scientific paper.1.1,1.2,1.3,1.4,1.5,1.6.	



AKS University Faculty of Agriculture Science and Technology Department of Agronomy/Plant Pathology/GPB/Soil Science/Horti. Curriculum of M.Sc.Agri Program

Course Code:	PGS 501
Course Title :	Library and Information Services
Pre-requisite:	Student should have basic knowledge of library because course aims to familiarize the learners with the basic concept of use of library services.
Rationale:	To impart to the students an understanding of knowledge classification and the theories of library classification, to develop skills in document classification and content analysis. The course provides the opportunity, ensuring freedom and equal access to information for all members of the community, to educate and enlighten them. To maintain and preserve books, materials and resources with historical, cultural, social, economic and archival value, and other related materials in an organized collection to provide members of the community these materials and enriched their personal and professional lives.

Course Outcomes:

CO1. Able to understand about various concepts of Library, its functions, objective and connect foundational concepts, theories, and principles of information organization and access to professional contexts.

Scheme of Studies:

Board	oard				Schei	Scheme of studies(Hours/Week)			
ofStudy	Course Code	CourseTitle	Cl	LI	SW	SL	Total StudyHours(CI+L I+SW+SL)	(C)	
	PGS 501	Library and Information Services	0	1	1	1	3	1	

Legend: CI:Class room Instructions (Includes different instructional strategies i.e. Lecture(L),Tutorial (T)and others),
 LI:Laboratory Instruction(Includes Practical performance sin 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 out come of Learning.

Scheme of Assessment:

Theory

				Schem	e of Ass	sessment	(Marks)		
				Progres	sive Ass	sessment	(PRA)		End Semest	Total
Boar Cou d of se Stud Cod y e	Cou se Cod e	Course Title	Class/Ho me Assignm ent 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3) 10 marks each (CT)	Semi nar one (SA)	Class Activi ty any one (CAT)	Class Attenda nce (AT)	Total Marks (CA+C T+ SA+CA T+AT)	er Assess ment (ESA)	Total Marks (PRA+ ESA)
	PGS 501	Library and Informatio							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

PGS501.1: Able to understand about various concepts of Library, its functions, objective and connect foundational concepts, theories, and principles of information organization and access to professional contexts.

Approximate Hours					
Item	Appx				
	Hrs.				
Cl	0				
LI	30				
SW	6				
SL	3				

.

Total

39

SessionOutcomes (SOs)	Laboratory Instruction (LI) 1 class= 2 hrs	Classroom Instruction (CI)	(SL)
 SO1.1Understand the Concept, Definition & Characteristics of Library SO1.2Understand the Importance &Functions of Library SO1.3 Understand the Role of Library and Information Services 	Introduction to library and its services; Role of libraries in education, research and technology transfer; Classification systems and organization of library; Sources of information- Primary Sources, Secondary Sources and Tertiary Sources; Intricacies of abstracting and indexing services (Science Citation Index, Biological Abstracts, Chemical Abstracts, CABI Abstracts, etc.); Tracing information from reference sources;		 How to Accessioning of Books on software How to Books search in Library through the OPAC Difference Between Library and Information Services
	Literature survey; Citation techniques/Preparation of bibliography; Use of CD- ROM Databases, Online Public Access Catalogue and other computerized library services; Use of Internet including search engines and its resources; ere sources access methods. 1.1 Introduction to library, 1.2 Types of library, 1.3 Role of library in society 1.4 Role of Education sector, 1.5 Classification scheme, 1.6 Types of Information sources 1.7 Abstracting and indexing services, 1.8 Use of Databases, OPAC 1.9 Computerized library services 1.10 Library Services 1.11 Online Public Access		

Catalogue	
1.12 Types of Information Centers	
1.13 Library Automation	
1.14 Create a Digital Library	
1.15 Use of e resources	

a. Assignments:

- 1. Introduction to library and its services;
- 2. Role of libraries in education, research and technology transfer,
- 3. Classification systems and organization of library;
- 4. Sources of information-, Primary Sources, Secondary Sources and Tertiary Sources;
- 5. Intricacies of abstracting and indexing services (Science Citation Index, Biological Abstracts,
- Chemical Abstracts, CABI Abstracts, etc.);
- 6. Tracing information from reference sources;

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class lecture (CL)	Sessional Work (SW)	Self- Learning (SL)	Total hour (CL+SW+SL)
Able to understand about various				
concepts of Library, its functions,				
objective and connect foundational				
concepts, theories, and principles of				
information organization and access to				
professional contexts.	30	6	3	39

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

СО	Unit Titles	Marks	Distrib	Total Marks		
			R	U	Α	

CO1	Library and Information Services	30	70	100

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

The end of semester assessment for Library and Information Services 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 and Year
01				
02				

Curriculum Development Team:

- 1. .Dr. S.S. Tomar, DEAN, Faculty of Agriculture Science and Technology, AKS University.
- 2. .Dr. Neeraj Verma, PG Coordinator, Faculty of Agriculture Science and Technology, AKS University.
- 3. Dr. T.Singh , Professor and Head Agronomy AKS University
- 4. Dr V.D Dwivedi , Professor Agronomy AKS University
- 5. Dr H.S. Kushwaha Professor Agronomy MGCGVV Chitrakoot satna M.P

- 6. Dr. D. P Chaturv4edi ,Assistant Professor, Dept. Of Agronomy AKS University
- 7. Dr. Pankaj Bagri, Assistant Professor, Dept. Of Agronomy AKS University
- 8. Mr. Amit Singh Tiwari , Assistant Professor, Dept. Of Agronomy AKS University
- 9. Mr. Sanjay Lillhare, Assistant Professor, Dept. Of Agronomy AKS University
- 10. Ms. Prachi Singh, Teaching Associate, Dept. Of Agronomy AKS University

•

11. Ms. Prachi Awadhiya, Teaching Associate, Dept. Of Agronomy AKS University

Cos, POs and PSOs Mapping Course Code:- PGS 501 Course Title: - Library and Information Services

Course	Program Ou	utcomes						Program Specific Outcome						
Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
	Specific knowledge of various branches of agronomy will be made specialized and to provide knowledge disseminati on regarding various technique of farming and farming system in India	Wide knowle dge in the concern ing subject which will improve the farmers conditio n through student' s contribu tions.	Detailed knowled ge regardin g package and practices soil fertilizer and water manage ment of producti ve crop aspects.	Use appr opri ate scie ntifi c meth ods colla bora tion with stati stics alon g with eval uatio n whic h whic h will prov ed to deci sion in vari	Detail ed knowl edge of cultiva tion practic es, soil, fertiliz ers, water manag ement and plant protec tion econo mic associ ated with farmin g enterp rises.	Create, select and apply an appropr iate techniq ues, resourc es and modern it tools in improv ement of agrono mical packag e and practic es.	Student will apply various statistic al method s to analyze their master research work	Student will apply basic concepts in laboratory techniques during their research work	Understan d the impact of the profession al expert solutions in societal and environme ntal contexts, and demonstrat e the knowledge of, and need for sustainable developme nt in Agricultur e.	Enable to recognize and examine the relationshi ps between inputs and outputs in their agricultural field to make effective and profitable decisions. To understand the mechanics of agri Entreprene urship.	Acquainting with basic concepts theories and terminology of Agronomy.	To undertake teaching research and extension activates along with administrati ve and consultancy services.	Apply researc h and experti se in resolvi ng the proble ms of existin g farm in the periphe ry of univers ities.	To unders nd and analyz the curren issues that ar occurr g in local a global agricu re and how th will affect futuris agricu re

				ous part of agric ultur e										
CO1- Able to	1	1	1	1	1	1	3	3	1	1	1	2	1	1
understand														
about various														
concepts of														
Library, its														
functions,														
objective and														
connect														
foundational														
concepts,														
theories, and														
principles of														
information														
organization														
and access to														
professional														
contexts.														

Legend: 1 – Low, 2 – Medium, 3 – High

	000110	Laboratory	Classroom Instruction (CI)	Self Learning
Titles		Instruction(LI)		(SL)
Citles CO1- Able to inderstand about arious concepts of Library, its inctions, bjective and onnect oundational oncepts, neories, and rinciples of information rganization and ccess to rofessional ontexts.	SO1.1 SO1.2 SO1.3	Instruction(LI)	Unit-1. Introduction to library and its services; Role of libraries in education, research and technology transfer; Classification systems and organization of library; Sources of information- Primary Sources, Secondary Sources and Tertiary Sources; Intricacies of abstracting and indexing services (Science Citation Index, Biological Abstracts, Chemical Abstracts, CABI Abstracts, etc.); Tracing information from reference sources; Literature survey; Citation techniques/Preparation of bibliography; Use of CD-ROM Databases, Online Public Access Catalogue and other computerized library services; Use of Internet including search engines and its resources; ere sources access methods. 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9,1.10,1.11,1.12,1.13,1.14,1.15	(SL) As mentioned in page number
COI nde arie f L inc bje oni oni oni rin ifo rga cce rof	I- Able to erstand about ous concepts ibrary, its ctions, ective and nect ndational cepts, ories, and ciples of rmation anization and ess to fessional texts.	I- Able to erstand about ous concepts ibrary, its tions, ctive and nect ndational cepts, ories, and ciples of rmation anization and ess to fessional texts.	Instruction(L1)I- Able to erstand about ous conceptsSO1.2ibrary, its tions, ective and nect ndational cepts, ories, and ciples of rmation anization and ess to fessional texts.	esInstruction(L1)I- Able to erstand about ous concepts ibrary, itsSO1.2SO1.2 ibrary, its ctions, ctive and nect dational cepts, ories, and ciples of rmation anization and ess to ressional texts.SO1.3Unit-1. Introduction to library and its services; Role of libraries in education, research and technology transfer; Classification systems and organization of library; Sources of information- Primary Sources, Secondary Sources and Tertiary Sources; Intricacies of abstracting and indexing services (Science Citation Index, Biological Abstracts, Chemical Abstracts, CABI Abstracts, etc.); Tracing information from reference sources; Literature survey; Citation techniques/Preparation of bibliography; Use of CD-ROM Databases, Online Public Access Catalogue and other computerized library services; Use of Internet including search engines and its resources; ere sources access methods. 1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9,1.10,1.11,1.12,1.13,1.14,1.15 .

Course Curriculum Map: Library and Information Services



AKS University

Faculty of Agriculture Science and Technology Department of Agronomy Curriculum of M.Sc Ag Agronomy Program

Course Code:	Agron 503
Course Title:	Principles and practices of weed management
Pre-requisite:	Student should have basic knowledge of weed its characteristics Allelopathic effect of weed on crop. Students are acquaint with the herbicides and weed Management practices and Integrated Weed Management.
Rationale:	The students should be acquainted with the knowledge of weed its importance and crop weed competition and weed ecology. Students have basic knowledge of herbicides and principles and practices of weed management practices in different cropping system. This field of study and practice is driven by several key factors and considerations: Safety, Sustainability, Innovation and technology, Economic efficiency.

Course Outcomes:

Agron 503.1 Define weeds, its intensity and crop weed competition to make student expert in the weed science.

Agron 503.2 Students may acquire knowledge to herbicide classification based on Chemical, physiological mode and mechanism of action Of herbicides.

Agron 503.3 Students may acquire knowledge about herbicide structure and weed control through use of nano-herbicides and bio-herbicides, myco-herbicides and degradation of herbicide.

Agron 503.4 Student will acquaint knowledge about principles and method of weed control and management. Agron 503.5 PG students of agronomy will become to expert in integrated weed management practices.

Scheme of Studies:

Category					Sche	me of studi	ies(Hours/Week)	TotalCredits
of	~		Cl	LI	SW	SL	Total	(C)
course	Course	CourseTitle					StudyHours(CI+L	
	Code						+SW+SL)	
	Agro-	Principles and	02	1	1	1	5	3
	503	practices of weed						
		management						

 Legend:
 CI: Classroom Instruction(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: 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 ofteacherto ensure outcome of Learning.

Scheme of Assessment:

Theory

			Scheme of Assessment (Marks)							
					End Semester	Total Marks				
Category of C course C	Couse Code	Course Title	Class/ Home Assig nment 5 numb er 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 T)	Assessme nt (ESA)	(PRA+ ESA)
Program Core (SDGs)	Agro- 503	Principles and practices of weed manageme nt	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.

Agro 503.1 Define weeds, its intensity and crop weed competition to make student expert in the weed science.

Approximate Hours

Item	Appx Hrs.
Cl	06
LI	4
SW	1
SL	1
Total	12

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO1.1 Understand the weed biology and ecology of	1. Identification	Unit-1. Weed biology, and ecology and	1. principles and methods
weed and its	weeds of	classification, crop-	of weed
importance of weed.	2. Preparation of	including Allelopathy;	management
SO1.2Understand the crop	a weed herbarium	principles and methods of weed control and	and different weed indices
weed competition and its effect on crop.		classification	

SO1.3 Understand the allelopathy its types and allelopathic effect of weed on crop and crop on weed.	 management; weed indices, weed shift in different eco-systems 1.1Introduction to Characteristics of weed and classification of weeds. 	
SO1.4 Understand the principles and methods of weed control and different	1. 2 1 Introduction to crop weed competition.	
types of weed management practices. SO1.5 Understand the different types of weed	1.3 Introduction to allelopathy and its effect of weed on crop and crop on weed.	
shift in different eco-systems	1.4 Explain the principles and methods of weed control and management1.5 introduction to different types of weed indices.	
	1.6 Explain the weed shift in different eco-systems	

SW-1 Suggested Sessional Work (SW): Assignments:

What is Weed biology and ecology. Explain classification, crop-weed competition including Allelopathy.

a. Other Activities(Specify):

•

Collection of weed species in AKS Campus.

Agro 503.2 Students may acquire knowledge to herbicide classification based on Chemical, physiological mode and mechanism of action Of herbicid

Approximate Hours

Item	AppxHrs.
Cl	06
LI	4
SW	1
SL	1
Total	12

			Total	12
Session Outcomes	Laboratory	Classroom Instruction		Self-
(SOs)	Instruction	(CI)		Learning
	(LI)			(SL)
SO1.1 Understand the herbicide	1. Preparation	Unit-2 Herbicides introduction	1. h	istory and
and concept of herbicide.	of spray	and history of their	deve	lopment of
-	solutions of	development; classification	herbi	icide.
SO1.2 Understand the	herbicides	based on Chemical, physiologi	cal	

for high and	application and selectivity; mode	
sprayers	Of herbicides.	
2.Calculation	1.1 Introduction to Herbicides and	
requirement	its history	
_	1.2 Introduction to Herbicides	
	development.	
	1.3 . Explain the classification of	
	herbicide on the basis of Chemical	
	1.4 Explain the classification of	
	herbicide on the basis of	
	physiological application	
	1.5 Explain the classification of	
	herbicide on the basis of selectivity	
	1.6 Explain the classification of	
	herbicide on the basis of mode and	
	mechanism of action	
	for high and low-volume sprayers 2. Calculation of herbicidal requirement	for high and low-volume sprayersapplication and selectivity; mode and mechanism of action Of herbicides.2. Calculation of herbicidal requirement1.1 Introduction to Herbicides and its history 1.2 Introduction to Herbicides development.1.3. Explain the classification of herbicide on the basis of Chemical1.4 Explain the classification of herbicide on the basis of physiological application1.5 Explain the classification of herbicide on the basis of selectivity1.6 Explain the classification of herbicide on the basis of mode and mechanism of action

Assignments:

Classification based on Chemical, physiological application and selectivity mode and mechanism of action of herbicides.

b. Other Activities(Specify):

Agro 503.3 Students may acquire knowledge about herbicide structure and weed control through use of nano-herbicides and bio-herbicides, myco-herbicides and degradation of herbicide.

Approximate Hours		
Item	Appx Hrs.	
C1	06	
LI	4	
SW	1	
SL	1	
Total	12	

Session Outcomes (SOs)	Laboratory Instruction	Classroom Instruction (CI)	Self- Learning
Session Outcomes (SOs)SO1.1 Understand the Herbicide structure factors affecting the efficiency of Herbicides.SO1.2 Understand the herbicide formulations, herbicide mixtures, sequential application of Herbicides, and herbicide rotation .SO1.3 Understand the use of nano- herbicides and bio-herbicides,myco- herbicides bio-agents, and allelochemicals for control the weed.SO1.4. Understand the movement of herbicides in soil and 	Laboratory Instruction (LI) 1.Herbicide resistance analysis in plant and soil 2.Bioassay of herbicide resistance	Classroom Instruction (CI) Unit-3 Herbicide structure - activity relationship; factors affecting the efficiency of Herbicides; herbicide formulations, herbicide mixtures, sequential application of Herbicides, rotation; weed control through use of nano- herbicides and bioherbicides,myco-herbicides bio-agents, and allelochemicals; movement of herbicides in soil and plant, degradation of herbicides in soil and plants; herbicide resistance, residue, persistence and management; development of herbicide resistance in weeds and crops and their management, herbicide combination and rotation. 1.1Introduction to Herbicide structure - activity relationship; factors affecting the efficiency of Herbicides. 1.2 Introduction to herbicide formulations, herbicide mixtures,	Self- Learning (SL) 1. Study on herbicide resistance in weeds and crops and their manageme nt, herbicide combinatio n and rotation
		 1.2 Introduction to herbicide formulations, herbicide mixtures, sequential application of Herbicides, rotation . 1.3. Introduction to weed control through use of nano-herbicides and bio-herbicides, myco-herbicides bio-agents, and allelochemicals. 1.4. Introduction to movement of herbicides in soil and plant, degradation of herbicides in soil and plant, degradation to herbicide resistance, residue, persistence and management. 1.6 Introduction to development of herbicide resistance in weeds and crops and their management, 	

	herbicide combination and rotation	
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Assignments:

Movement of herbicides in soil and plant, degradation of herbicides in soil and plants herbicide resistance and its mamangement.

c. OtherActivities(Specify):

Agron 511.4 Student will acquaint knowledge about principles and method of weed control and management.

ApproximateHours		
Item	AppxHrs.	
Cl	06	
LI	4	
SW	1	
SL	1	
Total	12	

SessionOutcomes	Laboratory	Classroom Instruction	Self-Learning
(SOs)	Instruction	(CI)	(SL)
	(LI)		
SO1.1 Understand the management	1.Weed	Unit-4 Weed management in	1. Weed
of Weed in major crops and	survey in	major crops and cropping	management in
cropping systems.	crops	systems; alien, invasive and	major crops and
	and	parasitic weeds and their	cropping
SO1.2 Understand the the	cropping	management; weed shifts in	systems; alien,
management of alien, invasive and	systems	cropping systems; aquatic and	invasive and
parasitic weeds.		perennialweed control; weed	parasitic weeds
		control in non-crop area.	and their
SO1.3 Understand the weed shifts in different types of cropping systems.	2.Crop- weed competiti on	1.1 Introduction to Weed management in major crops and cropping systems	management.
SO1.4 . Understand the aquatic weed control and their management.	studies	1.2. IIntroduction to alien, invasive and parasitic weeds and their managemen	
SO1.5 Understand the perennial weed control and their management.		1.3 .Introduction to weed shifts in different types of cropping systems.	
SO1.6 Understand the weed control			

in non-crop area.	1.4 Introduction to aquatic weed control and management
	1.5 Introduction to perennial weed control and management.
	1.6 Introduction to weed control in non-crop area.

Assignments:

weed shifts in cropping systems; aquatic and perennial weed control; weed control in non-crop area

d. OtherActivities(Specify):

Agron 511. 5 PG students of agronomy will become to expert in integrated weed management practices.

ApproximateHours

Item	AppxHrs.
Cl	06
LI	4
SW	1
SL	1
Total	12

SessionOutcomes	Laboratory	Classroom Instruction	Self-
(SOs)	Instruction	(CI)	Learning
	(LI)		(SL)
SO1.1 Understand the Integrated	1.Use of	Unit-5 Integrated weed	1. Study on
weed management practice.	various	management; recent	robotics,
	types of	development in weed	drones and
SO1.2 Understand the latest	spray	management- robotics, use	aeroplanes
technology for the weed control	pumps and	of drones and aeroplanes,	technology
	nozzles and	organic etc., cost: benefit	for the
	calculation	analysis of weed	weed
SO1.3 Understand the robotics	of swath	Management.	control.
technology methods for the weed control.	width.		
	2. Economics	1.1 Introduction to Integrated	
	of weed	weed management practice	
SO1.4. Understand the drones	control	for the management of weed.	
technology and aeroplane for the			
weed control.		1.2 . Introduction to latest	
		technology for the weed control	
SO1.5 Understand the weed		and management.	

control through organic methods.	
SO1.6 Understand the cost:	1.3 .Introduction to robotics for the weed control.
Management	14 Introduction to use of
Management.	drones and aeroplane for the weed control.
	1.5 Introduction to weed control through organic methods.
	1.6 Introduction to cost: benefit analysis of weed Management.

Assignments:

Study on latest technology for the weed control and management.

Other Activities(Specify):

Study on plant growth regulators and their role in sustainability.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class	Laboratory	Sessional	Self	Total hour
	Lectue	Instruction	Work	Learning	(Cl+SW+Sl)
	(Cl)	(LI)	(SW)	(Sl)	
Agro 503.1 Define weeds, its intensity and	6	4	1	01	12
crop weed competition to make student expert					
in the weed science.					
Agro 503.2 Students may acquire knowledge to	6	4	1	01	12
herbicide classification based on Chemical,					
physiological mode and mechanism of action Of					
herbicides					
Agro 503.3 Students may acquire knowledge	6	4	1	01	12
about herbicide structure and weed control					
through use of nano-herbicides and bio-					
herbicides,myco-herbicides and degradation of					
herbicide.					
Agro 503.4 Student will acquaint knowledge	6	4	1	01	12
about principles and method of weed control					

and management					
Agro 503.5 PG students of agronomy will become to expert in integrated weed management practices.	6	4	1	01	12
Total Hours	30	20	5	5	60

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

СО	Unit Titles	Ma	arks Dis	tribution	Total
		R	U	Α	Marks
CO-1	Weed biology, and ecology and classification, crop-weed competition including Allelopathy; principles and methods of weed control and classification management; weed indices, weed shift in different eco- systems	03	01	01	05
CO-2	Herbicides introduction and history of their development; classification based on Chemical, physiological application and selectivity; mode and mechanism of action Of herbicides	02	06	02	10
CO-3	Herbicide structure - activity relationship; factors affecting the efficiency of Herbicides; herbicide formulations, herbicide mixtures, sequential application of Herbicides, rotation; weed control through use of nano-herbicides and bioherbicides, myco-herbicides bio-agents, and allele chemicals; movement of herbicides in soil and plant, degradation of herbicides in soil and plants; herbicide resistance, residue, persistence and management; development of herbicide resistance in weeds and crops and their management, herbicide combination and rotation.	03	07	05	15

CO-4	Weed management in major crops and cropping systems; alien, invasive and parasitic weeds and their management; weed shifts in cropping systems; aquatic and perennialweed control; weed control in non-crop area	05	05	05	15
CO-5	Integrated weed management; recent development in weed management- robotics, use of drones and aeroplanes, organic etc., cost: benefit analysis of weed Management.	01	02	02	05
Total		11	26	13	50

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

The end of semester assessment for principles and practices of weed management to 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 sasper requirement, for end semester assessment.

SuggestedInstructional/ImplementationStrategies:

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

Suggested Learning Resources:

<u>c</u>	Title	Author	Publisher	Edition &
No.	The	Autior	i ublisher	Year
1	Weed science: basics and applications,	das tk.	jain brothers (new delhi).	2008.
2	Recent advances in weed management.	chauhan b and mahajan g	Springer	2014
3	Principles of weed control,	fennimore, steven a and bell, carl.	Weed sci. Soc.Grains, crc press	4th ed, 2014
4	Integrated weed management for sustainable agriculture,	zimdahl rl.	b. D. Sci. Pub.	(ed). 2018

(a)Books:

CurriculumDevelopmentTeam

- 1. Dr. T.Singh , Professor and Head Agronomy AKS University
- 2. Dr V.D Dwivedi , Professor Agronomy AKS University
- 3. Dr H.S. Kushwaha Professor Agronomy MGCGVV Chitrakoot satna M.P
- 4. Dr. D. P Chaturv4edi ,Assistant Professor, Dept. Of Agronomy AKS University
- 5. Dr. Pankaj Bagri, Assistant Professor, Dept. Of Agronomy AKS University
- 6. Mr. Amit Singh Tiwari , Assistant Professor, Dept. Of Agronomy AKS University
- 7. Mr. Sanjay Lillhare, Assistant Professor, Dept. Of Agronomy AKS University
- 8. Ms. Prachi Singh, Teaching Associate, Dept. Of Agronomy AKS University
- 9. Ms. Prachi Awadhiya, Teaching Associate, Dept. Of Agronomy AKS University

Cos, POs and PSOs Mapping Course Code:-Agron- 503 Course Title: - Principles And Practices of Weed Management

Course	Program Ou	tcomes								Program Sp	ecific Outcome	•		
Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
	Specific	Wide	Detailed	Use	Detail	Create,	Student	Student	Understan	Enable to	Acquainting	То	Apply	То
	knowledge	knowle	knowled	appr	ed	select	will	will apply	d the	recognize	with basic	undertake	researc	understa
	of various	dge in	ge	opri	knowl	and	apply	basic	impact of	and	concepts	teaching	h and	nd and
	branches of	the	regardin	ate	edge	apply	various	concepts in	the	examine	theories and	research and	experti	analyze
	agronomy	concern	g	scie	of	an	statistic	laboratory	profession	the	terminology	extension	se in	the
	will be	ing	package	ntifi	cultiva	appropr	al	techniques	al expert	relationshi	of	activates	resolvi	current
	made	subject	and	с	tion	iate	method	during their	solutions	ps between	Agronomy.	along with	ng the	issues
	specialized	which	practices	meth	practic	techniq	s to	research	in societal	inputs and		administrati	proble	that are
	and to	will	soil	ods	es,	ues,	analyze	work	and	outputs in		ve and	ms of	occurrin
	provide	improve	fertilizer	colla	soil,	resourc	their		environme	their		consultancy	existin	g in
	knowledge	the	and	bora	fertiliz	es and	master		ntal	agricultural		services.	g farm	local and
	disseminati	farmers	water	tion	ers,	modern	research		contexts,	field to			in the	global
	on	conditio	manage	with	water	it tools	work		and	make			periphe	agricultu
	regarding	n dama li	ment of	stati	manag	1n •			demonstrat	effective			ry or	re and
	various	through	producti	stics	ement	improv			e the	and			univers	now they
	technique	student	ve crop	alon	and	ement			knowledge	profitable			ities.	W111
	or farming	S	aspects.	g with	piant	01			oi, and	To				futuristic
	forming	tions		with	tion	mical			sustainable	10 understand				agricultu
	system in	110115.		uatio	econo	nackag			developme	the				re
	India			n	mic	e and			nt in	mechanics				10
	mula			whic	associ	nractic			A gricultur	of agri				
				h	ated	es			e	Entreprene				
				will	with	•5.			••	urship.				
				prov	farmin					un simp i				
				ed to	g									
				deci	enterp									
				sion	rises.									
				in										
				vari										
				ous										

				part of agric ultur e										
CO1- Define weeds, its intensity and crop weed competition to make student expert in the weed science.	3	3	3	3	3	1	1	1	3	3	1	2	3	1
CO2- Students may acquire knowledge to herbicide classification based on Chemical, physiological mode and mechanism of action Of herbicides	3	3	3	2	3	1	1	1	3	3	1	3	2	1
CO3- Students	3	2	1	3	2	3	1	1	3	3	2	2	1	2

may acquire														
knowledge														
about														
herbicide														
structure and														
weed control														
through use														
of nano-														
herbicides														
and bio-														
herbicides,my														
co-herbicides														
and														
degradation														
of herbicide.			_											
CO- 4	3	2	1	3	1	3	1	1	1	3	1	3	2	1
Student will														
acquaint														
knowledge														
about														
principles														
and method														
of weed														
control and														
management		1		2	1	-	1	1	1	2		1	1	1
CO5- PG	3	1	2	3	1	3	1	1	1	2	3	1	1	1
students of														
agronnomy														
will become														
to expert in														
integrated														

weed							
managemen							
t practices.							

Legend: 1 – Low, 2 – Medium, 3 – High

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction(LI)	Classroom Instruction (CI)	Self Learning (SL)
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO1- Define weeds, its intensity and crop weed competition to make student expert in the weed science.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5 SO1.6		Unit-1 . Weed biology, and ecology and classification, crop-weed competition including Allelopathy; principles and methods of weed control and classification management; weed indices, weed shift in different eco-systems 1.1, 1.2, 1.3, 1.4, 1.5, 1.6.	As mentioned in page number
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO2- Students may acquire knowledge to herbicide classification based on Chemical, physiological mode and mechanism of action Of herbicides	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5 SO1.6		 Unit-2 Herbicides introduction and history of their development; classification based on Chemical, physiological application and selectivity; mode and mechanism of action Of herbicides. 1.1, 1.2,1.3,1.4,1.5,1.6. 	As mentioned in page number
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO3- Students may acquire knowledge about herbicide structure and weed control through use of nano-herbicides and bio- herbicides,myco- herbicides and degradation of herbicide.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5 SO1.6		Unit-3 Herbicide structure - activity relationship; factors affecting the efficiency of Herbicides; herbicide formulations, herbicide mixtures, sequential application of Herbicides, rotation; weed control through use of nano-herbicides and bioherbicides, myco-herbicides bio- agents, and allele chemicals; movement of herbicides in soil and plant, degradation of herbicides in soil and plants; herbicide resistance, residue,	As mentioned in page number

Course Curriculum Map: Principles and practices of weed management

PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO- 4 Student will acquaint knowledge about principles and method of weed control and management	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5 SO1.6	persistenceandmanagement;developmentofherbicideresistanceinweedsandcropsandtheirmanagement,herbicidecombinationandrotation.1.1, 1.2, 1.3, 1.4, 1.5, 1.6Unit 4. Weed management in major cropsand cropping systems; alien, invasive andparasitic weeds and their management;weed shifts in cropping systems; aquaticand perennial weed control; weed controlin non-crop area.1.1, 1.2, 1.3, 1.4, 1.5, 1.6.	As mentioned in page number
PO 1,2,3,4,5,6 7,8,9,10,11,12 PSO 1,2, 3, 4, 5	CO5- PG students of agronnomy will become to expert in integrated weed management practices.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5 SO1.6	Unit 5 Integrated weed management; recent development in weed management- robotics, use of drones and aeroplanes, organic etc., cost: benefit analysis of weed Management.1.1, 1.2,1.3,1.4 1.5,1.6	As mentioned in page number



Faculty of Agriculture Science and Technology Department of Agronomy Curriculum of M.Sc Ag Agronomy Programme

Course Code: Agron - 504 (2+1)

Course Title: Principles and practices of water management

Pre-requisite:

Students of PG need to know the basic points of water management, available water ofcrops, water need of crops, critical stages of crops for WR, soil plant water relationship its impact on crops and studies what are the role of water in crops etc.

Rationale:

This course is compulsory in agriculture because water is a life besides the utility of water for crops students need to learn water management and different practices how to applied water in crops to obtain maximum WUE.

Course Outcomes :

Agron 504.1P.G. student will become expert in water management to calculate the water use efficiency (WUE).

Agron 504.2 Acquired knowledge about water drainage system

Agron 504.3 Draw suitable figure of 90⁰ v, notch to major quantity of flowing irrigation water.

Agron 504.4 To evaluate the performance of tensiometer for determination of moisture tension in experimental field.

Agron 504.5 Acquire knowledge to differentiate irrigation methods, systems and drainage methods.

Scheme of Studies:

Category	Course	Course	Sc	hem	e of s	tudie	es (Hours/Week)	Total
of	Code	Title	Cl	LI	SW	SL	Total Study Hours(CI+LI+SW+SL)	Credit
course								S
								(C)
Program core (SDGS)	AGRO 504	Principles and practices of water management	2	1	1	1	5	3

Legend: CI: Class room Instructions (Includes different instructional strategies i.e. Lecture(L),Tutorial (T)and others),

LI: Laboratory Instruction(Includes Practical performance sin 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 ofteachertoensure out come of Learning.

Scheme of Assessment:

Theory

			Scheme of Assessment (Marks)							
Board of Study	Couse Code	Course Title	Progressive A Class/Home Assignment 5 number 3 marks each (CA)	Class Test 2 (2 best out of 3)10 marks each (CT)	A) Semin ar one (SA)	Class Activity any one (CAT)	Class Attendanc e (AT)	Total Marks (CA+CT+S A+CAT+AT)	End Semester Assessment (ESA)	Total Marks (PRA + ESA)
Program core (SDGS)	AGRO 504	Principl es and practice s of water manage ment	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), Sessional Work (SW), and Self-Learning (SL). Which students are familiar through various mode of instruction .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.

Agro- 504.1 PG Students has keen interest to know in details about WUE, WR and CSC

Approximate Hours				
Item	Appx Hrs.			
CI	5			
LI	6			
SW	1			
SL	1			
Total	13			

Session Outcomes	Laboratory	Classroom Instruction	Self-Learning
(SOs)	Instruction	(CI)	(SL)
	(LI)		
SO1.1PG students	1. Determination	Unit-1.Water and its role in	
will become a	of soil	plants; irrigation: definition	1.Prepare a notes
good faculty	moisture	and objectives, water	on water
	percentage by	resources and irrigation	resources in
SO1.2Students gain	gravimetric	development in India and	India
knowledge	method.	concerned state, major	2.study of water
about	2. Determination	irrigation projects, extent of	management
importance of	or field	area and crops irrigated in	systems and
water, its role	field method	India and in different states.	irrigation
in crop growth	3. Determination	1.1.Water and its role in plants	methods
	of soil	1.2. Give introductory remarks in	
SO1.3 Students	moisture	respect of role of water in crops	
acquired a lot	characteristics		
of feed back	curves.	1.2Instruct the students about	
after study of		importance of irrigation in field	
course		crops.	
SO1.4.They		1.3Enlist the water resources in	
acquainted		India	
with familiar		1.4Give short notes on difference	
relations		between catchment & command	
during the		area.	
time of study		1.5 Detail study of irrigation project	
		in India and M.P.	

Assignments: Definition of irrigation given by inventor scientist with place of invention and its importance in field crops.

a. Other Activities(Specify): To determine the moisture content in soil by use of gravimetric method in field

Agro504.2Students of PG classes will become as a expert to use irrigation system.

Item	Appx Hrs.
CI	05
LI	04
SW	01
SL	01
Total	11

Approximate Hours
Session Outcomes	Laboratory	Classroom Instruction	Self-
(SUS)	Instruction (LI)	(CI)	(SL)
SO1.1 Students	1. Measurem	Unit-II Field water cycle, water	1.Prepare
understand soil-	ent of soil	movement in soil and plants; transpiration; soil-	assignment
relationship	moisture	water plant relationships;	in regards to
SO1.2 Students gain	tension by	water absorption by plants; plant response to water	soil-water-
knowledge for	using	stress, crop plant	plant
water absorption process by plant.	tensiometer	adaptation to moisture stress condition. Water	relationship.
SO1.3 Students obtain		availability and its	2. Study made
knowledge about	2. Problems/	relationship with nutrient availability and loses.	in the way
nutrient	numericals	1.1 Instruction given on	of NUE.
crop plants.	to calculate	hydrological cycle.	
SO1.4. They understand	N, P_2O_5	students towards soil- water-	
nyulological	requiremen	plant relationship.	
SO1.5 . They have to	t of any	1.3 Instruct about soil moisture	
know	crop	1 4 To give knowledge about	
Scheduling of	through	nutrition translocation process	
methods	available	in crop plants	
methous.	inorganic	1.5 Instruct the students of PG how to increase NUE.	
	fertilizers		

SW-1 Suggested Sessional Work(SW):

Assignments: Prepare assignment in regards to soil-water- plant relationship with suitable figure.

b. Other Activities(Specify):Irrigation practices done by student of PG in the field crops

Agro504.3 students will become to learn all type of irrigation methods for the purpose of increasing WUE

Item	Appx Hrs.
CI	06
LI	04
SW	01
SL	01
Total	12

Approximate Hours

Session Outcomes (SOs)	Laboratory Instruction (L1)	Classroom Instruction (CI)	Self-Learning (SL)
 SO1.1 To understand the water need of crops. SO1.2 Difference between criteria and scheduling of irrigation. SO1.3 Micro irrigation methods SO1.4.Micro Plot technique method. SO1.5 Students will aquired knowledge in relation to fertigation and herbigation. 	 Determinati on of field capacity and permanent wilting point by pressure plate apparatus. Determinati on of hygroscopic coefficient. 	 Unit-3 Soil, plant and meteorological factors determining water needs of crops, scheduling, depth and methods of irrigation; micro irrigation systems; deficit irrigation; fertigation; management of water in controlled environments and poly houses. Irrigation efficiency and water use efficiency. 1.1To teach which climatic factor effect the water need of crops& how. 1.2 Study of WUE. 1.3 Plant response to depth of irrigation 1.4 Study of CSC to increase crop productivity. 1.5 To acquired knowledge how drip irrigation applied in poly houses& why. 1.6 Difference between systems and methods of irrigation discussed in details. 	 Students provide practical knowledge during the time of study and they have to prepared assignment. Practical calculation work for WUE.

SW-1 Suggested Sessional Work(SW):

Assignments: Assignment provide the best way of learning activity, students has been completed assignment in favour of irrigation systems & methods.

c. Other Activities(Specify):Some research work activities conducted towards water conservation practices.

Agro504.4Students will become expert to brought his knowledge amongst the farmers after filed practices.

Approximate Hours

		Item	Appx Hrs.
		CI	05
		LI	04
		SW	01
		SL	01
		Total	11
Session Outcomes	Laboratory	Classroom Instruction	Self-Learning
(SOs)	Instruction	(CI)	(SL)
	(LI)		
SO1.1 Aquired	1.Determination	Unit-4 Water management of crop and	1.Students learn
knowledge	of	cropping system, quality of	self about
about quality	permanent	irrigation water and	sen about
of irrigation	wilting point	management of saline water for	CWR.
water.	by	irrigation, water use efficiency,	2.Students learn
sol.2 PO students	pot culture	crop water requirement-	WITE
information	method	rainfall: water management of	WUL.
about CWR	2 Determination	the major crops and cropping	3. They learn self
SO1 3 Adoption of	of hydraulic	systems Automated irrigation	CSC
crop water	conductivity	system.	0.50
management	of saturated	1.1 To teach the water management of	
system for	soil below	crops.	
crops and	the water	1.2 Explain in details, quality of	
cropping	table by	irrigation water and SWI.	
system.	auger hole	1.3 To instruct about WUE with formula.	
	method.	1.4 Detail study of CWR with formula.	
SO1.4.Gain		1.5 Definition of effective rainfall &	
knowledge		water management of corps.	
for			
management			
of saline			
water.			
SOI.3 Studies Of			
walt			
of major			
crop			
crop.			

SW-1 Suggested Sessional Work(SW):

Assignments: Assignment prepared during the study of course practical.

d. Other Activities(Specify):Practical study conducted in the field for irrigation of crops.

Agro504.5PG students will become master in water management practices and they have brought knowledge in future amongst the farmers.

Approximate Hours

Item	Appx Hrs.
CI	05
LI	02
SW	01
SL	01
Total	09

Session outcomes	Laboratory	Classroom Instruction	Self-Learning
(SOs)	Instruction	(CI)	(SL)
	(LI)		
SO1.1 Impact of water	1.Determination	Unit-5- Excess of soil water	1. Students aquired
management in	of maximum	and plant growth; water	knowledge &
problem soils.	water	management in problem	10
SO1 2 Knowledge	holding	soils, drainage requirement	prepare self
about water	soil	of crops and methods of field	learning notes for
drainage.	3011.	drainage, their layout and	self study.
C		spacing; rainwater	2 Students hasself
SO1.3 Impact found on		management and its	2. Students hassen
field drainage.		utilization for crop	notes building
SO1 4 To know very		production.	capacity after
well about rain		1.1 Give a brief notes on water	classroom
water management.		management in corps	
		1.2 Management of problems	instruction.
SO1.5. This course study		soils explain in detail.	
develop grand		1.3 Instruct in detail drainage	
knowledge towards		requirement of crops and	
water management.		its importance.	
•		1.4 Layout of drainage channel	
		and details on interception	
		drainage method.	
		1.5 Study in brief rain water	
		management and its	
		utilization for corp.	

SW-1 Suggested Sessional Work(SW):

Assignments: Prepared assignment in details with suitable figure for different methods of drainage after field visit.

e. Other Activities(Specify): Field visit, visit in progressive farmers field & research farms.

Course Outcomes	Class	Laboratory	Sessional	Self	Total hour
	Lecture	nstruction	Work	Learning	(Cl+SW+Sl)
	(Cl)	(LI)	(SW)	(Sl)	
Agro 504.1P.G. student will become expert in	05	6	01	01	13
water management to calculate the water use					
efficiency (WUE)					
Agro 504 2 Acquired knowledge about water	05	4	01	01	11
drainage system					
Agro 504.3Draw suitable figure of 90 ⁰ v, notch to major quantity of flowing irrigation water.	06	4	01	01	12
Agron504.4To evaluate the performance of tensiometer for determination of moisture tension in experimental field.	06	4	01	01	12
Agro 504.5Acquire knowledge to differentiate irrigation methods, systems and drainage methods.	05	2	01	01	9
Total Hours	27	20	05	05	57

Brief of Hours suggested for the Course Outcome

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

СО	Unit Titles		Marks Distril	Total Mark	
		R	U	Α	s
CO-1	Water and its role in plants major irrigation projects, extent of area and crops irrigated in India and in different states	07	02	02	11
CO-2	Field water cycle, water movement in soil and plantsWater availability and its relationship with nutrient availability and loses	05	02	02	09
CO-3	Soil, plant and meteorological factors determining water needs of crops, management of water in controlled environments and	07	02	02	11

	polyhouses. Irrigation efficiency and water use efficiency.				
CO-4	Water management of crop and cropping system, quality of irrigation water water management of the major crops and cropping systems. Automated irrigation system.	05	02	02	9
CO-5	Excess of soil water and plant growth; water management in problem soils, rainwater management and its utilization for crop production.	07	02	01	10
Total		31	10	09	50

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

The end of semester assessment Principles and practices of water 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 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. Visit to cement plant
- 7. Demonstration
- 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	Irrigation water management: principles and practice.	Majumdar dk.	Phl learning Private publishers	2014
2	Irrigation: theory and practice.	michael am.	Vikas publ	1978.
3	Principles of crop production	reddy sr.	Kalyani publ	2000.

Curriculum Development Team

- 1. Dr. T.Singh, Professor and Head Agronomy AKS University
- 2. Dr V.D Dwivedi , Professor Agronomy AKS University
- 3. Dr H.S. Kushwaha Professor Agronomy MGCGVV Chitrakoot satna M.P
- 4. Dr. D. P Chaturv4edi ,Assistant Professor,Dept. Of Agronomy AKS University
- 5. Dr. Pankaj Bagri, Assistant Professor, Dept. Of Agronomy AKS University
- 6. Mr. Amit Singh Tiwari , Assistant Professor, Dept. Of Agronomy AKS University
- 7. Mr. Sanjay Lillhare, Assistant Professor, Dept. Of Agronomy AKS University
- 8. Ms. Prachi Singh, Teaching Associate, Dept. Of Agronomy AKS University
- 9. Ms. Prachi Awadhiya, Teaching Associate, Dept. Of Agronomy AKS University

Cos, POs and PSOs Mapping Course Code:-Agron- 504 Course Title: - Principles And Practices of Water Management

Course	Program Outcomes Program Specific Outcome													
Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
	Specific	Wide	Detailed	Use	Detail	Create,	Student	Student	Understan	Enable to	Acquainting	То	Apply	То
	knowledge	knowle	knowled	appr	ed	select	will	will apply	d the	recognize	with basic	undertake	researc	understa
	of various	dge in	ge	opri	knowl	and	apply	basic	impact of	and	concepts	teaching	h and	nd and
	branches of	the	regardin	ate	edge	apply	various	concepts in	the	examine	theories and	research and	experti	analyze
	agronomy	concern	g	scie	of	an	statistic	laboratory	profession	the	terminology	extension	se in	the
	will be	ing	package	ntifi	cultiva	appropr	al	techniques	al expert	relationshi	of	activates	resolvi	current
	made	subject	and	c	tion	iate	method	during their	solutions	ps between	Agronomy.	along with	ng the	issues
	specialized	which	practices	meth	practic	techniq	s to	research	in societal	inputs and		administrati	proble	that are
	and to	will	soil	ods	es,	ues,	analyze	work	and	outputs in		ve and	ms of	occurrin
	provide	improve	fertilizer	colla	soil,	resourc	their		environme	their		consultancy	existin	g in
	knowledge	the	and	bora	fertiliz	es and	master		ntal	agricultural		services.	g farm	local and
	disseminati	tarmers	water	tion	ers,	modern	research		contexts,	field to			in the	global
	on	conditio	manage	with	water	it tools	work		and	make			periphe	agricultu
	regarding	n 1	ment of	stati	manag	1n			demonstrat	effective			ry of	re and
	various	through	producti	stics	ement	improv			e the	and			univers	how they
	technique	student	ve crop	alon	and	ement			knowledge	profitable			ities.	W111
	or farming	S	aspects.	g with	plant	OI ognon o			of, and	decisions.				anect
	forming	tions		with	protec	agrono			need for	10 understand				
	system in	tions.		eval		nnekag			davalopma	the				ro
	System III India			n	mic	e and			nt in	mechanics				10
	mula			whic	associ	practic			Agricultur	of agri				
				h	ated	es			e	Entreprene				
				will	with	05.			0.	urship				
				prov	farmin					urship.				
				ed to	g									
				deci	enterp									
				sion	rises.									
				in										
				vari										
				ous										

				part of agric ultur e										
CO1- P.G. student will become expert in water management to calculate the water use efficiency (WUE)	3	3	3	3	3	1	1	1	3	3	1	2	3	1
CO2- Acquired knowledge about water drainage system	3	3	3	2	3	1	1	1	3	3	1	3	2	1
CO3- Draw suitable figure of 90 ⁰ v, notch to major quantity of flowing irrigation water.	3	2	1	3	2	3	1	1	3	3	2	2	1	2
CO4- To evaluate the	3	2	1	3	1	3	1	1	1	3	1	3	2	1

performance														
of														
tensiometer														
for														
determinatio														
n of moisture														
tension in														
experimental														
field.														
CO5-	3	1	2	3	1	3	1	1	1	2	3	1	1	1
CO5- Acquire	3	1	2	3	1	3	1	1	1	2	3	1	1	1
CO5- Acquire knowledge to	3	1	2	3	1	3	1	1	1	2	3	1	1	1
CO5- Acquire knowledge to differentiate	3	1	2	3	1	3	1	1	1	2	3	1	1	1
CO5- Acquire knowledge to differentiate irrigation	3	1	2	3	1	3	1	1	1	2	3	1	1	1
CO5- Acquire knowledge to differentiate irrigation methods,	3	1	2	3	1	3	1	1	1	2	3	1	1	1
CO5- Acquire knowledge to differentiate irrigation methods, systems and	3	1	2	3	1	3	1	1	1	2	3	1	1	1
CO5- Acquire knowledge to differentiate irrigation methods, systems and drainage	3	1	2	3	1	3	1	1	1	2	3	1	1	1

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map: Principles and practices of water management

tles SOs No.	Laboratory	Classroom Instruction (CI)	Self Learning (SL)
	Instruction(LI)		
ident SO1.1		Unit-1. Water and its role in plants;	As mentioned in page
expert SO1.2		irrigation: definition and objectives, water	number
SO1.3		resources and irrigation development in	
to SO1.4		India and concerned state, major	
water		irrigation projects, extent of area and	
7		crops irrigated in India and in different	
		states	
ad SO1 1		1.1, 1.2, 1.3, 1.4, 1.5,	As montioned in page
SO1.1		in soil and plants: transpiration: soil water	As mentioned in page
501.2		nant relationships: water absorption by	
SO1.5		plants: plant response to water stress crop	
SO1.4 SO1.5		plant adaptation to moisture stress	
SO1.5 SO1.6		condition. Water availability and its	
501.0		relationship with nutrient availability and	
		loses	
		1.1, 1.2, 1.3, 1.4, 1.5,	
SO1.1		Unit-3 Soil, plant and meteorological	As mentioned in page
e of SO1.2		factors determining water needs of	number
to SO1.3		crops, scheduling, depth and	
y of SO1.4		methods of irrigation; micro	
sol.5		irrigation systems; deficit irrigation;	
		fertigation; management of water in	
		controlled environments and poly	
		houses. Irrigation efficiency and	
	tiesSOs No.identSO1.1expertSO1.2so1.3SO1.4waterSO1.4pedSO1.1poutSO1.2soSO1.4soSO1.5soSO1.6soSO1.1e ofSO1.2toSO1.3ty ofSO1.4soSO1.4soSO1.5soSO1.4soSO1.4soSO1.4soSO1.4soSO1.5	tlesSOs No.Laboratory Instruction(LI)identSO1.1expertSO1.2SO1.3SO1.4waterSO1.4waterSO1.2edSO1.2poutSO1.2soSO1.4SO1.5SO1.6soSO1.1e of to y of ationSO1.4soSO1.1e of to soSO1.4soSO1.4soSO1.4soSO1.4soSO1.3soSO1.4soSO1.4ationSO1.5soSO1.4soSO1.4soSO1.5	tlesSOs No.Laboratory Instruction(LI)Classroom Instruction (CI)ident expertSO1.1 SO1.2 SO1.3 water ySO1.1 SO1.4Unit-1. Water and its role in plants; irrigation: definition and objectives, water resources and irrigation development in India and concerned state, major irrigated in India and in different states 1.1, 1.2, 1.3, 1.4, 1.5,ed bout ySO1.1 SO1.2 so1.3 so1.4SO1.1 Unit-2 Field water cycle, water movement in soil and plants; transpiration; soil-water plant relationships; water absorption by plants; plant response to water stress, crop plant adaptation to moisture stress condition. Water availability and its relationship with nutrient availability and losese of to y of ttionSO1.1 SO1.4Unit-3 Soil, plant and meteorological factors determining water needs of crops, scheduling, depth and methods of irrigation; micro irrigation systems; deficit irrigation; fertigation; management of water in controlled environments and poly houses. Irrigation efficiency and

			water use efficiency.	
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO4- To evaluate the performance of tensiometer for determination of moisture tension in experimental field.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	Unit 4. Water management of crop and cropping system, quality of irrigation water and management of saline water for irrigation, water use efficiency, crop water requirement- estimation of ET and effective rainfall; water management of the major crops and cropping systems. Automated irrigation system.	As mentioned in page number
PO 1,2,3,4,5,6 7,8,9,10,11,12 PSO 1,2, 3, 4, 5	CO5- Acquire knowledge to differentiate irrigation methods, systems and drainage methods.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	Unit 5 Excess of soil water and plant growth; water management in problem soils, drainage requirement of crops and methods of field drainage, their layout and spacing; rainwater management and its utilization for crop production 1.1, 1.2,1.3,1.4 1.5,	As mentioned in page number

*



Course Code:	Faculty of Agriculture Science and Technology Department of Agronomy Curriculum of M.Sc.(Ag),Department of Agronomy Agron- 513
Course Title:	Principles and Practices 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.
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 heal so maintaint 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:

Agron-513.1 Student may become expert in organic farming as well as about the organic production technology for pushing up the field through organic farming.

Agron-513.2 The knowledge gained by student through this course will be use in making decision so nnutrient dose, choice of manures and method of application etc.

Agron-513.3 Student will get to know about different processing techniques of agricultural waste products as NADED, FYM, Vermicompost etc.

Agron-513.4 Student will know different cropping and farming system like integrated farming system. To get knowledge on sustainable agricultural practices such as organic farming.

Agron- 513.5 P.G. student will able to acquaint with the modern knowledge about, certification, labelling and accreditati on procedure for organic farming.

Scheme of Studies:

Board of					Sche	emeofstudi	ies(Hours/Week)	TotalCred
Study			Cl	LI	SW	SL	TotalStudyHour	its (C)
	CourseCode	CourseTitle					S	
							(CI+LI+SW+SL)	
Progra	AGRON-	Principles and	3	1	1	1	6	3
m Core	512	Organic Farming						
(SDGs)	513	organie i arning						

Legend: CI:ClassroomInstruction(Includesdifferentinstructionalstrategiesi.e.Lecture(L)andTutorial (T)andothers),

LI:LaboratoryInstruction(IncludesPracticalperformancesinlaboratoryworkshop,fieldorotherlocatio nsusing different instructional strategies)

SW:SessionalWork(includes assignment,seminar,miniproject etc.),

SL:SelfLearning,

C: Credits.

Note: SW & SL has to beplanned and performed under the continuous guidance and feedback ofteacherto ensure outcome of Learnin

SchemeofAssessment:

Theory

						Schem	eofAssessmen	nt(Marks)		
					Progre	ssiveAss	sessment(PRA)	End Semes	
Boardof Study ode	CourseTitl e	Class/ Home Assig nment 5num ber3 marks eac h(C A)	ClassT est2 (2bestout of3) 10mar kseach (CT)	Semi naro ne (SA)	Clas sAct ivity anyo ne (CAT)	Class Attendance (AT)	TotalMarks (CA+CT+SA+CAT +AT)	t er Assess ment (ESA)	Total Mark s (PRA + ESA)	
Progra m Core (SDGs)	AG R ON- 513	Principles and Practices ofOrgani c Farming	15	20	5	5	5	50	50	100

Course-CurriculumDetailing:

This coursesy llabusillustrates 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.

AGRON-513.1Student may be comeexpertinorganicfarmingaswellasabouttheorganicproduction technology for pushing up the field through organic farming.

ApproximateHours				
Item	Appx Hrs.			
Cl	5			
LI	6			
SW	1			
SL	2			
Total	14			

SessionOutcomes	Laborato	ClassroomInstruction (CI)	Self-
(508)	I y Instructio n (LI)		g (SL)
SO1.1UnderstandtheOrganic farming systems. SO1.2Understandtheprinciples and its scope of organic farming. SO1.3 Understand the taken by Government(central/state),NGOs. SO1.4 Understand the other Organizations for promotion of organic agriculture.	 1-Visit of organic farms to study the various components and their utilization. 2-Preparation of enrich compost. 3-VC 	 Unit-1. Organic farming - concept and definition, its relevance to india and global agriculture and future prospects; principles of organic agriculture; organics and farming standards; organic farming and sustainable agriculture; selection and conversion of land, soil and water management - land use, conservation tillage; shelter zones, hedges, pasture management, agron- forestry. 1.1 Introduction to organic farming system and its benefit. 1.2 Indices and principles and its scope of organic farming. 1.3 Introduction then taken by Government (central/state), NGOs. 1.3 Explain the soil and water management in cropping systems 1.4 introduction to assessment of land use. 1.5 Introduction to assessment of land use. 	 1.Organic farming system and know the importance of cropping system and management of resources. 2. The assessment of land use according to the crop.

SW-1SuggestedSessionalWork(SW):

Assignments:

What is Organic farming systems?definition ,indices and its importance and physical resources and its managemen **a.** Other Activities(Specify):

Research on most suitable organic farming systems for the Satna Region.

AGRON-513.2 P.G. student will able to acquaint with the modern knowledge about, certification, labelling and accreditation procedure for organic farming.

Approximate Hours

Item	AppxHrs.
Cl	06
LI	8
SW	2
SL	1
Total	17

SessionOutcomes (SOs)	Laboratory Instruction (LI)	ClassroomInstruction (CI)	Self- Learning (SL)
sustainability in organic farming systems and farming systems.	of biofertilizers, technique of treating legume	use efficiency; soil fertility, nutrient recycling, organic residues, organic manures, composting, soil biota and	organic farming systems and farming systems. in
SO1.2 Understand the Organic farming and water use efficiency and farming systems	seeds with <i>rhizobium</i> . 2- Cultures,	decomposition of organic residues, earthworms and vermicompost, green manures, bio-fertilizers and biogas technology.	Satna region.
SO1.3 Understand the nutrient recycling, organic residues, organic manures, composting, soil biota.	use of <i>azotobacter</i> , <i>azospirillum</i> , and psb	1.1 Introduction to Concept of sustainability intercropping systems and farming systems.	
manures, bio-fertilizers and biogas technology.	cultures in field.	1.2 The nutrient recycling, organic residues, organic manures, composting, soil biota.	

SO1.5 Understand the decomposition	3- visit to a	1.3 .production potential under	
of organic residues, earth worms and	bio gas	Organic nutrient resources.	
vermicompost.	plant		
		1.4 production potential green	
	4- visit to an	manures, bio-fertilizers and biogas	
	organic farm	technology.	
		1.5 P roduction potential under	
		fortification.	
		1.6 The decomposition of organic	
		residues, earthworms and	
		vermicompost.	

SW-1SuggestedSessionalWork(SW):

Assignments:

Concept of sustainability intercropping systems and farming systems, scope and Objectives production potential under different cropping system.

b. OtherActivities(Specify):

Research on most suitable organic farming for the Satna Region.

AGRON-513.3 Students will know different cropping and farming system like integrated farming system. To get knowledge on sustainable agricultural practices such as organic farming.

ApproximateHours				
Item	Appx Hrs.			
Cl	06			
LI	4			
SW	1			
SL	1			
Total	12			

SessionOutcomes (SOs)	Laboratory Instruction (LI)	ClassroomInstruction (CI)	Self-Learning (SL)
 SO1.1Understand the Choice of crops and varieties in organic farming. SO1.2Understand the allelopathic effects of weed on crop, weed on crop and crop on weed. SO1.3Understand the multiple and relay cropping systems. SO1.4.Understand the role of intercropping in relation to maintenance of soil. SO1.5Understand the research need on sustainable agriculture 	 Indigenous technology knowledge (ITK) for nutrient, insect, pest disease and weed management. Cost of organic production system. 	 Unit-3 Farming systems, selection of crops and crop rotations, multiple and relay cropping systems, intercropping in relation to maintenance of soil productivity. 1.1 Introduction to Choice of crops and varieties in organic farming. 1.2 Introduction to allelopathic and its effects on crop. 1.3 Introduction to the multiple and relay cropping systems. 1.4 Multi-storied cropping and yield stability in intercropping 1.5 Role of disease and weed management under organic mode of production. 1.6 New research need on sustainable agriculture and new innovation on sustainable agriculture. 	1.Study of insect, pest, disease and weed management under organic mode of production in Sustainable agriculture.

SW-1SuggestedSessionalWork(SW):

Assignments:

Role of non-monetary Inputs and low cost technologies; research need on sustainable agriculture

c. OtherActivities(Specify):

New Research on sustainable agriculture.

AGRON-513.4Studentwillgettoknowaboutdifferentprocessingtechniquesofagriculturalwaste products as NADED, FYM, Vermicompost etc

ApproximateHours

Item	AppxHrs.
Cl	04
LI	4
SW	1
SL	1
Total	10

SessionOutcomes (SOs)	Laboratory Instruction (LI)	ClassroomInstruction (CI)	Self-Learning (SL)
SO1 III denotes 1 Constant of some de	1 Cost of	Unit A Constant of source to discourse	1 Ctorday and and
diseases and insect pest management.	organic	and insect pest management,	diversification and
SO1.2 Understand the organic farming and role for organic farming to maintain	production system.	biological agents and pheromones, bio-pesticides.	importance of organic farming for the sustainable agriculture
soil Fertility.	2- Post harvest	1.1 Introducing to Control of weeds, diseases and insect pest	
SO1.3 Understand the biological agents and pheromones, bio- pesticides.	management.	management.	
SO1.4 .Understand the fertilizer Use in intensive organic farming system.		1.2 organic farming and role of organic farming to maintain soil Fertility. 1.3 The biological agents and	
SO1.5 Understand the advanced nutritional tools for big data analysis		pheromones, bio-pesticides. 1.4 Introduction to management of	
and interpretation.		crop residue and nutrient use efficiency.	

SW-1SuggestedSessionalWork(SW):

Assignments:

d. Operational Control of weeds, diseases and insect pest management, biological agents and pheromones, biopesticides of organic farming.

OtherActivities(Specify):

Research on weeds, diseases and insect pest management.

AGRON-513.5Theknowledgegainedbystudentthroughthiscoursewillbeusefulin making decisions on nutrient dose, choice of manures and method of application etc.

Approxin	nateHours
Item	AppxHrs.
Cl	04
LI	4
SW	1
SL	1
Total	10

SessionOutcomes (SOs)	Laboratory Instruction (LI)	ClassroomInstruction (CI)	Self- Learning (SL)
 SO1.1UnderstandtheProcessingof organic farming. SO1.2Understandthelevelingof organic farming. SO1.3Understandthemarketingand export of organic farming. SO1.4. Understand the economic considerations and viability, marketing of organic products. 	 quality standards, inspection, certification and labeling and accreditation. Procedures for farm produce from organic farms. 	 Unit-5 Control of weeds, diseases and insect pest management, biological agents and pheromones, bio-pesticides. 1.1Introduction to Processing of organic farming. 1.2.Introduction the leveling of organic farming. 1.3Introduction marketing and export of organic farming. 1.4Introduction to the economic considerations and viability, marketing of organic products. 	1. Study on Processing, leveling, economic considerations and viability, marketing and export potential of organic products.

SW-1SuggestedSessionalWork(SW):

Assignments: Processing, leveling, economic considerations and viability, marketing and export potential of organic products

e. OtherActivities(Specify):

Study on Processing, leveling, economic considerations and viability, marketing and export of organic materials.

Brief of Hours suggested for the Course Outcome

CourseOutcomes	Class	Laborato	Sessional	Self	Totalhou
	Lectur	ry	Work	Learning	r
	e	Instructio	(SW)	(Sl)	(Cl+SW+
	(Cl)	n (LI)			SI)
AGRON- 513.1 Student may become expert in organic farming as well as about the organic production technology for pushing up the field through organic farming.	5	6	1	2	14
AGRON- 513.2 The knowledge gained by student through this course will be useful in making decisions on nutrient dose, choice of manures and method of application etc.	6	8	2	1	17
AGRON-513.3Studentwillgettoknowaboutdifferent processing techniques of agricultural waste products as NADED, FYM, Vermicompost etc.	6	4	1	1	12
AGRON- 513.4 Student will know different cropping and farming system like integrated farming system. To get knowledge on sustainable agricultural practices such As organic farming.	4	4	1	1	10
AGRON- 513.5 P.G. student will able to acquaint with the modern knowledge about, certification, labelling and accreditation procedure for organic farming.	4	4	1	1	10
Total Hours	25	26	6	6	63

SuggestionforEndSemesterAssessment

СО	UnitTitles	Ma	arks Dis	tribution	Total
		R	U	Α	Marks
CO-1	Unit-1. Organic farming - concept and definition, its relevance to india and global agriculture and future prospects; principles of organic agriculture; organics and farming standards; organic farming and sustainable agriculture; selection and conversion of land, soil and water management-land use, conservation tillage ;shelter zones, hedges, pasture management, agron-forestry.	03	01	01	05
CO-2	Unit-2 Organic farming and water use efficiency; soil fertility, nutrient recycling, organic residues, organic manures, composting, soil biota and decomposition of organic residues, earthworms and vermicompost, green manures, bio-fertilizers and bio gas technology.	02	06	02	10
CO-3	Unit-3Farming systems, selection of crops and crop rotations, multiple and relay cropping systems, intercropping in relation to maintenance of soil productivity.	03	07	05	15
CO-4	Unit-4Control of weeds, diseases and insect pest management, biological agents and pheromones, bio- pesticides.	-	10	05	15
CO-5	Unit-5 Socio-economic impacts; marketing and export potential: inspection, certification, labeling and accreditation procedures ;organic farming and national economy.	03	02	-	05
Total		11	26	13	50

R:Remember, Legend:

U:Understand,

A:Apply

TheendofsemesterassessmentforIntroductiontoprinciplesandpracticesof organicfarming willbeheld with written examination of 50 marks

Note.DetailedAssessmentrubricneedtobepreparedbythecoursewiseteachersforabove tasks.Teacherscanalso designdifferent tasks asperrequirement, forendsemesterassessment.

SuggestedInstructional/ImplementationStrategies:

- 1. ImprovedLecture
- 2. Tutorial
- 3. CaseMethod
- 4. GroupDiscussion
- 5. Visittofarm/ field
- 6. Demonstration

SuggestedLearning Resources:

(a)Books:

S. No.	Title	Author	Publisher	Edition& Year
1	Organic farming	Lampinn	lpswitch,uk	1990
2	Organic farming-theory and practice.	Palaniappansp &ananduraik.		1999
3	Hand book of organic farming	SharmaA	Agronbios	2002
4	Soil microbiology	Subbaraons	Oxford&ibh.	2002
5	A text book of environmental sciences	Trivedirn.	anmolpubl.	1993
6	Organic farming and sustainable agriculture.	Veereshgk, shivashankar k&suiglacharma.		1997

CurriculumDevelopmentTeam

- 1. Dr.T.Singh, Professor&headDept.ofAgronomy, FAST
- 2. Dr.V.D.Dwivedi, Professor, Dept. of Agronomy, FAST
- 3. Dr.H.S.Kushwah, Professor, Dept. of Agronomy, MGCGVV
- 4. Dr.D.P.Chaturvedi,AssistantProfessor,Dept.ofAgronomy,FAST
- 5. Dr.P.K.Bagri,AssistantProfessor,Dept.ofAgronomy,FAST
- 6. Mr.AmitSinghTiwariAssistantProfessor,Dept.ofAgronomy,FAST
- 7. Mr.SanjayLillhare,AssistantProfessor,Dept.ofAgronomy,FAST
- 8. Mis.PrachiSinghTeaching,Associate,Dept.ofAgronomy,FAST
- 9. Mis.PrachiAwadhiya,TeachingAssociate,Dept.ofAgronomy, FAST

Course	Program O	utcomes					-		0	Program S	pecific Outco	me		
Outcomes	PO1	PO2	PO3	PO	PO5	PO6	PO7	PO8	PO9	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
				4										
	Specific	Wide	Detailed	Use	Detail	Create	Student	Student	Understa	Enable to	Acquaintin	То	Apply	То
	knowledg	knowle	knowled	appr	ed	, select	will	will apply	nd the	recognize	g with	undertake	researc	underst
	e of	dge in	ge	opri	know	and	apply	basic	impact of	and	basic	teaching	h and	and and
	various	the	regardin	ate	ledge	apply	various	concepts	the	examine	concepts	research	experti	analyze
	branches	concer	g	scie	of	an	statistic	1N	professio	the	theories	and	se in	the
	of	ning	package	ntifi	cultiv	approp	al	laboratory	nal expert	relationshi	and	extension	resolvi	current
	agronomy	subject	and	c	ation	riate	method	techniques	solutions		terminolog	extension	ng the	icence
	will be	which	practice	met	practi	techni	s to	during	1n	ps	terminolog		ng the	issues
	made	WIII	S SOII fortilizor	nod	ces,	ques,	their	raccorch	societai	between	y of	along with	proble	that are
	specialize	niprov a tha	and	s 2011	SOII, fortili	resour	meeter	research	anu	inputs and	Agronomy.	administrat	ms of	occurrin
	u allu to	farmers	allu water	abor	Tertill	and	researc	WOIK	ental	outputs in		ive and	existin	g in
	knowledg	conditi	manage	atio	vater	moder	h work		contexts	their		consultanc	g farm	local
	e	on	ment of	n	mana	n it	II WOIK		and	agricultur		y services.	in the	and
	disseminat	throug	producti	with	geme	tools			demonstr	al field to		-	periph	global
	ion	h	ve crop	stati	nt and	in			ate the	make			erv of	agricult
	regarding	student	aspects.	stics	plant	impro			knowledg	effective			univer	ure and
	various	's	F	alon	prote	vemen			e of. and	and			citios	how
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	of farming	utions.		with	econo	agrono			sustainabl					iney
	and			eval	mic	mical			e	decisions.				WIII
	farming			uati	associ	packag			developm	То				affect
	system in			on	ated	e and			ent in	understan				futuristi
	India			whi	with	practic			Agricultu	d the				c
				ch	farmi	es.			re.	mechanics				agricult
				will	ng					of agri				ure
				prov	enter					Entrepren				
				ed	prises					Lincepton				

Cos, POs and PSOs Mapping Course Code:-Agron- 513 Course Title: - Principles and Practices of Organic Farming

				to deci sion in vari ous part of agri cult ure						eurship.				
Col - Student may become expert in organic farming as well as about the organic production technology for pushing up the field through organic farming.	3	3	3	3	3	2	1	1	3	3	1	2	3	2
Co2 -The knowledg e gained by student throughth iscoursew illbeusefu linmaking	3	3	3	2	3	1	1	1	3	3	1	3	2	2

decisions														
on														
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and														
method of														
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n etc.														
<u>Co3</u> -	2	2	2	3	2	3	1	1	3	3	2	2	1	2
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<u>Co4</u>	3	2	1	3	1	3	1	1	1	3	1	3	2	1
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Co5 -P.G.	3	1	2	3	1	3	1	1	1	2	3	1	1	1
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procedure														
for														
organic														
farming.														

Legend: 1 – Low, 2 – Medium, 3 – High

POs & PSOs	COs No.& Titles	SOs No.	Laboratory	Classroom Instruction	Self
No.			Instruction(LI)	(CI)	Learning
					(SL)
PO 1,2,3,4,5,6	Col - Student may become expert in organic farming	SO1.1		Unit-1. Organic farming -	As
7,8,9	as well as about the organic production technology for	SO1.2		concept and definition, its	mentioned in
PSO 1,2, 3, 4,	pushing up the field through organic farming	SO1.3		relevance to india and	page number
5	proming up are note an organic ramming.	SO1.4		global agriculture and	
				future prospects; principles	
				of organic agriculture;	
				organics and farming	
				standards; organic farming	
				solution and conversion of	
				land soil and water	
				management - land use	
				conservation tillage: shelter	
				zones, hedges, pasture	
				management, agron-	
				forestry.	
				1.1, 1.2, 1.3, 1.4.	
PO 1,2,3,4,5,6	Co2 -The knowledge gained by student through this	SO1.1		Unit-2 Organic farming	As
7,8,9	course will be use ful in making decision nutrient	SO1.2		and water use efficiency;	mentioned in
	dose, choice of manures and method of application	SO1.3		soil fertility, nutrient	page number
PSO 1,2, 3, 4,	etc.	SO1.4		recycling, organic	
5		SO1.5		residues, organic	
				manures, composting,	
				soil biota and	
				decomposition of organic	
				residues, earthworms and	
				vermicompost, green	
				manures, bio-fertilizers	

Course Curriculum Map: Principles and Practices of Organic Farming

			and biogas technology.	
			1.1, 1.2, 1.3, 1.4, 1.5.	
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	Co3 –Student will get to know about different processing techniques of agricultural waste products as NADED, FYM, Vermicompost etc.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	Unit-3 Farming systems, As selection of crops and crop mention rotations, multiple and page mention relay cropping systems,	oned in number
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	Co4 Student will know different cropping and farming system like integrated farming system. To get knowledge on sustainable agricultural practices such As organic farming.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	1.1, 1.2,1.3,1.4,1.5,Unit 4. Control of weeds, diseases and insect pest management, biological agents and pheromones, bio-pesticides.As mentio page n 1.1, 1.2,1.3,1.4 1.5.	oned in umber
PO 1,2,3,4,5,6 7,8,9,10,11,12 PSO 1,2, 3, 4, 5	Co5 -P.G. student will able to acquaint with the modern knowledge about, certification, labeling and accreditation procedure for organic farming.	SO1.1 SO1.2 SO1.3 SO1.4	Unit 5AsControl of weeds, diseases and insect pest management, biological agents and pheromones, bio-pesticides. 1.1, 1.2,1.3,1.4 .As	oned in number

AKS University

Faculty of Agriculture Science and technology Department of Agronomy Curriculum of M.Sc Ag Agronomy Program

Course Code: Agron 512			
Course Title:	Dry land farming and watershed management (2+1)		
Pre-requisite:	Student should have specific knowledge of crops, Dry land farming and watershed management		
Rationale:	The students should be acquainted with the knowledge of Crops and patterns refer to the types and sequences of crops that are grown. They are involve 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:

Agron 512.1. Students will become to define dryland farming and its constraints.

Agron 512.2 students will become to differentiate dryland farming and rainfed farming.

Agron 512.3. Pg students acquainting knowledge to calculate catchment and command area.

Agron 512.4 students of pg able to evaluate concept of conservation of tillage.

Agron 512.5. Students will become as expert to design water harvesting tank under the watershed management technology.

Scheme of Studies:

Category	Course				Scher	me of studi	ies(Hours/Week)	Total Credits
of course	Code	Course Title	Cl	LI	SW	SL	Total Study Hours(CI+LI+SW +SL)	(C)
Program Core (SDGs)	Agron 512	Dry land farming and watershed 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 work shop, 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

				Scheme of Assessment (Marks)						
					Progr	essive Asse	ssment (PRA)		End Semester Assessm	Total Marks
Board of Study	Couse Code	Course Title	Class/H ome Assignm ent 5 number	Class Test 2 (2 best out of 3)	Seminar one	Class Activit y any one	Class Attendance	Total Marks	ent	
			3 marks each (CA)	each (CT)	(SA)	(CAT)	(AT)	(CA+CT+SA+CAT+A T)	(ESA)	(PRA+ ESA)
Program Core (SDGs)	Agron 512	Dry land farming and watershed manageme nt	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.

Agron 512.1. Students will become to define dryland farming and its constraints.

Approximate Hours

Itarea	A mary I Ing
nem	Appx Hrs.
Cl	06
LI	06
SW	1
SL	1
Total	14

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self- Learning
			(SL)
SO1.1 Students will	1.Method of seed	Unit i	1. Definition,
become to define dryland	priming.	Definition, concept and	concept
farming	2. Determination of	characteristics of dry land	characteristics
SO1.1 Dryland farming	moisture content of	farming; dry land versus	of dry land
Constraints.	germination of important	rainfed farming;	farming
	dryland crops	significance and	_
	3.Determination of	dimensions of dry land	
	relative water content	farming in indian	
	and saturation deficit of	agriculture.	
	leaf		
		1.1 Definition, concept	
		1.2 characteristics of dry	
		land farming;	
		1.3 dry land versus rainfed	
		farming;	
		1.4 significance	
		1.5 dimensions of dry	
		land farming	
		1.6 dimensions of dry	
		land farming in indian	
		agriculture.	

SW-1 Suggested Sessional Work (SW): Assignments:

What is Cropping systems? definition, indices and its importance and physical resources and its management in cropping system.

a. OtherActivities(Specify):

Research on most suitable Cropping systems for the Satna Region.

Agron 512.2 students will become to differentiate dryland farming and rainfed farming.

Approximate Hours				
Item	Appx Hrs.			
Cl	06			
LI	06			
SW	1			
SL	1			
Total	14			

Session Outcomes La	boratory Classi	coom Instruction Sel	lf-
---------------------	-----------------	----------------------	-----

(SOs)	Instruction	(CI)	Learning
	(LI)		(SL)
(SOs) SO1.1 students will become to differentiate dryland farming SO1.2 students will become to differentiate rainfed farming.	Instruction (LI) 1.Moisture stress effects and recovery behaviour of important crops 2. estimation of potential et by thornthwaite method 3. estimation of reference et ny penman monteith method	(CI) Unit ii Soil and climatic parameters with special emphasis on rainfall characteristics; constraints limiting crop production in dry land areas; types of drought, characterization of environment for water availability; crop planning for erratic and aberrant weather conditions. 1.1Soil and climatic parameters 1.2 special emphasis on rainfall 1.3characteristics; constraints limiting 1.4crop production in dry land areas; types of drought, 1,5characterization of environment for water	Learning (SL) 1. crop production in dry land areas; typesof drought,
	monteith method	 1.3characteristics; constraints limiting 1.4crop production in dry land areas; typesof drought, 1,5characterization of environment for water availability; 1.6crop planning for erratic and aberrant weather conditions 	

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. OtherActivities(Specify):

Research on most suitable intercropping for the Satna Region.

Approximate Hours

Item	Appx Hrs.
Cl	06
LI	06
SW	1
SL	1
Total	14

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO1.1 students acquainting knowledge to calculate catchment SO1.2 students acquainting knowledge to calculate command area.	 1.Classification of climate by thornthwaite method (based on moisture index, Humidity index and aridity index) 2.Classification of climate by koppen method 3. Estimation of water balance by thornthwaite method 	 Unit iii- Stress physiology and resistance to drought, adaptation of crop plants todrought, drought management strategies; preparation of appropriate crop plans for dry land areas; mid contingent plan for aberrant weather Conditions. 3.1 Stress physiology 3.2 Resistance todrought, 3.3 Adaptation of crop plants to drought, 3.4 Drought management strategies; 3.5 Preparation of appropriate cropplans for dry land areas; 3.6 Mid contingent plan for aberrant weather Conditions. 	1 adaptation of crop plants todrought,

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.

Approximate Hours

Item	Appx Hrs.
Cl	06
LI	06
SW	1
SL	1
Total	14

Session Outcomes (SOs)	Laboratory Instruction	Classroom Instruction (CI)	Self-Learning (SL)	
SO1.1 students of pg able to evaluate concept of tillage.SO1.2 students of pg able to evaluate concept of conservation of tillage.	1. assessment of drought 2.estimation of length of growing period 3. estimation of probability of rain and crop planning for different drought condition	Unit iv- Tillage, tilth, frequency and depth of cultivation, compaction in soil tillage; concept of conservation tillage; tillage in relation to weed control and moisture conservation; techniques and practices of soil moisture conservation (use of mulches, kinds, effectiveness and economics); antitranspirants; soil and crop management techniques, seeding and efficient fertilizer use.	1. Tillage in relation to weed control and moisture conservation.	
		 4.1 Tillage, tilth, 4.2 frequency and depth of cultivation, 4.3 compaction in soil tillage; 4.4 concept of conservation tillage; 4.5 tillage in relation to weed control and moisture conservation; 4.6 techniques and practices of soil moisture conservation (use of mulches, kinds, effectiveness and economics); antitranspirants; soil and crop management techniques, seeding and efficient fertilizer use. 		

SW-1 Suggested Sessional Work (SW):

Assignments:

Crop diversification for sustainability; role of organic matter in maintenance of soil Fertility; crop residue management; fertilizer use efficiency

d. OtherActivities(Specify):

Research on nutrient use efficiency. .

Agron 512.5. Students will become as expert to design water harvesting tank under the watershed management technology.

Approximate Hours

				Item	Appx Hrs.	
				Cl	06	
				LI	06	
				SW	1	
				SL	1	
				Total	14	
Session Outcomes	Laboratory	Classroom Instruction		Self-Learning		
(SOs)	Instruction (LI)	(CI)		(SL)		
SO1.1 Students will become	1.spray of anti-	Unit v-	1. r	resource of		
as expert to design water	transpirants and	Concept of watershed	wate	rshed		
harvesting tank under the	their effect on	resource management,	man	agement, of		
	crops	problems, approach and	wate	rshed		
SO1.2 Students will become	2.water use	components.				
as expert to watershed	efficiency	5.1 Concept of				
management technology.	3. Visit to	watershed		2.problems,		
	dryland research	5.2 Resource of		of		
	stations and	watershed		watershed		
	watershed	5 3 Management of				
	projects	watershed				
		5.4 Problems of				
		watershed				
		5.5 Approach of				
		S.S Approach of				
		ao Components of				
		watershed				

SW-1 Suggested Sessional Work (SW):

Assignments:

Crop diversification for sustainability; role of organic matter in maintenance of soil Fertility; crop residue management; fertilizer use efficiency
e. OtherActivities(Specify):

Research on nutrient use efficiency. .

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self Learning (Sl)	Total hour (Cl+SW+ Sl)
Agron 512.1. Students will become to define dryland farming and its constraints.	6	6	1	14
Agron 512.2 students will become to differentiate dryland farming and rainfed farming.	6	6	1	14
Agron 512.3. Pg students acquainting knowledge to calculate catchment and command area.	6	6	1	14
Agron 512.4 students of pg able to evaluate concept of conservation of tillage.	6	6	1	14
Agron 512.5. Students will become as expert to design water harvesting tank under the watershed management technology.	6	6	1	14
Total Hours	30	30	5	70

Suggestion for End Semester Assessment

СО	Unit Titles	Ma	arks Dis	tribution	Total	
		R	U	Α	Marks	
CO-1	Unit i –	03	01	01	05	
	Definition, concept and characteristics of dry land farming; dry land versusrainfed farming; significance and dimensions of dry land farming in indian agriculture.					
CO-2	Unit ii	02	06	02	10	
	Soil and climatic parameters with special emphasis on rainfallcharacteristics; constraints limiting crop production in dry land areas; typesof drought, characterization of environment for water availability; crop planning for erratic and aberrant weather conditions.					
CO-3	Unit iii-	03	07	05	15	
	Stress physiology and resistance to drought, adaptation of crop plants todrought, drought management strategies; preparation of appropriate cropplans for dry land areas; mid contingent plan for aberrant weather Conditions.					
CO-4	Unit iv-	-	10	05	15	
	Tillage, tilth, frequency and depth of cultivation, compaction in soil tillage; concept of conservation tillage; tillage in relation to weed control and moisture conservation; techniques and practices of soil moisture conservation (use of mulches, kinds, effectiveness and economics); antitranspirants; soil and crop management techniques, seeding and efficient fertilizer use.					
CO-5	Unit v-	03	02	-	05	
	Concept of watershed resource management, problems, approach andcomponents.					
Total		11	26	13	50	

The end of semester assessment for Introduction to principles and practices of organic farming will be held with written examination of 50 marks

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for abovetasks. 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 farm/ field
- 6. Demonstration

Suggested Learning Resources:

S.	Title	Author	Publisher	Edition &
INO.				Y ear
1	Tillage and crop production.	Das nr	Scientific publishers.	2007
2	Agron technology for dryland farming.	Dhopte am.	Scientific publ.	2002.
3	Soil and water conservation research in india.	Dhruv narayan vv.	Icar.	2002.
4	Production and improvements of crops for drylands.	Gupta us. (ed.)	Oxford & ibh.	1995

(a) Books :

Curriculum Development Team

- 1. Dr. T. Singh, Professor & head Dept. of Agronomy, FAST
- 2. Dr. V. D. Dwivedi, Professor, Dept. of Agronomy, FAST
- 3. Dr. H. S. Kushwah, Professor, Dept. of Agronomy, MGCGVV
- 4. Dr. D. P. Chaturvedi, Assistant Professor, Dept. of Agronomy, FAST
- 5. Dr. P. K. Bagri, Assistant Professor, Dept. of Agronomy, FAST
- 6. Mr. Amit Singh Tiwari Assistant Professor, Dept. of Agronomy, FAST
- 7. Mr. Sanjay Lillhare, Assistant Professor, Dept. of Agronomy, FAST
- 8. Mis. Prachi Singh Teaching, Associate, Dept. of Agronomy, FAST
- 9. Mis. Prachi Awadhiya, Teaching Associate, Dept. of Agronomy, FAST

Cos, POs and PSOs Mapping Course Code:-Agron- 512 Course Title: - Dry land farming and watershed management

Course	Program Ou	itcomes								Program Sp	ecific Outcome	9		
Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
	Specific	Wide	Detailed	Use	Detail	Create,	Student	Student	Understan	Enable to	Acquainting	То	Apply	То
	knowledge	knowle	knowled	appr	ed	select	will	will apply	d the	recognize	with basic	undertake	researc	understa
	of various	dge in	ge	opri	knowl	and	apply	basic	impact of	and	concepts	teaching	h and	nd and
	branches of	the	regardin	ate	edge	apply	various	concepts in	the	examine	theories and	research and	experti	analyze
	agronomy	concern	g	scie	of	an	statistic	laboratory	profession	the	terminology	extension	se in	the
	will be	ing	package	ntifi	cultiva	appropr	al	techniques	al expert	relationshi	of	activates	resolvi	current
	made	subject	and	с	tion	iate	method	during their	solutions	ps between	Agronomy.	along with	ng the	issues
	specialized	which	practices	meth	practic	techniq	s to	research	in societal	inputs and		administrati	proble	that are
	and to	will	soil	ods	es,	ues,	analyze	work	and	outputs in		ve and	ms of	occurrin
	provide	improve	fertilizer	colla	soil,	resourc	their		environme	their		consultancy	existin	g in
	knowledge	the	and	bora	fertiliz	es and	master		ntal	agricultural		services.	g farm	local and
	disseminati	farmers	water	tion	ers,	modern	research		contexts,	field to			in the	global
	on	conditio	manage	with	water	it tools	work		and	make			periphe	agricultu
	regarding	n	ment of	stati	manag	in			demonstrat	effective			ry of	re and
	various	through	producti	stics	ement	improv			e the	and			univers	how they
	technique	student	ve crop	alon	and	ement			knowledge	profitable			ities.	Will
	of farming	S	aspects.	g	plant	of			of, and	decisions.				affect
	and	contribu		with	protec	agrono			need for	10				futuristic
	farming	tions.		eval	tion	mical			sustainable	understand				agricultu
	system in			uatio	econo	раскад			developme	the				re
	mara			II whie		e and				of a gri				
				wille b	associ	practic			Agricultur	OI agri				
				11 wi11	with	CS .			с.	urship				
				nrov	farmin					ursnip.				
				ed to	σ									
				deci	8 entern									
				sion	rises									
				in	11000.									
				vari										
				ous										
				part										

				of agric ultur e										
CO1- Students will become to define dry lond forming	3	3	3	1	3	1	1	1	3	3	1	2	3	1
and its constraints.														
CO2- students will become to differentiate dry land farming and rainfed farming.	3	3	3	1	3	1	1	1	3	3	1	3	2	1
CO3- Pg students acquainting knowledge to calculate catchment and command area.	3	2	3	1	2	3	1	1	3	3	2	2	1	2
CO4- students of pg able to evaluate concept of	3	2	1	1	1	3	1	1	1	3	1	3	2	1

conservation														
of tillage.														
CO5	3	1	2	1	1	3	1	1	1	2	3	1	1	1
Students will														
become as														
expert to														
design water														
harvesting														
tank under														
the														
watershed														
management														
technology.														

Legend: 1 – Low, 2 – Medium, 3 – High

POs & PSOs	COs No.& Titles	SOs No.	Laboratory	Classroom Instruction (CI)	Self Learning (SL)
No.			Instruction(LI)		
PO 1,2,3,4,5,6	CO1- Students will	SO1.1		Unit-1. Definition, concept and	As mentioned in page
7,8,9	become to define	SO1.2		characteristics of dryland	number
PSO 1,2, 3, 4, 5	dry land farming			farming;dryland versus rainfed farming;	
	and its constraints.			significance and dimensions of dry land	
				farming in indian agriculture	
				1.1, 1.2, 1.3, 1.4, 1.5, 1.6,	
PO 1,2,3,4,5,6	CO2- students will	SO1.1		Unit-2 Soil and climatic parameters	As mentioned in page
7,8,9	become to	SO1.2		with special emphasis on rainfall	number
	differentiate dry			characteristics; constraints limiting	
PSO 1,2, 3, 4, 5	land farming and			crop production in dry land areas;	
	rainfed farming.			types of drought, characterization of	
				environment for water availability;	
				crop planning for erratic and aberrant	
				weather conditions.	
				111212141516	
PO123456		SO1 1		Linit-3 Stress physiology and resistance	As mentioned in page
789	CO3- Pg students	SO1.1 SO1.2		to drought adaptation of cron plants to	number
7,0,5	acquainting	501.2		drought drought management	
PSO 1 2 3 4 5	knowledge to			strategies: preparation of appropriate	
150 1,2, 5, 4, 5	calculate calcillent			crop plans for dry land areas: mid	
	and command area.			contingent plan for aberrant weather	
				Conditions	
				1.1. 1.2.1.3.1.4.1.5.1.6	
PO 1,2,3,4,5,6	CO4- students of	SO1.1		Unit-4 Tillage, tilth. frequency and	
7,8,9	pg able to evaluate	SO1.2		depth of cultivation, compaction in soil	
	concept of			tillage; concept of conservation tillage;	
PSO 1,2, 3, 4, 5	conservation of			tillage in relation to weed control and	
	tillage.			moisture conservation; techniques and	

Course Curriculum Map: Dry land farming and watershed management

			practices of soil moisture conservation (use of mulches, kinds, effectiveness and economics); antitranspirants; soil and crop management techniques, seeding and efficient fertilizer use. 1.1, 1.2,1.3,1.4,1.5,1.6
PO 1,2,3,4,5,6	CO5 Students	SO1.1	Unit-5 Concept of watershed resource
7,8,9	will become as	SO1.2	management, problems, approach and
	expert to design		components.
PSO 1,2, 3, 4, 5	water harvesting		1.1, 1.2,1.3,1.4,1.5,1.6
	tank under the		
	watershed		
	management		
	technology.		



AKS University Faculty of Agriculture Science and technology Department of Agronomy Curriculum of M.Sc.(Ag) Agronomy Program

Course Code: APP 501 Course Title: Principles of plant physiology Pre-requisite: Student should have knowledge of plant physiology Core concepts in plant physiology, with specific focus on photosynthesis, respiration, water relations, mineral nutrition, growth and allocation, hormones, secondary metabolites, reproduction, and stress physiology. **Rationale:** The students should be acquainted with the knowledge of Plant physiology it is a disc botany concerned with physiological processes and activities of plants. It's a descript of variation and structure at the molecular and cellular level that leads to investigation ecological, physiological, and biochemistry-related elements of plants. Plant physiolc study of all of a plant's internal functions, including the chemical and physical mecha are connected with life in plants. This encompasses research at many scales of size ar Photosynthesis, molecular interactions and internal diffusion of water, minerals, and 1 are at the molecular level. Plant development, seasonality, dormancy, and reproductiv are all activities that take place on a large scale. Phytochemistry and phytopathology major subfields of plant physiology. Plant physiology is the initial line of defence and primary means of interaction with the environment and climate.

Course Outcomes:

App 501.1PG students will familiar with the knowledge of plant physiology.

App 501.2Students will able to acquaints knowledge about anti transparent to check the loss of water.

App 501.3Students will become expert to calculate the daily plant growth by recording the growth data taken by auxanometer.

App 501.4Students will able to acquaint knowledge to distinguish between osmosis and diffusion process.

App 501.5PG students will become expert in soil plant water relationship.

cine of Stu	uics.							
Board of	Course	Course Title		Scheme of studies (Hours/Week)				Total
Study	Code		Cl	LI	SW	SL	Total Study Hours(CI+LI+S W+SL)	Credits (C)
Progra m Core (SDGs	APP- 501	Principles of plant physiology	3	1	1	1	6	3

Scheme of Studies:

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

				Scheme of Assessment (Marks)								
]	Progress	sive Asse	essment (PRA))	End Semest	Total Mark		
Board of Study	Cous e Code	Course Title	Class/ Home Assig nment 5 numb er 3 marks each	Class Test 2 (2 best out of 3) 10 marks each (CT)	Semi nar one (SA)	Class Activ ity any one (CAT)	Class Attendance (AT)	Total Marks (CA+CT+SA+C AT+AT)	er Assess ment (ESA)	s (PRA + ESA)		
Program Core (SDGs)	APP- 501	Principles of plant physiolog y	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.

App 501.1 PG students will familiar with the knowledge of plant physiology.

Approximate Hours								
Item	Appx Hrs.							
Cl	6							
LI	4							
SW	1							
SL	2							
Total	13							

Session Outcomes	Laboratory	Classroom Instruction	Self-
(SOs)	Instruction	(CI)	Learning
	(LI)		(SL)
SO1.1 Understand the Water and its importance, molecular structure of water	1. Standard solutions and preparation of different	Unit 1: soil and plant water relations Water and its importance; molecular structure of water;	1. methods to determine cell and soil water potential
SO1.2Understand the Concept of water potential.SO1.3 Understand the concept of	forms of solutions 2. Studies on	properties and functions of water. Concept of water potential; plant cell and soil water potential and their	2. Studies on WHC, FC and PWP.
osmosis and diffusion.	the basic properties of	components; methods to determine cell and soil water	
SO1.4 Understand the Soil physical properties and water availability in different soils.	water	potential; concept of osmosis and diffusion. Soil physical properties and water availability in different soils; water holding	
SO1.5 Understand the WHC and PWP		capacity and approaches to improve WHC; concept of FC and PWP; Water holding polymers and	
		their relevance.	
		1.1 Introduction toWater and its importance.	
		1.2 Molecular structure of water; properties and functions of water.	
		1.3 Introduction to concept of water potential.	
		1.4 Explain theconcept of osmosis and diffusion.	
		1.5 Explain the soil physical properties and water availability in different soils.	
		1.6 Explain the WHC, FC and PWP	

SW-1 Suggested Sessional Work (SW): Assignments:

What is the concept of water potential? **OtherActivities(Specify):**

Research on study soil WHC, FC and PWP.

App 501.2 students will able to acquaints knowledge about anti transparent to check the loss of water.

Approximate Hours

Item	AppxHrs.
Cl	5
LI	6
SW	1
SL	1
Total	13

Session Outcomes	Laboratory	Classroom Instruction	Self-
(SOs)	Instruction	(CI)	Learning
	(LI)		(SL)
SO1.1 Understand the Root structure	1.Demonstrati	Unit 2: water absorption and	1.Concept of root
and functions.	on of surface	translocation	structure and
	tension of	Root structure and functions; root	function of plant.
SO1.2Understand the root	water and	architecture and relevance in water	
architecture and relevance in water	other solvents.	mining; mechanism of water absorption	
mining.		and translocation; theories explaining	
	2.Measuremen	water absorption and trans	
SO1.3Understand the mechanism of	t of plant	location;aquaporins. Mycorrhizal	
water absorption and translocation.	water status:	association and its relevance in water	
	relative water	mining.	
SO1.4. Understand the mycorrhizal	content and		
association and its relevance in water	rate of water		
mining.	loss.	1.1Introduction to Root structure and	
		functions.	
	3.Determinatio		
	n of water	1.2Introduction toroot architecture and	
	potential	relevance in water mining.	
	through tissue		
	volume and	1.3 .Introduction tomechanism of water	
	chardakov's	absorption and translocation.	
	test		
		1.4 Explain thetheories explaining water	
		absorption and translocation.	
		1.5 Introduction to aquaporins.	
		Mycorrhizal association and its	
		relevance in water mining.	

SW-1 Suggested Sessional Work (SW):

Assignments:

Concept in Root structure and functions; root architecture and relevance in water mining; mechanism of water absorption and translocation; theories explaining water absorption and translocation.

Other Activities (Specify):

Research on study Mycorrhizal association and its relevance in water mining.

App 501.3students will become expert to calculate the daily plant growth by recording the growth data taken by auxanometer.

Approximate Hours

Item	Appx Hrs.
Cl	6
LI	4
SW	1
SL	1
Total	12

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self- Learning (SL)
SO1.1 Understand the Evaporation and transpiration.	1.Determination of water potential using pressure	Unit 3: transpiration and evaporative cooling Evaporation and transpiration;	1.StudyonEvaporationandtranspirationin
SO1.2 Understand the concept of CCATD and its relevance.	bomb, osmometer, psychrometer	relevance of transpiration; factors regulating transpiration; measurement of transpiration;	details.
SO1.3 Understand the Energy balance: solar energy input and output at crop canopy level.	2.Determination of soil moisture	approaches to minimize evaporation and transpiration; concept of CCATD and its relevance Energy balance; solar	
SO1.4. Understand the Stomata- its structure, functions and distribution; molecular mechanisms of stomatal opening and closing	water potential	energy input and output at crop canopy level. Stomata- its structure, functions and distribution; molecular mechanisms of stomata opening	
SO1.5 Understand the concept of Guard cell turgidity; role of k and other osmolytes; role of aba in stomatal closure; guard cells response to environmental signals; signaling cascade associated with stomatal opening and closure.		and closing; concept of Guard cell turgidity; role of k and other osmolytes; role of aba in stomatal closure; guard cells response to environmental signals; signaling cascade associated with stomatal opening and closure. Anti	
SO1.6 Understand the concept of Anti transparent and their relevance in agriculture.		 transparent and their relevance in agriculture. 1.1 Introduction to Evaporation and transpiration. 1.2 Introduction to concept of CCATD and its relevance. 1.3.Introduction toEnergy balance: solar energy input and output at crop canopy level. 	
		1.4 . Introduction toStomata- its structure, functions and distribution; molecular mechanisms of stomatal opening and closing	
		1.5. Introduction totheconcept of Guard cell turgidity; role of k and other osmolytes; role of aba in stomatal closure; guard cells	
		response to environmental signals; signaling cascade associated with stomatal opening and closure. 1.6 .Introduction toconcept of Anti transpirant sand their	

	relevance in agriculture.	

Assignments:

Role of Antitranspirants and their relevance in agriculture.

a. Other Activities(Specify):

New Research on role of physiology in agriculture.

App 501.4 students will able to acquaint knowledge to distinguish between osmosis and diffusion process.

Approximate Hours				
Item	AppxHrs.			
Cl	5			
LI	6			
SW	1			
SL	1			
Total	13			

Session Outcomes	Laboratory Classroom Instruction		Self-Learning
(SOs)	Instruction	(CI)	(SI)
(503)	(LI)		(51)
 SO1.1 Understand the WUE and its relevance in water productivity. SO1.2Understand the transpiration efficiency, a measure of intrinsic WUE. SO1.3 Understand the approaches to measure WUE. 	(LI) 1. Use of soil moisture probes and soil moisture sensors 2.Measurement of transpiration rate in plants; use of	Unit 4: water productivity and water use efficiency WUE and its relevance in water productivity; transpiration efficiency, a measure of intrinsic WUE; approaches to measure WUE; stomatal and mesophyll regulation on WUE; passioura's yield model emphasizing WUE.	1. Study on WUE of different crop.
SO1.4. Understand the stomatal and mesophyll regulation on WUE.SO1.5Understand the passioura's yield model emphasizing WUE.	porometry. 3.Measurement of CCATD and its relevance.	 1.1 Introduction to WUE and its relevance in water productivity. 1.2. Introduction to the transpiration efficiency, a measure of intrinsic WUE. 1.3. Introduction to the approaches to measure WUE. 1.4 Introduction the stomatal and mesophyll regulation on WUE. 1.5 Introduction to passioura's yield model emphasizing WUE. 	

Assignments:

Crop diversification for sustainability; role of WUE in maintenance of soil Moisture.

Other Activities(Specify):

Research on WUE.

App 501.5PG students will become expert in soil plant water relationship.

Approximate Hours

Item	AppxHrs.
Cl	6
LI	6
SW	1
SL	1
Total	14

Session Outcomes	Laboratory	Classroom Instruction	Self-
(SOs)	Instruction	(CI)	Learning
	(LI)		(SL)
SO1.1 Understand the Physiology of	1.	Unit 5: moisture stress and	1.Study on
water stress in plants.	Demonstration	plant growth	Physiology of water
-	and use of	Physiology of water stress in	stress in plants.
SO1.2 Understand the effect of	anti-	plants; effect of moisture stress at	
moisture stress.	transpirants to	molecular, cellular organ and	
	reduce	plant level. Drought indices and	
SO1.3 Understand the cellular organ	transpiration.	drought tolerance strategies.	
and plant level.		Drought tolerance traits.	
	2. Influence of		
SO1.4. Understand the Drought	potassium and	1.1 Introduction the Physiology of	
indices.	aba on	water stress in plants.	
	stomatal		
SO1.5. Understand the Drought	opening and	1.2. Introduction to Understand	
tolerance.	closing	the effect of moisture stress.	
	respectively	13 Introduction to the collular	
SOI.6. Understand the Drought	2 Deficiency	1.3. Introduction tome central	
tolerance traits.	3.Deficiency	organ and plant level.	
	symptoms of	1.4 Introduction to the Drought	
	nutrients	indices	
	nutrents	mulees.	
		1.5 Introduction to the Drought	
		tolerance	
		1.6 Introduction to the Drought	
		tolerance traits.	

Assignments:

Understand the Physiology of water stress in plants.

b. Other Activities(Specify):

Study on Drought tolerance traits.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lectu re (Cl)	Laborator y Instruction (LI)	Sessional Work (SW)	Self Learning (SL)	Total hour (Cl+LI+S W+Sl)
App 501.1 pg students will familiar with the knowledge of plant physiology.	6	4	1	2	13
App 501.2 students will able to acquaints knowledge about antitranspirant to check the loss of water.	5	6	1	1	13
App 501.3 students will become expert to calculate the daily plant growth by recording the growth data taken by auxanometer.	6	4	1	1	12
App 501.4 students will able to acquaint knowledge to distinguish between osmosis and diffusion process.	5	6	1	1	13
App 501.5 PG students will become expert in soil plant water relationship.	6	6	1	1	14
Total Hours	28	26	5	6	65

Suggestion for End Semester Assessment

СО	Unit Titles		Marks Distrib	ution	Total Marks
		R	U	A	iviai KS
CO-1	Unit 1: soil and plant water relations	03	01	01	05
	Water and its importance; molecular structure of water; properties and functions of water. Concept of water potential; plant cell and soil water potential and their components; methods to determine cell and soil water potential; concept of osmosis and diffusion. Soil physical properties and water availability in different soils; water holding capacity and approaches to improve WHC; concept of FC and PWP; Water holding polymers and their relevance.				
CO-2	Unit 2: water absorption and translocation Root structure and functions; root architecture and relevance in water mining; mechanism of water absorption and translocation; theories explaining water absorption and translocation; aquaporins. Mycorrhizal association and its relevance in water mining.	02	06	02	10
CO-3	Unit 3: transpiration and evaporative cooling Evaporation and transpiration; relevance of transpiration; factors regulating transpiration; measurement of transpiration; approaches to minimize evaporation and transpiration; concept of CCATD and its relevance. Energy balance: solar energy input and output at crop canopy level. Stomata- its structure, functions and distribution; molecular mechanisms of stomatal opening and closing; concept of Guard cell turgidity; role of k and other osmolytes; role of aba in stomatal closure; guard cells response to environmental signals; signaling cascade associated with stomatal opening and closure. Antitranspirants and their relevance in agriculture.	03	07	05	15
CO-4	Unit 4: water productivity and water use efficiency WUE and its relevance in water productivity; transpiration efficiency, a measure of intrinsic WUE; approaches to measure WUE; stomatal and mesophyll regulation on WUE; passioura's yield model emphasizing WUE.	-	10	05	15

	Unit 5: moisture stress and plant growth	03	02	-	05
CO-5	Physiology of water stress in plants; effect of moisture stress at molecular, cellular organ and plant level. Drought indices and drought tolerance strategies. Drought tolerance traits.				
	Total	11	26	13	50

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

The end of semester assessment for Principles and practices of soil fertility and nutrients 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. Visitto field
- 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	Plant Physiology	Bhatia KN & Prashar AN.	Truman Book Company.	1990
2	Plant Physiology	Salisbury FB. & Ross CW	Wordsworth Publishing Company.	1992
3	Plant Physiology	F. B. and Ross,C. W.	Thomson Asia Ptd, Ltd. Singapore.	2004
4	Physicochemical and Environmental Plant Physiology.	Nobel P. S.	Elsevier Academic Press, Amsterdam Salisbury,	2005
5	Physiological Plant Ecology: Ecophysiology and Stress Physiology of Functional Groups	Larcher, W.	Springer Science & Business Media	2003

Curriculum Development Team

- 1. Dr. T. Singh, Professor & head Dept.of Agronomy, FAST
- 2. Dr. V. D. Dwivedi, Professor, Dept. of Agronomy, FAST
- 3. Dr. H. S. Kushwah, Professor, Dept. of Agronomy, MGCGVV
- 4. Dr. D. P. Chaturvedi, Assistant Professor, Dept. of Agronomy, FAST
- 5. Dr. P. K. Bagri, Assistant Professor, Dept. of Agronomy, FAST
- 6. Mr.Amit Singh Tiwari, Assistant Professor, Dept. of Agronomy, FAST
- 7. Mr. Sanjay Lillhare, Assistant Professor, Dept. of Agronomy, FAST
- 8. Mis. Prachi Singh, Teaching Associate, Dept. of Agronomy, FAST
- 9. Mis. Prachi Awadhiya, Teaching Associate, Dept. of Agronomy, FAST

Cos, POs and PSOs Mapping

Course Code:- APP 501

Course Title: - Principles of plant physiology

Course	Program O	utcomes								Program S	pecific Outco	me		
Outcomes	PO1	PO2	PO3	PO 4	PO5	PO6	PO7	PO8	PO9	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
	Specific knowledg e of various branches of agronomy will be made specialize d and to provide knowledg e dissemina tion regarding various technique of farming and farming system in India	Wide knowle dge in the concer ning subject which will improv e the farmer s conditi on throug h student 's contrib utions.	Detailed knowle dge regardin g package and practice s soil fertilize r and water manage ment of producti ve crop aspects.	Use appr opri ate scie ntifi c met hod s coll abor atio n with stati stics alon g with eval uati on whi ch	Detai led know ledge of cultiv ation practi ces, soil, fertili zers, water mana geme nt and plant prote ction econo mic assoc iated with	Create , select and apply an approp riate techni ques, resour ces and moder n it tools in impro vemen t of agrono mical packa ge and practic	Studen t will apply various statisti cal method s to analyz e their master researc h work	Student will apply basic concepts in laboratory technique s during their research work	Understa nd the impact of the professio nal expert solutions in societal and environm ental contexts, and demonstr ate the knowledg e of, and need for sustainab le developm ent in Agricultu re.	Enable to recognize and examine the relationsh ips between inputs and outputs in their agricultur al field to make effective and profitable decisions. To understan d the mechanic s of agri Entrepren eurship.	Acquaintin g with basic concepts theories and terminolog y of Agronomy.	To undertake teaching research and extension activates along with administrat ive and consultanc y services.	Apply resear ch and experti se in resolvi ng the proble ms of existin g farm in the periph ery of univer sities.	To underst and and analyze the current issues that are occurri ng in local and global agricult ure and how they will affect futuristi c agricult ure

				will pro ved to deci sion in vari ous part of agri cult ure	farmi ng enter prises	es.									
CO1- pg students will familiar with the knowledge of plant physiology.	3	3	3	3	3	1	1	1	3	3	1	2	3	1	
CO2-students will able to acquaints knowledge about antitranspirant to check the loss of water.	3	3	3	2	3	1	1	1	3	3	1	3	2	1	
CO3 students will become expert to calculate the daily plant	3	2	1	3	2	3	1	1	3	3	2	2	1	2	

growth by recording the growth data taken by auxanometer.														
CO 4 students will able to acquaint knowledge to distinguish between osmosis and diffusion process.	3	2	1	3	1	3	1	1	1	3	1	3	2	1
CO5- PG students will become expert in soil plant water relationship.	3	1	2	3	1	3	1	1	1	2	3	1	1	1

Legend: 1 – Low, 2 – Medium, 3 – High

POs & PSOs	COs No.& Titles	SOs No.	Laboratory	Classroom Instruction (CI)	Self Learning (SL)
No.			Instruction(LI)		
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO1- pg students will familiar with the knowledge of plant physiology.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5		Unit-1 . Water and its importance; molecular structure of water; properties and functions of water. Concept of water potential; plant cell and soil water potential and their components; methods to determine cell and soil water potential; concept of osmosis and diffusion. Soil physical properties and water availability in different soils; water holding capacity and approaches to improve WHC; concept of FC and PWP; Water holding polymers and their relevance.	As mentioned in page number
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO2 -students will able to acquaints knowledge about antitranspirant to check the loss of water.	SO1.1 SO1.2 SO1.3 SO1.4		1.1, 1.2, 1.3, 1.4, 1.5, 1.6. Unit-2 Root structure and functions; root architecture and relevance in water mining; mechanism of water absorption and translocation; theories explaining water absorption and trans location; aquaporins. Mycorrhizal association and its relevance in water mining. 1.1, 1.2, 1.3, 1.4, 1.5	As mentioned in page number
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO3 students will become expert to calculate the daily plant growth by recording the growth data taken by auxanometer.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5 SO1.6		Unit-3 Evaporation and transpiration; relevance of transpiration; factors regulating transpiration; measurement of transpiration; approaches to minimize evaporation and transpiration; concept of CCATD and its relevance. Energy balance: solar energy input and output at crop canopy level. Stomata- its structure, functions and distribution; molecular mechanisms of stomata opening	As mentioned in page number

			and closing; concept of Guard cell turgidity; role of k and other osmolytes; role of aba in stomatal closure; guard cells response to environmental signals; signaling cascade associated with stomatal opening and closure. Anti transparent and their relevance in agriculture. 1.1, 1.2,1.3,1.4,1.5,1.6	
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO 4 students will able to acquaint knowledge to distinguish between osmosis and diffusion process.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	Unit 4. WUE and its relevance in water productivity; transpiration efficiency, a measure of intrinsic WUE; approaches to measure WUE; stomatal and mesophyll regulation on WUE; passioura's yield model emphasizing WUE 1.1, 1.2,1.3,1.4 1.5	As mentioned in page number
PO 1,2,3,4,5,6 7,8,9,10,11,12 PSO 1,2, 3, 4, 5	CO5- PG students will become expert in soil plant water relationship.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5 SO1.6	Unit 5 Physiology of water stress in plants; effect of moisture stress at molecular, cellular organ and plant level. Drought indices and drought tolerance strategies. Drought tolerance traits.1.1, 1.2, 1.3, 1.4 1.5, 1.6	As mentioned in page number



A K S University Faculty of Agricultural Science and Technology Curriculum of M.Sc. (All Branches)

Course Code:	STAT 512
Course Title:	Experimental Designs
Pre-requisite:	Experimental design is the process of carrying out research in an objective and controlled fashion so that precision is maximized and specific conclusions can be drawn regarding a hypothesis statement. Generally, the purpose is to establish the effect that a factor or independent variable has on a dependent variable.
Rationale:	Experimental design is used to establish the effect an independent variable has on a dependent variable. An experimental design helps a researcher to objectively analyze the relationship between variables, thus increasing the accuracy of the result.
Course Outcomes:	 CO1 Understand of basic concepts of design of experiments. Introduction to planning valid and economical experiments within given resources. CO2 Analyze completely randomized design, Randomized block design, Latin square design. The conditions and circumstances under which results of the experiment are valid should be extensive. CO3 Understand and compute Full and confounded factorial designs with two and three levels. Fractional factorial designs with two levels. CO4 Understand the purpose for balanced incomplete block design, resolvable designs and their applications. Split and Strip plot design will help students to know the applications of DOE and learn and apply these techniques in the field experiment.
Scheme of Studies:	

neme of Studies:

Board of	Course	Course Title			Schen	Scheme of studies(Hours/Week)			
Study	Code		Cl	LI	SW	SL	Total Study	Credits	
							Hours	(C)	
							(CI+LI+SW+SL)		
Program	STAT 512	EXPERIMENTAL	2	01	02	01	6	3	
Core		DESIGNS							
(PCC)									

Legend:	CI: Class room 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

			Marks)	Schem	e of Assessn	nent (
			Progressiv	e Assessm	ent(PRA))		End Semester Assessmen	Total Mar ks
Board of Study	Course Code	Course Title	Class/Home Assignment 1 number 5 marks each	Class Test 2 (2 best out) 15 marks	Practical Exam	Class Attenda nce	Total Marks	, L	
			(CA) each (CT)		(PA)	(AT)	(CA+CT +PA+AT)	(ESA)	(PRA+ ESA)
PCC	STAT 512	ED	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.

STAT 512 CO-1 Understand of basic concepts of design of experiments. Introduction to planning valid and economical experiments within given resources

Approximate Hours

Item	Appx. Hrs.
CI	3
LI	4
SW	1
SL	2
Total	10

Session Out Comes	Laboratory	Classroom	Self-
(SOs)	Instruction	Instruction	Learning
	(LI)	(CI)	(SL)
 SO1.1 Design of Experiment is a tool to develop an experimentation strategy that maximizes learning using a minimum of resources. SO1.2 Extensively used by engineers and scientists involved in the improvement of manufacturing processes to maximize yield and decrease variability. SO1.3 It is widely used in many fields with broad application across all the natural and social sciences, to name a few: Biostatistics, Agriculture, Marketing, Software engineering, Industry etc. 	1-Uniformity trial data analysis. 2- formation of plots and blocks, Fairfield Smith Law	 Unit-1. Need for designing of experiments, characteristics of a good design. Basic principles of designs- randomization, replication and local control. 1.1. Need for designing of experiments 1.2 characteristics of a good design 1.3 Basic principles of designs- randomization, replication and local control 	1. Prepare the assignment on Basic principles of designs- randomization, replication and local control.

SW-1 Suggested Sessional Work (SW):

a. Assignments: Prepare the assignment on Basic principles of designs- randomization, replication and local control.

b. Mini Project: -

c. Other Activities (Specify):-

STAT 512 CO-2 Analyze completely randomized design, Randomized block design, Latin square design. The conditions and circumstances under which results of the experiment are valid should be extensive.

Approximate Hours			
Item	Appx. Hrs.		
CI	5		
LI	6		
SW	1		
SL	2		
Total	14		

Session Outcomes (SOs)	Laboratory Instruction	Classroom Instruction (CI)	Self- Learning (SL)
 SO2.1 Good experimental design is important in all research, it helps to ensure the data collection, data analysis and conclusions from a study, are valid (true). SO2.2 Experiments are designed to test hypotheses, or specific statements about the relationship between variables. 	1- Analysis of data obtained from CRD 2 Analysis of data obtained from RBD 3 Analysis of data obtained from LSD	 Unit-2 Uniformity trials, size and shape of plots and blocks; Analysis of variance; Completely randomized design, randomized block design and Latin square design. 1.1 Uniformity trials 1.2 size and shape of plots and blocks 1.3. Analysis of variance; Completely randomized design 1.4 Analysis of variance; randomized block design 1.5 Analysis of variance; Latin square design. 	1. Prepare the assignment on Analysis of variance; Completely randomized design, randomized block design and Latin square design.

SW-1 Suggested Sessional Work (SW):

Assignments: Prepare the assignment on Simple Problems Based on Analysis of variance; Completely randomized design, randomized block design and Latin square design.

a. Other Activities (Specify):

STAT 512 CO-3 Understand and compute Full and confounded factorial designs with two and three levels. Fractional factorial designs with two levels.

Approximate Hours

Item	Appx. Hrs.
CI	6
LI	14
SW	1
SL	2
Total	23

Session Out Comes	Laboratory	Classroom Instruction	Self-
(SOs)	Instruction	(CI)	Learning
SO3 1 Experimental	(LI) 1- Analysis	Unit-3 Factorial experiments	(SL)
methods introduce erogeneity,	of factorial	(symmetrical as well as	assignment on
conclusions about the effects of an event or a program.	without confounding.	partitioning of degrees of freedom, Confounding in	experiments with control
event or a program. SO3.2 An experimental design helps a researcher to objectively analyze the relationship between variables, thus increasing the accuracy of the result.	 2- Analysis of factorial experiments with confounding. 3- Analysis with missing data in CRD. 4- Analysis with missing data in RBD. 5- Analysis with missing 	symmetrical factorial experiments, Factorial experiments with control treatment. 1.1 . Factorial experiments, (symmetrical) 1.2 Factorial experiments, (asymmetrical) 1.3 orthogonality 1.4 partitioning of degrees of freedom 1.5 . Confounding in symmetrical factorial	treatment.
	data in LSD. 6- Split plot designs. 7- Strip plot	experiments 1.6 . Factorial experiments with control	
	designs		

SW-1 Suggested Sessional Work (SW):

Assignments: Prepare the assignment on Factorial experiments with control treatment. Other Activities (Specify):

STAT 512 CO-4 Understand the purpose for balanced incomplete block design, resolvable designs and their applications. Split and Strip plot design will help students to know the applications of DOE and learn and apply these techniques in the field experiment.

Approximate Hours

Item	Appx Hrs.
CI	16
LI	6
SW	1
SL	2
Total	25

Session Out Comes	Laboratory	Classroom Instruction	Self-Learning
(SOs)	Instruction	(CI)	(SL)
	(LI)		
SO4.1 .Ensure your experiment	1- Transformation	Unit-4 Split plot and strip	1. Prepare the
is unbiased.	of data.	plot designs; Analysis of	assignment on Analysis of
	2- Analysis of	covariance and missing plot	covariance and missing plot
SO4.2 Make sure your	resolvable	techniques in randomized	techniques in randomized
experiment is adequately	designs	block and Latin square	block and Latin square
powered.	3- Fitting of	designs; Transformations,	designs
SO4.3 Consider the range of	response	crossover designs, balanced	
applicability of your	surfaces.	incomplete block design,	
experiment.		resolvable designs and their	
		applications ~ Lattice	
		design, alpha design-	
		concepts, randomization	
		procedure, analysis and	
		interpretation of results.	
		Response surfaces.	
		Experiments with mixtures.	
		1.1 Split plot	
		1.2 strip plot designs	
		1.3 Analysis of covariance	
		1.4 Missing plot techniques	
		in randomized block.	
		1.5 Missing plot techniques	
		in Latin square designs.	
		1.6 Transformations	
		1.7 crossover designs	
		1.8 balanced incomplete	
		block design	
		1.9 resolvable designs	
		1.10 Applications of	
		resolvable designs	
		Lattice design	
		1.11 Lattice design	
		1.12 Applications of	

Lattice design
1.13 Alpha design-concepts.
1.14 Randomization
procedure.
1.15 Interpretation of
results.
1.16 Response surfaces.
Experiments with mixtures

Assignments: Prepare the assignment on Analysis of covariance and missing plot techniques in randomized block and Latin square designs

Other Activities (Specify):

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture	Laborato rv	Sessional Work	Self Learning	Total hour (C l + LI+
	(C l)	Lecture (L I)	(SW)	(S I)	SW +S1)
CO1: Understand of basic concepts of design of experiments. Introduction to planning valid and economical experiments within given resources.	03	04	01	02	10
CO2: Analyze completely randomized design, Randomized block design, Latin square design. The conditions and circumstances under which results of the experiment are valid should be extensive.	05	06	01	02	14
CO3: Understand and compute Full and confounded factorial designs with two and three levels. Fractional factorial designs with two levels.	06	14	01	02	25
CO4: Understand the purpose for balanced incomplete block design, resolvable designs and their applications. Split and Strip plot design will help students to know the applications of DOE and learn and apply these techniques in the field experiment.	16	06	01	02	25

Total Hours	30	30	04	08	74

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

СО	Unit title	N	Marks Distribution		
		R	U	Α	Marks
CO-1	Understand of basic concepts ofdesignofexperiments.Introduction to planning validandeconomicalexperimentswithin given resources.	04	04	04	12
CO-2	Analyzecompletelyrandomizeddesign,Randomizedblockdesign,LatinLatinsquaredesign.Theconditionsandcircumstancesunderwhichresultsoftheexperimentarevalidshouldbeextensive	04	04	04	12
CO-3	Understand and compute Fulland confounded factorialdesigns with two and threelevels.Fractional factorialdesigns with two levels.	04	04	04	12
CO-4	Understand the purpose for balanced incomplete block design, resolvable designs and their applications. Split and Strip plot design will help students to know the	05	04	05	14

applications of DOE and learn and apply these techniques in the field experiment.				
Total	17	16	17	50

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

The end of semester assessment for Experimental Designs 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.	Title	Author	Publisher	Edition &
No.				Year
01	Basic Concepts and Application of Experimental Designs and Analysis	Felix Kusanedzie Sylverster Achio Edmund Ameko	Science PG	
02	Theory and Analysis of Experimental Designs	B.L. Agrawal	CBS	
03	Design and Analysis of Experiments	Angela Dean Daniel Voss	Springer	

Curriculum Development Team:

- 1. Professor B.B. Beohar, Director Planning, & Director Extension, A.K.S. University
- 2. Dr. V.K. Vishwakarma, Head Department of Agricultural Economics, FAST
- 3. Mr. Navneet Raj Rathore, Teaching Associate, Department of Agricultural Economics, FAST

Cos, POs and PSOs Mapping Course Code:- STAT 512 Course Title: - Experimental Designs

Course	Program Outcomes Program Specific Outcome													
Outcomes	PO1	PO2	PO3	РО	PO5	PO6	PO7	PO8	PO9	PSO 1	PSO 2	PSO 3	PSO	PSO 5
				4									4	
	Specific	Wide	Detaile	Use	Detai	Create	Studen	Student	Understa	Enable to	Acquainti	То	Apply	То
	knowledg	knowl	d	app	led	,	t will	will	nd the	recogniz	ng with	undertake	resear	underst
	e of	edge	knowle	ropr	know	select	apply	apply	impact	e and	basic	teaching	ch	and
	various	in the	dge	iate	ledge	and	variou	basic	of the	examine	concepts	research	and	and
	branches	concer	regardi	scie	of	apply	S	concepts	professio	the	theories	and	expert	analyze
	of	ning	ng	ntifi	cultiv	an	statisti	in	nal	relations	and	extension	ise in	the
	agronom	subjec	packag	с	ation	appro	cal	laborator	expert	hips	terminolo	activates	resolv	current
	y will be	t	e and	met	practi	priate	metho	У	solutions	between	gy of	along	ing	issues
	made	which	practice	hod	ces,	techni	ds to	technique	in	inputs	Agronom	with	the	that are
	specialize	will	s soil	S	soil,	ques,	analyz	s during	societal	and	у.	administra	proble	occurri
	d and to	impro	fertilize	coll	fertili	resour	e their	their	and	outputs		tive and	ms of	ng in
	provide	ve the	r and	abo	zers,	ces	master	research	environ	in their		consultan	existi	local
	knowledg	farmer	water	rati	water	and	resear	work	mental	agricultu		cy	ng	and
	e	S	manage	on	mana	moder	ch		contexts,	ral field		services.	farm	global
	dissemin	conditi	ment of	wit	geme	n it	work		and	to make			in the	agricult
	ation	on	product	h .	nt	tools			demonst	effective			periph	ure and
	regarding	throug	ive	stati	and	in			rate the	and			ery of	how
	various	h	crop	stic	plant	impro			knowled	profitabl			univer	they
	technique	studen	aspects.	S	prote	veme			ge of,	e			sities.	W1ll
	of	t's		alo	ction	nt of			and need	decisions				affect
	tarming	contri		ng	econ	agron			for	. 10				futurist
	and	bution		wit	omic	omica			sustaina	understa				10
	farming	s.		h	assoc	1			ble	nd the				agricult
	system in			eval	iated	packa			develop	mechanic				ure
	India			uati	with	ge			ment in	s of agri				
				on	farmi	and			Agricult	Entrepre				

				whi	ng	practi			ure.	neurship.				
				ch	enter	ces.								
				will	prise									
				pro	s.									
				ved										
				to										
				deci										
				sion										
				in										
				vari										
				ous										
				part										
				of										
				agri										
				cult										
				ure										
				uic										
CO1:	1	2	1	3	1	3	3	3	3	3	1	2	3	3
CO1: Understand	1	2	1	3	1	3	3	3	3	3	1	2	3	3
CO1: Understand of basic	1	2	1	3	1	3	3	3	3	3	1	2	3	3
CO1: Understand of basic concepts of	1	2	1	3	1	3	3	3	3	3	1	2	3	3
CO1: Understand of basic concepts of design of	1	2	1	3	1	3	3	3	3	3	1	2	3	3
CO1: Understand of basic concepts of design of experiments.	1	2	1	3	1	3	3	3	3	3	1	2	3	3
CO1: Understand of basic concepts of design of experiments. Introduction	1	2	1	3	1	3	3	3	3	3	1	2	3	3
CO1: Understand of basic concepts of design of experiments. Introduction to planning	1	2	1	3	1	3	3	3	3	3	1	2	3	3
CO1: Understand of basic concepts of design of experiments. Introduction to planning valid and	1	2	1	3	1	3	3	3	3	3	1	2	3	3
CO1: Understand of basic concepts of design of experiments. Introduction to planning valid and economical	1	2	1	3	1	3	3	3	3	3	1	2	3	3
CO1: Understand of basic concepts of design of experiments. Introduction to planning valid and economical experiments	1	2	1	3	1	3	3	3	3	3	1	2	3	3
CO1: Understand of basic concepts of design of experiments. Introduction to planning valid and economical experiments within given	1	2	1	3	1	3	3	3	3	3	1	2	3	3
CO1: Understand of basic concepts of design of experiments. Introduction to planning valid and economical experiments within given resources.	1	2	1	3	1	3	3	3	3	3	1	2	3	3
CO1: Understand of basic concepts of design of experiments. Introduction to planning valid and economical experiments within given resources. CO2:	1	2	1	3	1	3	3	3	3	3	1	2	3	3
CO1: Understand of basic concepts of design of experiments. Introduction to planning valid and economical experiments within given resources. CO2: Analyze	1	2	1	3	1	3	3	3	3	3	1	2	3	3
randomized design, Randomized block design, Latin square design. The conditions and circumstance s under which results of the experiment are valid should be extensive														
--	---	---	---	---	---	---	---	---	---	---	---	---	---	---
CO3: Understand and compute Full and confounded factorial designs with two and three levels. Fractional factorial designs with two levels.	1	2	1	3	1	3	3	3	3	3	1	2	3	3
CO4: Understand the purpose for balanced	1	2	1	3	1	3	3	3	3	3	1	2	3	3

incomplete							
block design,							
resolvable							
designs and							
their							
applications.							
Split and							
Strip plot							
design will							
help students							
to know the							
applications							
of DOE and							
learn and							
apply these							
techniques in							
the field							
experiment.							

Course Curriculum Map: Experimental Designs

POs & PSOs	COs No.&	SOs No.	Laboratory	Classroom Instruction (CI)	Self Learning
No.	Titles		Instruction(LI)		(SL)
PO 1,2,3,4,5,6	CO1:	SO1.1		Unit-1. Need for designing of experiments, characteristics	As mentioned
7,8,9	Understand of	SO1.2		of a good design. Basic principles of designs-	in page
PSO 1.2. 3. 4.	basic concepts	SO1.3		randomization, replication and local control.	number
	of design of	~ ~ ~ ~ ~		1.1, 1.2,1.3.	

5	experiments.				
-	Introduction to				
	planning valid				
	and economical				
	experiments				
	within given				
	resources				
PO 1 2 3 4 5 6	CO2· Analyze	SO2 1	T	Init-2 2 Uniformity trials size and shape of plots and	As mentioned
7.00	completely	502.1	L L	Nocke: Analysis of variance: Completely randomized	
7,8,9	randomized	502.2	0	boices, Analysis of variance, Completely fandomized	in page
	dagian		a	iesign, fandomized block design and Latin square design.	number
PSO 1,2, 3, 4,	Dendomized		1	1, 1.2, 1.3, 1.4, 1.5.	•••••
5	kandonnized				
	Lotin course				
	Latin square				
	design. The				
	conditions and				
	circumstances				
	under which				
	results of the				
	experiment are				
	valid should be				
	extensive.				
PO 1,2,3,4,5,6	CO3:	SO3.1	ι	Unit-3. Factorial experiments, (symmetrical as well as	As mentioned
7,8,9	Understand and	SO3.2	a	symmetrical). orthogonality and partitioning of degrees	in page
	compute Full		0	of freedom, Confounding in symmetrical factorial	number
PSO 1 2 3 4	and confounded		e	experiments, Factorial experiments with control	•••••
5	factorial designs		tı	reatment.	
5	with two and		1	1, 1.2, 1.3, 1.4, 1.5, 1.6	
	three levels.				
	Fractional				
	factorial designs				
	with two levels.				

PO 1,2,3,4,5,6	CO4:	SO4.1	Unit 4 Split plot and strip plot designs; Analysis of	As mentioned
7,8,9	Understand the	SO4.2	covariance and missing plot techniques in randomized	in page
PSO 1.2, 3, 4,	purpose for	SO4.3	block and Latin square designs; Transformations,	number
5	balanced		crossover designs, balanced incomplete block design,	
	incomplete		resolvable designs and their applications ~ Lattice design,	
	block design,		alpha design-concepts, randomization procedure, analysis	
	resolvable		and interpretation of results. Response surfaces.	
	designs and		Experiments with mixtures.	
	their		1.1, 1.2, 1.3, 1.4	
	applications.		1.5,1.6,1.7,1.8,1.9,1.10,1.11,1.12,1.13,1.14,1.15,1.16,1.17.	
	Split and Strip			
	plot design will			
	help students to			
	know the			
	applications of			
	DOE and learn			
	and apply these			
	techniques in			
	the field			
	experiment.			



A K S University Faculty of Agricultural Science and Technology Department of Agronomy Curriculum of M.Sc. (All Branches)

Course Code:	PGS 503
Course Title:	Intellectual Property and Its Management in Agriculture
Pre- requisite:	To teach the physiology of Intellectual Property and Its Management in
	Agriculture
Rationale:	The main objective of this course is to equip students and stakeholders with knowledge of Intellectual Property Rights (IPR) related protection systems, their significance and use of IPR as a tool for wealth and value creation in a knowledge based economy.

Course outcomes:

PGS 503.1: Students will be able to understand Historical perspectives and need for the introduction of Intellectual Property Right.

PGS 503.2: Students will be able to understand National Biodiversity protection initiatives. Convention on Biological Diversity.

PGS 503.3: Students will be able to understand Research Collaboration Agreement, License agreement

Scheme of Studies:

Board of Study	Course				Sch (Ho	studies eek)	Total Credits(C)	
	Code	Course Title	Cl	LI	SW	SL	Total Study	
							Hours(CI+LI+	
Program	PGS 503	Intellectual	1	0	1	1	3 (V+5L)	1
Core	105 505	Property and Its	1	0	1	1	5	1
(PGS)		Management in						
		Agriculture						

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	y	1	1							
			Scheme of Assessment (Marks)							
Board of	Course Code	Course		End Semester Assessmen t						
Study		Title	Class/Home Assignment 1number 5 marks each	Class Test2 (2bestout) 20 marks each(CT)	Practical Exam	Class Attenda nce	Total Marks			
			(CA)		(PA)	(AT)	(CA+CT+P A+AT)	(ESA)		
PGS	PGS 503	Intellectu al Property and Its Manage ment in Agricultu	5	40	0	5	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.

PGS 503.1: Students will be able to understand Historical perspectives and need for the introduction of Intellectual Property Right.

Approximate Hours

Total

Mar

ks

PRA+

ESA)

100

Item	AppX Hrs
Cl	04
LI	0
SW	01
SL	02
Total	07

Session Outcomes(SOs)	Laboratory	Classroom Instruction(CI)	Self-Learning		
	Instruction(LI)			(SL)	
SO1.1 Student will understand		Unit-1. Historical perspectives	1. R	lole	of
the Historical perspectives and		and need for the introduction of	IPR	and	its
need for the introduction of		Intellectual Property Right regime;	benefit	s.	
Intellectual Property Right.		TRIPs and various provisions in			
		TRIPS Agreement; Intellectual	2. R	lole	of
SO1.2 Student will recognize		Property and Intellectual Property	TRIPS	and	its
the TRIPs and various		Rights (IPR), benefits of securing	benefit	S	
provisions in TRIPS		IPRs.			
Agreement.					
		1.1 Historical perspectives and			
SO1.3 Student will understand		need for the introduction of	-		
different Intellectual Property		Intellectual Property Right regime.			
and Intellectual Property Rights (IPR), benefits of securing IPRs		1.2 TRIPs and various provisions in TRIPS Agreement.			
		1.3 Intellectual Property and Intellectual Property Rights (IPR).			
		1.4 Benefits of securing IPRs.			

SW-1 Suggested Sessional Work (SW): Assignments:

I. Preparation of file and write the role of IPR and TRIPS and their purpose.

PGS 503.2: Students will be able to understand National Biodiversity protection initiatives. Convention on Biological Diversity.

			Терголі			1
			Item	Аррхн	rs	
			Cl	06	5	
			LI	0		
			SW	02	2	
			SL	03	3	
			Total	11	[
Session Outcomes(SOs)	Laboratory	Class	room Instruction	n(CI)	S	elf -
	Instruction(LI)				Learn	ning(SL)

SO2.1 Students will	Unit-2 Indian Legislations for the	1. Basic
understand the Indian	protection of various types of	Indian
Legislations for the	Intellectual Properties;	Legislature.
protection of various types	Fundamentals of patents,	
of Intellectual Properties;	copyrights, geographical	
Fundamentals of patents,	indications, designs and layout,	2 Dlant
copyrights, geographical	trade secrets and traditional	2. I lain
indications, designs and	knowledge, trademarks, protection	farmers' rights act
layout	of plant varieties and farmers' rights	(2001)
	and biodiversity protection;	(2001).
	Protectable subject matters,	
SO2 2Students will	protection in biotechnology,	
understand the trade	protection of other biological	3.
secrets and traditional	materials, ownership and period of	Biodiversity act
knowledge trademarks	protection.	(2002).
protection of plant	2.1 Indian Legislations for the	
varieties and farmers'	protection of various types of	
rights and biodiversity	Intellectual Properties.	
protection.	2.2 Fundamentals of patents.	
	copyrights, geographical	
	indications, designs and layout.	
SO2.3 Students will	2.3 trade secrets and traditional	
identify the role of	knowledge and trademarks.	
Protectable subject	2.4 protection of plant varieties	
matters, protection in	and farmers' rights and	
biotechnology, protection	biodiversity protection.	
of other biological	2.5 Protectable subject matters,	
materials, ownership and	protection in biotechnology.	
period of protection.	2.6 protection of other biological	
	materials, ownership and period of	
	protection.	

SW-2 Suggested Seasonal Work (SW):

Assignments:

- Note on Plant varieties and farmers' rights act (2001). Note on Biodiversity act (2002). I.
- II.

PGS 503.3: Students will be able to understan	d Research Collaboration Agreement,
License agreement	Approximate Hours

Item	AppXHrs					
Cl	05					
LI	0					
SW	02					
SL	01					
Total	08					

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO3.1 Students will identify the National Biodiversity protection initiatives and Convention on Biological Diversity.		Unit-3: National Biodiversity protection initiatives; Convention on Biological Diversity; International Treaty on Plant Genetic Resources for Food and Agriculture; Licensing of technologies. Material transfer	1. Plant Genetic Resources.
 SO3.2 Students will understand the International Treaty on Plant Genetic Resources for Food and Agriculture and Licensing of technologies. SO3.2 Students will understand the Material transfer agreements, Research collaboration Agreement and License Agreement. 		 agreements, Research collaboration Agreement, License Agreement. 3.1 National Biodiversity protection initiatives. 3.2 Conventions on Biological Diversity. 3.3 International Treaty on Plant Genetic Resources for Food and Agriculture. 3.4 Licensing of technologies and Material transfer agreements. 3.5 Research collaboration Agreement and License 	

SW-3 Suggested Sessional Work (SW):

- a. Assignments:
- i. Note on Plant Genetic Resources.
- ii. Note on National Biodiversity protection initiatives

Brief of Hours suggested for the Course Outcome

00				
Course Outcomes	Class	Sessional	Self-	Total hour
	Lecture	Work (SW)	Learning	(Cl+SW+Sl)
	(Cl)		(Sl)	
CO1- Students will be able to	04	01	02	07
understand Historical				
perspectives and need for the				
introduction of Intellectual				
Property Right.				
CO.2: Students will be able to	06	02	03	11

understand National				
Biodiversity protection				
initiatives. Convention on				
Biological Diversity.				
CO.3 Students will be able to	05	02	01	08
understand Research				
collaboration Agreement,				
License agreement.				
Total	15	05	06	26

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Mai	Total		
		R	U	Α	Marks
CO 1	Historical perspectives and need for the introduction of Intellectual Property Right regime; TRIPs and various provisions in TRIPS Agreement; Intellectual Property and Intellectual Property Rights (IPR), benefits of securing IPRs.	05	03	02	10
CO 2	Indian Legislations for the protection of various types of Intellectual Properties; Fundamentals of patents, copyrights, geographical indications, designs and layout, trade secrets and traditional knowledge, trademarks, protection of plant varieties and farmers' rights and biodiversity protection; Protectable subject matters, protection in biotechnology, protection of other biological materials, ownership and period of protection.	05	02	03	10
CO 3	National Biodiversity protection initiatives; Convention on Biological Diversity; International Treaty on Plant Genetic Resources for Food and Agriculture; Licensing of technologies, Material transfer agreements, Research collaboration Agreement, License Agreement.	05	03	02	10

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

The end of semester assessment for **Intellectual Property and Its Management in Agriculture** 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 organic fields
- 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.	Title	Author	Publisher	Edition &
No.				Year
1	Intellectual Property Rights in	•Erbisch FH and	CABI.	1998
	Agricultural Biotechnology	Maredia K		
2	Intellectual Property Rights:	•Ganguli P	McGraw-Hill.	2001
	Unleashing Knowledge Economy			
3	Intellectual Property Rights: Key		NRDC and	2001
	to New Wealth Generation		Aesthetic	
			Technologies.	
4	State of Indian Farmer. Vol. V.	 Ministry of Agriculture, 	Academic	2004
	Technology Generation and IPR	Government of India	Foundation	
	Issues			
5	Intellectual Property Rights in	 Rothschild M and Scott 	CABI	2003
	Animal Breeding and Genetics	N		

Curriculum Development Team:

- 1. Dr. S.S. Tomar, DEAN, Faculty of Agriculture Science and Technology, AKS University.
- 2. Dr. NeerajVerma, PG Coordinator, Faculty of Agriculture Science and Technology, AKS University.
- 3. Dr. T.Singh, Professor and Head Agronomy AKS University
- 4. Dr V.D Dwivedi, Professor Agronomy AKS University
- 5. Dr. D. P Chaturvedi ,Assistant Professor,Dept. Of Agronomy AKS University
- 6. Dr. Pankaj Bagri, Assistant Professor, Dept. Of Agronomy AKS University
- 7. Mr. Amit Singh Tiwari , Assistant Professor, Dept. Of Agronomy AKS University

- 8. Mr. Sanjay Lillhare, Assistant Professor, Dept. Of Agronomy AKS University
- 9. Ms. Prachi Singh, Teaching Associate, Dept. Of Agronomy AKS University
- 10. Ms. Prachi Awadhiya, Teaching Associate, Dept. Of Agronomy AKS University

Cos, POs and PSOs Mapping Course Code:- PGS 503 Course Title: Intellectual Property and Its Management in Agriculture

Course	Program (Outcome	5							Program S	Specific Out	come		
Outcomes	PO1	PO2	PO3	PO 4	PO5	PO6	PO7	PO8	PO9	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
Outcomes	PO1 Specific knowledg e of various branches of agronom y will be made specialize d and to provide knowledg e dissemin ation regarding various technique of farming and farming system in Ir dia	PO2 Wide knowl edge in the concer ning subjec t which will impro ve the farmer s conditi on throug h studen t's contri bution s.	PO3 Detaile d knowle dge regardi ng packag e and practice s soil fertilize r and water manage ment of product ive crop aspects.	PO 4 Use app ropr iate scie ntifi c met hod s coll abo rati on wit h stati stic s alo ng wit h eval wati	PO5 Detai led know ledge of cultiv ation practi ces, soil, fertili zers, water mana geme nt and plant prote ction econ omic assoc iated with	PO6 Create , select and apply an appro priate techni ques, resour ces and moder n it tools in impro veme nt of agron omica 1 packa	PO7 Studen t will apply variou s statisti cal metho ds to analyz e their master resear ch work	PO8 Student will apply basic concepts in laborator y technique s during their research work	PO9 Understa nd the impact of the professio nal expert solutions in societal and environ mental contexts, and demonst rate the knowled ge of, and need for sustaina ble develop	PSO 1 Enable to recogniz e and examine the relations hips between inputs and outputs in their agricultu ral field to make effective and profitabl e decisions . To	PSO 2 Acquainti ng with basic concepts theories and terminolo gy of Agronom y.	PSO 3 To undertake teaching research and extension activates along with administra tive and consultan cy services.	PSO 4 Apply resear ch and expert ise in resolv ing the proble ms of existi ng farm in the periph ery of univer sities.	PSO 5 To underst and and analyze the current issues that are occurri ng in local and global agricult ure and how they will affect futurist
	manu			on whi	farmi ng	and practi			Agricult ure.	nd the mechanic				agricult

				ch	enter	ces.				s of agri				ure
				will	prise					Entrepre				
				pro	s.					neurship.				
				ved										
				to										
				dec1										
				sion										
				m vari										
				OUS										
				part										
				of										
				agri										
				cult										
				ure										
CO1-	1	3	1	2	1	3	3	1	3	1	3	3	3	2
Students														
will be able														
to														
understand														
Historical														
perspectives														
and need for														
the														
introduction														
of														
Intellectual														
Property														
Right.														
CO.2:	1	3	1	2	1	3	3	1	3	1	3	3	3	2
Students														
will be able														

to														
understand														
National														
Biodiversity														
protection														
initiatives.														
Convention														
on														
Biological														
Diversity.														
00.0	1	2	1	2	1	2	2	1	2	1	2	2	3	2
CO.3	1	3	1	2	1	3	3	1	3	1	3	3	3	2
Students	1	3	1	Ζ	1	5	5	1	3	1	3	5	5	2
Students will be able	1	3	1	2	1	5	5	1	5	1	5	5	3	2
Students will be able to	1	5	1	2	1	5	5	1	5	1	3	3	5	2
Students will be able to understand	1	5	1	2	1	3	5	1	5	1	5	5	5	2
Students will be able to understand Research	1	3	1	2	1	3	5	1	5	1	5	5	5	2
Students will be able to understand Research collaboratio	1	3	1	2	1	3	3	1	5	1	5	5	5	2
Students will be able to understand Research collaboratio n	1	3	1	2	1	3	3	1	5	1	5	5	5	2
Students will be able to understand Research collaboratio n Agreement,	1	5	1	2	1	3	3	1	5	1	5	5	5	2
Students will be able to understand Research collaboratio n Agreement, License	1	5	1	2	1	3	3	1	5	1	5	5	5	2

POs & PSOs	COs No.&	SOs No.	Laboratory	Classroom Instruction (CI)	Self Learning
No.	Titles		Instruction(LI)		(SL)
PO 1,2,3,4,5,6	CO1-	SO1.1		Unit-1. Historical perspectives and need for the	As mentioned in
7,8,9	Students will	SO1.2		introduction of Intellectual Property Right regime; TRIPs	page number
PSO 1,2, 3, 4,	be able to	SO1.3		and various provisions in TRIPS Agreement; Intellectual	•••••
5	understand			Property and Intellectual Property Rights (IPR), benefits	
	Historical			11121314	
	perspectives			1.1, 1.2,1.3,1.7	
	and need for				
	the				
	introduction				
	of Intellectual				
	Property				
	Right.				
PO 1,2,3,4,5,6	CO.2:	SO2.1		Unit-2. Indian Legislations for the protection of various	As mentioned in
7,8,9	Students will	SO2.2		types of Intellectual Properties; Fundamentals of patents,	page number
	be able to	SO2.3		copyrights, geographical indications, designs and layout,	
PSO 1,2, 3, 4,	understand			trade secrets and traditional knowledge, trademarks,	
5	National			biodiversity protection: Protectable subject matters	
	Biodiversity			protection in biotechnology, protection of other biological	
	protection			materials, ownership and period of protection.	
	initiatives.				
	Convention			1.1, 1.2, 1.3, 1.4, 1.5, 1.6.	
	on				
	Biological				
	Diversity.				
PO 1,2,3,4,5,6	CO.3	SO3.1		Unit-3. National Biodiversity protection initiatives;	As mentioned in
7,8,9	Students will	SO3.2		Convention on Biological Diversity; International Treaty	page number
				on Plant Genetic Resources for Food and Agriculture;	

	be able to		Licensing of technologies, Material transfer agreements,
PSO 1,2, 3, 4,	understand	SO3.3	Research collaboration Agreement, License
5	Research		Agreement1.1, 1.2, 1.3, 1.4, 1.5, 1.6
	collaboration		
	Agreement,		
	License		
	agreement.		



A K S University Faculty of Agricultural Science and Technology Department of Biochemistry and Crop Physiology Curriculum of M.Sc. (All Branches)

Course Code:	PGS504
Course Title:	Basic Concept in laboratory
Pre requisite:	No specific requirements
Rationale:	Studying basic laboratory techniques are fundamental for scientific research, ensuring accurate experimentation and data analysis. Mastery of these skills cultivates precision, reproducibility, and safety, forming the cornerstone of scientific inquiry across disciplines and facilitating advancements in knowledge and technology.
Course Outcon	nes: CO1_PGS504 Student will learn about basic instrumentation, its principles, working and use. They will learn about Making solutions of different concentrations, learn acid base interaction. Also, students will learn about Procedural outline of various experiments. Student will learn about Basics of plant tissue culture and seed viability testing.

Scheme of Studies:

Board Of Study	Course Code	Course Title	Sch	eme	Total Credit (C)			
			С	LI	S	SL	Total Study Hours	
			Ι		W			
NC	PGS504	Basic	0	2	00	00	2	01
		Concepts in	0					
		Laboratory						
		Techniques						

Legend:

•

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

LI:LaboratoryInstruction(IncludesPracticalperformancesinlaboratoryworksh op, 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 teacherto ensure outcome of Learning.

Scheme of Assessment: Practical

Boa rd of	Cour se Code	Course Title	Scheme of A	cheme of Assessment (Marks)								
Stu			Progressive	Assessment	(PRA)				End	Total		
dy			Class/Ho	Class	Semina	Class	Class	Total	Semester	Mark		
			me	Test 2	r one	Activity	Attenda	Mark	Assessme	S		
			Assignme	(2 best		anyone	nce	S	nt	(PRA		
			nt 5	out of3)				(CA+C		+		
			number3	10				T+SA+	(ESA)	ESA)		
			mark	marks		(CAT)		CAT+A				
			seach(CA)	each(CT			(AT)	T)				
)								
NC	PGS	Basic							100	100		
	504	Concep										
		ts in										
		Labora										
		tory										
		Techni										
		ques										

Course-Curriculum Detailing:

Laboratory techniques are important for any person conducting an experiment. Every procedure needs to be complete with accuracy and precision with proper safety measures. Student will understand the safety and details of working in scientific laboratory. Student will familiarize with various instruments and their principles. Student will practice and visualize common experimental procedures.

PGS504 Basic Concept of Laboratory Techniques

Approximate Hours						
Item	Appx Hrs					
CI	00					
LI	30					
SW	00					
SL	00					
Total	30					

Session Outcomes (SOs)	Laboratory Instructions (LI) 1 class= 2 hrs.	Classroom Instructions (CI)	Self-Learning (SL)
SO.L1 Identify safety	L1. Safety measures while in		
measures while in Lab	Lab;		
SO.L2 Recognize use of	L2. Use of burettes, pipettes,		
glassware.	measuring cylinders, flasks,		
	separatory funnel, condensers,		
SO.L3 Discover handling of	micropipettes and vaccupets;		
glassware.			
	L3. Washing, drying and		
SO.L4 Recognize Drying of	sterilization of glassware;		
solvents/ chemicals;			
	L4. Drying of solvents/		

COLE Describe	al anni a a las		
SULS Describe working	cnemicals;		
with chemicals.			
	L5. Handling of chemical		
SO.L6 Describe working	substances; Weighing and		
with solutions	preparation of solutions of		
with bolutions.	different strengths and their		
SO I 7 Anti-meter the			
SO.L7 Articulate the	dilution;		
technique of formulating			
doses of agrochemicals	L6. Handling techniques of		
	solutions;		
SO.L8 Discover handling			
techniques of solutions	L7. Preparation of different		
1	agro-chemical doses in field		
SO I Q Identify the handling	and not applications:		
solution of a side and has see	and pot applications,		
of actu and bases			
	L8. Preparation of solutions of		
SO.L10 Discover the	acids;		
formulation of buffer and			
solutions of specific pH.	L9. Neutralisation of acid and		
	bases;		
SO.L11 Identify the use of			
lab instruments	L10 Preparation of buffers of		
	different strengths and nH		
SO I 12 Recognize and	values.		
sotagorize the media	values,		
categorize the media			
requirements and its types	L11. Use and handling of		
	microscope, laminar flow,		
SO.L13 Discover the	vacuum pumps, viscometer,		
methods and application of	thermometer,		
viability of germ plasm	magnetic stirrer, micro-ovens,		
	incubators, sand bath, water		
SO L14 Illustrate procedure	bath oil bath.		
for plant tissue culture	Electric wiring and earthling:		
for plant tissue culture	Licetic winnig and cartining,		
SO L 15 Deservice	112 Dremanation of modia and		
SO.L15 Recognize	L12. Preparation of media and		
flowering plant by its	methods of sterilization;		
taxonomical description			
	L13. Seed viability testing,		
	testing of pollen viability;		
	L14. Tissue culture of crop		
	plants.		
	Prairie,		
	115 Description of		
	flowering plants in botonics		
	nowering plants in botanical		
	terms in relation to taxonomy	1	

Brief of Hours suggested for the Course Outcome

	Class			
Course Outcomes	lecture (CL)	Sessional Work (SW)	Self- Learning (SL)	Total hour (CL+SW+SL)
Basic Concept of Laboratory Techniques				
_	0+30	0	0	30

Suggestion for End Semester Assessment:

Suggested	Specification	Table	(For ESA)
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СО	Unit Titles	Marks Distribution			Total
		R	U	Α	Marks
CO1	Basic Concept of Laboratory Techniques		30	70	100

Suggested Learning Resources:

Sl. No.	Title	Author	Publisher	Edition and Year
01	Laboratory Techniques in Organic Chemistry	Jerry R. Mohrig, David G. Alberg, and Gretchen M. Adams	W. H. Freeman and Company.	2014
02	Biotechnology: Expanding Horizons	B D Singh	Kalyani Publishers	2005

Curriculum Development Team

- 1. Dr. T. Singh, Professor & head Dept. of Agronomy, FAST
- 2. Dr. V. D. Dwivedi, Professor, Dept. of Agronomy, FAST
- 3. Dr. H. S. Kushwah, Professor, Dept. of Agronomy, MGCGVV
- 4. Dr. D. P. Chaturvedi, Assistant Professor, Dept. of Agronomy, FAST
- 5. Dr. P. K. Bagri, Assistant Professor, Dept. of Agronomy, FAST
- 6. Mr. Amit Singh Tiwari Assistant Professor, Dept. of Agronomy, FAST
- 7. Mr. Sanjay Lillhare, Assistant Professor, Dept. of Agronomy, FAST
- 8. Mis. Prachi Singh Teaching, Associate, Dept. of Agronomy, FAST
- 9. Mis. Prachi Awadhiya, Teaching Associate, Dept. of Agronomy, FAST

Cos, POs and PSOs Mapping Course Code:- PGS504 Course Title: - Basic concept in laboratory

Course	Program Ou	itcomes								Program Sp	ecific Outcome	2		
Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
	Specific	Wide	Detailed	Use	Detail	Create,	Student	Student	Understan	Enable to	Acquainting	То	Apply	То
	knowledge	knowle	knowled	appr	ed	select	will	will apply	d the	recognize	with basic	undertake	researc	understa
	of various	dge in	ge	opri	knowl	and	apply	basic	impact of	and	concepts	teaching	h and	nd and
	branches of	the	regardin	ate	edge	apply	various	concepts in	the	examine	theories and	research and	experti	analyze
	agronomy	concern	g	scie	of	an	statistic	laboratory	profession	the	terminology	extension	se in	the
	will be	ing	раскаде	ntin	cultiva	appropr	al	techniques	al expert	relationshi	of	activates	resolvi	current
	specialized	subject	and practices	C moth	nractic	tachnia		research	in sociatal	ns between	Agronomy	along with	ng the	issues
	and to	will	soil	ods	es	ues	s to analyze	work	and	inputs and	rigionomy.	administrati	ng the	that are
	provide	improve	fertilizer	colla	soil.	resourc	their	WOIK	environme	outputs in		vo and	ms of	
	knowledge	the	and	bora	fertiliz	es and	master		ntal	thoir		consultancy	avistin	a in
	disseminati	farmers	water	tion	ers,	modern	research		contexts,			consultancy		g 111 1 a a a 1 a m d
	on	conditio	manage	with	water	it tools	work		and			services.	g larm	
	regarding	n	ment of	stati	manag	in			demonstrat	field to			in the	global
	various	through	producti	stics	ement	improv			e the	make			periphe	agricultu
	technique	student'	ve crop	alon	and	ement			knowledge	effective			ry of	re and
	of farming	S	aspects.	g	plant	of			of, and	and			univers	how they
	and	contribu		with	protec	agrono			need for	profitable			ities.	will
	system in	tions.		uatio	econo	nackag			developme	decisions.				affect
	India			n	mic	e and			nt in	То				futuristic
	India			whic	associ	practic			Agricultur	understand				agricultu
				h	ated	es.			e.	the				re
				will	with					mechanics				
				prov	farmin					of agri				
				ed to	g					Entreprene				
				deci	enterp					urship.				
				sion	rises.					1				
				in Vori										
				vari										
				part										

				of agric ultur e										
CO1- Basic Concept of Laboratory Techniques	1	1	1	1	1	1	1	3	1	1	1	1	1	1

Legend: 1 – Low, 2 – Medium, 3 – High

POs & PSOs	COs No.& Titles	SOs No.	Laboratory	Classroom Instruction (CI)	Self Learning (SL)
No.			Instruction(LI)		
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO1- Basic Concept of Laboratory Techniques	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5 SO1.6 SO1.7 SO1.8 SO1.9 SO1.10 SO1.11 SO1.12 SO1.13 SO1.14 SO1.15		Unit-1 Safety measures while in Lab; Handling of chemical substances; Use of burettes, pipettes, measuring cylinders, flasks, separatory funnel, condensers, micropipettes and vaccupets; washing, drying and sterilization of glassware; Drying of solvents/chemicals. Weighing and preparation of solutions of different strengths and their dilution; Handling techniques of solutions; Preparation of different agrochemical doses in field and pot applications; Preparation of solutions of acids; Neutralization of acid and bases; Preparation of buffers of different strengths and pH values. Use and handling of microscope, laminar flow, vacuum pumps, viscometer, thermometer, magnetic stirrer, micro-ovens, incubators, sand bath, water bath, oil bath; Electricwiring and earthing. Preparation of media and methods of sterilization; Seed viability testing, testing of pollen viability; Tissue culture of crop plants; Description of flowering plants in botanical terms in relationto taxonomy	As mentioned in page number

Course Curriculum Map: Basic concept in laboratory



A K S University Faculty of Agricultural Science and Technology Department of Agronomy Curriculum of M.Sc. Agronomy

Course Code: Agron 599 Course Title: Research/Thesis

Pre- requisite: Conduct research to resolving the problem of farmers and society by applying advanced technology adopted in field of Agronomy.

Rationale: The basic purpose of master's research is to understand the application of research methodology tools to do research on particular topic related to Agronomy and follow technical writing skill to design the synopsis, thesis, research paper, abstract, articles, etc as per results obtained during research studies.

Course Outcomes:

AGRO 599.1. Prepare various research activities related to Agronomy field and compose manuscript i.e., synopsis related to particular topic.

Scheme of	Studies:	

				Total					
Board of Study	Course Code	Course Title		LI	SW	SL	Total Study HoursCI+LI+SW+ SL	Credits (C)	
	AGRO 599	Master Research	0	30	0	0	30	(0+15)= 15	

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.

				Progressive Assessment (PRA)							
Boa	Соц		Class/Hom	ClassTe					End		
rd	rso	Course	е	st 2(2		Class	Class	Total	Semeste	Total	
of	Cod	Title	Assignmen	bestout	Somin	Activi	Attend	Marks(C	r	Marks(P	
Stu	e	THE	t 5	of3)10	arone	tyany	ance(A	A+CT+S	Assess	RA +	
dy	č		number3	marks	arone	one(C	T)	A+	ment	ESA)	
			markseach	each(C		AT)		CAT+AT)	(ESA)		
			(CA)	T)							
	AGRO 599	Master Research	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.

AGRO 599. 1 Prepare various research activities related to Agronomy field and compose manuscript i.e., synopsis related to particular topic.

	Approximate Hours
Item	Approximate Hours
CI	0
LI	30
SW	0
SL	30
Total	60

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class	Self
		room	Learning
		Instructi	(SL)
		on (CI)	
SO1. Plan the proposal of research	1.1. Submission of research		1.Finding
related to the topic taken with the	proposal consisting concern		of reviews
help of guide	programme		related
SO2. Design the layout according to	1.2 . Explain definition of the		with the
topic	problems reference to topic		topic of
SO3. Describe the terminology	1.3 . Explanation of results		research.
related to the topic	1.4 . Arrange the references of past		2.Preparati
SO4. Plan the methodology to	work of 10 years		on of
conduct the research on the topic	1.5 . Collection of data by focusing		manuscript
SO5. Select the data to be taken	their objectives and observations to		s related to
during research	be taken mentioned in their		concerned
	synopsis		topic.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class	Lab	Self	Total hour
	Lecture	Instructi	Learning	(Cl+SW+Sl
	(Cl)	on (LI)	(Sl))
AGRO 599.1 Prepare various research activities				
related to Agronomy field and compose manuscript		30	30	60
i.e., synopsis related to particular topic.				

Total		30	30	60
Note. Detailed Assessment rubric need to be prepared	by the	course v	wise teacher	rs 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. Brainstorming

Suggested Learning Resources:

(a) Books:

S.	Title	Author	Publisher	Edition
INO.				& Year
1	Research publications			
2	Science direct			
3	Research gate			
4	Pubmade			
5	Academia			
6	Multi authored books			
7	Book chapters			

Curriculum Development Team:

- 1. Dr. S.S. Tomar, DEAN, Faculty of Agriculture Science and Technology, AKS University.
- 2. Dr. NeerajVerma, PG Coordinator, Faculty of Agriculture Science and Technology, AKS University.
- 3. Dr. T.Singh, Professor and Head Agronomy AKS University
- 4. Dr V.D Dwivedi, Professor Agronomy AKS University
- 5. Dr H.S. Kushwaha Professor Agronomy MGCGVV Chitrakoot satna M.P
- 6. Dr. D. P Chaturvedi ,Assistant Professor,Dept. Of Agronomy AKS University
- 7. Dr. Pankaj Bagri, Assistant Professor, Dept. Of Agronomy AKS University
- 8. Mr. Amit Singh Tiwari , Assistant Professor, Dept. Of Agronomy AKS University
- 9. Mr. Sanjay Lillhare, Assistant Professor, Dept. Of Agronomy AKS University
- 10 Ms. Prachi Singh, Teaching Associate, Dept. Of Agronomy AKS University
- 11 Ms. Prachi Awadhiya, Teaching Associate, Dept. Of Agronomy AKS University

Cos, POs and PSOs Mapping Course Code:- Agron 599 Course Title: Research/Thesis

Course	Program Ou	itcomes								Program Sp	ecific Outcome	2		
Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
	Specific	Wide	Detailed	Use	Detail	Create,	Student	Student	Understan	Enable to	Acquainting	То	Apply	То
	knowledge	knowle	knowled	appr	ed	select	will	will apply	d the	recognize	with basic	undertake	researc	understa
	of various	dge in	ge	opri	knowl	and	apply	basic	impact of	and	concepts	teaching	h and	nd and
	branches of	the	regardin	ate	edge	apply	various	concepts in	the	examine	theories and	research and	experti	analyze
	agronomy	concern	g	scie	of	an	statistic	laboratory	profession	the	terminology	extension	se in	the
	will be	ing	package	ntifi	cultiva	appropr	al	techniques	al expert	relationshi	of	activates	resolvi	current
	made	subject	and	с	tion	iate	method	during their	solutions	ps between	Agronomy.	along with	ng the	issues
	specialized	which	practices	meth	practic	techniq	s to	research	in societal	inputs and		administrati	proble	that are
	and to	will	soil	ods	es,	ues,	analyze	work	and	outputs in		ve and	ms of	occurrin
	provide	improve	fertilizer	colla	soil,	resourc	their		environme	their		consultancy	existin	g in
	knowledge	the	and	bora	fertiliz	es and	master		ntal	agricultural		services.	g farm	local and
	disseminati	farmers	water	tion	ers,	modern	research		contexts,	field to			in the	global
	on	conditio	manage	with	water	it tools	work		and	make			periphe	agricultu
	regarding	n	ment of	stati	manag	in			demonstrat	effective			ry of	re and
	various	through	producti	stics	ement	improv			e the	and			univers	how they
	technique	student'	ve crop	alon	and	ement			knowledge	profitable			ities.	will
	of farming	S	aspects.	g	plant	of			of, and	decisions.				affect
	and	contribu		with	protec	agrono			need for	То				futuristic
	farming	tions.		eval	tion	mical			sustainable	understand				agricultu
	system in			uatio	econo	packag			developme	the				re
	India			n	mic .	e and			nt in	mechanics				
				whic	assoc1	practic			Agricultur	of agri				
				h .11	ated	es.			e.	Entreprene				
				WIII	with					urship.				
				prov	farmin									
				ed to	g									
				deci	enterp									
				sion	rises.									
				in i										
				vari										
				ous										
				part										
				arria										
				agric										

				ultur										
				e										
CO1-Prepare	2	3	3	2	3	3	2	1	3	3	3	2	3	3
various														
research														
activities														
related to														
Agronomy														
field and														
compose														
manuscript														
i.e., synopsis														
related to														
particular														
topic														

Legend: 1 – Low, 2 – Medium, 3 – High

POs & PSOs	COs No.& Titles	SOs No.	Laboratory	Classroom Instruction (CI)	Self Learning (SL)
No.			Instruction(LI)		
PO 1,2,3,4,5,6	CO1- Prepare	SO1.1	Submission of		As mentioned in page
7,8,9	various research	SO1.2	research proposal		number
PSO 1,2, 3, 4, 5	activities related to	SO1.3	consisting		
	Agronomy field and	SO1.4	concern		
	compose	SO1.5	programme		
	manuscript i.e.,		Explain		
	synopsis related to		definition of the		
	particular topic		problems		
			reference to topic		
			Explanation of		
			results		
			Arrange the		
			references of past		
			work of 10 years		
			Collection of		
			data by focusing		
			their objectives		
			and observations		
			to be taken		
			mentioned in		
			their synopsis		
			1.1,1.2,1.3,1.4,1.5		

Course Curriculum Map: Research/Thesis



A K S University Faculty of Agricultural Science and Technology **Department of Agronomy**

Curriculum of M.Sc. (All Branches)

Course Code: -	PGS 505				
Course Title: -	Agricultural Research, Research Ethics and Rural Development Programmes				
Pre requisite: -	Student should have basic knowledge of agricultural research research ethics, and agricultural history along with fellowship program, rural development programme.				
Rationale: -	The students studying agricultural research and research ethics should possess understanding about method of research application, research ethics and fellowship for research and other scholars in construction agricultural development. This encompasses familiarity with the invention and evolution of agricultural research and development of agricultural programme, students ought to acquire fundamental insights into various agricultural technologies, their applications, as well as the Indian needs in agricultural developments.				

Course Outcomes:

PGS 505 CO 1: Identify the history, levels of research, economic and social welfare through research programme.

PGS 505 CO 2: Apply the functioning, role and significant of regional, national and international research.

PGS 505 CO 3: Asses the agricultural research, research ethics with operating and safety of laboratory.

PGS 505 CO 4: Analyze the various development programmes and their functioning with its impact on agricultural development

PGS 505 CO 5: Evaluate the role and functioning of panchayati raj, NGO and evaluation of different rural development program.

Scheme of studies

Catego ries of	Course Code	Course Title	Scheme of studies (Hours/Week)				Total Credi	
course			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	ts (C)
Non	PGS	Agricultural Research,	01	00	02	01	04	01
credit	505	Research Ethics and Rural						
course		Development Programmes						
(NCC)								

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:

Catego ries of	Cours e	Course Title	Scheme of Assessment (Marks)							
course	Code		Class/ Home Assign ment 5 numb er 3 marks each (CA)	Prog Class Test 2 (2 best out of 3) 10 marks each (CT)	gressive A Semin ar one (SA)	ssessment (Class Activity any one (CAT)	(PRA) Class Attend ance (AT)	Total Marks (CA+C T+SA+ CAT+A T)	End Semest er Assess ment (ESA)	Total Marks (PRA+ ESA)
(NCC)	PGS 505	Agricultural Research, Research Ethics and Rural Development Programmes	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.

PGS 505 CO-1 Identify the history, levels of research, economic and social welfare through research programme

Approximate Hours				
Item	Appx Hrs			
C 1	3			
LI	0			
SW	2			
SL	1			
Total	06			

Session Outcomes	Laboratory	Class room	Self Learning
(SOs)	Instruction	Instruction	(SL)
	(LI)	(CI)	` ,
		TT . •4 T	
SOI.1- Introduce		Unit-1	1.1- Prepare the
about the history of		History of	assignment on Global
agriculture in brief		agriculture in brief;	agricultural research
SO1.2 - Brief the basic		Global agricultural	system
concept global		research system:	
agricultural research		need, scope,	
system.		opportunities; Role	
SO1.3 - Discuss about		in promoting food	
the need, scope,		security, reducing	
opportunities; Role in		poverty and	
promoting food		protecting the	
security of global		environment;	
agricultural research		National Agricultural	
system.		Research Systems	
SO1.4- Describes the		(NARS) and Regional	
reducing poverty and		Agricultural	
protecting the		Research	
environment through		Institutions:	
global agricultural			
research system		1.1- History of	
SO1 5 Asses the		agriculture in brief	
functions and use of		1.2- Global agricultural	
national Agricultural		research system: need,	
Research Systems		scope, opportunities;	
(NARS) and Regional		Role in promoting	
(NARS) and Regional		food security, reducing	
Agricultural Research		poverty and protecting	
institutions.		the environment	
		1.3- National	
		Agricultural Research	
		Systems (NARS) and	
		Regional Agricultural	
		Regional Agricultural	
		Research Institutions	

SW-1 Suggested Sessional Work (SW):

a. Assignments: Prepare the assignment on Global agricultural research system

b. Mini Project: -

c. Other Activities (Specify):-

PGS 505 CO 2: Apply the functioning, role and significant of regional, national and international research.

Approximate Hours

Item	AppX Hrs
C 1	3
LI	0
SW	1
SL	2
Total	06

Session Outcomes	Laboratory	Class room Instruction	Self Learning
(SOs)	Instruction	(CI)	(SL)
	(LI)		
 SO2.1 – introduce to the Consultative Group on International Agricultural Research (CGIAR) SO2.2 – learned about the International Agricultural Research Centers (IARC), SO2.3- Briefing the partnership with NARS, role as a partner in the global agricultural research system SO2.4- Briefing the strengthening capacities at national levels; International fellowships for scientific mobility SO 2.5-Discuss to the strengthening capacities at regional levels; International fellowships for scientific mobility 	(LI) LE2.1	 Unit-II Consultative Group on International Agricultural Research (CGIAR): International Agricultural Research Centers (IARC), partnership with NARS, role as a partner in the global agricultural research system, strengthening capacities at national and regional levels; International fellowships for scientific mobility 2.1 - Consultative Group on International Agricultural Research (CGIAR): International Agricultural Research Centers (IARC) 2.2 - Partnership with NARS, role as a partner in the global agricultural research system. 2.3-, Strengthening capacities at national and regional levels; International fellowships for scientific mobility. 	2.1 – Prepare the assignment on partnership with NARS, role as a partner in the global agricultural research system

SW-1 Suggested Sessional Work (SW):

a. Assignments: Prepare the assignment on partnership with NARS, role as a partner in the global agricultural research system.

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

PGS 505 CO 3: Asses the agricultural research, research ethics with operating and safety of laboratory. Approximate Hours

Item	AppX Hrs
C 1	3
LI	0
SW	2
SL	1
Total	06

Session Outcomes	Laboratory	Class room	Self Learning	
(SOs)	Instruction	Instruction	(SL)	
	(LI)	(CI)		
SO3.1 – Identify to the	LE3.1	Unit-3	3.1 Prepare	the
Research ethics		Research ethics:	assignment	on
		research integrity,	Research ethic	and
SO3.2 – Discuss to the		research safety in	research integrity.	
research integrity,		laboratories, welfare		
research safety in		of animals used in		
laboratories		research, computer		
		ethics, standards and		
SO3.3- Apply the		problems in research		
welfare of animals		ethics		
used in research		21 Descent athic and		
SO3.4- Discuss to		5.1 -Research ethic and		
computer ethics and		research integrity		
standards		3.2- Research safety in		
		laboratories, welfare		
SO3.5 – Describe the		of animals used in		
problems in research		research.		
ethics		3.3- Computer ethics,		
		standards and		
		problems in research		
		ethics.		

SW-1 Suggested Sessional Work (SW):

a. Assignments: Prepare the assignment on Research ethic and research integrity

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

PGS 505 CO 4: Analyze the various development programmes and their functioning with its impact on agricultural development

Approximate Hours

Item	App X Hrs
Cl	3
LI	0
SW	2
SL	1
Total	06

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO1.1 –Identify the	LE1.1 -	Unit-4.0 - I	1.1- Prepare the
Concept and connotations		Concept and connotations	assignment on
of rural development.		of rural development,	Community
		rural development policies	Development
SO1.2 - Apply the rural		and strategies. Rural	Programme.
development policies and		development programmes:	
strategies		Community Development	
		Programme, Intensive	
SOI.3- Asses the Rural		Agricultural District	
development programmes:		Programme, Special group	
Drogramma Intensivo		– Area Specific	
A grieviturel District		Programme, Integrated	
Agriculturar District		Rural Development	
Plogramme.		Programme (IRDP)	
SO1.4- Describes the		4.1- Concept and	
Special group – Area		connotations of rural	
Specific Programme.		development, rural	
-F		development policies and	
SO1.5– Brief the		strategies	
Integrated Rural		4.2- Rural development	
Development Programme		programmes: Community	
(IRDP)		Development Programme,	
		Intensive Agricultural	
		District Programme	
		4.3- Special group – Area	
		Specific Programme	
		Integrated Rural	
		Development Programme	
		(IRDP)	

SW-1 Suggested Sessional Work (SW):

a. Assignments: Prepare the assignment on Community Development Programmeb. Mini Project: Prepare a project report of leadership styles and influence process; leadership theories, leadership styles and effective leader

c. Other Activities (Specify):
PGS 505 CO 5: Evaluate the role and functioning of panchayati raj, NGO and evaluation of different rural development program.

Approxima	te Hours
Item	AppX Hrs
Cl	06
LI	00
SW	02
SL	02
Total	10

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)	
SO1.1 –Indentify	LE1.	Unit-5.0	1.1 - Prepare	the
Panchayati Raj		Panchayati Raj Institutions,	assignment	on
Institutions and Co-		Co-operatives, Voluntary	Panchayati	Raj
operatives.		Agencies/Non-Governmental	Institutions,	5
		Organizations. Critical		
SO1.2- Identify the		evaluation of rural		
Voluntary Agencies		development policies and		
SO1.3- Identify the		programmes. Constraints in		
Non-Governmental		implementation of rural		
Organizations		policies and programmes		
SO1.4- Discuss the , Critical evaluation of rural development policies		5.1- Panchayati Raj Institutions, Co-operatives, Voluntary Agencies/Non- Governmental Organizations		
SO1.5- Briefs the programmes.		5.2- Critical evaluation of rural development policies and programmes		
implementation of rural policies and programmes		5.3- Constraints in implementation of rural policies and programmes		

SW-1 Suggested Sessional Work (SW):

a. Assignments: Prepare the assignment on Panchayati Raj Institutions,

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

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class	Laborato	Sessional	Self	Total hour
	Lecture	ry	Work	Learning	(C l + LI+
	(C l)	Lecture	(SW)	(S l)	SW +S l)

PGS 505 CO-1 Identify the	3	0	2	1	06
history, levels of research,					
economic and social welfare					
through research programme					
PGS 505 CO 2: Apply the	3	0	2	1	06
functioning, role and significant of					
regional, national and international					
research.					
PGS 505 CO 3: Asses the	3	0	2	1	06
agricultural research, research					
ethics with operating and safety of					
laboratory.					
PGS 505 CO 4: Analyze the	3	0	2	1	06
various development programmes					
and their functioning with its					
impact on agricultural					
development					
PGS 505 CO 5: Evaluate the role	3	0	2	1	06
and functioning of panchayati raj,					
NGO and evaluation of different					
rural development program.					
Total Hours	15	00	10	05	30

Suggested Specification Table (For ESA)

CO	Unit title	Μ	arks Distr	ibution	Total
		R	U	Α	Marks
CO-1	Identify the history, levels of research, economic and social welfare through research programme.	02	03	00	05
CO-2	Apply the functioning, role and significant of regional, national and international research.	02	05	03	10
CO-3	Asses the agricultural research, research ethics with operating and safety of laboratory.	00	08	07	15
CO-4	Analyze the various development programmes and their functioning with its impact on agricultural development.	02	05	08	15
CO-5	Evaluate the role and functioning of panchayati raj, NGO and evaluation of different rural development program	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.	Title	Author	Publisher	Edition &
No.				Year
01	Indian Agriculture - Four	Bhalla GS & Singh	Sage Publ	2001
	Decades of Development	G.		
02	Manual on International	Punia MS	CCS, Haryana	
	Research and Research		Agricultural	
	Ethics		University, Hisar.	
03	Rural Development	Rao BSV.	Mittal Publ	2007
	Strategies and Role of			
	Institutions Issues,			
	Innovations and Initiatives.			
	Rural Development -	Singh K	Sage Publ	1998.
	Principles, Policies and			
	Management			

Curriculum Development Team:

1. Professor B.B. Beohar, Director Planning, & Director Extension, A.K.S. University

2. Dr. V.K. Vishwakarma, Head Department of Agricultural Economics, FAST

3. Dr. Ashutosh Kumar Singh, Associate professor Department of Agricultural Economics, FAST

4. Dr. Yogesh Tiwari , Assistant Professor Department of Agricultural Economics, FAST

5. Shri Deepnarayan Mishra

Cos, POs and PSOs Mapping Course Code:- PGS 505

Course Title: - Agricultural Research, Research Ethics and Rural Development Programmes

Course	Program Ou	itcomes					·			Program Sp	ecific Outcom	e		
Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
Outcomes	PO1 Specific knowledge of various branches of agronomy will be made specialized and to provide knowledge disseminati on regarding various technique of farming and farming system in India	PO2 Wide knowle dge in the concern ing subject which will improve the farmers conditio n through student' s contribu tions.	PO3 Detailed knowled ge regardin g package and practices soil fertilizer and water manage ment of producti ve crop aspects.	PO4 Use appr opri ate scie ntifi c meth ods colla bora tion with stati stics alon g with eval uatio n whic h will prov ed to deci sion in vari ous part of agric ultur	PO5 Detail ed knowl edge of cultiva tion practic es, soil, fertiliz ers, water manag ement and plant protec tion econo mic associ ated with farmin g enterp rises.	PO6 Create, select and apply an appropr iate techniq ues, resourc es and modern it tools in improv ement of agrono mical packag e and practic es.	PO7 Student will apply various statistic al method s to analyze their master research work	PO8 Student will apply basic concepts in laboratory techniques during their research work	PO9 Understan d the impact of the profession al expert solutions in societal and environme ntal contexts, and demonstrat e the knowledge of, and need for sustainable developme nt in Agricultur e.	PSO 1 Enable to recognize and examine the relationshi ps between inputs and outputs in their agricultural field to make effective and profitable decisions. To understand the mechanics of agri Entreprene urship.	PSO 2 Acquainting with basic concepts theories and terminology of Agronomy.	PSO 3 To undertake teaching research and extension activates along with administrati ve and consultancy services.	PSO 4 Apply researc h and experti se in resolvi ng the proble ms of existin g farm in the periphe ry of univers ities.	PSO 5 To understa nd and analyze the current issues that are occurrin g in local and global agricultu re and how they will affect futuristic agricultu re

CO-1	3	3	3	1	3	1	1	1	3	3	1	2	3	1
Identify the														
history, levels														
of research,														
economic and														
social welfare														
through														
research														
programme														
CO 2: Apply	3	3	3	2	3	1	1	1	3	3	1	3	2	1
the														
functioning,														
role and														
significant of														
regional,														
national and														
international														
research.														
CO 3: Asses	3	2	1	3	2	3	1	3	3	3	2	2	1	2
the														
agricultural														
research,														
research														
ethics with														
operating and														
safety of														
laboratory.														
CO 4:	3	2	1	3	1	3	1	1	1	3	1	3	2	1
Analyze the														
various														
development														
programmes														
and their														
functioning														
with its														
impact on														

agricultural														
development														
CO5:	3	1	2	3	1	3	1	1	1	2	3	1	1	1
Evaluate the														
role and														
functioning														
of panchayati														
raj, NGO and														
evaluation of														
different rural														
development														
program.														

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map: Agricultural Research, Research Ethics and Rural Development Programmes

POs & PSOs	COs No.& Titles	SOs No.	Laboratory	Classroom Instruction (CI)	Self Learning (SL)
No.			Instruction		
			(LI)		
PO 1,2,3,4,5,6	CO1: Identify the	SO1.1		Unit-1.0	As mentioned in page
7,8,9 PSO 1,2, 3, 4, 5	history, levels of research, economic	SO1.2		History of agriculture in brief; Global agricultural research system: need, scope,	number
	through research	SO1.3		security, reducing poverty and protecting	
	programme	SO1.4		the environment; National Agricultural	
		SO1.5		Research Systems (NARS) and Regional Agricultural Research Institutions 1.1, 1.2, 1.3.	
PO 1,2,3,4,5,6	CO 2: Apply the	SO1.1		Unit-2.0 –	As mentioned in page
7,8,9	functioning, role and significant of	SO1.2		Consultative Group on International Agricultural Research (CGIAR):	number
PSO 1,2, 3, 4, 5	regional, national	SO1.3		International Agricultural Research	
	and international			Centers (IARC), partnership with NARS,	
	research.	SO1.4		role as a partner in the global agricultural	
				research system, strengthening capacities	

PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO 3: Asses the agricultural research, research ethics with operating and safety of laboratory.	SO1.5 SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	at national and regional levelsInternational fellowships for scientificmobility2.1, 2.2, 2.3.Unit-3.0Research ethics: research integrityresearch safety in laboratories, welfare ofanimals used in research, computer ethicsstandards and problems in research ethics3.1, 3.2, 3.3.	As mentioned in page number
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO 4: Analyze the various development programmes and their functioning with its impact on agricultural development	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	Unit-4.0Concept and connotations of rural development, rural development policies and strategies. Rura development programmes: Community Development Programme, Intensive Agricultural District Programme, Special group – Area Specific Programme Integrated Rural Development Programme (IRDP) 4.1, 4.2, 4.3.	As mentioned in page number
PO 1,2,3,4,5,6 7,8,9,10,11,12 PSO 1,2, 3, 4, 5	CO 5: Evaluate the role and functioning of panchayati raj, NGO and evaluation of different rural development program.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	Unit-5.0 Panchayati Raj Institutions, Co- operatives, Voluntary Agencies/Non- Governmental Organizations. Critical evaluation of rural development policies and programmes. Constraints in implementation of rural policies and programmes 5.1, 5.2, 5.3.	As mentioned in page number



A K S University Faculty of Agricultural Science and Technology Department Of Agronomy Curriculum of M.Sc. Agronomy

Course Code:AGRO 599Course Title:Research/ThesisPre- requisite:Conduct research to resolving the problem of farmers and society by
applying advanced technology adopted in field of Agronomy .Rationale:The basic purpose of master's research is to understand the application
of research methodology tools to do research on particular topic related
to Agronomy and follow technical writing skill to design the synopsis,
thesis, research paper, abstract, articles, etc as per results obtained
during research studies.

Course Outcomes:

Agro 599 Propose research methodology tools for conducting research on selected topic of field of Agronomy and prepare Final manuscript i.e. Thesis

Scheme of Studies:

Doord of	Course			Sche	Total			
Study	Code	Course Title	CI	LI	SW	SL	Total Study Hours CI+LI+SW+SL	Credits (C)
	AGRO 599	Master Research	0	30	0	0	30	(0+15)= 15

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 (Marks)										
				Progressive Assessment (PRA)									
	Cou		Class/Hom	Class		Class			Ellu Somosto				
Boar		Cour	e	Test 2(2		Class A otivi	Class	Total	semeste	Total			
d of Study	Cod e	se Title	Assignmen	best out	Semin	ty anyon	Attend ance(A T)	Marks (CA+CT+ SA+		Marks(P			
			t 5	of3)10					ment	RA +			
			number3	marks	ai one				ment	ESA)			
			mark each	each(C		T)		CAT+AT)	(ESA)				
			(CA)	T)		1)			(LDII)				
	Agno	Master											
	Agr0-	Resear	0	0	0	0	0	0	100	100			
	399	ch											

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.

Agro- 599 Propose research methodology tools for conducting research on selected topic of field of Agronomy.

Approximate nours						
Item	Approximate Hours					
CI	0					
LI	30					
SW	0					
SL	30					
Total	60					

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room	Self Learning
		Instruction	(SL)
		(CI)	
SO1. Choose the topic and	1.1 Perform research work as		1. Finding of
objectives for the research	per their topic by using various		reviews related
SO2. Select the suitable data	tools and production technology		with the topic of
during the research	methods in particular season of		

SO3. Assemble the data taken	crop.	research.
during the research for	1.2 . Collection of data	
interpretation	1.3 . Analysis and interpretation	2.Preparation of
SO4. Arrange the whole work	of data	manuscripts
with the interpretate data	1.4. Submission of final thesis	related to
SO5. Formulate the hypothesis	based on the research topic	concerned topic.
according the final composition.	-	

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class	Lab	Self	Total hour
	Lecture	Instructi	Learning	(Cl+SW+Sl
	(Cl)	on (LI)	(Sl))
AGRO 599 Propose research methodology tools for conducting research on selected topic of field of Agronomy.		30	30	60
Total		60	60	60

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. Brainstorming

Suggested Learning Resources:

(a) Books:

S.	Title	Author	Publisher	Edition
No.				& Year
1	Research publications			
2	Science direct			
3	Research gate			
4	Pub made			
5	Academia			
6	Multi authored books			
7	Book chapters			

Curriculum Development Team:

1. Dr. S.S. Tomar, DEAN, Faculty of Agriculture Science and Technology, AKS University.

- 2. Dr. NeerajVerma, PG Coordinator, Faculty of Agriculture Science and Technology, AKS University.
- 3. Dr. T.Singh, Professor and Head Agronomy AKS University
- 4. Dr V.D Dwivedi, Professor Agronomy AKS University
- 5. Dr. D. P Chaturvedi , Assistant Professor, Dept. Of Agronomy AKS University
- 6. Dr. Pankaj Bagri, Assistant Professor, Dept. Of Agronomy AKS University
- 7. Mr. Amit Singh Tiwari , Assistant Professor, Dept. Of Agronomy AKS University
- 8. Mr. Sanjay Lillhare, Assistant Professor, Dept. Of Agronomy AKS University
- 9. Ms. Prachi Singh, Teaching Associate, Dept. Of Agronomy AKS University
- 10. Ms. Prachi Awadhiya, Teaching Associate, Dept. Of Agronomy AKS University

Cos, POs and PSOs Mapping Course Code:- AGRO 599 Course Title: Research/Thesis

Course	Program Outcomes									Program Specific Outcome				
Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
	Specific	Wide	Detailed	Use	Detail	Create,	Student	Student	Understan	Enable to	Acquainting	То	Apply	То
	knowledge	knowle	knowled	appr	ed	select	will	will apply	d the	recognize	with basic	undertake	researc	understa
	of various	dge in	ge	opri	knowl	and	apply	basic	impact of	and	concepts	teaching	h and	nd and
	branches of	the	regardin	ate	edge	apply	various	concepts in	the	examine	theories and	research and	experti	analyze
	agronomy	concern	g	scie	of	an	statistic	laboratory	profession	the	terminology	extension	se in	the
	will be	ing	package	ntifi	cultiva	appropr	al	techniques	al expert	relationshi	of	activates	resolvi	current
	made	subject	and	c	tion	iate	method	during their	solutions	ps between	Agronomy.	along with	ng the	issues
	specialized	which	practices	meth	practic	techniq	s to	research	in societal	inputs and		administrati	proble	that are
	and to	will	soil	ods	es,	ues,	analyze	work	and	outputs in		ve and	ms of	occurrin
	provide	improve	fertilizer	colla	soil,	resourc	their		environme	their		consultancy	existin	g in
	knowledge	the	and	bora	fertiliz	es and	master		ntal	agricultural		services.	g farm	local and
	disseminati	farmers	water	tion	ers,	modern	research		contexts,	field to			in the	global
	on	conditio	manage	with	water	it tools	work		and	make			periphe	agricultu
	regarding	n	ment of	stati	manag	in			demonstrat	effective			ry of	re and
	various	through	producti	stics	ement	improv			e the	and			univers	how they
	technique	student'	ve crop	alon	and	ement			knowledge	profitable			ities.	will
	of farming	s 	aspects.	g	plant	of			of, and	decisions.				affect
	and	contribu		with	protec	agrono			need for	То				futuristic
	farming	tions.		eval	tion	mical			sustainable	understand				agrıcultu
	system in			uatio	econo	packag			developme	the				re
	India			n	m1c	e and			nt in	mechanics				
				whic	associ	practic			Agricultur	of agri				
				n :11	ated	es.			e.	Entreprene				
				WIII	With formin					ursnip.				
				prov ad to	rariiiii									
				eu to	g									
				deci	rises									
				in	11808.									
				III Vori										
				Vall										
				part										

				of										
				agric										
				ultur										
	-	-	-	e	-	-	-			-	-	-		
CO1- 599	2	3	3	2	3	3	2	1	3	3	3	2	3	3
Propose														
research														
methodology														
tools for														
conducting														
research on														
selected topic														
of field of														
Agronomy.														

Legend: 1 – Low, 2 – Medium, 3 – High

POs & PSOs	COs No.& Titles	SOs No.	Laboratory	Classroom Instruction (CI)	Self Learning (SL)
No.			Instruction(LI)		
PO 1,2,3,4,5,6	CO1- 599 Propose	SO1.1	Perform		As mentioned in page
7,8,9	research	SO1.2	research work		number
PSO 1,2, 3, 4, 5	methodology tools	SO1.3	as per their		
	for conducting	SO1.4	topic by using		
	research on selected	SO1.5	various tools		
	topic of field of		and production		
	Agronomy.		technology		
			methods in		
			particular		
			season of crop.		
			Collection of		
			data analysis		
			and		
			interpretation of		
			data		
			Submission of		
			final thesis		
			based on the		
			research topic		
			1.1,1.2,1.3,1.4		

Course Curriculum Map: Research/Thesis