Curriculum Book

and

Assessment and Evaluation Scheme

based on

Outcome Based Education (OBE)

Pre-Ph.D. Programe

Revised as on 01 August 2023
Applicable w.e.f. Academic Session 2023-24

AKS University

Satna 485001, Madhya Pradesh, India

Directorate of Research

AKS University, Satna M.P.

AKS University
Directorate of Research
Curriculum of Ph.D. Program
(Revised as on 01 August 2023)

Forwarding

I am thrilled to observe the updated curriculum for **Ph.D.** Program, which seamlessly integrates the most recent genetically plant advancements and adheres to the guidelines set forth by National Core Group. The revised curriculum also thoughtfully incorporates the directives of NEP-2020 and the Sustainable Development Goals.

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

ER. Anant Soni

Pro Chancellor & Chairman

01 August 2023 AKS University, Satna

AKS University
Directorate of Research
Curriculum of Ph.D. Program
(Revised as on 01 August 2023)

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 inspired 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.

I'm delighted to learn that the revised curriculum has been meticulously crafted by the Directorate of Research, in consultation with an array of experts from the Seed industry, research institutes, and academia. This curriculum effectively integrates the principles outlined in the NEP-2020 guidelines, and National Core Group, as well as sustainable goals. It also adeptly incorporates the latest advancements in development of new varieties and seed production technology.

To enhance students' skills, the curriculum integrates Hands On Training, industrial visits, and Training experiences, research and progress. This well-rounded approach ensures that students receive a comprehensive education, fostering their skill development and preparing them for success in the seed industry.

I am confident that the updated curriculum for **Ph.D.** will not only enhance students' technical skills but also contribute significantly to their employability. During the process of revising the curriculum, I am pleased to observe that the **Directorate of Research** has diligently adhered to the guidelines provided by the National Core Group. Additionally, they have maintained a total credit requirement of 12 for **Ph.D.** program. It's worth noting that curriculum revision is an ongoing and dynamic process, designed to address the continuous evolution of technological advancements and both local and global concerns. This ensures that the curriculum remains responsive and attuned to the changing landscape of education and industry.

AKS University warmly invites input and suggestions from government departments, farmers, entrepreneurs, industry experts and technocrats and Alumni students to enhance the curriculum and make it more student-centered. Your valuable insights will greatly contribute to shaping an education that best serves the needs and aspirations of our students.

Prof. B. A. Chopade

AKS University, Satna Vice- Chancellor

01 August 2023

AKS University
Directorate of Research
Curriculum of Ph.D. Program
(Revised as on 01 August 2023)

Preface

As part of our commitment to ongoing enhancement, the Directorate of Research consistently reviews and updates its **Ph.D.** program curriculum as per recommendation and need of UGC. 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 **Ph.D.** Program undergoes evaluation by a panel of technocrats, industry specialists, and academics. Following meticulous scrutiny, the revised curriculum has been formulated and is set to be implemented starting from August 01, 2023. This implementation is contingent upon the endorsement of the curriculum by the University's Board of Studies and Governing Body.

This curriculum closely adheres to the National Core Group, syllabus distributed in August 2021. It seamlessly integrates the guidelines set forth by the Ministry of Higher Education, Government of India, through NEP2020, as well as the principles of Sustainable Development Goals. 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, Report Writing, Seminars, and Industrial Training, have been incorporated.

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.

01 August 2023

Dr. S. S. Tomar,

Director Research

Directorate of Research

AKS University, Satna

CONTENTS

Dy. Director
Directorate of Research
AKS University, Satna (M.P.)

Professor B.A. Chopade
Vice-Chancellor
AKS University
Satna, 485001 (M.P.)

Course Code: - 117PH01

Course Title: - Research Methodology

Pre requisite: -Student should have basic knowledge of scientific methods of research, the initiation of an inquiry, formulation of research problems and hypotheses, the role of induction and deduction in research, collection and analysis of date and interpretation of results

Rationale: - The students studying research methodology should possess understanding about basic concepts in research methodology in concern subject. The course deals with scientific methods of research, the initiation of an inquiry, formulation of research problems and hypotheses, the role of induction and deduction in research, collection and analysis of date and interpretation of results

Course Outcomes:

CO 1: Students will be able to understand and comprehend the basics in research methodology and applying them in research/ project work.

CO 2: The student will enable to collect the data, edit it properly and analyze it accordingly. Thus, it will facilitate their prosperity in higher education.

CO 3: Develop insights about the statistical analysis tools and techniques for better research outcomes.

CO 4: To explain the art of interpretation and the art of writing research reports

CO 5: Evaluate the role and functioning of computer in research

Scheme of studies

Categories of course	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			C l	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
	117PH01	**Research Methodology**	03	00	02	01	06	03

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

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

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

SL: Self Learning,

C: Credits.

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

Scheme of Assessment:

Categories of course	Course Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class Test 1 (T1)	Class Test 2 (T2)	Mini Review (MR)	Seminar (SA)	Mini Project (MP)	Total Marks (T1+ T2+ MR+SA+ MP)		
	117PH01	**Research Methodology**	10	10	10	10	10	50	50	100

Course-Curriculum Detailing:

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

CO-1 Students will be able to understand and comprehend the basics in research methodology and applying them in research/ project work.

Approximate Hours

Item	AppX Hrs
C l	9
LI	0
SW	1
SL	1
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO1.1. Understand the basic idea of research and its different types **SO1.2.** The student will be able to identify various problems in concern field **SO1.3.** Understand the basic criteria for good research **SO1.4.** Develop scientific attitude among students		**Unit-I Introduction & Research design** **1.1.** Nature and objectives of research **1.2.** Methods of Research: historical, descriptive and experimental erty and protecting the environment **1.3-** Types of Research (Descriptive/ Analytical/ Applied/ Fundamental/ Quantitative/ Qualitative/ Conceptual/ Empirical) **1.4.** Research process, research approaches **1.5.** Criteria for good research	**1.1.** Different experimental design

SO1.5. Student will able to explain various research designs and their characteristics **SO1.6.** Student will able to select an appropriate research design		**1.6**. Meaning and need of research design **1.7**. Features of good design **1.8.** Different research design and basic principles of experimental designs **1.9**. Design of experiments	

SW-1 Suggested Sessional Work (SW):

a. Assignments: Collect research papers on different topics related to your subject

CO 2: The student will enable to collect the data, edit it properly and analyse it accordingly. Thus, it will facilitate their prosperity in higher education.

Approximate Hours

Item	AppX Hrs
C l	9
LI	0
SW	1
SL	1
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO2.1 Student will able to Select data collection tools and procedures **SO2.2.** To explain the details of sampling designs, and also different methods of data collections **SO2.3.** Understand the concept of and usage of data science **SO2.4-** Develop insights about the statistical analysis tools and techniques for better research outcomes **SO2.5.** Developed the learning capacity through collection of review articles.		**Unit-II** **Data Collection & Analysis** **2.1.** Types of data **2.2. M**ethods and techniques of data collection **2.3.** Hypothesis Testing **2.4.** Primary and secondary data, meta analysis **2.5.** Historical methods and content analysis **2.6.** Devices used in data collection **2.7.** Pilot study and pretest of tools **2.8**. Choice of data collection methods **2.9.** Literature Review Collection	**2.1.** Sampling techniques

SW-1 Suggested Sessional Work (SW):

a. Assignments: Prepare the assignment on data collection techniques

CO 3: Develop insights about the statistical analysis tools and techniques for better research outcomes**.**

Approximate Hours

Item	AppX Hrs
C l	8
LI	0
SW	1
SL	1
Total	10

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO3.1. Student will able to analyze collected data with writing research report **SO3.2** Choose an appropriate methodology for collecting and analyzing data **SO3.3.** The Students will develop skills in qualitative and quantitative data analysis **SO3.4.** Understand about the measures of different statistical tools **SO3.5**. Describe the problems in data interpretation.		**Unit-3** **Processing and analysis of data** **3.1.** Measures of central Tendency **3.2.** Measures of dispersion **3.3.** Measures of variation **3.4.** Measures of central tendency vs. measures of dispersion **3.5**. Normal distribution **3.6.** Measures of skewness and Interpretation **3.7.** Correlation and regression: types & application **3.8.** Chi-square test its purpose and use	**3.1** Different statistical tests

SW-1 Suggested Sessional Work (SW):

a. Assignments: Prepare the assignment on Chi-square test

CO 4: To explain the art of interpretation and the art of writing research reports

Approximate Hours

Item	App X Hrs
Cl	9
LI	0
SW	1
SL	1
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO4.1. The Students will develop skills in result presentation. **SO4.2.** Understand the basic idea of		**Unit-4.0** **Paper writing and report and report generation** **4.1.** Basic concept of paper/thesis	**4.1-** Types of research writing

scientific writing and referencing. **SO4.3.** To explain carrying out a literature search, its review, developing theoretical and conceptual frameworks and writing a review. **SO4.4.** Students will be able to take up and implement a research project/ study **SO4.5** Able to understand the steps of report writing. **SO4.6**. Understand about the impact factor of different popular journals		writing and report generation **4.2**. Writing research abstract, introduction **4.3.** Writing Review of literature. Result, conclusion **4.4.** concepts of Bibliography and References **4.5.** Significance of report writing steps of report writing **4.6**. Types of research reports **4.7.** methods of presentation of report **4.8.** Formats of publication in research journal/ book/ conference etc., **4.9**. Concept of impact factor, H-index.	

SW-1 Suggested Sessional Work (SW):

a. Assignments: Enlist the journals with their impact factor and H-index

CO 5: Evaluate the role and functioning of computer in research

Approximate Hours

Item	AppX Hrs
Cl	10
LI	00
SW	01
SL	01
Total	12

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self Learning (SL)**
SO5.1. To understand about various technical writing approaches for scientific strengthening of research documents using computer. **SO5.2.** Able to survey the popular articles **SO5.3.** Ease to data analysis using different analysis software. **SO5.4.** Develop the skill on appropriate preparation and presentation of research data. **SO5.5.** To understand about editing and press reading method to avoid plagiarism **SO5.6.** Briefs the programmes. Constraints in implementation of rural policies and programmes		**Unit-5.0** **5.1.** Basics of operating systems **5.2. H**andling different operating systems (Windows) **5.3**. Literature survey using web **5.4.** handling search engines (Wolfram and Google scholar) **5.5.** Computer usage for collecting/analyzing data-simulation **5.6.** Using fortran/C/Mathmatica/ Matlab **5.7.** Using Mathcad/IBM-SPSS **5.8.** Using word processing software-MS Word **5.9.** Drawing graphs and diagram-Excel. **5.10.** Power point for oral and poster presentations	**5.1** MS office

SW-1 Suggested Sessional Work (SW):

a. Assignments: Prepare the assignment data analysis stools like excel, spss, sas

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (C l)	Laboratory Lecture (L I)	Sessional Work (SW)	Self Learning (S l)	Total hour (C l + LI+ SW +S l)
CO-1 Students will be able to understand and comprehend the basics in research methodology and applying them in research/ project work.	9	0	1	1	11
CO 2: The student will enable to collect the data, edit it properly and analyse it accordingly. Thus, it will facilitate their prosperity in higher education.	9	0	1	1	11
CO 3: Develop insights about the statistical analysis tools and techniques for better research outcomes**.**	8	0	1	1	10
CO 4: To explain the art of interpretation and the art of writing research reports	9	0	1	1	11
CO 5: Evaluate the role and functioning of computer in research	10	0	1	1	12
Total Hours	**45**	**00**	**05**	**05**	**55**

Suggested Specification Table (For ESA)

CO	Unit title	Marks Distribution				Total Marks
		Ap	An	E	C	
CO-1	**Introduction & Research design**	03	03	03	03	12
CO-2	**Data Collection & Analysis**	02	03	02	03	10
CO-3	**Processing and analysis of data**	02	02	02	03	09
CO-4	**Paper writing and report and report generation**	02	03	01	03	09
CO-5	**Using Computer in research:**	03	02	02	03	10
	Total	12	13	10	15	50

Legend: Ap: Apply, An: Analyze, E: Evaluate, C: Create

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

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

Suggested Instructional/Implementation Strategies:

1. Improved Lecture

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

Suggested Learning Resources:

S. No.	**Title**	**Author**	**Publisher**	**Edition &** Year
01	Research Methodology (Methods and Techniques)	Kothari C.R.	New Age International Publishers	2023
02	Research Methodology – Methods Techniques	Rabi Narayan Subudhi, Sumita Mishra, and Malabika Sahoo	Taxmann.	2024
03	Research Design: Qualitative, Quantitative, and Mixed Methods Approaches	John W. Creswell, and J. David Creswell	Sage Pubns; 6th edition	2022
04	Research Methodology: A Step by Step Guide for Beginners, 4th EDN	Ranjit Kumar	SAGE Publications Pvt. Ltd	2023
05	Research Methodology: Techniques and Applications	K. Hanumantha Rao	Discovery Publishing House	2012

Curriculum Development Team:

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4. Dr. Akhilesh Waoo, Professor, Dept. of CSE, Faculty of Engineering and Technology, AKS University.

Cos, POs and PSOs Mapping
Course Code:-
Course Title: - Research Methodology

Course Outcomes	PO 1	PO 2	PO-3	PO-4	PSO1	PSO2	PSO3	PSO4
CO-1 Students will be able to understand and comprehend the basics in research methodology and applying them in research/ project work.								
CO 2: The student will enable to collect the data, edit it properly and analyse it accordingly. Thus, it will facilitate their prosperity in higher education..								
CO 3: Develop insights about the statistical analysis tools and techniques for better research outcomes**.**								
CO 4: To explain the art of interpretation and the art of writing research reports								
CO 5: Evaluate the role and functioning of computer in research								

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map: Research Methodology

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4, 5, 6, 7, 8, 9, 10, 11	**CO-1** Students will be able to understand and comprehend the basics in research methodology and applying them in research/ project	**SO1.1** **SO1.2** **SO1.3**		**Unit-1.0** **Introduction & Research design** Nature and objectives of research, Methods of Research: historical, descriptive and experimental. Types of Research (Descriptive/ Analytical/ Applied/ Fundamental/ Quantitative/ Qualitative/ Conceptual/ Empirical) Research process, research approaches, criteria for good research.	As mentioned in page number ……..

	work.	**SO1.4** **SO1.5** **So1.6**		Meaning of research design. Need of research design, features of good design, different research design and basic principles of experimental designs. Design of experiments. 1.1, 1.2, 1.3. 1.4, 1.5, 1.6, 1.7, 1.8, 1.9	
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4, 5, 6, 7, 8, 9, 10, 11	**CO 2:** The student will enable to collect the data, edit it properly and analyse it accordingly. Thus, it will facilitate their prosperity in higher education.	**SO2.1** **SO2.2** **SO2.3** **SO2.4** **SO2.5**		**Unit-2.0 –** **Data Collection & Analysis** Types of data, methods and techniques of data collection, Hypothesis Testing, primary and secondary data, meta analysis, historical methods, content analysis, devices used in data collection. Pilot study and pretest of tools. Choice of data collection methods, Literature Review Collection. 2.1, 2.2, 2.3.2.4, 2.5, 2.6, 2.7, 2.8, 2.9	As mentioned in page number ……..
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4, 5, 6, 7, 8, 9, 10, 11	**CO 3:** Develop insights about the statistical analysis tools and techniques for better research outcomes**.**	**SO3.1** **SO3.2** **SO3.3** **SO3.4** **SO3.5**		**Unit-3.0** **Processing and analysis of data** Measures of central Tendency. Measures of dispersion. Measures of variation. Measures of central tendency vs. measures of dispersion. Normal distribution. Measures of skewness and Interpretation. Correlation and regression: types & application. Chi-square test its purpose and use. 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8	As mentioned in page number ……..
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4, 5, 6, 7, 8, 9, 10, 11	**CO 4:** To explain the art of interpretation and the art of writing research reports	**SO4.1** **SO4.2** **SO4.3** **SO4.4** **SO4.5** **SO4.6**		**Unit-4.0** **Paper writing and report and report generation** Basic concept of paper/thesis writing and report generation. Writing research abstract, introduction, Review of literature. Result, conclusion, concepts of Bibliography and References. Significance of report writing steps of report writing. Types of research reports, methods of presentation of report. Formats of publication in research journal/ book/ conference etc., Concept of impact factor, H-index. 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 4.9	As mentioned in page number ……..
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4, 5, 6, 7, 8, 9, 10, 11	**CO 5:** Evaluate the role and functioning of computer in research	**SO5.1** **SO5.2** **SO5.3** **SO5.4** **SO5.5** **SO5.6**		**Unit-5.0** **Using Computer in research:** **Basics of operating systems-** handling different operating systems (Windows) **1.** Literature survey using web, handling search engines (Wolfram and Google scholar)	As mentioned in page number ……..

				2. Computer usage for collecting/analyzing data-simulation using fortran/C/Mathmatica/ Matlab/Mathcad/IBM-SPSS. **3. Preparation presentations:** **(A) Research paper:** using word processing software-MS Word, Drawing graphs and diagram-Excel. **(B) Seminar presentation:** Power point for oral and poster presentations 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7, 5.8, 5.9, 5.10	

Course Code: - 117PH03

Course Title: - Research and Publication Ethics

Pre requisite: -Student should have basic knowledge about ethical issues related to Research, Publication, Patents, IPR (Intellectual Property Rights).

Rationale: - The students studying research and publication ethics should possess understanding about basic concepts in research and publication in concern subject. The course deals with scientific methods of research, the initiation of an inquiry, formulation of research problems and hypotheses, the role of induction and deduction in research, collection and analysis of date and interpretation of results

Course Outcomes:

CO 1: Students will be able to understand the ethics in conduct of scientific research.

CO 2: The student will enable to utilize indexing and citation databases, open access publications, research.

CO 3: Identify research misconduct and predatory publications.

CO 4: Understand about the infer the ethical framework and principles

CO 5: Student will be able to explore plagiarism tools for a valid and ethical research report

CO 6: Develop a valid and ethical research report.

Scheme of studies

Categories of course	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			C l	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
	117PH03	**Research and Publication Ethics**	03	00	02	01	06	03

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

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

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

SL: Self Learning,

C: Credits.

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

Scheme of Assessment:

Categories of course	Course Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class Test 1 (T1)	Class Test 2 (T2)	Mini Review (MR)	Seminar (SA)	Mini Project (MP)	Total Marks (T1+ T2+ MR+SA+ MP)		
	117PH03	**Research and Publication Ethics**	10	10	10	10	10	50	50	100

Course-Curriculum Detailing:

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

CO-1 Students will be able to understand the ethics in conduct of scientific research.

Approximate Hours

Item	AppX Hrs
C l	6
LI	0
SW	1
SL	2
Total	9

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO1.1. Understand about the introduction of research philosophy and ethics **SO1.2.** The student will be able to understand definition, nature and scope of Philosophy and Ethics **SO1.3.** Understand the basic concept and moral philosophy of ethics. **SO1.4.** Student will able to explain Nature of moral judgments of Philosophy and Ethics. **SO1.5.** Student will able to understand Reactions Philosophy and research ethics.		**Unit-I** **1.1.** Introduction of research philosophy and ethics **1.2.** Definition, nature and scope research philosophy and ethics. **1.3-** Philosophy and Ethics: concept, branches **1.4.** Ethics: definition, moral philosophy **1.5.** Nature of moral judgments of Philosophy and Ethics**.** **1.6**. Reactions Philosophy and research ethics.	**1.1.** Learn about the philosophy and ethics of research **1.2** Nature of moral judgments and reactions of Philosophy and Ethics of research.

SW-1 Suggested Sessional Work (SW):

a. Assignments: Moral Philosophy of research ethics.

CO 2: The student will enable to utilize indexing and citation databases, open access publications, research.

Approximate Hours

Item	AppX Hrs
C l	9
LI	0
SW	1
SL	2
Total	12

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO2.1 Student will able to understand Ethics with respect to science and research **SO2.2.** Understand the concept of Intellectual honesty and research integrity **SO2.3.** Understand the concept of Scientific misconducts: Falsification, Fabrication, and Plagiarism **SO2.4-** Develop insights about the Redundant Publication: duplicate and overlapping publications, salami slicing **SO2.5.** Developed the learning capacity to understand selective reporting and misinterpretation of data		**Unit-II** 2.1. Ethics with respect to science and research 2.2. Intellectual honesty and research integrity 2.3. Scientific misconducts 2.4. Falsification, Fabrication, and Plagiarism (FFP) 2.5. Redundant publications 2.6 Duplicate and overlapping publications, 2.7. Salami slicing of publication 2.8. Selective reporting Philosophy of research ethics. 2.9. Misrepresentation of data	**2.1.** Intellectual honesty and research integrity **2.2** Selective reporting and misinterpretation of data

SW-1 Suggested Sessional Work (SW):

a. Assignments: Prepare the assignment on scientific misconducts: Falsification, Fabrication, and Plagiarism

CO 3: Identify research misconduct and predatory publications.

Approximate Hours

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

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO3.1. Student will able to understand Publication Ethics: definition, introduction, and importance **SO3.2** Understand about Best practices/ standards-setting initiatives and guidelines: COPE, WAME etc. **SO3.3**. Student is know about the Conflicts of Interest **SO3.4.** Understand about the Publication misconduct: definition, concept, problems that lead to unethical behavior and vice versa, types **SO3.5**. Understand about the violation of publication ethics, authorship, and contributorship **SO3.6.** Student know about Identification of publication misconduct, complaints, and appeals. **SO3.7**. Student will able to understand Predatory publishers and journals		**Unit-3** **3.1.** Publication ethics: definition and scope. **3.2.** Publication ethics: introduction and importance **3.3.** Best practices / standards setting initiatives and guidelines: COPE, WAME, etc. **3.4.** Conflicts of interest **3.5.** Publication misconduct: definition, concept, problems that lead to unethical behavior and vice versa, types **3.6**. Violation of publication ethics, authorship and contributorship **3.7.** Identification of publication misconduct, complaints and appeals **3.8.** Predatory publishers and journals	**3.1** Publication Ethics: definition, introduction, and importance **3.2** Standards-setting initiatives and guidelines: COPE, WAME

SW-1 Suggested Sessional Work (SW):

a. Assignments: Prepare the assignment on Best practices setting initiatives and guidelines: COPE, WAME etc.

CO 4: Understand about the infer the ethical framework and principles.

Approximate Hours

Item	App X Hrs
Cl	8
LI	0

SW	1
SL	2
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO4.1. The Students will develop open access publications and initiatives **SO4.2.** Understand the basic idea of SHERPA/RoMEO online resource to check publisher copyright & self-archiving policies **SO4.3.** Student will able to understand Software tool to identify predatory publications developed by SPPU **SO4.4**. Understand about Journal finder / journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer Journal Suggested, etc.		**Unit-4.0** **4.1.** Open access publications of research **4.2**. Research and Publication Ethics of Initiatives **4.3.** Online resource to check publisher copyright & self-archiving policies in SHERPA **4.4.** Online resource to check publisher copyright & self-archiving policies in RoMEO **4.5.** Software tool to identify predatory publications developed by SPPU **4.6**. Journal finder / journal suggestion tools viz. JANE **4.7.** Journal finder / journal suggestion tools viz. Elsevier Journal Finder **4.8.** Journal finder / journal suggestion tools viz. Springer Journal Suggested**.**	**4.1-** SHERPA/RoMEO online resource to check publisher copyright & self-archiving policies **4.2**. Software tool to identify predatory publications developed by SPPU

SW-1 Suggested Sessional Work (SW):

a. Assignments: Enlist the Journal finder / journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer Journal Suggested, etc.

CO 5: Student will be able to explore plagiarism tools for a valid and ethical research report

Approximate Hours

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

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO5.1. To understand about Subject specific ethical issues, FFP, authorship. **SO5.2.** Understand about the Conflicts of interest **SO5.3.** Student will able to		**Unit-5.0** **5.1.** Group Discussions:Subject specific ethical issues. **5.2.** Group Discussions: FFP, authorship, Conflicts of interest **5.3.** Complaints and appeals: examples	**5.1** Conflicts of interest **5.2** Use of plagiarism software like Tumitin, Urkund

understand complaints and appeals: examples and fraud from India and abroad. **SO5.4-** Understand about the use of plagiarism software like Tumitin, Urkund and other open source software tools.		and fraud from India and abroad **5.4.** Software tools use of plagiarism software like Tumitin **5.5.** Software tools use of plagiarism software like Urkund. **5.6.** Open source software tools for plagiarism.	and other open source software tools.

SW-1 Suggested Sessional Work (SW):

a. Assignments: Prepare the assignment on use of plagiarism software like Tumitin, Urkund and other open source software tools.

CO 6: Develop a valid and ethical research report.

Approximate Hours

Item	AppX Hrs
Cl	08
LI	00
SW	01
SL	02
Total	11

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self Learning (SL)**
SO6.1. To understand about Indexing databases **SO6.2.** Understand about the Citation databases: Web of Science, Scopus, etc. **SO6.3.** Student will able to understand Impact Factor of a journal as per Journal Citation Report, SNIP, SJR, IPP,Cite Score **SO6.4-** Understand about the Metrics: h-index, g-index, i10 index, altmetrics. **SO6.5.** Student will know about the National Academies Press.		**Unit-6.0** **5.1.** Indexing databases **5.2.** Citation databases: Web of Science **5.3.** Citation databases: Scopus **5.4.** Impact Factor of a journal as per Journal Citation Report **5.5.** Software tools SNIP, SJR, IPP,Cite Score. **5.6.** Metrics: h-index, g-index **5.7.** Metrics: i10 index, altmetrics **5.8.** National Academies Press.	**5.1** Citation databases: Web of Science, Scopus, etc. **5.2** Metrics: h-index, g-index, i10 index, altmetrics.

SW-1 Suggested Sessional Work (SW):

a. Assignments: Prepare the assignment on Metrics: h-index, g-index, i10 index, altmetrics.

Brief of Hours suggested for the Course Outcome

Course Outcomes	**Class Lecture (C l)**	**Laboratory Lecture (L I)**	**Sessional Work (SW)**	**Self Learning (S l)**	**Total hour (C l + LI+ SW +S l)**

CO-1 Students will be able to understand the ethics in conduct of scientific research.	06	00	01	02	09
CO 2: The student will enable to utilize indexing and citation databases, open access publications, research.	09	00	01	02	12
CO 3: Identify research misconduct and predatory publications.	08	00	01	02	11
CO 4: Understand about the infer the ethical framework and principles	08	00	01	02	11
CO 5: Student will be able to explore plagiarism tools for a valid and ethical research report	06	00	01	02	09
CO 6: Develop a valid and ethical research report.	08	00	01	02	11
Total Hours	**45**	**00**	**06**	**12**	**63**

Suggested Specification Table (For ESA)

CO	**Unit title**	**Marks Distribution**				**Total Marks**
		Ap	**An**	**E**	C	
CO-1	**Philosophy and Ethics**	02	02	01	02	07
CO-2	**Scientific Conduct**	03	02	00	03	08
CO-3	**Publication Ethics**	02	03	02	03	10
CO-4	**Open Access Publishing**	01	02	02	03	08
CO-5	**Publication Misconduct**	02	02	02	02	08
CO-6	**Databases and Research Metrics**	02	02	03	02	09
	Total	12	13	10	15	50

Legend: Ap: Apply, An: Analyze, E: Evaluate, C: Create

The end of semester assessment for Introduction to **Research and Publication Ethics** 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:

9. Improved Lecture
10. Tutorial
11. Case Method
12. Group Discussion
13. Role Play
14. Demonstration

15. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Face book, Twitter, Whatsapp, Mobile, Online sources)
16. Brainstorming

Suggested Learning Resources:

S. No.	**Title**	**Author**	**Publisher**	**Edition &** Year
01	Research and Publication Ethics: A Comprehensive Guide to Ethical Research Practices	Sheeba P.S.	Notion Press	2024
02	RESEARCH AND PUBLICATION ETHICS: CORE CONCEPTS AND PRINCIPLES	Vishal Verma and Geetika Tandon Kapoor	Bharti Publications	2023
03	RESEARCH AND PUBLICATION ETHICS	Noushad Husain	Shipra Publications	2023
04	Research and Publication Ethics	Dr. Upendra Pratap Singh, Ms. Sakshi Ahlawat, and Dr. Sushma Sharma	Sultan Chand Sons	2023
05	Ethics in Competitive Research: Do not get scooped; do not get plagiarized	P. Chaddah,		2018
06	What is ethics in research and why is it important.	Resnik, D. B.	National Institute of Environmental Health Sciences	2011

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. Kaushik Mukharji, Professor, Dept. of Business Administration, Faculty of Management Studies, AKS University.
4. Dr. Akhilesh Waoo, Professor, Dept. of CSE, Faculty of Engineering and Technology, AKS University.

Cos, POs and PSOs Mapping
Course Code:-
Course Title: - Research and Publication Ethics

Course Outcomes	PO 1	PO 2	PO-3	PO-4	PSO1	PSO2	PSO3	PSO4
CO-1 Students will be able to understand the ethics in conduct of scientific research.								
CO 2: The student will enable to utilize indexing and citation databases, open access publications, research.								
CO 3: Identify research misconduct and predatory publications.								
CO 4: Understand about the infer the ethical framework and principles								
CO 5: Student will be able to explore plagiarism tools for a valid and ethical research report								
CO 6: Develop a valid and ethical research report.								

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map: Research and Publication Ethics

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4, 5, 6, 7, 8,	**CO-1** Students will be able to understand the ethics in conduct of	**SO1.1** **SO1.2** **SO1.3**		**Philosophy and Ethics** • Introduction to philosophy: definition, nature and scope, concept, branches. • Ethics: definition, moral philosophy, nature of moral judgements and reactions	As mentioned in page number ……..

9, 10, 11	scientific research.	**SO1.4** **SO1.5**		**1.**1, 1.2, 1.3, 1.4, 1.5, 1.6	
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4, 5, 6, 7, 8, 9, 10, 11	**CO 2:** The student will enable to utilize indexing and citation databases, open access publications, research.	**SO2.1** **SO2.2** **SO2.3** **SO2.4** **SO2.5**		**Scientific Conduct** • Ethics with respect to science and research • Intellectual honesty and research integrity • Scientific misconducts: Falsification, Fabrication, and Plagiarism (FFP) • Redundant publications: duplicate and overlapping publications, salami slicing • Selective reporting and misrepresentation of data 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9	As mentioned in page number ……..
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4, 5, 6, 7, 8, 9, 10, 11	**CO 3:** Identify research misconduct and predatory publications.	**SO3.1** **SO3.2** **SO3.3** **SO3.4** **SO3.5** **SO3.6** **SO3.7**		**Publication Ethics** Publication ethics: definition, introduction and importance, Best practices / standards setting initiatives and guidelines: COPE, WAME, etc. Conflicts of interest, Publication misconduct: definition, concept, problems that lead to unethical behavior and vice versa, types. Violation of publication ethics, authorship and contributorship Identification of publication misconduct, complaints and appeals, Predatory publishers and journals 3.1,3.2, 3.3, 3.4, 3.5,3.6, 3.7, 3.8	As mentioned in page number ……..
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4, 5, 6, 7, 8, 9, 10, 11	**CO 4:** Understand about the infer the ethical framework and principles	**SO4.1** **SO4.2** **SO4.3** **SO4.4**		**Open Access Publishing** Open access publications and initiatives. SHERPA/RoMEO online resource to check publisher copyright & self-archiving policies, Software tool to identify predatory publications developed by SPPU. Journal finder / journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer Journal Suggested, etc. 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7,4.8	As mentioned in page number ……..

PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4, 5, 6, 7, 8, 9, 10, 11	**CO 5:** Student will be able to explore plagiarism tools for a valid and ethical research report	**SO5.1** **SO5.2** **SO5.3** **SO5.4**		**Publication Misconduct** **A. Group Discussions** Subject specific ethical issues, FFP, authorship, Conflicts of interest, Complaints and appeals: examples and fraud from India and abroad **B. Software tools** Use of plagiarism software like Tumitin, Urkund and other open source software tools 5.1, 5.2, 5.3, 5.4, 5.5, 5.6	As mentioned in page number ……..
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4, 5, 6, 7, 8, 9, 10, 11	**CO 6:** Develop a valid and ethical research report.	**SO6.1** **SO6.2** **SO6.3** **SO6.4** **SO6.5**		**Databases and Research Metrics** **A. Databases** Indexing databases, Citation databases: Web of Science, Scopus, etc. **B. Research Metrics** Impact Factor of journal as per Journal Citation Report, SNIP, SIR, IPP, Cite Score. Metrics: h-index, g index, i10 index, altmetrics 6.1, 6.2, 6.3, 6.4, 6.5, 6.6, 6.7, 6.8	

Course Code: 117PH52

Course Title: Review of Literature

Pre- requisite: Students should be thoroughly conversant with the literature of their intended area of study and understand the major theories, methodological assumptions, key concepts, issues, problems, areas of neglect, and newly acquired knowledge within their selected and related areas of study.

Rationale: Students should identify the elements of a literature review and can state in writing the purpose and process of the literature review as they relate to the research process. They can search for and access information in multiple formats and use found sources to mine for additional sources and manage information resources and a workflow process in support of the literature review process.

Course Outcomes:

CO1. Students will able to produce his/her research outcome on writing a review of literature in respect of recent trends and technologies.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits (C)
			CI	LI	SW	SL	Total Study Hours CI+LI+SW+SL	
	117PH52	**Review of Literature**	0	3	1	1	5	(0+3) =3

Legend:

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

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

Scheme of Assessment:

Categories of course	Course Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class Test 1 (T1)	Class Test 2 (T2)	Mini Review (MR)	Seminar (SA)	Mini Project (MP)	Total Marks (T1+ T2+ MR+SA+ MP)		
	117PH52	**Review of Literature**	10	10	10	10	10	50	50	100

Course-Curriculum Detailing:

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

CO 1. Students will able to produce his/her research outcome on writing a review of literature in respect of recent trends and technologies.

Approximate Hours

Item	Approximate Hours
CI	**0**
LI	**45**
SW	**1**
SL	**1**
Total	**47**

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO1.1 Student should be able to articulate a specific purpose and a clear set of objectives to guide the writing of their literature review **SO1.2.** Student should be able to demonstrate an in-depth understanding of the importance and various roles of the literature review in research **SO1.3.** Able to demonstrate the ability to apply a broad range of strategies for developing a literature review to a specific body of knowledge or practice and evaluate critically complex ideas at an abstract level. **SO1.4.** Able to demonstrate advanced critical skills to investigate, analyse and synthesize complex literature, problems, concepts and theories in a professional context **SO1.5.** Student should be able to select, evaluate and synthesise appropriate literature for their chosen topic area and develop this into a review which critically explores the issues in their chosen topic area in depth and with balance	**1.** Define a literature review **2.** Identify sources of information **3.** Conducting the literature review **4.** Using bibliographic management software **5.** Managing the literature review process **6.** Writing the literature review		**1.**Software (s) to be used, laboratory planning, data survey etc for the proposed research work.

SW-1 Suggested Sessional Work (SW):

a. **Assignments:**
   i) Writing a review paper relevant to the proposed research work
b. **Mini Project:**
c. **Other Activities (Specify)**

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self - Learning (Sl)	Total hour (Cl+SW+Sl)
CO 1. Students will able to produce his/her research outcome on writing a review of literature in respect of recent trends and technologies.	**45**	**1**	**1**	**47**

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit title	Marks Distribution	Total

		Ap	An	E	C	Marks
CO-1	**1.** Define a literature review **2.** Identify sources of information **3.** Conducting the literature review **4.** Using bibliographic management software **5.** Managing the literature review process. **6.** Writing the literature review	15	15	10	10	50
	Total	15	15	10	10	50

Legend: Ap: Apply, An: Analyze, E: Evaluate, C: Create

The end of semester assessment for **Review of Literature** will be 100 marks.

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

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Group Discussion
3. Demonstration
4. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, Whatsapp, Mobile, Online sources)
5. Brainstorming
6. Smart board

Suggested Learning Resources:

(a) Books:

S. No.	Title
1.	As per directions of course instructor.
2.	Research publications, (Course Specific)
3.	Sciencedirect
4.	Researchgate
5.	Pubmade
6.	Academia
7.	Multi authored books
8.	Book chapters

Curriculum Development Team:

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7. Dr. Kaushik Mukharji, Professor, Dept. of Business Administration, Faculty of Management Studies, AKS University.
8. Dr. Akhilesh Waoo, Professor, Dept. of CSE, Faculty of Engineering and Technology, AKS University.

Cos, POs and PSOs Mapping
Course Code:-
Course Title: - Review of Literature

Course Outcomes	PO 1	PO 2	PO-3	PO-4	PSO1	PSO2	PSO3	PSO4
CO.1 Students will able to produce his/her research outcome on writing a review of literature in respect of recent trends and technologies.								

Legend: 1- Low,2 – Medium, 3- High

Course Curriculum Map: Review of Literature

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4, 5, 6, 7, 8, 9, 10, 11	**CO 1:** Students will able to produce his/her research outcome on writing a review of literature in respect of recent trends and technologies.	**SO1.1** **SO1.2** **SO1.3** **SO1.4** **SO1.5**	**1.** Define a literature review **2.** Identify sources of information **3.** Conducting the literature review **4.** Using bibliographic management software **5.** Managing the literature review process **6.** Writing the literature review		As mentioned in page number ……..

Course Code: 117PH04

Course Title: Advanced Pedagogical Theories and Practices

Pre-requisite: The research scholar should have knowledge the Pedagogical Theories and Practices.

Rationale: The research scholar to understand about the This Ph.D.-level course on General Pedagogy focuses on critical theories of learning, teaching strategies, curriculum development, and assessment methods. Students will explore the philosophical, psychological, and Socio cultural foundations of pedagogy, engage in research-based learning, and apply advanced instructional strategies. The course also emphasizes the role of pedagogy in promoting inclusive, equitable, and effective learning environments, with particular attention to the latest trends and innovations in education

Course Outcomes:

CO1:Analyze advanced pedagogical theories and their application in diverse learning environments.

CO2:Apply research-based instructional methods to promote active learning.

CO3:Critically evaluate different educational philosophies and their impact on teaching and learning.

CO4:Develop inclusive teaching practices that address the needs of diverse learners.

CO5:Design and evaluate assessments that align with pedagogical goals

Scheme of Studies

Board of Study	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits (C)
			CI	LI	SW	SL	Total Study Hours CI+LI+SW+SL	
		Advanced Pedagogical Theories and Practices	15	0	01	01	17	01

Legend:

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

Boar dof Study	Course Code	Course Title	Scheme of Assessment(Marks)							
			Progressive Assessment(PRA)						End Semeste r Assessm ent (ESA)	Total Marks (PRA+ ESA)
			Class Test -1 (A)	ClassTest 2 , (B)	Mini Review(c)	Seminar(D)	Mini Project (E)	Total Marks (A+B+C + D+ E)		
		Advanced Pedagogic al Theories and Practices	10	10	10	10	10	50	50	100

Course-Curriculum Detailing:

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

CO1: Analyze advanced pedagogical theories and their application in diverse learning environments.

Item	Appx. Hrs
Cl	03
LI	00
SW	01
SL	01
Total	05

sessional outcomes (SOs)	**Labor-atory Instruc-tion (LI)**	**Classroom Instruction (CI)**	**Self Learning (SL)**
1SO1.Students will gain knowledge about Overview of major educational philosophies **1SO2.** Student will understand the Sociocultural and psychological theories of learning **1SO3.** Students will know Theories of motivation and engagement in education		**unit1: Philosophical and Theoretical Foundations of Pedagogy** 1.1.Overview of major educational philosophies (e.g., Progressivism, Constructivism, Behaviorism, Critical Pedagogy). 1.2.Sociocultural and psychological theories of learning (e.g., Vygotsky, Piaget, Bruner). 1.3.Theories of motivation and engagement in education	. Overview of major educational philosophies

SW-1:Suggested Sessional Work(SW): Progressivism, Constructivism, Behaviorism, Critical Pedagogy

CO2: Apply research-based instructional methods to promote active learning.

Approximate Hours

Item	Appx. Hrs
Cl	03
LI	00
SW	00
SL	00
Total	03

sessional outcomes (SOs)	**Labor-atory Instruc-tion (LI)**	**Classroom Instruction (CI)**	**Self Learning (SL)**
2SO1.Students will gain knowledge about Instructional design models**.** **2SO2**.Students will gain knowledge about Differentiated instruction and personalized learning **2SO3**.Students will gain knowledge about The role of research in informing teaching practices .		**unit 2: Instructional Design and Teaching Strategies** 2.1.Instructional design models (ADDIE, SAM, and Understanding by Design).Active learning strategies, including problem-based learning, collaborative learning, and flipped classrooms. 2.2.Differentiated instruction and personalized learning approaches Challenges and opportunities in teaching at the university level. 2.3.The role of research in informing teaching practices Effective mentorship and supervision of graduate students engagement in education.	1.Active learning strategies, including problem-based learning,collaborative learning, and flipped classrooms

Mini Project: Challenges and opportunities in teaching at the university level.

CO3: Critically evaluate different educational philosophies and their impact on teaching and learning

Approximate Hours

Item	Appx. Hrs
Cl	03
LI	00
SW	00
SL	00
Total	03

sessional outcomes (SOs)	**Labor-atoryInstruc-tion (LI)**	**Classroom Instruction (CI)**	**Self Learning (SL)**
3SO1.Students will gain knowledge about Theories and principles of inclusive education **3SO2**.Students will gain knowledge about Universal Design for Learning and equitable teaching practices **3SO3**.Students will gain knowledge about Aligning assessment with learning objectives and instructional methods .		**unit 3: Inclusive Education and Pedagogy** 3.1.Theories and principles of inclusive education.Pedagogical strategies for diverse learners (students with disabilities, gifted students, and culturally diverse students). 3.2.Universal Design for Learning (UDL) and equitable teaching practices.Formative and summative assessment methods. 3.3.Aligning assessment with learning objectives and instructional methods.Innovative assessment strategies (portfolios, peer assessments, self-assessment	**1.** Formative and summative assessment methods Innovative assessment strategies

Mini Review: Formative and summative assessment methods.

CO4: Develop inclusive teaching practices that address the needs of diverse learners.

Approximate Hours

Item	Appx. Hrs
Cl	03
LI	00
SW	00
SL	00
Total	03

Sessional outcomes (SOs)	**Labor-atory Instruc-tion (LI)**	**Classroom Instruction (CI)**	**Self Learning (SL)**
4SO1.Students will gain knowledge about The role of educational technology in pedagogy **4SO2**.Students will gain knowledge about Integrating digital tools into instructional design **4SO3**.Students will gain knowledge about Ethical issues in the use of technology in education		**unit 4: Educational Technology and Pedagogy** 4.1.The role of educational technology in pedagogy (e-learning, blended learning, MOOCs). 4.2.Integrating digital tools into instructional design. 4.3.Ethical issues in the use of technology in education	**1.** Ethical issues in the use of technology in education

CO5: Design and evaluate assessments that align with pedagogical goals

Item	Appx. Hrs
Cl	03
LI	00
SW	00
SL	00
Total	03

Sessional outcomes (SOs)	**Labor-atory Instruc-tion (LI)**	**Classroom Instruction (CI)**	**Self Learning (SL)**
5SO1.Students will gain knowledge about The role of reflection in teaching practice. **5SO2**.Students will gain knowledge about Models of reflective practice. **5SO3**.Students will gain knowledge about Peer observation and feedback as a tool for professional growth		**Unit5: Reflective Practice and Continuous Improvement in Teaching** 5.1.The role of reflection in teaching practice. 5.2.Models of reflective practice (Kolb's Experiential Learning Cycle, Schön's Reflective Practitioner). 5.3.Peer observation and feedback as a tool for professional growth	**1.** Peer observation and feedback as a tool for professional growth

Brief of Hours suggested for the Course Outcome

Course Outcome	Class lecture(CL)	Sessional work (SL)	Self learning(SL)	Total hours
CO1: Analyze advanced pedagogical theories and their application in diverse learning environments.	03	01	01	05
CO2: Apply research-based instructional methods to promote active learning.	03	00	00	03
CO3: Critically evaluate different educational philosophies and their impact on teaching and learning.	03	00	00	03
CO4: Develop inclusive teaching practices that address the needs of diverse learners.	03	00	00	03
CO5: Design and evaluate assessments that align with pedagogical goals.	03	00	00	03
Total-	15	01	01	17

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

CO	Unit title	Marks distribution				
		Ap	An	E	C	Total marks
CO1	Philosophical and Theoretical Foundations of Pedagogy	01	02	03	04	10
CO2	Instructional Design and Teaching Strategies	01	02	03	04	10
CO3	Inclusive Education and Pedagogy	01	02	03	04	10
CO4	Educational Technology and Pedagogy	01	02	03	04	10
CO5	Reflective Practice and Continuous Improvement in Teaching	01	02	03	04	10
	TOTAL-	5	10	15	20	50

Ap: Apply ,An: Analyze, E:Evaluate, C:Create
The end of semester assessment for Introduction 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 tasks as per requirement, for end semester assessment.
Suggested Instructional/Implementation Strategies:

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

6. ICT Based Teaching Learning(VideoDemonstration/TutorialsCBT,Blog,Facebook,Twitter, Whatsapp, Mobile, Online sources)

7. Brainstorming

Reference books:

- **Educational Psychology: Theory and Practice (12th Edition)** by Robert E. Slavin. Published by Pearson in 2018
- **Learning Theories: An Educational Perspective (7th Edition)** by Dale H. Schunk. Published by Pearson in 2020.
- **Understanding by Design (2nd Edition)** by Grant Wiggins and Jay McTighe. Published by ASCD in 2005

. Constructivist Strategies: Teaching for the Future (1st Edition) by A. M. H. E. H. Roberts. Published by Routledge in 2020. Dewey,

. Brookfield, S. D. (2017). *Becoming a Critically Reflective Teacher*. Jossey-Bass

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Course Code: 117PH05

Course Title: Curriculum Development in Higher Education

Pre-requisite: The research scholar should have knowledge the advanced theories and practices of curriculum development.

Rationale: This course introduces Ph.D. students to advanced theories and practices of curriculum development. It covers the history and evolution of curriculum theory, models of curriculum design, methods for curriculum evaluation, and the role of educators in the process. Students will engage in critical discussions on contemporary challenges in curriculum development and explore research-based strategies for improving educational outcomes. The course also emphasizes the role of curriculum in educational reform and policy making.

Course Outcomes:

CO1:Analyze historical and contemporary theories of curriculum development.

CO2:Critically evaluate different curriculum design models.

CO3:Apply principles of curriculum development to design programs for higher education.

CO4:Assess the impact of educational policies on curriculum design and implementation.

CO5:Develop comprehensive evaluation methods for curriculum effectiveness.

Scheme of Studies

Board of Study	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits (C)
			CI	LI	SW	SL	Total Study Hours CI+LI+SW+SL	
		Curriculum Development in Higher Education	15	00	01	01	17	01

Legend:

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

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

Board of Study	Course Code	Course Title	Scheme of Assessment(Marks)							
			Progressive Assessment(PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class Test -1 (A)	ClassTest 2 , (B)	Mini Review(c)	Seminar(D)	Mini Project (E)	Total Marks (A+B+C + D+ E)		
		Curriculum Development in Higher Education	10	10	10	10	10	50	50	100

Course-Curriculum Detailing:

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

CO1:Analyze historical and contemporary theories of curriculum development.

Item	Appx. Hrs
Cl	03
LI	00
SW	01
SL	01
Total	05

sessional outcomes (SOs)	**Labor-atory Instruc-tion (LI)**	**Classroom Instruction (CI)**	**Self Learning (SL)**
1SO1.Students will gain knowledge about concept of curriculum. **1SO2**.Students will gain knowledge about The relationship between philosophy, psychology, and curriculum development **1SO3**.Students will gain knowledge about Multicultural curriculum design and inclusivity. .		**unit1: Foundations of Curriculum Development** 1.1.Definition and concept of curriculum.Historical perspectives on curriculum theory. 1.2.The relationship between philosophy, psychology, and curriculum development. Overview of key curriculum design models: Tyler's Rational Model, Taba's Model, Backward Design, Competency-Based Education (CBE), and others. 1.3.Curriculum alignment (objectives, content, assessment).Multicultural curriculum design and inclusivity.	**1.** Curriculum alignment (objectives, content, assessment

SW-1 :Suggested Sessional Work(SW): Examine the Tyler's Rational Model, Taba's Model

CO2:Critically evaluate different curriculum design models.

Item	Appx. Hrs
Cl	03
LI	00
SW	00
SL	00
Total	03

sessional outcomes (SOs)	**Labor-atory Instruc-tion (LI)**	**Classroom Instruction (CI)**	**Self Learning (SL)**
2SO1.Students will gain knowledge about The role of stakeholders in curriculum development **2SO2**.Students will gain knowledge about Strategies for effective curriculum **2SO3**.Students will gain knowledge about Addressing challenges in curriculum delivery		**Unit2: Curriculum Implementation** 2.1.The role of stakeholders in curriculum development and implementation. 2.3.Strategies for effective curriculum implementation in higher education. 2.3.Addressing challenges in curriculum delivery (resources, training, alignment). .	**1.** Addressing challenges in curriculum delivery

Mini Project: Addressing challenges in curriculum delivery.

CO3:Apply principles of curriculum development to design programs for higher education.

Item	Appx. Hrs
Cl	03
LI	00
SW	00
SL	00
Total	03

sessional outcomes (SOs)	**Labor-atoryInstruc-tion (LI)**	**Classroom Instruction (CI)**	**Self Learning (SL)**
3SO1.Students will gain knowledge about The impact of national and international educational policies **3SO2**.Students will gain knowledge about Understanding accreditation standards and quality assurance **3SO3**.Students will gain knowledge about Policy reform and its effect.		**unit 3: Educational Policy and Curriculum Development** 3.1.The impact of national and international educational policies on curriculum design. 3.2.Understanding accreditation standards and quality assurance in curriculum development. 3.3.Policy reform and its effect on higher education curricula	**1.** Understanding accreditation standards and quality assurance in curriculum development

Mini Review: Policy reform and its effect on higher education curricula.

CO4:Assess the impact of educational policies on curriculum design and implementation.

Item	Appx. Hrs
Cl	03
LI	00
SW	00
SL	00
Total	03

sessional outcomes (SOs)	**Labor-atory Instruc-tion (LI)**	**Classroom Instruction (CI)**	**Self Learning (SL)**
4SO1.Students will gain knowledge about Methods of curriculum evaluation 4SO2.Students will gain knowledge about Developing evaluation frameworks**.** 4SO3.Students will gain knowledge about Linking assessment strategies		**Unit4: Curriculum Evaluation and Assessment** 4.1.Methods of curriculum evaluation (formative, summative, and process-based evaluations). 4.2.Developing evaluation frameworks for educational programs. 4.3.Linking assessment strategies to curriculum objectives.	**1.** Methods of curriculum evaluation (formative, summative, and process-based evaluations).

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CO5:Develop comprehensive evaluation methods for curriculum effectiveness.

Approximate Hours

Item	Appx. Hrs
Cl	03
LI	00
SW	00
SL	00
Total	03

sessional outcomes (SOs)	**Labor-atory Instruc-tion (LI)**	**Classroom Instruction (CI)**	**Self Learning (SL)**
5SO1.Students will gain knowledge about Digital learning and its impact 5SO2.Students will gain knowledge about Globalization and internationalization based on identified educational needs. 5SO3.Students will gain knowledge about developing &Presenting curriculum proposals for peer and instructor feedback. ▪		**unit 5: Emerging Trends in Curriculum Development** 5.1.Digital learning and its impact on curriculum design. Curriculum development for lifelong learning and continuing education. 5.2.Globalization and internationalization of curricula.Developing a curriculum proposal based on identified educational needs. 5.3.Synthesizing research findings into curriculum development. Presenting curriculum proposals for peer and instructor feedback.	**1.** Curriculum development for lifelong learning and continuing education

Brief of Hours suggested for the Course Outcome

Course Outcome	Class lecture(CL)	Sessional work (SL)	Self learning(SL)	Total hours
CO1:Analyze historical and contemporary theories of curriculum development.	03	01	01	05
CO2:Critically evaluate different curriculum design models.	03	00	00	03
CO3:Apply principles of curriculum development to design programs for higher education.	03	00	00	03
CO4:Assess the impact of educational policies on curriculum design and implementation.	03	00	00	03
CO5:Develop comprehensive evaluation methods for curriculum effectiveness	03	00	00	03
Total-	15	01	01	17

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

CO	Unit title	Marks distribution				
		Ap	An	E	C	Total marks
CO1	Foundations of Curriculum Development	01	02	03	04	10
CO2	Curriculum Implementation	01	02	03	04	10
CO3	Educational Policy and Curriculum Development	01	02	03	04	10
CO4	Curriculum Evaluation and Assessment	01	02	03	04	10
CO5	Emerging Trends in Curriculum Development	01	02	03	04	10
	TOTAL-	5	10	15	20	50

Ap: Apply ,An: Analyze, E:Evaluate, C:Create

The end of semester assessment for Introduction 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 tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

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

6. ICT Based Teaching Learning(VideoDemonstration/TutorialsCBT,Blog,Facebook,Twitter, Whatsapp, Mobile, Online sources)

7. Brainstorming

Reference books: Curriculum Studies: Curriculum and the Culture of Schooling (1st Edition) by David J. Flinders and Stephen J. Thornton. Published by Rout ledge in 2013.

. **Philosophy of Education (4th Edition)** by Nel Noddings. Published by Rout ledge in 2016..

- **Curriculum Development in the Postmodern Era (3rd Edition)** by William F. Pinar. Published by Routledge in 2014.

- Ornstein, A. C., & Hunkins, F. P. (2018). *Curriculum: Foundations, Principles, and Issues*. Pearson.
- Gable, R. 2021, The Hiddin Curriculum, Princeton Criversity press, Princeton. ISBN-9780691190761.
- Ellis. V. and Mc Michool, J. 2015. Trasforming teacher Education reconfiguring , the academic work, London, Bloomsbury.
- Mangan, J. A., ed. 2012. The Imperial Curriculum: Racial Images and Education in the British Colonial Experience. Routledge: London. ISBN: 9780415682572.

Beacco, J. C., Fleming, M., Goullier, F. ed. 2016. A Handbook for Curriculum Development and Teacher Training. The Language Dimension in All Subjects with contributions by Joseph Sheils ISBN 978-92-871-8456-6

Curriculum Development Team:

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Course Code: 117PH06

Course Title: Advanced Assessment and Evaluation in Education

Pre-requisite: The research scholar should have knowledge the Assessment and Evaluation of subjects of present day educational system.

Rationale: Student will know about the Assessment and Evaluation of subjects of present day educational system. The student will understand about the role of education in the society. This curriculum provides a structured and in-depth exploration of Assessment and Evaluation, equipping PhD students with theoretical knowledge and practical skills essential for effective teaching and research in education

Course Outcomes:

CO1:Define and understand key concepts in assessment and evaluation.

CO2:Apply various assessment methods to measure different cognitive skills.

CO3:Analyze the strengths and weaknesses of traditional and alternative assessment techniques.

CO4:Evaluate assessment tools for reliability, validity, and fairness

CO5:Create assessments that align with Bloom's Taxonomy to foster deeper learning

Scheme of Studies

Board of Study	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits (C)
			CI	LI	SW	SL	Total Study Hours CI+LI+SW+SL	
		Advanced Assessment and Evaluation in Education	15	00	01	01	17	01

Legend:

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

Boar dof Study	Course Code	Course Title	Scheme of Assessment(Marks)							
			Progressive Assessment(PRA)						End Semeste r Assessm ent (ESA)	Total Marks (PRA+ ESA)
			Class Test -1 (A)	ClassTest 2 , (B)	Mini Review(c)	Seminar(D)	Mini Project (E)	Total Marks (A+B+C + D+ E)		
		Advanced Assessment and Evaluation in Education	10	10	10	10	10	50	50	100

Course-Curriculum Detailing:

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

CO1:Define and understand key concepts in assessment and evaluation

Item	Appx. Hrs
Cl	03
LI	00
SW	01
SL	01
Total	05

sessional outcomes (SOs)	**Labor-atoryInstruc-tion (LI)**	**Classroom Instruction (CI)**	**Self Learning (SL)**
1SO1.Students will gain knowledge about Definition and types of assessment 1SO2.Students will gain knowledge about Distinction between assessment and evaluation 1SO3.Students will gain knowledge about Overview of Bloom's Taxonomy.		**unit 1: Introduction to Assessment and Evaluation** 1.1.Definition and types of assessment (formative, summative, diagnostic). 1.2.Distinction between assessment and evaluation. 1.3.Overview of Bloom's Taxonomy: its application to assessment.	Overview of Bloom's Taxonomy

SW-1 Suggested Sessional Work(SW): Importance of assessment and evaluation in education

CO2:Apply various assessment methods to measure different cognitive skills.

Item	Appx. Hrs
Cl	03
LI	00
SW	00
SL	00
Total	03

sessional outcomes (SOs)	**Labor-atoryInstruc-tion (LI)**	**Classroom Instruction (CI)**	**SelfLearning (SL)**
2SO1.Students will gain knowledge about Using Bloom's Taxonomy to design assessments 2SO2.Students will gain knowledge about Developing questions for different cognitive levels 2SO3.Students will gain knowledge about Constructing assessments for higher-order thinking skills.		**unit2: Aligning Assessments with Bloom's Taxonomy** 2.1.Using Bloom's Taxonomy to design assessments The three categories of the bloom Taxonomy cognitive Domain, Affective Domain, psychomotor Domain. 2.2.Developing questions for different cognitive levels: remembering, understanding, applying, analyzing, evaluating, and creating. 2.3.Constructing assessments for higher-order thinking skills (HOTS).	1. The three categories of the bloom Taxonomy cognitive Domain affective Domain psychomotor Domain.

Mini Project: Developing questions for different cognitive levels.

CO3:Analyze the strengths and weaknesses of traditional and alternative assessment techniques.

Item	Appx. Hrs
Cl	03
LI	00
SW	00
SL	00
Total	03

sessional outcomes (SOs)	**Labor-atoryInstruc-tion (LI)**	**Classroom Instruction (CI)**	**SelfLearning (SL)**
3SO1.Students will gain knowledge about assessment validity 3SO2.Students will gain knowledge about Addressing fairness and bias in assessments 3SO3.Students will gain knowledge about Advantages and challenges of performance-based and authentic assessments .		**unit 3: Validity, Reliability, and Fairness in Assessment** 3.1.Understanding and measuring assessment validity (content, construct, criterion-related).Exploring reliability in assessments (test-retest, internal consistency). 3.2.Addressing fairness and bias in assessments.Exploring alternative assessment methods: portfolios, projects, presentations, peer and self-assessment. 3.3.Advantages and challenges of performance-based and authentic assessments.Using rubrics and criteria-based assessments.	1. Advantages and challenges of performance-based and authentic assessments.Using rubrics and criteria-based assessments.

Mini Review: Advantages and challenges of performance-based and authentic assessments.Using rubrics and criteria-based assessments.

CO4:Evaluate assessment tools for reliability, validity, and fairness.

Item	Appx. Hrs
Cl	03
LI	00
SW	00
SL	00
Total	03

sessional outcomes (SOs)	**Labor-atoryInst ruc-tion (LI)**	**Classroom Instruction (CI)**	**SelfLearning (SL)**
4SO1.Students will gain knowledge about Using data to drive educational improvement 4SO2.Students will gain knowledge about formative and summative evaluation 4SO3.Students will gain knowledge about Designing and implementing evaluation frameworks		**unit 4: Data-Driven Evaluation and Program Assessment** 4.1.Using data to drive educational improvement. 4.2.Program evaluation methods: formative and summative evaluation. 4.3.Designing and implementing evaluation frameworks. .	Program evaluation methods: formative and summative evaluation.

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CO5:Create assessments that align with Bloom's Taxonomy to foster deeper learning

Item	Appx. Hrs
Cl	03
LI	00
SW	00
SL	00
Total	03

sessional outcomes (SOs)	**Labor-atoryInstruc-tion (LI)**	**Classroom Instruction (CI)**	**SelfLearning (SL)**
5SO1.Students will gain knowledge about Designing assessments for diverse learning environments 5SO2.Students will gain knowledge about Creating assessments for formative and summative purposes 5SO3.Students will gain knowledge about The role of assessment in student motivation and engagement.		**unit 5: Creating Effective Assessments** 5.1.Designing assessments for diverse learning environments Integrating Bloom's Taxonomy in course-level and program-level assessments. 5.2.Creating assessments for formative and summative purposes Ethical issues in educational assessment. 5.3.The role of assessment in student motivation and engagement Dealing with high-stakes assessments and their implications on learning.	**1.** Bloom's Taxonomy in course-level and program-level assessments

Brief of Hours suggested for the Course Outcome

Course Outcome	Class lecture(CL)	Sessional work (SL)	Self learning(SL)	Total hours
CO1:Define and understand key concepts in assessment and evaluation.	03	01	01	05
CO2:Apply various assessment methods to measure different cognitive skills.	03	00	00	03
CO3:Analyze the strengths and weaknesses of traditional and alternative assessment techniques.	03	00	00	03
CO4:Evaluate assessment tools for reliability, validity, and fairness	03	00	00	03
CO5:Create assessments that align with Bloom's Taxonomy to foster deeper learning	03	00	00	03
Total-	15	01	01	17

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

CO	Unit title	Marks distribution				
		Ap	An	E	C	Total marks
CO1	Introduction to Assessment and Evaluation	01	02	03	04	10
CO2	Aligning Assessments with Bloom's Taxonomy	01	02	03	04	10
CO3	Validity, Reliability, and Fairness in Assessment	01	02	03	04	10
CO4	Data-Driven Evaluation and Program Assessment	01	02	03	04	10
CO5	Creating Effective Assessments	01	02	03	04	10
	TOTAL-	5	10	15	20	50

Ap: Apply ,An: Analyze, E:Evaluate, C:Create
The end of semester assessment for Introduction 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 tasks as per requirement, for end semester assessment.
Suggested Instructional/Implementation Strategies:

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

6. ICT Based Teaching Learning(VideoDemonstration/TutorialsCBT,Blog,Facebook,Twitter, Whatsapp, Mobile, Online sources)

7. Brainstorming

Referencebooks : Assessment and Evaluation in Higher Education (1st Edition) by John Gardner. Published by Routledge in 2019

- **Learning Theories: An Educational Perspective (8th Edition)** by Dale H. Schunk. Published by Pearson in 2023.
- **lassroom Assessment: Principles and Practice for Effective Standards-Based Instruction (6th Edition)** by James H. McMillan. Published by Pearson in 2017.
- **Developing and Validating Multiple-Choice Test Items (3rd Edition)** by Laura A. V. Behar-Horenstein and Steven B. D. McFadden. Published by Jossey-Bass in 2019..

- Nitko, A. J., & Brookhart, S. M. (2011). *Educational Assessment of Students*. Pearson.
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- Guskey, T. R., & Jung, L. A. (2013). *Answers to Essential Questions About Standards, Assessments, Grading, and Reporting*. Corwin.
- **Curriculum Development Team**:
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Course Code: - 117PH02

Course Title: - ADVANCE IN AGRICULTURAL ECONOMIC ANALYSIS

Pre requisite: -Student should have advance knowledge of Agricultural Economics

Rationale: - A advance in Agricultural Economic **Analysis** of PhD degree is the express through the concept and procurers with provide the advanced information and economic analysis for researchers of economics and agricultural economics as analyst and professionals in accurate manners. Professional or economics researchers should skill the research to apply for achieves the fixed goal and desire. Also the advanced in economic analysis is help for understands of judging the new knowledge and research problems is appropriate for researchers of economics and resolve the issues.

Course Outcomes:

117PH02 CO 01 - Apply the macroeconomic theory as theory of consumer behaviour and welfare of consumers

117PH02 CO 02 - Inculcate the macroeconomic, analysis for different research issue as economic analysis

117PH02 CO 03 - Analyze the price and pricing policy and their application in advance research in economics

117PH02 CO 04 - Apply the welfare economics theory and principal in achieve the different economic aspects in particular researches

117PH02 CO 05 - Evaluate the macro economics principle as Keynesian theory, Theory of unemployment, Inflation and Productivity and distribution - Fiscal policy

Scheme of studies

Board of Study	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			C l	LI	SW	SL	Total Study Hours (CI+LI+SW +SL)	
Program Core (PCC)	117PH02	Advance In Agricultural Economic Analysis	2	2	1	1	06	03

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

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

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

SL: Self Learning

C: Credits.

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

Scheme of Assessment:

Categories of Courses	Course Code	Course Title	**Scheme of Assessment (Marks)**							
			Progressive Assessment (PRA)						**End Semester Assessment (ESA)**	**Total Marks** (PRA+ ESA)
			Class Test I A	Class Test 2 B	Mini Review C	Seminar D	Mini Project E	Total Marks (A+B+C +D+E)		
(PCC)	117PH 02	Advance In Agricultural Economic Analysis	10	10	10	10	10	50	50	100

Course-Curriculum Detailing:

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

117PH02 CO 01 - Apply the macroeconomic theory as theory of consumer behaviour and welfare of consumers

Approximate Hours

Item	Appx hrs
C l	10
LI	0
SW	02
SL	02
Total	**14**

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self Learning (SL)**
SO1.1- Brief Introduction about consumer theory **SO1.2** – Briefly define the Income Effect and Substitution Effect **SO1.3 -** Discuss the consumers' welfare – consumer's surplus **SO1.4-** Describe the Inerrability of demand functions **SO1.5** -Explain the household model and time allocation	**LE1.1 –**	**Unit-1.0** **Theory of consumer behavior – Duality in consumer theory - expenditure function and indirect utility function - Measurement of Income Effect and Substitution Effect. Measurement of Changes in Consumers' Welfare – Consumer's Surplus, Compensating Variation and Equivalent Variation - Dynamic versions of demand functions – Inerrability of demand functions. Applications of consumer theory – Household model and time allocation – Labour supply decisions by households.** **1.1-** Theory of consumer behavior **1.2-** Duality in consumer theory **1.3 -** Expenditure and indirect utility function **1.4 -** Income Effect and	**1.1-**Prepare the assignment on Duality in consumer theory

		Substitution Effect **1.5 -** Consumer's Surplus **1.6-** Compensating Variation and Equivalent Variation **1.7** Dynamic versions of demand function **1.8** Applications of consumer theory **1.9** Household model and time allocation **1.10** Labour supply decisions by households	

SW-1 Suggested Sessional Work (SW):

a. Assignments: Prepare the assignment on Duality in consumer theory

b. Mini Project: -

c. Other Activities (Specify)

117PH02 CO 02 - Inculcate the macroeconomic, analysis for different research issue as economic analysis

Approximate Hours

Item	Appx hrs
C l	08
LI	00
SW	02
SL	02
Total	**12**

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO2.1 – Introduce to Perfect competition **SO2.2 –** Learned about the monopolistic competition and oligopoly **SO2.3-** Briefing about the oligopoly models **SO2.4-** Discuss about the general equilibrium theory **SO 2.5–**Explain the general equilibrium conditions	**LE2.1**	**Unit-2.0- Perfect competition – Monopoly, monopolistic competition and oligopoly. Oligopoly models – collusive and non-collusive models of oligopoly. General equilibrium theory – Conceptual overview - General equilibrium conditions with Production and Consumption.** **2.**1– Perfect competition **2.2** - Monopoly, monopolistic competition **2.3-** Oligopoly **2.4-**Collusive and non-collusive models 2.5- General equilibrium **2.6-**General equilibrium theory **2.7-**Conceptual overview **2.8** - General equilibrium conditions	**2.1 –** Prepare the assignment on Perfect competition

SW-1 Suggested Sessional Work (SW):

a. Assignments: Prepare the assignment on Perfect competition

b. Mini Project:

c. Other Activities (Specify):

117PH02 CO 03 - Analyze the price and pricing policy and their application in advance research in economics

Approximate Hours

Item	Appx hrs
C l	08
LI	00
SW	02
SL	02
Total	**12**

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO3.1 – Define the Market failure **SO3.2 –** Briefing the Incomplete markets **SO3.3-** Discuss the concept of Welfare Economics **SO3.4-** Explain the limitations of Welfare Economics **SO3.5**– Describe the pareto conditions of maximum welfare	**LE3.1**	**Unit-3.0 Market failure - Incomplete markets - Asymmetric information – Principal-Agent problem, adverse selection and moral hazard. Welfare Economics - Concepts, problems, approaches and limitations of Welfare Economics, Pareto conditions of maximum welfare – Criteria for social welfare** 3.1- Market failure 3.2- Incomplete markets 3.3-Asymmetric information 3.4- Agent problem 3.5- Welfare Economics 3.6- Problems of Welfare Economics 3.7- Approaches of Welfare Economics 3.8- Pareto conditions of maximum welfare	**3.1** Prepare the assignment on Incomplete markets - Asymmetric information

SW-1 Suggested Sessional Work (SW):

a. Assignments: Prepare the assignment on incomplete markets - Asymmetric information

b. Mini Project:

c. Other Activities (Specify):

117PH02 CO 04 - Apply the welfare economics theory and principal in achieve the different economic aspects in particular researches

Approximate hours

Item	App X Hrs
Cl	09
LI	00
SW	02
SL	02
Total	**13**

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self Learning (SL)**
SO 4.1 –Define the concept of macro economics **SO 4.2 -** Briefing the comparative statistics of macro economics **SO 4.3-**Discuss the consumption function **SO 4.4-** Briefing the theories of Saving **SO 4.5**–Explain the savings and investment equality	**LE1.1 -**	**Unit-4.0 Review of Macro Economics concepts-Comparative statistics- Keynesian theory- Consumption Function and Theories of Consumption - Saving Function and Theories of Saving. Theories of investment-Savings and investment equality** 4.1- Macro Economics 4.2-Thories of macro economics 4.3- Comparative statistics of macro economics 4.4- Consumption function 4.5- Theories of Consumption 4.6- Saving Function 4.7- Theories of Saving 4.8 - Theories of investment	**4.1-**Prepare the assignment on Consumption Function and Theories of Consumption

		4.9- Savings and investment equality	

SW-1 Suggested Sessional Work (SW):

a. Assignments: Prepare the assignment on Consumption Function and Theories of Consumption

b. Mini Project:

c. Other Activities (Specify):

117PH02 CO 05 - Evaluate the macro economics principle as Keynesian theory, Theory of unemployment, Inflation and Productivity and distribution - Fiscal policy

Approximate Hours

Item	AppX Hrs
Cl	10
LI	00
SW	02
SL	02
Total	14

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self Learning (SL)**
SO5.1 –Define the stagflation **SO5.2-** Briefing the Fiscal policies **SO5.3-** Discuss about the Foreign Exchange Policy **SO5.4-** Discuss about the Impact of WTO **SO 5.5** Explain the Impact of IMF & IBRD	**LE1.**	**Unit-5.0- Stagflation and Supply side Economics - Theory of Unemployment, Inflation, Productivity and distribution - Fiscal policy. BOP & Adjustment Policies - Foreign Exchange Policy - Foreign sector : Capital and Current Account - Impact of WTO on Indian Economy - Impact of IMF & IBRD on Indian Economy - Review of Macro Economic Policies in India.** 5.1- Stagflation 5.2- Supply side Economics 5.3 Theory of Unemployment 5.4- Inflation 5.5- Fiscal policy 5.6- BOP & Adjustment Policies 5.7- Foreign Exchange	**5.1 -**Prepare the assignment on Stagflation and Supply side Economics

		Policy 5.8- Impact of WTO on Indian Economy 5.9- Impact of IMF & IBRD on Indian Economy 5.10- Review of Macro Economic Policies in India	

SW-1 Suggested Sessional Work (SW):

a. Assignments: Prepare the assignment on Stagflation and Supply side Economi

b. Mini Project:

c. Other Activities (Specify):

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (C l)	Laboratory Lecture (L I)	Sessional Work (SW)	Self Learning (S l)	Total hour (C l + LI+ SW +S l)
CO 01 -Apply the macroeconomic theory as theory of consumer behavior and welfare of consumers	10	00	02	02	14
CO02- Inculcate the macroeconomic, analysis for different research issue as economic analysis	08	00	02	02	12
CO 03 Analyze the price and pricing policy and their application in advance research in economics	08	00	02	02	12
CO 04 - Apply the welfare economics theory and principal in achieve the different economic aspects in particular researches	09	00	02	02	13
CO 05 - Evaluate the macro economics principle as Keynesian theory, Theory of unemployment, Inflation and Productivity and distribution - Fiscal policy	10	00	02	02	14
Total Hours	**45**	**00**	**10**	**10**	**65**

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit title	Marks Distribution				Total Marks
		Ap	An	E	C	
CO-1	Theory of consumer behavior – Duality in consumer theory	03	02	03	02	10
CO-2	Perfect competition – Monopoly, monopolistic competition and oligopoly. Oligopoly models	02	03	03	02	10
CO-3	Market failure - Incomplete markets - Asymmetric information	02	03	04	01	10
CO-4	Review of Macro Economics concepts- Comparative statistics- Keynesian theory.	02	04	03	01	12
CO-5	Stagflation and Supply side Economics	02	01	02	05	10
	Total	11	13	15	11	50

Legend:

Ap: Apply, An: Analysis, E: Evaluate C: Create

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

Suggested Learning Resources:

S. No.	Title	Author	Publisher	Edition & Year
01.	Principles of Economics	Robort Frank, Ben Bernanke, Katl, Antonovics & Ori-Heffetz	Mc Graw Hill	2024
02.	Macro Economic Analysis	Dirk Nilpelt	The MIT Press Combrids, Massachsetts Landan Eglend	2019
03.	Modern Economics Theory and Application	Bradle Bradeley R.Schiller	S Chand Publishing	2017
04.	Modern Economics	Dr. K.K. Dewett	S Chand Publishing	2010

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Cos, POs and PSOs Mapping

Course Code:- 117PH02

Course Title: - ADVANCE IN AGRICULTURAL ECONOMIC ANALYSIS

Course Outcomes	Program Outcomes												Program Specific Outcome			
	PO1	PO2	PO3	PO 4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3	PSO 4
	Man agerial kno wled ge	Pro ble m anal ysis	Mod ern tool usag e	Eth ics	Indiv idual and team work	Com muni cati on	Proj ect man age men t and fina nce	Busi ness deci sion mak ing	Life-long lear ning	Envi ron men t and sust aina bilit y	Entr epre neur ial opp ortu nitie s	Glo bal outl ook	Ability to apply managerial and business skilled for development of business growth with the available resources	Ability to understand the day to day business operational problems and startup development of agribusiness and provide economical solution to enhance the decide goal without compromising	Inculcate proactive thinking to ensure effective performance in the dynamic socio-economic and business ecosystem entrepreneurial approach and skill sets aligned with the national	Ability to use the research based innovative knowledge for sustainable development in agribusiness growth and develops

														ethical value	prioritie s	
CO 01 - Apply the macroeconomic theory as theory of consumer behavior and welfare of consumers	3	1	1	2	1	1	1	2	3	2	1	3	3	1	2	1
CO 02 Inculcate the macroeconomic, analysis for different research issue as economic analysis	3	2	1	2	2	2	1	3	2	1	2	3	3	2	2	3
CO 03 Analyze the price and pricing policy and their application in advance research in economics	3	2	1	2	2	2	3	2	1	2	3	3	2	3	3	3

CO 04 - Apply the welfare economics theory and principal in achieve the different economic aspects in particular researches	2	2	3	1	2	2	3	2	1	2	1	1	3	3	2	2
CO 05 - Evaluate the macro economics principle as Keynesian theory, Theory of unemployment, Inflation and Productivity and distribution - Fiscal policy	2	3	3	1	3	2	2	2	2	1	1	2	2	2	2	2

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map: ADVANCE IN AGRICULTURAL ECONOMIC ANALYSIS

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction(LI)	Classroom Instruction (CI)	Self Learning (SL)
PO 1,2,3,4,5,6 7,8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO 01** - To recognize the macroeconomic theory as theory of consumer behavior and welfare of consumers	**SO1.1** **SO1.2** **SO1.3** **SO1.4** **SO1.5**		**Unit-1.0** **Theory of consumer behavior – Duality in consumer theory - expenditure function and indirect utility function - Measurement of Income Effect and Substitution Effect. Measurement of Changes in Consumers' Welfare – Consumer's Surplus, Compensating Variation and Equivalent Variation - Dynamic versions of demand functions – Inerrability of demand functions. Applications of consumer theory – Household model and time allocation – Labour supply decisions by households.** 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9.1.10	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 02** To examine the macroeconomic, analysis for different research issue as economic analysis	**SO1.1** **SO1.2** **SO1.3** **SO1.4** **SO1.5**		**Unit-2.0-** **Perfect competition – Monopoly, monopolistic competition and oligopoly. Oligopoly models – collusive and non-collusive models of oligopoly. General equilibrium theory – Conceptual overview - General equilibrium conditions with Production and Consumption.** 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8.	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 03** To analyze the price and pricing policy and their application in advance research in	**SO1.1** **SO1.2** **SO1.3** **SO1.4** **SO1.5**		**Unit-3.0** **Market failure - Incomplete markets - Asymmetric information – Principal-Agent problem, adverse selection and moral hazard. Welfare Economics - Concepts, problems, approaches and limitations of Welfare Economics, Pareto conditions of**	As mentioned in page number ……..

	economics			**maximum welfare – Criteria for social welfare** 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8.	
PO 1,2,3,4,5,6 7,8,9,10,11,12 PSO 1,2, 3, 4, 5	**CO 04** To apply the welfare economics theory and principal in achieve the different economic aspects in particular researches	**SO1.1** **SO1.2** **SO1.3** **SO1.4** **SO1.5**		**Unit-4.0** **Review of Macro Economics concepts- Comparative statistics- Keynesian theory- Consumption Function and Theories of Consumption -Saving Function and Theories of Saving. Theories of investment-Savings and investment equality** 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 4.9.	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 05** Evaluate the macro economics principle as Keynesian theory, Theory of unemployment, Inflation and Productivity and distribution - Fiscal policy	**SO1.1** **SO1.2** **SO1.3** **SO1.4** **SO1.5**		**Unit-5.0-** **Stagflation and Supply side Economics - Theory of Unemployment, Inflation, Productivity and distribution - Fiscal policy. BOP & Adjustment Policies - Foreign Exchange Policy - Foreign sector : Capital and Current Account - Impact of WTO on Indian Economy - Impact of IMF & IBRD on Indian Economy - Review of Macro Economic Policies in India.** 5.1, 5.2, 5.3, 5.4, 5.5, 5.6,5.7, 5.8, 5.9,5.10	As mentioned in page number ……..

Course Code: AGRO - 134 PH02 (3+0)

Course Title: Advances in Agronomy

Pre-requisite: Course study reflects the fundamentals of agronomy hence Ph.D. scholar should fulfil with the sound knowledge of precision agriculture. The study of this course to make scholar as a specialist as agronomist either to conduct filed experiments or to conduct higher classes with justification supported by scientific views, so it required scholars has complete & thorough knowledge of concerned field before taken course work admission

Rationale: Advances in Agronomy is the subject which help to Ph.D. scholars in the area of agriculture as specific expertise, to enhance crop productivity qha^{-1} of agronomical crops. Scholars will become philosopher and do all the work with proper review of literature.

Course Outcomes

Agro 134PH02.1 Ph.D. scholars will able to become philosopher of crop production technology.
Agro 134 PH02.2 Scholars will acquainted with soil- plant- water relationship and scheduling of irrigation
Agro 134 PH02.3 Ph.D. scholar's will familiar with the precision agricultural technologies of cereals, pulses and oilseed crops.
Agro 134 PH02.4 Ph.D. scholars of agronomy may become to expert for using of new innovation in crop production e.g. GIS, GPS and remote sensing
Agro 134 PH02.5 scholars of Ph.D. will become expert in making decision to enhancing crop production

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			CI	LI	SW	SL	Total Study Hours(CI+LI+SW+SL)	
Program core (SDGS)	Agro 134 PH02	Advances in Agronomy	3	0	1	2	6	3

Legend: **CI** Classroom Instructions

(Includes different instructional strategies i.e. Lecture(L),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:

Board of Study	Course Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA +ESA)
			Class test-1 (CT1)	Class test-2 (CT2)	Seminar (S)	Review (R)	Mini project (MP)	Total Marks (CT1+CT2+S+R+MP)		
Program core	Agro 134 PH02	Advances In Agronomy	10	10	10	10	10	50	50	100

Theory

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 134 PH02.1 Ph.D. scholars will able to become philosopher of crop production technology.

Approximate Hours

Item	AppxHrs.
CI	5
LI	00
SW	02
SL	01
Total	08

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO1.1 To impart knowledge about irrigation **SO1.2** Enlist the water resources of irrigation in India **SO1.3**To understand irrigation needs of crops **SO1.4.**To makestudy in details soil-plant-water relationship **SO1.5**.Study of CSC for differentcrops.		Unit-1. Water resources of India, IRG and IRN, irrigation needs of crops, criteria deciding for irrigation, scheduling of irrigation, soil-plant-water relationship, evaporation, transpiration. 1. Detail study conducted about soil-plant water relationship 2. Enlist the water resources of India. 3. Give necessary instruction in relationtsscheduling of irrigation & CSC. 4. Studies how to differentiate IRG and IRN. 5.To explain about evaporation & transpiration and factor affecting for both	1. Prepare assignment with suitable figure about soil-plant-water relationship. 2. Make a study of critical stages of different crops. 3. Prepare a chart about water resources of India.

SW-1 Suggested Sessional Work(SW):

Assignments:- **Other Activities(Specify): Field activities as practices of irrigation methods.**

Agro 134 PH02.2 Scholars will acquainted with soil- plant- water relationship and scheduling of irrigation

Approximate Hours

Item	Appx Hrs.
CI	4
LI	00
SW	02
SL	02
Total	08

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO1.1 Ph.D. scholars make them self as a expertise in agronomy **SO1.2** Gain knowledge about package **&** practicesof crop production **SO1.3** Deals some new technologies e.g. SWI, SMI, SRI, SAI etc. **SO1.4.**The capacity build up how to increase crop productivity.		Unit-II Crop production technologies for wheat, chickpea and mustard. Objectives Describe in details crop production technologies with references. 1.Give details remarks on study of wheat production technologies 2. Study conducted on SWI, SMI etc. 3.Package & practices of chickpea production with reason for low productivity & their measures 4. Instruction given on oilseed production techniques.	1.Scholars of Ph.D. make yourself not amaster but make as a philospher - need a assignment 2 .Prepare a comparative chart of crops in relation to package and practices 3.Study made about calculation of seed rates q ha^{-1}

SW-1 Suggested Sessional Work (SW):

Assignments: Prepare a chart for comparative study of cereals, chickpea and oilseed production technology.

Other Activities(Specify): Visit research farm of AKS University for see the crop cafeteria

Agro 134 PH02.3 3 Ph.D. scholar's will familiar with the precision agricultural technologies of cereals, pulses and oilseed crops.

Approximate Hours

Item	Apprx 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 Ph.D. scholars will become to gain knowledge about rice genotypes & GM rice. **SO1.2** It is explicit from study of oilseed low productivity facts, that scholar should do the efforts in this **regards.** **SO1.3** Scholars acquired knowledge in relation to different types of wheat. **SO1.4**.Express the economic viability of pulses. **SO1.5** Scholer familiar with knowledge of cereals, pulses & oilseed corps.		Unit-3 Rice genotypes, GM rice, types of wheat, measure for increasing pulse production, economic importance of pulses, reason for low productivity of oilseeds. Objectives: To teach in details rice, wheat, pulses and oilseed crops parameter in relation to concerning facts. 1 Explain importance of crops and role of protein in human life. 2 Describe rice genotypes, GM rice and its utility. 3 Give suggestions in class room about to increase oilseed crop productivity. 4 Details instruction in relation to economic importance of pulses. 5 Study of different types of wheat & know about best stapletypes.	1. To prepare comparative chart For detail study. 2. Determine the factors for economic importance of pulses. 3. Studies on several reasons For low productivity of oilseeds.

SW-1 Suggested Sessional Work(SW):

Assignments: To prepare a short notes on all titles of unit No. 3

a. Other Activities(Specify):Field activities.

Agro 134 PH02.4 Ph.D. scholars of agronomy may become to expert for using of new innovation in crop production e.g. GIS, GPS and remote sensing.

Approximate Hours

Item	AppxHrs.
CI	06
LI	00
SW	02
SL	01
Total	09

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO1.1 Ph.D. scholars will become expert to know details about weeds. SO1.2 Scholars acquired knowledge in relation to catchment and command area. SO1.3 Understand the watershed management technology. SO1.4.Scholar make to able self them as ideal teacher. SO1.5 Ph.D. scholar acquainted knowledge in all aspect of agronomical practices.		Unit-4Weeds, damaged caused by weeds, classification of weeds, weeds sampling technique, methods of integrate weed management, dry land farming constraints, farming systems, watershed management. Objectives: To learn about weeds its control &IWM . 1.To Teach the Scientific principles of IWM. 2.Studies on watershed management in details with catchment and commandarea. 3. Instruction on weeds & its classification 4.Introductory remarks on dry farming& its constraints. 5. Describe weed sampling techniques.	1. Ph.D. scholars makea Notes for home study. 2. Scholars prepare a comparativ e chart of weeds classificatio n. 3. Prepare a layout of watershedArea of G.T.C.A. (Govindg ar hTank Comman d Area)

SW-1 Suggested Sessional Work(SW):

Assignments: A ideal assignment bring by students of Ph.D. on watershed management project from S.M.P. of GTCA.

i. **Othe rActivities(Specify): Detail study on weeds, causes & classification.**

Agro 134 PH02.5 scholars of Ph.D. will become expert in making decision to enhancing crop production

Approximate Hours

Item	Appx Hrs.
CI	04
LI	00
SW	01
SL	02
Total	07

Session outcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self-Learning (SL)**
SO1.1 Ph.D. scholars will become to apply GIS, GPS & remote sensing technology. SO1.2 Scholars obtain knowledge towards new technology for crop management. SO1.3 Ph.D. scholars will able to show his expertise in agricultural field. SO1.4.Scholars make your self as a expert to produce breeder seed. SO1.5.They will become as		Unit-5- GIS, GPS and remote sensing for crop management,seed production technologies for breeder seed. Objectives- To teach the modern concept in crop production technology with the view of low cost technology for the purpose of double the income of farmer's in India. 1. Give detail instructions on seed production technology to produce breeder seed from nucleus seed only. 2 Study on drawn technology. Give detail information how to	1. According to instruction given at class they made a model of prescription farming. 2. They make a chart about modern concept in agricultural technology.

good philosopher in the area of agronomy after award of Ph.D. degree		3 Apply GPS, GIS & remote sensing in agriculture for doubling the income of farmers. 4 Ph.D. scholar has expertise in the subject, so in class room weare doing representation by them	

SW-1 Suggested Sessional Work(SW):

Assignments: Preparation of a detailed reports on GIS, GPS and remote sensing technologies for crop management.

Other Activities (Specify): Field activities to gain practical knowledge in area of prescription farming for the purpose of doubling the income of farmers.

Brief of Hours suggested for the Course Outcome

Course Outcomes	**Class Lecture (C l)**	**Laborator y Lecture (L I)**	**Sessional Work (SW)**	**Self Learning (Sl)**	**Total hour (C l + LI+ SW +S l)**
CO-1 Ph.D. scholars will able to become philosopher of crop production technology	05	00	02	01	08
CO 2: Scholars will acquainted with soil- plant- water relationship and scheduling of irrigation	4	00	02	02	8
CO 3:. Ph.D. scholar's will familiar with the precision agricultural technologies of cereals, pulses and oilseed crops.	6	00	02	01	9
CO 4: Ph.D. scholars of agronomy may become to expert for using of new innovation in crop production e.g. GIS, GPS and remote sensing	06	00	02	01	9
CO 5:. scholars of Ph.D. will become expert in making decision to enhancing crop production	04	00	01	02	7
Total Hours	**25**	**00**	**09**	**7**	**41**

Suggested Specification Table (For ESA)

CO	Unit title	Marks Distribution				Total Marks
		A	A	E	C	
CO-1	Water resources of India, IRG and IRN, irrigation needs of crops, criteria deciding for irrigation, scheduling of irrigation, soil-plant-water relationship, evaporation, transpiration	02	02	03	03	10
CO-2	Crop production technologies for wheat, chickpea and mustard.	02	02	03	03	10
CO-3	Rice genotypes, GM rice, types of wheat, measure for increasing pulse production, economic importance of pulses, reason for low productivity of oilseeds	02	02	03	03	10
CO-4	Weeds, damaged caused by weeds, classification of weeds, weeds sampling technique, methods of integrated weed management, dry land farming constraints, farming systems, watershed management.	02	02	03	03	10
CO-5	GIS, GPS and remote sensing for crop management, seed production technologies for breeder seed	02	02	03	03	10
	Total	**10**	**10**	**15**	**15**	**50**

Legend: A: Application, A:Analysis,E:Evaluate, C: Creative

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

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

Suggested Instructional/Implementation Strategies:

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

9. Brainstorming

Suggested Learning Resources:

S. No.	Title	Author	Publisher	Edition & Year
01	Principles of crop production.	Reddy S.R	Kalyani	2000
02	Principles and practices of Agronomy.	Balasubramaniyan p & Palaniappan sp.	Agron bios	2001.
03	Principles and practices of Agronomy	Singh S.S.	Kalyani publication	2006.

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Cos, POs, and PSOs Mapping Course Code:- AGRO - 134 PH02 Course Title: - Advances in Agronomy

Course Outcomes	Program Outcomes									Program Specific Outcome				
	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 dissemination regarding various technique of farming and farming system in India	Wide knowledge in the concerning subject which will improvethe farmers condition through student's contributions.	Detailed knowledge regarding package and practicessoil fertilizer and water management of productive crop aspects.	Use appropriate scientific methods collaboration with statistics along with evaluation which will proved to decision in various part of agric	Detailed knowledge of cultivation practices, soil, fertilizers, water management and plant protection economic associated with farming enterprises.	Create, select and apply an appropriate techniques, resources and modern it tools in improvement of agronomical package and practices.	Student will apply various statistical methods to analyze their master researchwork	Student will apply basic concepts in laboratory techniques during their research work	Understand the impact of the professional expert solutions in societal and environmental contexts, and demonstrate the knowledgeof, and need for sustainable development in Agriculture.	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.	Acquaintingwith basic concepts theories and terminologyof Agronomy.	To undertake teaching research and extension activates along with administrative and consultancy services.	Apply research and expertise in resolving the problems of existing farm in the periphery of universities.	To understand and analyze the current issues that are occurring in local and global agriculture and how theywill affect futuristic agriculture

				ultur e										
CO-1 Ph.D. scholars will able to become philosopher of crop production technology	3	3	3	1	1	3	3	1	3	2	3	3	3	3
CO 2 Scholars will acquainted with soil-plant- water relationship and scheduling ofirrigation	3	1	3	1	1	3	2	1	3	3	2	3	3	1
CO 3:. Ph.D. scholar's will familiar with the precision agricultural technologie s of cereals, pulses and oilseed crops.	3	3	3	1	3	3	3	3		1	3	2	3	2
CO 4: Ph.D. scholars of	3	2	3	1	3	3	2	1	3	3	3	3	2	3

agronomy may become to expert for usingof new innovation in crop production e.g. GIS, GPSand remote sensing														
CO 5:. scholars ofPh.D. will become expert in making decision to enhancing crop productio n	3	3	3	1	3	3	3	1	3	2	3	3	3	1

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map: Advances in Agronomy

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	**CO-1** Ph.D. scholars will able to become philosopher of crop production technology	**SO1.1** **SO1.2** **SO1.3** **SO1.4**		Water resources of India, IRG and IRN, irrigation needs of crops, criteria deciding for irrigation, scheduling of irrigation, soil-plant-water relationship, evaporation, transpiration 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 2** Scholars will acquainted with soil- plant- water relationship and scheduling of irrigation	**SO1.1** **SO1.2** **SO1.3** **SO1.4** **SO1.5**		Crop production technologies for wheat, chickpea and mustard. 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	**CO 3:**. Ph.D. scholar's will familiar with the precision agricultural technologies of cereals, pulses and oilseed crops.	**SO1.1** **SO1.2** **SO1.3** **SO1.4** **SO1.5**		Rice genotypes, GM rice, types of wheat, measure for increasing pulse production, economic importance of pulses, reason for low productivity of oilseeds. 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:** Ph.D. scholars of agronomy may become to expert for using of new innovation in crop production e.g. GIS, GPS and remote sensing	**SO1.1** **SO1.2** **SO1.3** **SO1.4** **SO1.5**		Weeds, damaged caused by weeds, classification of weeds, weeds sampling technique, methods of integrated weed management, dry land farming constraints, farming systems, watershed management. 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	**CO 5:**. scholars of Ph.D. will become	**SO1.1** **SO1.2**		GIS, GPS and remote sensing for crop management, seed production	As mentioned in page number ……..

PSO 1,2, 3, 4, 5	expert in making decisionto enhancing cropproduction	**SO1.3** **SO1.4**		technologies for breeder seed. 1.1.1.2.1.3,1.4,1.5	

Course Code: 132PH02

Course Title: Advances in Genetics & Plant Breeding

Pre- requisite: To impart practical, understand the molecular and genetic basis of plant breeding theoretical, and advance scientific knowledge about genetics and plant breeding which will help the student in their field of research.

Rationale: After completion of this course the student will be able to well verse with the stress and its causes. This will enable the students for the development of RIL, NIL, FISH, GISH etc. for pest resistance and use of standard MAS procedures Explore advanced techniques in genetics and breeding strategies.

Course Outcomes:

132PH02: Students are able to understand historical perspective need for conservation taxonomical classification and center of origin and plant genetic resources.

132PH02: Students are able to learn about biometrical genetics, models designs and system and the mitochondrial genomes and complexity.

132PH02: To understand about the karyotyping chromosome painting introgressions, mapping, distance hybridization and allopolyploids.

132PH02: Students are learn about trisomics breeding behavior and location of gene, allelic interactions and telocentric method of mapping.

132PH02: Students are gain knowledge about self-incompatibility and male sterility and comparison of genome sequence using tools of bioinformatics.

Scheme of Studies:

Board of Study	**Course Code**	**Course Title**	**Scheme of studies (Hours/Week)**					**Total Credits (C)**
			CI	**LI**	**SW**	**SL**	**Total Study Hours CI+LI+SW+SL**	
Program Core (PCC)	**132PH02**	**Advances in Genetics & Plant Breeding**	3	0	0	0	3	**3**

Legend:

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

locations using different instructional strategies), **SW:** Sessional Work (includes assignment, seminar, mini project etc.), **SL:** Self Learning, **C:** Credits.

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

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ESA)
			Class Test 1st (T-1)	Class Test 2nd (T-2)	Mini Review (MR)	Seminar one (SA)	Mini Project (MP)	Total Marks (T1+T2+MR+SA+MP)		
	132PH02	**Advances in Genetics & Plant Breeding**	10	10	10	10	10	50	50	100

Course-Curriculum Detailing:

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

CO.1: Students are able to understand historical perspective need for conservation taxonomical classification and center of origin and plant genetic resources.

Item	Approximate Hours
CI	**11**
LI	**0**
SW	**2**
SL	**1**

Total	**14**

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO1.1. Students are able to explain Historical perspectives and need for PGR conservation. **SO 1.2.** Students are able to explain Importance of plant genetic resources. **SO 1.3.** Students are able to explain Taxonomical classification of cultivated plants. **SO 1.4.** Students are able to explain Gene pool: primary, secondary and tertiary. **SO 1.5.** Students are able to explainCentres of origin and global pattern of diversity. **SO 1.6.** Students are able to explain Basic genetic resources and transgenes. **SO 1.7.** Students are able to explain Germplasm conservation- in situ, ex situ. **SO 1.8.** Students are able to explain On-farm Short, medium and long term conservation.		**Unit-1. Historical perspective need for conservation taxonomical classification and center of origin and plant genetic resources.** **1.1.** Historical perspectives and need for PGR conservation. **1.2.** Importance of plant genetic resources. **1.3.**Taxonomical classification of cultivated plants. **1.4.**Gene pool: primary, secondary and tertiary. **1.5.**Centres of origin and global pattern of diversity. **1.6.**Basic genetic resources and transgenes. **1.7.**Germplasm conservation- in situ, ex situ. **1.8.**On-farmShort, medium and long term conservation. **1.9.**strategies for conservation of orthodox seed.	**1**.Germplasm conservation- in situ, ex situ conservation.

SO 1.9. Students are able to explain strategies for conservation of orthodox seed. **SO 1.10.** Students are able to explain strategies for conservation of vegetative propagated crops. **SO 1.11.** Students are able to explain Registration of plant genetic resources.		**1.10.**Strategies for conservation of vegetative propagated crops. **1.11.** Registration of plant genetic resources.	

SW-1 Suggested Sessional Work (SW):

a. Assignments:

Strategies for conservation of vegetative propagated crops.

Mini Project:

Registration of plant genetic resources.

b. Other Activities (Specify):

CO.2: Students are able to learn about biometrical genetics, models designs and system and the mitochondrial genomes and complexity.

Item	**Approximate Hours**
CI	**8**
LI	**0**
SW	**2**
SL	**1**
Total	**11**

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO2.1.Students are able to explain Basic principles of Biometrical Genetics. **SO2.2**. Students are able to explain Selection of parents. **SO2.3**. Students are able to explain Advanced biometrical models for combining ability analysis. **SO2.4**. Students are able to explain Simultaneous selection models, Use of Multiple regression analysis. **SO2.5**. Students are able to explain Selection of genotypes, Designs and Systems. **SO2.6**. Students are able to explain Selection of stable genotypes. **SO2.7**. Students are able to explain Introduction to the plant genome- Plant nuclear genomes and their molecular description. **SO2.8**. Students are able to explain the chloroplast and the mitochondrial genomes in plants - Genome size and complexity.		**Unit-2. Biometrical genetics, models designs and system and the mitochondrial genomes and complexity.** **2.1**. Basic principles of Biometrical Genetics. **2.2**. Selection of parents. **2.3**. Advanced biometrical models for combining ability analysis. **2.4**. Simultaneous selection models, Use of Multiple regression analysis. **2.5**. Selection of genotypes, Designs and Systems. **2.6**. Selection of stable genotypes. **2.7**. Introduction to the plant genome- Plant nuclear genomes and their molecular description. **2.8**. The chloroplast and the mitochondrial genomes in plants - Genome size and complexity.	**1**.Chloroplast and the mitochondrial genomes in plants - Genome size and complexity.

SW-2 Suggested Sessional Work (SW):

a. Assignments:

Advanced biometrical models for combining ability analysis.

b. Mini Project:

Genome size and complexity.

c. Other Activities (Specify):

CO.3: To understand about the karyotyping chromosome painting introgressions, mapping, distance hybridization and allopolyploids.

Item	Approximate Hours
CI	**5**
LI	**0**
SW	**2**
SL	**1**
Total	**8**

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO3.1. Karyotyping – Chromosome banding and chromosome painting. **SO3.2.**Tracking introgressions using FISH, GISH. **SO3.3.**Loclalization and mapping of genes/genomic segments. **SO3.4.**Distant hybridization - Role of polyploids in crop evolution. **SO3.5.**Breeding - auto and allopolyploids.		**Unit3 Karyotyping chromosome painting introgressions, mapping, distance hybridization and allopolyploids.** **3.1.** Karyotyping – Chromosome banding and chromosome painting. **3.2.** Tracking introgressions using FISH, GISH. **3.3.** Loclalization and mapping of genes/genomic segments. **3.4.** Distant hybridization - Role of polyploids in crop evolution. **3.5.** Breeding - auto and allopolyploids.	**1**.Distant hybridization - Role of polyploids in crop evolution.

SW-3 Suggested Sessional Work (SW):

a. **Assignments:**
   Chromosome banding and chromosome painting.
b. **Mini Project:**
   Tracking introgressions using FISH, GISH.
c. **Other Activities (Specify):**

CO.4: Students are learn about trisomics breeding behavior and location of gene, allelic interactions and telocentric method of mapping.

Item	Approximate Hours
CI	**8**
LI	**0**
SW	**2**
SL	**1**
Total	**11**

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO4.1. Students are able to explainTrisomics- types, production. **SO4.2.**Students are able to explain Breeding behavior and location of genes. **SO4.3.** Students are able to explain Use of balanced tertiary trisomics in hybrid seed production. **SO4.4.** Students are able to explainMonosomics methods of production.		**Unit 4. Trisomics breeding behavior and location of gene, allelic interactions and telocentric method of mapping.** **4.1.**Trisomics- types, production. **4.2.**Breeding behavior and location of genes. **4.3.**Use of balanced tertiary trisomics in hybrid seed production. **4.4.**Monosomicsmethods of production.	**1.**Intervarietal non-allelic interactions.

SO4.5. Students are able to explain Breeding behavior and location of genes. **SO4.6.** Students are able to explainIntervarietal substitutions-allelic interactions. **SO4.7.** Students are able to explainIntervarietal non-allelic interactions. **SO4.8.** Students are able to explain Telocentric method of mapping.		**4.5.**Breeding behavior and location of genes. **4.6.**Intervarietal substitutions-allelicinteractions. **4.7.**Intervarietal non-allelic interactions. **4.8.**Telocentric method of mapping.	

SW-4 Suggested Sessional Work (SW):

a. **Assignments:**
   Breeding behavior and location of genes.
b. **Mini Project:**
   Breeding behavior and location of genes.
c. **Other Activities (Specify):**

CO.5: Students are gain knowledge about self-incompatibility and male sterility and comparison of genome sequence using tools of bioinformatics.

Item	Approximate Hours
CI	**13**
LI	**0**
SW	**2**
SL	**1**
Total	**16**

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO5.1. Students are able to explain self- incompatability and sterility. **SO5.2.**Students are able to explain types of self incompatability. **SO5.3.**Students are able to explain homomorphic (sporophytic and gametophytic). **SO5.4.**Students are able to explainheteromorphic - Breakdown of incompatibility. **SO5.5.**Students are able to explain floral adaptive mechanisms. **SO5.6.**Students are able to explain spatial and temporal. **SO5.7.**Students are able to explain genetic and biochemical basis of self-incompatibility. **SO5.8.**Students are able to explain sterility: male and female sterility. **SO5.9.**Students are able to explain types of male sterility: genic, cytoplasmic and cytoplasmic-genic.		**Unit-5.self-incompatibility and male sterility and comparison of genome sequence using tools of bioinformatics.** **5.1.**Self- incompatability and sterility. **5.2.**Types of self incompatability. **5.3.**Homomorphic (sporophytic and gametophytic). **5.4.**heteromorphic - Breakdown of incompatibility. **5.5.**Floral adaptive mechanisms. **5.6.**Spatial and temporal. **5.7.** Genetic and biochemical basis of self-incompatibility. **5.8.**Sterility: male and female sterility. **5.9.**Types of male sterility: genic,	**1**.Heteromorphic - Breakdown of incompatibility.

SO5.10. Students are able to explain exploitation in monocots and dicots. **SO5.11.**Students are able to explain difficulties in exploiting CGMS system in dicots. **SO5.12.**Students are able to explain working out efficiency of selection methods. **SO5.13.**Students are able to explain comparison of genome sequences using tools of bioinformatics.		cytoplasmic and cytoplasmic-genic. **5.10.** Exploitation in monocots and dicots. **5.11.**Difficulties in exploiting CGMS system in dicots. **5.12.**Working out efficiency of selection methods. **5.13.**Comparison of genome sequences using tools of bioinformatics. management.	

SW-5 Suggested Sessional Work (SW):

a. Assignments:

Working out efficiency of selection methods.

b. Mini Project:

Difficulties in exploiting CGMS system in dicots.

Other Activities (Specify):

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
132PH02.1: Students are able to understand historical perspective need for conservation taxonomical classification and center of origin and plant genetic resources.	**11**	**2**	**1**	**14**
132PH02.2: Students are able to learn about biometrical genetics, models designs and system and the mitochondrial genomes and complexity.	**8**	**2**	**2**	**12**
132PH02.3: To understand about the karyotyping chromosome painting introgressions, mapping, distance hybridization and allopolyploids.	**5**	**2**	**1**	**8**
132PH02.4: Students are learn about trisomics breeding behavior and location of gene, allelic interactions and telocentric method of mapping.	**8**	**2**	**1**	**11**
132PH02.5: Students are gain knowledge about self-incompatibility and male sterility and comparison of genome sequence using tools of bioinformatics.	**13**	**2**	**1**	**16**

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution				Total Marks
		A	A	E	C	
CO 1	Historical perspective need for conservation taxonomical classification and center of origin and plant genetic resources.	3	3	2	2	10
CO 2	Biometrical genetics, models designs and system and the mitochondrial genomes and complexity.	3	3	3	2	11
CO 3	Karyotyping chromosome painting introgressions, mapping, distance hybridization and allopolyploids.	2	3	3	2	10
CO 4	Trisomics breeding behavior and location of gene, allelic interactions and telocentric method of mapping.	3	2	2	2	9
CO 5	self-incompatibility and male sterility and comparison of genome sequence using tools of bioinformatics.	3	2	3	2	10
Total		14	13	13	10	50

Legend: A: Apply, A: Analyses, E: Evaluate, C: Create

The end of semester assessment for **Advances in Genetics & Plant Breeding** will be held with written examination of 50 marks

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

Suggested Instructional/Implementation Strategies:

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

Suggested Learning Resources:

(a) Books:

S. No.	Title	Author	Publisher	Edition & Year
1	Breeding For Quantitative Traits In Plants	Bernardo.	Vol. I, II. CBS.	2020
2	Principles of Plant Genetics and Breeding	George Acquaah	Springer	2020
3	Seed Science and Technology	Malavika Dadlani and DK. Yadava,	Springer	2023
4	The Seed Detective	Adam Alexander,	NBPGR, New Delhi.	2022

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Cos, POs and PSOs Mapping
Course Code: 132PH02
Course Title: - Advances in Genetics and Plant Breeding

Course Outcomes	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
	Student will identify the current scenario, crop diversity, climatic equirement and breeding echniques of different crops.	Articulates research problems, potentials, and limits with respect to knowledge within the field of plant breeding and plant genetics.	Student will apply various statistical methods to analyze their research work	Student will understand about library echniques, echnical writing skill, IPR, aboratory echniques and esearch thics in manuscript writing	Recognizes and applies principles of ethical and professional conduct.	Formulates ideas, concepts, designs, and/or techniques beyond the current boundaries of knowledge within the field of plant breeding and plant genetics.	Creates research that makes a substantive contribution to the field of plant breeding and plant genetics.	Conduct original, publishable research in plant breeding/genetics	Student will identify the current scenario, crop diversity, climatic requirement and breeding techniques of different crops.	Articulates research problems, potentials, and limits with respect to knowledge within the field of plant breeding and plant genetics.	Student will apply various statistical methods to analyze their research work	Student will understand about library techniques, technical writing skill, IPR, laboratory techniques and research ethics in manuscript writing	Student will apply various information services, technical writings and communication skills in their academics	student will apply basic statistical tools during their research work
132PH02.1: Students are able to understand historical perspective need for conservation taxonomical classification and center of origin and plant genetic resources.	3	3	2	3	3	1		3	3	3	2	2	1	1
132PH02.2: Students are able to learn about biometrical genetics, models designs and system and the	2	3	1	2	2	1	2	3	2	2	2	3	1	1

mitochondrial genomes and complexity.														
132PH02.3: To understand about the karyotyping chromosome painting introgressions, mapping, distance hybridization and allopolyploids.	2	2	2	2	3	1	2	2	3	2	2	2	2	2
132PH02.4: Students are learn about trisomics breeding behavior and location of gene, allelic interactions and telocentric method of mapping.	3	2	2	2	2	1	3	3	2	2	3	2	2	2
132PH02.5: Students are gain knowledge about self-incompatibility and male sterility and comparison of genome sequence using tools of bioinformatics.	2	2	2	2	2	1	2	2	2	2	2	3	2	2

Legend: 1- Low,2 – Medium, 3- High

Course Curriculum Map: Advances in Genetics and Plant Breeding

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO 1,2,3,4,5,6, PSO 1,2, 3, 4, 5, 6, 7, 8	**132PH02.1**:Students are able to understand historical perspective need for conservation taxonomical classification and center of origin and plant genetic resources.	**SO1.1** **SO1.2** **SO1.3** **SO1.4** **SO1.5**		**Unit-1.0** Historical perspective need for conservation taxonomical classification and center of origin and plant genetic resources. 1.1, 1.2, 1.3. 1.4, 1.5, 1.6	As mentioned in page number ……
PO 1,2,3,4,5,6, PSO 1,2, 3, 4, 5, 6, 7, 8	**132PH02.2:** Students are able to learn about biometrical genetics, models designs and system and the mitochondrial genomes and complexity.	**SO2.1** **SO2.2** **SO2.3** **SO2.4** **SO2.5** **SO2.6**		**Unit-2.0 –** Biometrical genetics, models designs and system and the mitochondrial genomes and complexity. 2.1, 2.2, 2.3. 2.4, 2.6,	As mentioned in page number ……
PO 1,2,3,4,5,6, PSO 1,2, 3, 4, 5, 6, 7, 8	**132PH02.3:** To understand about the karyotyping chromosome painting introgressions, mapping, distance hybridization and allopolyploids.	**SO3.1** **SO3.2** **SO3.3** **SO3.4** **SO3.5** **SO3.6**		Unit-3.0 Karyotyping chromosome painting introgressions, mapping, distance hybridization and allopolyploids. 3.1, 3.2, 3.3, 3.4, 3.5, 3.6	As mentioned in page number ……
PO 1,2,3,4,5,6, PSO 1,2, 3, 4, 5, 6, 7, 8	**132PH02.4:** Students are learn about trisomics breeding behavior and location of gene, allelic interactions and telocentric method of mapping.	**SO4.1** **SO4.2** **SO4.3** **SO4.4** **SO4.5** **SO4.6**		**Unit-4.0** Trisomics breeding behavior and location of gene, allelic interactions and telocentric method of mapping. 4.1, 4.2, 4.3. 4.4, 4.5, 4.6	As mentioned in page number ……

PO 1,2,3,4,5,6, PSO 1,2, 3, 4, 5, 6, 7, 8	**132PH02.5:** Students are gain knowledge about self-incompatibility and male sterility and comparison of genome sequence using tools of bioinformatics.	**SO5.1** **SO5.2** **SO5.3** **SO5.4** **SO5.5** **SO5.6**		**Unit-5.0** self-incompatibility and male sterility and comparison of genome sequence using tools of bioinformatics. 5.1, 5.2, 5.3. 5.4, 5.5, 5.6	As mentioned in page number ……

Course Code: 151HORT02

Course Title: **Advances in Horticulture**

Pre- requisite: To impart knowledge and skills on advancement in horticulture

Rationale: Horticulture is the branch of agricultural science which is related to the production and management of fruits, vegetables, ornamentals, flowers, medicinal plants etc. The Ph. D Horticulture programme reflects new methods, developments and dimension in horticulture discipline. The curriculum has strong theoretical and practical focus with the students being trained in production and management of horticultural crops. This programme also develop skill in development of a garden. The postharvest management stategies offers an opportunity to invest in postharvest and value addition industries

Course Outcomes:

151HORT02.1: Students will acquire advanced knowledge in production and total quality management in fruit crops

151HORT02.2: To ability to understand the current scenario and advanced production technology of vegetable crops.

151HORT02.3: Student able to know the advance scientific production technology of commercial flower crops.

151HORT02.4: Understand the advance cultural practices in vegetable production.

151HORT02.5: Toelaborates the knowledge in special horticulture practices under protected cultivation for flower crops.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			CI	LI	SW	SL	Total Study Hours CI+LI+SW+SL	
Program Core (PCC)	151HORT02	Advances in Horticulture	2		1	1	4	3

Legend:

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

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C: Credits.
Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment

Theory

			Scheme of Assessment(Marks)							
			Progressive Assessment (PRA)						**End Semester Assessment (ESA)**	**TotalMarks**
BoardofStudy	**CouseCode**	**CourseTitle**	Class Test 1 (A)	Class Test 2 (B)	Seminar (C)	Mini review (D)	Mini Project (E)	TotalMarks (A+B+C+D+E)		(PRA+ESA)
PCC	151HORT02	Advances in Horticulture	10	10	10	10	10	50	50	100

151HORT02.1: Students will acquire advanced knowledge in production and total quality management in fruit crops

Approximate Hours

Item	Approximate Hours
CI	**06**
LI	**00**
SW	**04**
SL	**02**
Total	**12**

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO 1.1 To understand the Advance Package and practices of tropical fruit crops. SO 1.2 Application of Production technology of sub-tropical fruit crops. SO 1.3 To understand the Scientific cultivation practices of temperate fruit crops. SO 1.4 To understand the Scientific cultivation practices of plantation crops such as		**Unit-I** **Recent advances in fruit production such as Mango, Banana, Papaya, Grape, citrus, Guava, Sapota, Litchi, Coconut, Pomegranate, Anola, Pear, Plums, Strawberry, Peach, Apricot and Cherries.** 1.1 Advance Package and practices of tropical fruit crops. 1.2 Production technology of sub-tropical fruit crops. 1.3 Scientific cultivation practices of temperate fruit	1.improved varieties of fruit crops 2Recent advances method of propagation in fruit crops.

coconut. SO 1.5 Ability to understand the Integrated and modern approaches in water and nutrient management in fruit crops. SO 1.6 Introduce the total quality management of fruit crops.		crops. 1.4 Scientific cultivation practices of plantation crops such as coconut. 1.5 Integrated and modern approaches in water and nutrient management in fruit crops. 1.6 Total quality management of fruit crops.	

SW-1 Suggested Sessional Work (SW):

a. Assignments:

i. High density Planting system in fruit crops.

ii. Resent advances planting system in fruit crops.

b. Mini Project:

i. Crop modeling in fruit crops.

ii. Decision support system in fruit crops.

151HORT02.2: To ability to understand the current scenario and advanced production technology of vegetable crops.

Approximate Hours

Item	Approximate Hours
CI	**6**
LI	**00**
SW	**3**
SL	**2**
Total	**11**

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO 2.1. Understand the Introduction, commercial and nutritional importance, origin and distribution, botany and taxonomy of cole crops. SO 2.2. Understand the advance package and practices in solanaceous and leafy vegetable crops. SO 2.3. Application of package and practices of cole crops and tuber crops. SO 2.4. Application of advanced Production technology of leafy vegetable crops. SO2.5 Understand the off season vegetable production technology and crop modeling.		**Unit II** **Present status and prospects of vegetable cultivation i.e., Tomato, brinjal, chilli, sweet pepper, potato, cucurbits, cabbage, cauliflower, knol-khol, bhensi, onion, peas, beans, amaranthus and drumstick, root crops.** 2.1. Introduction, commercial and nutritional importance, origin and distribution, botany and taxonomy of vegetable crops. 2.2 Advance package and practices in solanaceous and leafy vegetable crops. 2.3 Package and practices of cole crops and tuber crops.	1. Export and processing accepts in vegetable crops. **2.** Physiological and nutritional deficiencies and their correction methods in vegetable crops.

SO2.6 Introduce the Role of organic and in organic fertilizer, micronutrient and biofertilizer in vegetable crops.		2.4 Advanced Production technology of leafy vegetable crops. 2.5 Off season vegetable production technology and crop modeling. 2.6 Role of organic and in organic fertilizer, micronutrient and biofertilizer in vegetable crops.	

SW-2 Suggested Sessional Work (SW):

a. Assignments:

1. Current scenario of vegetable crops

2. Nutritional and meditational values of vegetable crops.

b. Mini Project:

1. Flow chart of recent varieties and their characteristic of vegetable crops.

151HORT02.3: Student able to know the advance scientific production technology of commercial flower crops.

Item	Approximate Hours
CI	**06**
LI	**00**
SW	**03**
SL	**02**
Total	**11**

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO 3.1 Understand theScope and importance of flower crops in India. **SO3.2** Ability to understand 2Global scenario in cut flower productionand trade, varierial wealth and diversity in flower production. **SO3.3** Application ofAdvances production technology of Rose, anthurium, orchids, carnation with their specific horticulture practices. **SO3.4** Application ofPackage and practices of, gladioli, gerbera, liliums, heliconia, Jasminum sp., **SO3.5** Understand therecent		**Unit III** **Commercial flower production and crop specific practices- Rose, anthurium, orchids, carnation, gladioli, gerbera, liliums, heliconia, Jasminum sp., marigold, tuberose and crossandra.** 3.1 Scope and importance of flower crops in India. 3.2Global scenario in cut flower production and trade, varierial wealth and diversity in flower production 3.3 Advances production	1. Improved varieties and their characterization of flower crops 2. Dry flower preservation method in flower crops.

advances production technology of marigold, tuberose and crossandra. **SO3.6** Understand about theSpecial characteristics and requirements; cut flower, loose flower, dry flower and flower oil trade.		technology of Rose, anthurium, orchids, carnation with their specific horticulture practices. 3.4 Package and practices of, gladioli, gerbera, liliums, heliconia, Jasminum sp., 3.5 Recent advances production technology of marigold, tuberose and crossandra. 3.6 Special characteristics and requirements; cut flower, loose flower, dry flower and flower oil trade.	

SW-3 Suggested Sessional Work (SW):

a. Assignments:

Package of practices cut flower.

Package of practices loose flower

Mini Project:

Flow chart of special horticulture practices adopted in flower crops

151HORT02.4: Understand the advance cultural practices in vegetable production.

Item	Approximate Hours
CI	**06**
LI	**00**
SW	**03**
SL	**02**
Total	**11**

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO4.1 Understand the regulation of flowering and fruiting in vegetable crops. **SO4.2** Application Production technology of tomato, sweet pepper under protected condition. **SO4.3** Application of Production technology of cucumber and other vegetables under protected condition. **SO4.4** Understand about the Training and staking in protected cultivated vegetable crops. **SO4.5** Understand the Suitable varieties and hybrids for growing in protected structure. **SO4.6** Introduces the Special		**Unit IV** **Regulation of flowering and fruiting in vegetable crops. Technology for raising tomato, sweet pepper, cucumber and other vegetables in protected structures. Training and staking in protected crops.** **4.1** Regulation of flowering and fruiting in vegetable crops. **4.2** Production technology of tomato, sweet pepper under protected condition **4.3** Production technology of cucumber and other vegetables under protected condition. **4.4** Training and staking in protected cultivated	1. Commercial and hybrid varieties of vegetable crops for protected cultivation 2. Training and staking in tomato and cucurbits and protected condition.

cultural practices adopted in vegetable crops under the protected condition.		vegetable crops. **4.5** Suitable varieties and hybrids for growing in protected structure. **4.6** Special cultural practices adopted in vegetable crops under the protected condition.	

SW-4 Suggested Sessional Work (SW):

a. Assignments:

Pruning and pruning method in vegetable crops under protected condition.
Special culture practices in vegetable crops under protected condition.

b. Mini Project:

i. Flowchart of botanical description of major protected vegetable crops.

151HORT02.5: To elaborates the knowledge in special horticulture practices under protected cultivation for flower crops.

Item	Approximate Hours
CI	**06**
LI	**00**
SW	**03**
SL	**02**
Total	**11**

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO5.1 Understand about the Water and nutrient management in flower crops. **SO5.2** Introduces the crop regulation, special horticultural practices under protected cultivation of flower crops. **SO5.3**. Application of Advances production technology of flower crops under protected cultivation. **SO 5.4.** Understand Harvest indices- harvesting, pH handling, marketing, export. **SO5.5** Application of Processing and preservation of flower crops.		**Unit V** **Water and nutrient management, crop regulation, special horticultural practices under protected cultivation of rose, chrysanthemum, carnation, orchids, anthurium, gerbera, liliums, cut foliage. Processing, preservation and value addition of important horticultural crops directly used for food.** **5.1** Water and nutrient management in flower crops. **5.2** Crop regulation, special horticultural practices under protected cultivation of flower crops. **5.3** Advances production technology of flower crops	1. Varietal description of flower crops under protected condition. 2. Production technology of flower crops under protected cultivation.

SO 5.6. Understand theValue addition of important horticultural crops directly used for food.		under protected cultivation. **5.4** Harvest indices- harvesting, pH handling, marketing, export. **5.5** Processing and preservation of flower crops. **5.6** Value addition of important horticultural crops directly used for food.	

SW-5 Suggested Sessional Work (SW):

a. Assignments:

Package of practices of flower crops under protected condition

Special horticulture practices in flower crops under protected condition.

b. Mini Project:

Flowchart of botanical description of flower crops.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
151HORT02.1: Students will acquire advanced knowledge in production and total quality management in fruit crops	06	04	02	12
11151HORT02.2: To ability to understand the current scenario and advanced production technology of vegetable crops.	06	03	02	11
151HORT02.3: Student able to know the advance scientific production technology of commercial flower crops.	06	03	02	11
151HORT02.4: Understand the advance cultural practices in vegetable production.	06	03	02	11
151HORT02.5: To elaborates the knowledge in special horticulture practices under protected cultivation for flower crops.	06	03	02	11
Total	**30**	**16**	**10**	**56**

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution				Total Marks
		A	A	E	C	
CO 1	Recent advances in fruit production such as Mango, Banana, Papaya, Grape, citrus, Guava, Sapota, Litchi, Coconut, Pomegranate, Anola, Pear, Plums, Strawberry, Peach, Apricot and Cherries.	02	03	03	02	**10**
CO 2	Present status and prospects of vegetable cultivation i.e., Tomato, brinjal, chilli, sweet pepper, potato, cucurbits, cabbage, cauliflower, knol-khol, bhensi, onion, peas, beans, amaranthus and drumstick, root crops.	01	03	04	02	**10**
CO 3	Commercial flower production and crop specific practices- Rose, anthurium, orchids, carnation, gladioli, gerbera, liliums, heliconia, Jasminum sp., marigold, tuberose and crossandra.	03	03	03	01	**10**
CO 4	Regulation of flowering and fruiting in vegetable crops. Technology for raising tomato, sweet pepper, cucumber and other vegetables in protected structures. Training and staking in protected crops.	03	02	03	02	**10**
CO 5	Water and nutrient management, crop regulation, special horticultural practices under protected cultivation of rose, chrysanthemum, carnation, orchids, anthurium, gerbera, liliums, cut foliage. Processing, preservation and value addition of important horticultural crops directly used for food.	03	02	03	02	**10**
	Total	**12**	**13**	**16**	**9**	**50**

Legend: A: Apply, A: Analysis, E: Evaluated, C, Create

The end of semester assessment for **Advances in Horticulture** will be held with written examination of 50 marks

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

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Visit of commercial horticulture 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	Advances in Horticulture (Volume - 23)	Dr. Sarvesh Kumar Lodhi	AkiNik Publications	2023
2	Handbook of Horticulture (Vol- 2)	Chadha KL	ICAR	2022
3	Vegetable Crops-Production Technology Text Book Vol. II,	Fageria M.S., Choudhary B.R., Dhaka R.S.	Kalyani Publishers (2nd Revised Edition)	2023
4	Production Technology of Vegetable Crops	Bhag Chand Shivran	Astral	2023
5	Text Book of Vegetables, Tubercrops and Spices HB 01	Tham buraj S and Singh N.	ICAR	2022

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Cos, POs and PSOs Mapping
Course Code:151HORT02
Course Title: -Advances in Horticulture

Course Outcomes	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
	Student will understand and analyze the current events and issues that are occurring in Horticulture and how they affect futuristic Horticulture.	Student will expertise in advance horticulture production technology and post-harvest management and value addition of horticultural crops.	Students have ability for critical and independent thinking in analyzing information and identifying valid scientific problems in horticultural crops.	Students have ability to plan, design and develop strategies to solve problems using sound scientific methodologies for horticulture crops.	Student will apply various statistical methods to analyze their doctoral research work	Student will plan about the big scale commercial project and also manage the research trails under horticultural crops.	Students have basic and advance knowledge in the field of horticulture science including crop production, nutrient management, intercultural operation, disease management, insect-paste management, postharvest management and economics of cultivation.	students have better understanding and high skill on breeding methods, Preservation, postharvest handling, experimental tools in soil samples, plant nursery development, garden development, statistical tools & analysis, research data computation, etc, required for higher learning in horticulture Science	Students able to design and execute individual research project, write concise & persuasive research articles and communicate effectively with their scientific colleagues, farmers and the general public.	Students become eligible to work in commercial horticultural units, garden, plant nursery, Seed Company, food industries, research projects, postharvest industries etc.	Students able to address complex problems taking into account related fruit crops, vegetable crops, flower crops, ornamental plants, medicinal plants, economic, and environmental issues.	student will apply basic concepts in laboratory techniques during their research work	Student will apply various information services, technical writings and communication skills in their academics	student will apply basic statistical tools during their research work
151HORT02.1: Students	3	3	2	3	3	1	3	3	3	3	3	2	1	1

will acquire advanced knowledge in production and total quality management in fruit crops														
151HORT02.2: To ability to understand the current scenario and advanced production technology of vegetable crops.	2	3	1	3	2	1	2	3	2	3	2	3	1	1
151HORT02.3: Student able to know the advance scientific production technology of commercial flower crops.	2	2	2	2	3	1	3	2	3	2	3	2	2	2
151HORT02.4: Understand the advance cultural practices in vegetable production.	3	2	2	3	2	1	3	3	2	3	3	2	2	2
151HORT02.5: To elaborates the knowledge in special horticulture practices under protected cultivation for flower crops.	2	3	2	3	2	1	2	2	2	2	2	3	2	2

Legend: 1- Low,2 – Medium, 3- High

Course Curriculum Map: Advances in Horticulture

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO 1,2,3,4,5,6, PSO 1,2, 3, 4, 5, 6, 7, 8	151HORT02 CO1: Students will acquire advanced knowledge in production and total quality management in fruit crops	**SO1.1** **SO1.2** **SO1.3** **SO1.4** **SO1.5**		**Unit-1.0** Recent advances in fruit production such as Mango, Banana, Papaya, Grape, citrus, Guava, Sapota, Litchi, Coconut, Pomegranate, Anola, Pear, Plums, Strawberry, Peach, Apricot and Cherries. 1.1, 1.2, 1.3. 1.4, 1.5, 1.6	As mentioned in page number ……
PO 1,2,3,4,5,6, PSO 1,2, 3, 4, 5, 6, 7, 8	151HORT02 CO2: To ability to understand the current scenario and advanced production technology of vegetable crops.	**SO2.1** **SO2.2** **SO2.3** **SO2.4** **SO2.5** **SO2.6**		**Unit-2.0 –** Present status and prospects of vegetable cultivation i.e., Tomato, brinjal, chilli, sweet pepper, potato, cucurbits, cabbage, cauliflower, knol-khol, bhensi, onion, peas, beans, amaranthus and drumstick, root crops. 2.1, 2.2, 2.3. 2.4, 2.6,	As mentioned in page number ……
PO 1,2,3,4,5,6, PSO 1,2, 3, 4, 5, 6, 7, 8	151HORT02 CO3: Student able to know the advance scientific production technology of commercial flower crops.	**SO3.1** **SO3.2** **SO3.3** **SO3.4** **SO3.5** **SO3.6**		**Unit-3.0** Commercial flower production and crop specific practices- Rose, anthurium, orchids, carnation, gladioli, gerbera, liliums, heliconia, Jasminum sp., marigold, tuberose and cross and ra. 3.1, 3.2, 3.3, 3.4, 3.5, 3.6	As mentioned in page number ……

PO 1,2,3,4,5,6, PSO 1,2, 3, 4, 5, 6, 7, 8	151HORT02 CO4: Understand the advance cultural practices in vegetable production.	**SO4.1** **SO4.2** **SO4.3** **SO4.4** **SO4.5** **SO4.6**		**Unit-4.0** Regulation of flowering and fruiting in vegetable crops. Technology for raising tomato, sweet pepper, cucumber and other vegetables in protected structures. Training and staking in protected crops. 4.1, 4.2, 4.3. 4.4, 4.5, 4.6	As mentioned in page number ……
PO 1,2,3,4,5,6, PSO 1,2, 3, 4, 5, 6, 7, 8	151HORT02 CO5: To elaborates the knowledge in special horticulture practices under protected cultivation for flower crops.	**SO5.1** **SO5.2** **SO5.3** **SO5.4** **SO5.5** **SO5.6**		**Unit-5.0** Water and nutrient management, crop regulation, special horticultural practices under protected cultivation of rose, chrysanthemum, carnation, orchids, anthurium, gerbera, liliums, cut foliage. Processing, preservation and value addition of important horticultural crops directly used for food. 5.1, 5.2, 5.3. 5.4, 5.5, 5.6	As mentioned in page number ……

Course Code: - (111PH02)
Course Title: - Advances in Chemistry

Pre-requisites: Students should have a foundational knowledge of scientific research methods and be familiar with commonly used analytical techniques in chemical research. This includes proficiency in Chromatography (GC, HPLC), Spectroscopy (UV-Vis, fluorescence, atomic absorption), Mass Spectrometry, Electrochemistry, and Analytical Methods Validation.

Rationale: - Develop critical thinking skills to evaluate and analyze previous research findings. Apply experimental techniques, instrumentation to create new knowledge in his selected area of research. Create and explain critically new experimental data obtained by conducting research of his research area.

Course Outcomes: Students will:

CO 1: Apply Laboratory apparatus and techniques, calibration of volumetric apparatus and create new knowledge in his selected research area

CO 2: Explain synthesis of coordination compounds and apply the CFSE and LFT for complexes.

CO 3: Apply UV-Visible Spectrophotometry, IR, TG-DTA, NMR, AAS, Mass spectroscopy and XRD spectroscopic techniques and evaluate data obtained from them for better research outcomes.

CO 4: Create new knowledge by evaluating data obtained from Mass, Ultraviolet visible, Infrared, ^{1}H-NMR and ^{13}C-NMR Spectroscopy.

CO 5: Evaluate the role and functioning of computer in research and apply QSAR and spectral analysis.

Unit-I

Analytical Chemistry

Laboratory apparatus and techniques, Errors, types of errors, calibration of volumetric apparatus, P^H measurement techniques , P^H Dependent function and structures of biomolecules, advance indicators principle of different chromatographic techniques, Separation by Paper ,thin layer and column chromatography, Advanced Chromatographic techniques.

Unit –II

Bonding in Metal Complexes

Coordination Compounds Types of ligands ,Homleptic and heteroleptic complexes Coordination numbers and structures Stability of complexes .Brief introduction of Valence Bond Approach ,Crystal Field Approach ,Molecular field approach, Octahedral complexes Crystal field stabilization energy(CFSE) Tetragonal distortion of octahedral complexes (Jahn-Teller distortion) Tetrahedral complexes Electronic spectra of transition metal complexes

Unit –III

Spectroscopy-I

Principle, Instrumentation, And Applications, for the Following techniques: UV-Visible Spectrophotometry, IR, TG-DTA, NMR, AAS, Mass spectroscopy and XRD.

Unit-IV

Spectroscopy-II

Structure elucidation of compound from following spectrum: Mass, Ultraviolet visible, Infrared NMR and CMR. Solution to problems based on interpretation of spectra of organic and inorganic compounds.

Unit-v

Application of Programming in Chemistry

Computer software's and chemistry, salient features of computer programming, programming in C/C++, implementation of control structures, class and object, some important programs for chemistry chemical modeling software, QSAR and spectral analysis.

Scheme of studies

Categories of course	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			C l	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
DCC Theory	117PH02	**Research Advances in Chemistry**	03	00	02	01	06	03

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

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

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

SL: Self Learning,

C: Credits.

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

Scheme of Assessment:

Categories of course	Course code	Course title	Scheme of Assessment (Marks)						
			Progressive Assessment (PRA)					End Semester Assessment (ESA	Total Marks (PRA+ESA
DCC Theory	117PH02		1st Class Test 15 marks (CT)	2nd Class Test 15marks (CT)	Seminar	Mini project	Total Marks (CT 1+CT2)		
		Research Advances in Chemistry	15	15	10	10	15+15+10+10=50	50	100

Course-Curriculum Detailing:

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

CO-1 Apply Laboratory apparatus and techniques, calibration of volumetric apparatus and create newknowledge in his selected research area

Approximate Hours

Item	AppX Hrs
C l	9
LI	0
SW	1
SL	1
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO1.1. Use the basic laboratory apparatus and techniques **SO1.2.** Evaluate different types of errors in measurements **SO1.3.** Explain Errors, types of errors **SO1.4.** Explain function and structures of biomolecules is Ph Dependent **SO1.5.** Apply various chromatographic techniques in researchfield and Measure and evaluate analytical data in his/ her research area.		**Unit-I** 1.1 Laboratory apparatus and techniques 1.2 Errors, types of errors. 1.3- calibration of volumetric apparatus. 1.4 function and structures of biomolecules is Ph Dependent 1.5Advanced indicators 1.6 Principle of different types ofchromatography. 1.7 Applications of different types of chromatography such as Paper andthin layer chromatography. 1.8 Application of column chromatography 1.9 Advance chromatographic techniques	**1.1.**Explain principle of column chromatography

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

a. Seminar: Calibration of volumetric apparatus (Specific apparatus is allotted to each student)

b. Mini project: Allotted to each student on the basis of his / her self selected tentative topic.

CO 2: Explain synthesis of coordination compounds and apply the CFSE and LFT for complexes

Approximate Hours

Item	AppX Hrs
C l	9
LI	0
SW	1
SL	1
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO2.1 Explain and synthesize coordination compounds **SO2.2.** Explain the details of crystal field approach and molecular field approach **SO2.3. Explain the** Coordination numbers and structures Stability of complexes **SO2.4-** Critically review electronic spectra of transition metal complexes SO2.5 Solve spectrum problem related to metal complex		2.1 Metal complexes and their applications 2.2 Properties of coordination compounds. 2.3 Types of ligands ,Homleptic and heteroleptic complexes. 2.4 Brief introduction of Valence Bond Approach. 2,5 Crystal field stabilization energy(CFSE) of Tetragonal. 2.6 Distortion of octahedral complexes (Jahn-Teller distortion). 2.7**.** Electronic spectra of transition metal complexes. 2**.**8 Nature of Metal Ligand bonding on the basis of LFT 2**.**9. Limitations of LFT	**2.1.** structures Stability of complexes

SW-1 Suggested Sessional Work (SW):

a. Seminar : Chelate ligands and stability of their complexes

b. Mini project: Allotted to each student on the basis of his / her self selected tentative topic.

CO 3: Explain UV-Visible Spectrophotometry, IR, TG-DTA, NMR, AAS, Mass spectroscopy and XRD Spectroscopy techniques for better research outcomes.

Approximate Hours

Item	AppX Hrs
C l	9
LI	0
SW	1
SL	1
Total	11

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self Learning (SL)**
SO3.1. Student will able to analyze collected data by Spectroscopy technique. **SO3.2** Choose an appropriate Spectroscopy technique for collecting and analyzing data **SO3.3.**Explain principle of UV- Spectroscopy. **SO3.4. Explain** about the measures of different Spectroscopy technique. **SO3.5**.Determination of structures by use of variousSpectroscopy techniques.		3.1 Spectrophotometry & colorimetry 3.2 Principle of UV- Visible Spectrophotometry. 3.3 Instrumentation and application of UV- Visible Spectrophotometry. 3.4Introduction of IR & TG-DTA Spectroscopy. 3.5Principle of IR& TG-DTA Spectroscopy. 3.6Instrumentation and application of IR & TG-DTA Spectroscopy. 3.7Introduction of NMR, AAS Spectroscopy. 3.8 Instrumentation and application of NMR, AAS Spectroscopy. 3.9 Solve structural problems on the basis of I.R., NMR. TGA , DTA	**3.1** Principle, Instrumentation, And Applications of Mass spectroscopy.

SW-1 Suggested Sessional Work (SW):
a. Seminar: Principle, Instrumentation, and Applications of XRD Spectroscopy.
b. Mini project: Allotted to each students on the basis of his / her self selected tentative topic.

CO 4: Create new knowledge by evaluating data obtained from Mass, Ultraviolet visible, Infrared, 1H-NMR and 13C-NMR Spectroscopy

Item	App X Hrs
Cl	9
LI	0
SW	1
SL	1
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO4.1. Explain Identification of spectral features**.** **SO4.2.** Explain the data analysis, processing and interpreting the collected spectroscopic data. **SO4.3.** Data Interpretation based on the analysis, conclusions can be drawn regarding the sample's composition, structure, or other relevant properties. **SO4.4.** E valuate proposed structure of a compound on the basis of spectral results and chemical test **SO4.5** Explain mass, UV, and NMR spectrum of a compound		4.1Structure elucidation of compound from Mass Spectroscopy. 4.2 Structure elucidation of compound from Ultraviolet visible Spectroscopy. 4.3 Structure elucidation of compound from Infrared Spectroscopy. 4.4 Structure elucidation of compound from NMR Spectroscopy. 4.5 Structure elucidation of compound from CMR Spectroscopy. 4.6 Solved problems based on interpretation of spectra of organic 4.7 Solved problems based on interpretation of spectra of Inorganic 4.8 Assess the isotopic pattern observed in the mass spectrum. 4.9 Use the mass spectral data to deduce the presence of specific functional groups within the molecule.	**4.1-** Analyze the absorption spectrum obtained from UV-Vis spectroscopy.

SW-1 Suggested Sessional Work (SW):
a. Seminar: Spectral techniques and chemical test are complimentary for structure determination of newly synthesized molecule .
b. **Mini project**: Allotted to each student on the basis of his / her self selected tentative topic.

CO 5: Evaluate the role and functioning of computer in research and apply QSAR and spectral analysis

Approximate Hours

Item	AppX Hrs
Cl	9
LI	00
SW	01
SL	01
Total	11

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self Learning (SL)**
SO5.1. Explain Programming is employed to develop educational software and simulations for teaching chemistry concepts and principles. **SO5.2.**Programming languages used to analyze experimental data generated from various analytical techniques such as spectroscopy, **SO5.3.**Utilized programming to develop database systems and informaticstools for storing, retrieving, and analyzing chemical information. **SO5.4-** Apply the C and C++ programming indeveloping computationalchemistry software packages for performing quantumchemical calculations **SO5.5.** Apply QSAR in development of new drug molecule		5.1 Introduction of C and C++ 5.2. Application of C and C++ In research field. 5.3 C and C++ programming languages find numerous applications in the field ofchemistry, especially in computational chemistry, data analysis, and instrument control. 5.4 Basic features of computer programming, programming in C/C++ 5.7 Some important programs for chemistry chemical modelingsoftware, 5.8 Introduction of QSAR . 5.9 QSAR and spectral analysis	**5.1** Application of QSAR

SW-1 Suggested Sessional Work (SW):

a.Seminar: Applications of QSAR

b. **Mini project**: Allotted to each student on the basis of his / her self selected tentative topic

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (C l)	Laboratory Lecture (L I)	Sessional Work (SW)	Self Learning (S l)	Total hour (C l + LI+ SW +S l)
CO-1 Students will be able to understand and comprehend the basics in Laboratory apparatus and techniques, calibration of volumetric apparatus and applying them in research/ project work.	9	0	1	1	11
CO 2: Explain synthesis of coordination compounds and apply the CFSE and LFT for complexes	9	0	1	1	11
CO 3: Explain UV-Visible Spectrophotometry, IR, TG-DTA, NMR, AAS, Mass spectroscopy and XRD Spectroscopy techniques for better research outcomes.	9	0	1	1	11
CO 4: Create new knowledge by evaluating data obtained from Mass, Ultraviolet visible, Infrared, 1H-NMR and 13C-NMR Spectroscopy.	9	0	1	1	11
CO 5: Evaluate the role and functioning of computer in research and apply QSAR and spectral analysis.	9	0	1	1	11
Total Hours	**45**	**00**	**05**	**05**	**55**

Suggested Specification Table (For ESA)

CO	Unit title	Marks Distribution				Total Marks
		A	AN	E	C	
CO-1	**Analytical Chemistry** Laboratory apparatus and techniques, Errors, types of errors, calibration of volumetric apparatus, The concept of Ph and measurements ,function and structures of biomolecules is Ph Dependent, use of indicators, Brief introduction of chromatography, Separation by Paper ,thin layer and column chromatography.	02	02	01	0	05
CO-2	**Bonding in Metal Complexes** Coordination Compounds Types of ligands ,Homleptic and heteroleptic complexes Coordination numbers and structures Stability of complexes .Brief introduction of Valence Bond Approach ,Crystal Field Approach ,Molecular field approach, Octahedral complexes Crystal field stabilization energy(CFSE) Tetragonal distortion of octahedral complexes (Jahn-Teller distortion) Tetrahedral complexes Electronic spectra of transition metal complexes	02	03	03	2	10
CO-3	**Spectroscopy-I** Principle, Instrumentation, And Applications, for the Following techniques: UV-Visible Spectrophotometry, IR, TG-DTA, NMR, AAS, Mass spectroscopy and XRD.	00	08	03	4	15
CO-4	**Spectroscopy-II** Structure elucidation of compound from following spectrum: Mass, Ultraviolet visible, Infrared NMR and CMR. Solved problems based on interpretation of spectra of organic and inorganic compounds.	02	05	04	4	15
CO-5	**Application of Programming in Chemistry** Computer software's and chemistry, Basic features of computer programming, programming in C/C++, implementation of control structures, class and object, some important programs for chemistry chemical modeling software, QSAR and spectral analysis.	00	03	02	00	05
	Total	06	21	13	10	50

Legend: A: Apply, AN: Analyze, E: Evaluate, C: Create

The end of semester assessment for Research advances in Chemistry will be held with written examinationof 50 marks

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

Suggested Instructional/Implementation Strategies:

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

Suggested Learning Resources:

S. No.	Title	Author	Publisher	Edition & Year
01	Advances in Chemistry Research. Volume 84	James C. Taylor	Nova Science	2024
02	Organic Spectroscopy	William Kemp	Bloomsbury Publishing India Pvt. Ltd	1st edition 2022
03	Vogel's Text book of quantitative chemical analysis	G.H. Jeffery	Longman Scientific & Technical	Revised edition 2023
04	Computational Chemistry	Errol G. Lewars	Springer	Latest edition 2024
05	Advanced Analytical Chemistry	Jessica Carol	NY RESEARCH PRESS, 2015	1st edition 2015

Cos, POs and PSOs Mapping Course Code:- 117PH02

Course Title: - Research Advances in Chemistry

Course Outcomes	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO 7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
	Skilled in research skills like experimental design, data analysis, and problem-solving original research under the guidance of a faculty advisor.	Write his research work findings of his research area in the written format document	Write research paper and Publish his research findings in peer-reviewed/indexed (UGC-Care, Scopous, SCI, ESCI) journals.	Present his research work findings as well as other newly created knowledge in national/international conferences/ seminars/ workshops.	Teach in U.G. and P.G. programmers during his research by getting opportunities for teaching assistantships, will provide valuable teaching experience.	Build a network for support of his carrier by Engaging with fellow students, faculty members, and professionals in the field of chemistry .	Able to apply reasoning to assess the different issues related to society and the consequent responsibilities relevant to the professional scientific practices.	Apply knowledge and skills that are necessary for participating in learning activities throughout life.	Pursue diverse career paths like academic careers as professors or researchers, work in industry, government agencies, or non-profit organizations.	Develop transferable skills such as critical thinking, communication, project management, and teamwork, valuable in both academic and non-academic settings as well as research skills	Make Ethical decision and Explain Ethical Principles, Responsible Conduct of Research, Compliance with Regulations, Informed Consent, Data Management and Sharing, Authorship and Publication Ethics, Conflict of Interest, Ethical and Professional Integrity.	Able to solve environmental problems related to chemistry	The detailed functional knowledge of theoretical concepts and experimental aspects of chemistry.	To integrate the gained knowledge with various contemporary and evolving areas in chemical sciences like analytical, synthetic, pharmaceutical etc.	To understand, analyze, plan and implement qualitative as well as quantitative analytical synthetic and phenome non-based problems in chemical sciences.	Provide opportunities to excel in academics, research or Industry by research based innovative knowledge for sustainable development in chemical science
CO-1 Apply Laboratory apparatus and techniques, calibration of volumetric apparatus and create new knowledge in his selected research area	1	1	1	1	1	3	3	1	1	1	1	1	1	1	1	3
CO 2: Explain synthesis of coordination compounds and apply the CFSE and LFT for complexes	1	1	1	1	1	3	2	1	1	1	1	1	1	1	1	2
CO 3: Explain UV-Visible Spectrophotometry, IR, TG-DTA, NMR, AAS, Mass spectroscopy and XRD Spectroscopy techniques for better research outcomes	1	1	1	1	1	2	3	1	1	1	1	1	1	1	1	2
CO 4: Create new knowledge by evaluating data obtained from Mass, Ultraviolet visible, Infrared, 1H-NMR and 13C-NMR Spectroscopy	1	1	1	1	1	2	3	1	1	1	1	1	1	1	1	3
CO5 Evaluate the role and functioning of computer in research and apply QSAR and spectral analysis.	1	1	1	1	1	3	2	1	1	1	1	1	1	1	1	2

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map: Research Advances in Chemistry

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
PO 1,2,3,4,5,6,7,8,9,10,11,12 PSO 1,2, 3, 4	**CO 1** Apply Laboratory apparatus and techniques, calibration of volumetric apparatus and create newknowledge in his selected research area	**SO1.1** **SO1.2** **SO1.3** **SO1.4** **SO1.5**		**Unit-1.0** **Analytical Chemistry** Laboratory apparatus and techniques, Errors, types of errors, calibration of volumetric apparatus, The concept of Ph and measurements ,function and structures of biomolecules is Ph Dependent, use of indicators, Brief introduction of chromatography, Separation by Paper ,thin layer and column chromatography. 1.1, 1.2, 1.3. 1.4, 1.5, 1.6, 1.7, 1.8, 1.9	Principle of column chromatography
PO 1,2,3,4,5,6,7,8,9,10,11,12 PSO 1,2, 3, 4	**CO 2:** Explain synthesis of coordination compounds and apply the CFSE and LFT for complexes	**SO2.1** **SO2.2** **SO2.3** **SO2.4** **SO2.5**		**Unit-2.0 –** **Bonding in Metal Complexes** Coordination Compounds Types of ligands ,Homleptic and heteroleptic complexes Coordination numbers and structures Stability of complexes .Brief introduction of Valence Bond Approach ,Crystal Field Approach ,Molecular field approach, Octahedral complexes Crystal field stabilization energy(CFSE) Tetragonal distortion of octahedral complexes (Jahn-Teller distortion) Tetrahedral complexes Electronic spectra of transition metal complexes 2.1, 2.2, 2.3.2.4, 2.5, 2.6, 2.7, 2.8, 2.9	structures Stability of complexes .
PO 1,2,3,4,5,6,7,8,9,10,11,12 PSO 1,2, 3, 4	**CO 3:** Explain UV-Visible Spectrophotometry, IR, TG-DTA, NMR, AAS, Mass spectroscopy and XRD Spectroscopy techniques for better research outcomes.	**SO3.1** **SO3.2** **SO3.3** **SO3.4** **SO3.5**		**Unit-3.0** **Spectroscopy-I** Principle, Instrumentation, And Applications, for the Following techniques: UV-Visible Spectrophotometry, IR, TG-DTA, NMR, AAS, Mass spectroscopy and XRD. 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8	Principle, Instrumentation, And Applications of Mass spectroscopy
PO 1,2,3,4,5,6,7,8,9,10,11,12 PSO 1,2, 3, 4	**CO 4:** Create new knowledge by evaluating data obtained from Mass, Ultraviolet visible, Infrared, ^{1}H-NMR and ^{13}C-NMR Spectroscopy	**SO4.1** **SO4.2** **SO4.3** **SO4.4** **SO4.5**		**Unit-4.0** **Spectroscopy-II** Structure elucidation of compound from following spectrum: Mass, Ultraviolet visible, Infrared NMR and CMR. Solved problems based on interpretation of spectra of organic and inorganic compounds. 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 4.9	Analyze the absorption spectrum obtained from UV-Vis spectroscopy
PO 1,2,3,4,5,6,7,8,9,10,11,12 PSO 1,2, 3, 4	**CO 5:** Evaluate the role and functioning of computer in research and apply QSAR and spectral analysis.	**SO5.1** **SO5.2** **SO5.3** **SO5.4** **SO5.5**		**Unit-5.0** **Application of Programming in Chemistry** Computer software's and chemistry, Basic features of computer programming, programming in C/C++, implementation of control structures, class and object, some important programs for chemistry chemical modeling software, QSAR and spectral analysis. poster presentations 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7, 5.8, 5.9, 5.10	Application of QSAR.

Course Code: 151MATH02
Course Title: Advances in Mathematics

Pre- requisite: Students should have basic knowledge of Tensors algebra.

Rationale: The Ph.D. program in the Department of Mathematics allows students to undertake specialized study and independent research in mathematics. Areas of study represented by faculty include analysis, applied mathematics, differential geometry, Cosmology, Fixed Point, Special Function.

Course Outcome :

CO1- 151MATH02.1 Understand the concept of tensors and their transformation laws.

CO2- 151MATH02.2 Newtonian approximation of relativistic equations of motion in general relativity.

CO3- 151MATH02.3 Understand the Principle of Equivalence and its implications in general relativity.

CO4- 151MATH02.4 Apply the Newtonian approximation of Einstein's Field Equations.

CO5- 151MATH02.5 Understand Friedmann-Robertson-Walker (FRW) Cosmological Models with Cosmological Constant.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
	151MATH02	Advances in Mathematics	03	00	02	01	06	03

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

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

Scheme of Assessment:
Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						**End Semester Assessment (ESA)**	**Total Marks** (PRA+ ESA)
			Class Test –I (a)	Class Test-II (b)	Review (c)	Seminar (d)	Mini Project (e)	Total Marks (a+b+c+d +e)		
	151MATH02	ADVANCES IN MATHEMATICS	10	10	10	10	10	50	50	100

Course-Curriculum Detailing:

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

CO1- 151MATH02.1

Understand the concept of tensors and their transformation laws.

Approximate Hours

Item	AppX Hrs
Cl	13
LI	0
SW	2
SL	1
Total	15

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self Learning (SL)**
SO1.1 **SO1.1** understand the Coordinate system and its dimension		**Unit-1.0** **1.1** Transformation of coordinates **1.2** Summation Convention	**SL.1** Transformation of coordinates **SL.2**

SO1.2 understand the difference between vector and tensor **SO1.3** understand the law of Transformation **SO1.4** understand the properties of tensor **SO1.5** understand the properties of Christoffel's Symbols		**1.3** Kronecker Delta **1.4** Tensor **1.5** Algebra of tensors **1.6** Types of Tensors **1.7** Rank of tensors **1.8** Inner product of two vectors **1.9** Fundamental tensor **1.10** Quotient law of tensors **1.11** Christoffel's Symbols **1.12** Properties of Christoffel's Symbols **1.13** Law of transformation for Christoffel's Symbols	Kronecker delta **SL.3** Outer product and contraction

SW-1 Suggested Sessional Work (SW):

a. Assignments:

i. Bianchi Identities and Einstein tensor.

ii. Riemann Christoffel's curvature tensor and its symmetry properties

CO2- 151MATH02.2

Understand the Principle of Equivalence and its implications in general relativity

Approximate Hours

Item	AppX Hrs
Cl	11
LI	0
SW	2
SL	1
Total	14

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self Learning (SL)**
SO2.1 **SO2.1** Understand the hypothesis of the theory of relativity **SO2.2** Understand the hypothesis of Newtonian Theory of gravitation **SO2.3** Understand Principle of equivalence **S02.4** Understand the hypothesis of General covariance **S02.5**		**Unit-2.0** 2.1 Principle of equivalence 2.2 General covariance 2.3 Geodesic principle 2.4 Differential Equation of Geodesics 2.5 Newtonian approximation of relativistic equations of motion 2.6 Poission's equation 2.7 Einstein's field equations :Introduction 2.8 derivation of Einstein's field equations 2.9 Newtonian approximation 2.10 Energy-Momentum	**SL.1** Understand the concept of Einstein's field equations **SL.2** Understand the solution of differential equation

Understand the application of Einstein's field equations		tensor 2.11 Energy-Momentum tensor for perfect fluid.	

SW-2 Suggested Sessional Work (SW):

a. Assignments:

General covariance,Geodesic principle, Einstein's field equations

CO3- 151MATH02.3

Understand the Principle of Equivalence and its implications in general relativity

Approximate Hours

Item	AppX Hrs
Cl	12
LI	0
SW	2
SL	1
Total	15

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self Learning (SL)**
SO3.1 Understand the hypothesis of the theory of relativity **SO3.2** Understand the hypothesis of Newtonian Theory of gravitation **SO3.3** Understand Principle of equivalence **S03.4** Understand the hypothesis of General covariance **S03.5** Understand the application of Einstein's field equations		**Unit-3.0** 3.1 Review of the special theory of relativity 3.2 General theory of relativity 3.3 Special theory of relativity 3.4 Bending of light rays in a gravitational field. 3.5 Gravitational field 3.6 Red shift of spectral lines. 3.7 Schwarzschild external solution- part I 3.8 Schwarzschild external solution- part II 3.9 Isotropic form 3.10 Planetary orbits 3.11 Anologues of Kepler's Laws in general relativity 3.12 Advance of perihelion of a planet.	**SL.1** Understand the concept of Einstein's field equations **SL.2** Understand the solution of differential equation

SW-3 Suggested Sessional Work (SW):

a. Assignments:

Write difference between General theory of relativity and Special theory of relativity

CO4- 151MATH02.4

Apply the Newtonian approximation of Einstein's Field Equations

Approximate Hours

Item	AppX Hrs
Cl	5
LI	0
SW	2
SL	1
Total	8

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self Learning (SL)**
SO4.1 Understand the hypothesis of General relativity SO4.2 Understand the Schwarzschild external solution SO4.3 Understand the Schwarzschild Internal solution SO4.4 Understand the Isotropic form SO4.5 Understand the anisotropic form		**Unit-4.0** 4.1 Heuristic derivation of Einstein's Field equations 4.2 Newtonian Approximation of Equations Motion 4.3 Schwarzschild external solution 4.4 Schwarzschild internal solution 4.5 Isotropic form	**SL.1** learn the properties of Christoffel's Symbols **SL.2** Learn the properties of metric tensor

SW-4 Suggested Sessional Work (SW):

a. Assignments:

line element, Isotropic models and Anisotropic models.

CO5- 151MATH02.5

Understand Friedmann-Robertson-Walker (FRW) Cosmological Models with Cosmological Constant.

Approximate Hours

Item	AppX Hrs
Cl	4
LI	0
SW	2
SL	1
Total	7

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self Learning (SL)**
SO5.1 Understand the role of Matter SO5.2 Understand the concept of static and non static model SO5.3 Understand the concept of FRW Model SO5.4 Understand the concept of cosmological constant SO5.5 Understand the term Geometry		**Unit-5.0** 5.1 Exact solution connecting Radiation 5.2 Matter Dominated Eras of the FRW models 5.3 Static Cosmological Models**,** de-Sitter Model, Lemaitre Model, Edington - Lemaitre Model. Their Physical and Geometrical properties **5.4** Friedmann-Robertson – Walker Cosmological Models with Cosmological Constant	**SL.1** Knowledge of static and Non- static cosmological models **SL.2** Knowledge of Isotropic and anisotropic form

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self Learning (Sl)	Total hour (Cl+SW+Sl)
CO1- 151MATH02.1 Understand the concept of tensors and their transformation laws.	13	2	1	16
CO2- 151MATH02.2 Newtonian approximation of relativistic equations of motion in general relativity.	11	2	1	14
CO3- 151MATH02.3 Understand the Principle of Equivalence and its implications in general relativity	12	2	1	15
CO4- 151MATH02.4 Apply the Newtonian approximation of Einstein's Field Equations.	5	2	1	8
CO5- 151MATH02.5 Understand Friedmann-Robertson-Walker (FRW) Cosmological Models with Cosmological Constant.	4	2	1	7
Total Hours	45	10	5	60

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution				Total Marks
		Ap	An	E	C	
CO-1	Understand the concept of tensors and their transformation laws.	03	02	03	04	12
CO-2	Newtonian approximation of relativistic equations of motion in general relativity.	02	03	03	04	12
CO-3	Understand the Principle of Equivalence and its implications in general relativity	01	02	02	03	08
CO-4	ApplytheNewtonian approximation of Einstein's Field Equations.	01	01	04	04	10
CO-5	Understand Friedmann-Robertson-Walker (FRW) Cosmological Models with Cosmological Constant.	02	02	02	02	08
Total		09	10	14	17	50

Legend: Ap: Apply, An: Analyze, E: Evaluate, C: Create

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

Suggested Instructional/Implementation Strategies

1. Improved Lecture
2. Tutorial
3. Presentation
4. Group Discussion
5. Online sources
6 .Seminar
7. Workshop

Suggested Learning Resources:

a) Books :

S. No.	Title	Author	Publisher	Edition & Year
1	Flashes of Creation	Paul Halpern	Basic Books	2021,1st
2	Before The Big Bang	Laura Mersini-Houghton	Mariner Books	2022 ,1st
3	Cosmology	Daniel Baumann	Cambridge University Press	2022,1st
4	Cosmology's Century	P. J. E. Peebles	Princeton University Press	2020,1st
5	Modern Cosmology	Scott Dodelson	Academic Press	2020,2nd

b) Reference Books :

S. No.	Title	Author	Publisher	Edition & Year
1	Relativity Thermodynamics and Cosmology	Tolman Richard C.	The Clarendon Press, Oxford, London	(Hindi)1934
2	Einstein's general theory of relativity, sigbom Hervik	Øyvind GrØn	Springer science &Business Media.	2007
3	An Introduction to cosmology	Jayant,V.Narlikar	Cambridge University Press	2010
4	General Relativity and Cosmology	J.V. Narlikar	Macmillan	1978.

c) Suggetsed Digital Platform Web links :

Suggested Digital Platforms Web links:	1.http://www.gutenberg.org/ebooks/5001 2.https://www.googleadservices.com/pagead/aclk?sa=L&ai=DChcSEwiwofuE7v-EAxVdwUwCHZS-B20YABAAGgJ0bQ&ase=2&gclid=EAIaIQobChMIsKH7hO7_hAMVXcFMAh2UvgdtEAMYASAAEgJHtfD_BwE&ohost=www.google.com&cid=CAASJeRoxBtCkX3PcVWlqe9GzlNxcQJNYrgF9vbHAHKw7kFLxnrh7M&sig=AOD64_3XX3ZyfwFLiVnLoibj5kLQmz7Bzg&q&nis=4&adurl&ved=2ahUKEwib6fWE7v-EAxWMr1YBHdA-AzkQ0Qx6BAgJEAE 3.https://www.freebookcentre.net/Physics/Relativity-Books-Download.html

Curriculum Development Team

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Cos,POs and PSOs Mapping

Course Title: Ph.D. COURSE WORK
Course Code : 151MATH02
Course Title: ADVANCES IN MATHEMATICS

Course Outcome																
	PO1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO1 1	PO12	PSO 1	PSO 2	PSO 3	PS O 4
	Ad vanc ed Ma the mat ical Kn owl edg e	Pro ble m- solv ing Ski lls	Resear ch Abiliti es	Qu anti tati ve An aly sis	Teac hing and Acad emia	The oret ical Un der sta ndi ng	Com muni catio n Skill s	Oper ation s Rese arch	Appl icati on in Indu stry	Engi neeri ng and Tech nolo gy	Go ver nm ent and Pub lic Sec tor	Cons ultin g	Under stand the mathe matica l concep ts and applic ations in the field of algebr a	Ha ndl e the adv anc ed tec hni que s	Devel op necess ary skills and experti se in the field of researc h	Cr eat es Ma the ma tic al Mo del s
CO1- Understand the concept of tensors and their transformation laws.	2	3	1	2	1	2	2	2	1	1	1	1	2	1	1	2
CO2- Newtonian approximation of relativistic equations of motion in general relativity.	1	3	2	1	1	1	1	1	1	2	3	1	3	1	1	3
CO3- Understand the Principle of Equivalence and its implications in general relativity	3	3	2	2	2	3	2	3	1	1	3	1	2	1	2	3
CO4- Apply the Newtonian approximation of Einstein's Field Equations	3	3	2	2	2	3	2	3	1	1	3	1	2	1	2	3

CO5- Understand Friedmann-Robertson-Walker (FRW) Cosmological Models with Cosmological Constant.	3	3	2	2	2	3	2	3	1	1	3	1	2	1	2	3

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map:Advances in Mathematics

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
PO 1,2,3,4,5,6,7,8,9,10 , 11,12 PSO 1,2, 3, 4	CO1- Understand the concept of tensors and their transformation laws. .	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5		Unit-1.0 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	SL1.1 SL1.2 SL1.3
PO 1,2,3,4,5,6,7,8,9,10 , 11,12 PSO 1,2, 3, 4	CO2-Newtonian approximation of relativistic equations of motion in general relativity.	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5		Unit-2 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8,2.9,2.10, 2.11	SL2.1 SL2.2
PO 1,2,3,4,5,6,7,8,9,10 , 11,12 PSO 1,2, 3, 4	CO3- Understand the Principle of Equivalence and its implications in general relativity	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5		Unit-3 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7,3.8,3.9,3.10, 3.11,3.12	SL2.1 SL2.2
PO 1,2,3,4,5,6,7,8,9,10 ,11,12 PSO 1,2, 3, 4	CO4- Apply the Newtonian approximation of Einstein's Field Equations	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5		Unit-4 4.1, 4.2, 4.3, 4.4, 4.5	SL2.1 SL2.2
PO 1,2,3,4,5,6,7,8,9,10 , 11,12 PSO 1,2, 3,4	CO5- Understand Friedmann-Robertson-Walker (FRW) Cosmological Models with Cosmological Constant.	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5		Unit-5 5.1, 5.2, 5.3, 5.4	SL2.1 SL2.2

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Course Code:-151PHY02

Course Title: -Advances in Physics

Pre requisite: -Student should have basic knowledge of scientific methods of research, the initiation of an inquiry, formulation of research problems and hypotheses, the role of induction and deduction in research, collection and analysis of date and interpretation of results

Rationale: - The students studying research methodology should possess understanding about basic concepts in research methodology in concern subject. The course deals with scientific methods of research, the initiation of an inquiry, formulation of research problems and hypotheses, the role of induction and deduction in research, collection and analysis of date and interpretation of results

Course Outcomes:

CO1:Students will be well-prepared to pursue further research, academic, or industrial endeavors in the interdisciplinary field of nanocomposites, contributing to advancements in materials science, engineering, and technology.

CO2: The students will be well-prepared to contribute to the advancement of knowledge and innovation in the field of advanced materials, whether through academic research, industrial applications, or technological advancements.

CO3: Students will be well-equipped to engage in advanced research and scholarship in the field of relativity, contributing to our understanding of the fundamental nature of space-time and the laws of physics.

CO4: Students will be well-prepared to engage in advanced research and scholarship in the fields of astrophysics and cosmology, contributing to our understanding of the universe's origins, evolution and fundamental properties.

CO5: Students will be well-prepared to conduct cutting-edge research in space science, whether in academia, government research institutions, or the private sector, and contribute to our understanding of the universe and its myriad phenomena.

Scheme of studies

Categories of course	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			C l	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
PCC	151PHY02	Advances in Physics	03	00	02	01	06	03

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

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

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

SL: Self Learning,

C: Credits.

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

Scheme of Assessment:

Categories of course	Course Code	Course Title	**Scheme of Assessment (Marks)**							
			Progressive Assessment (PRA)						**End Semester Assessment (ESA)**	**Total Marks** (PRA+ ESA)
			Class Test 1 (A)	**Class Test 2** (B)	**Mini Review (C)**	**Seminar (D)**	**Mini Project (E)**	**Total Marks (A+B+C+D+E)**		
PCC	151PHY02	Advances in Physics	10	10	10	10	10	50	50	100

Course-Curriculum Detailing:

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

CO-1 Students will be well-prepared to pursue further research, academic, or industrial endeavors in the interdisciplinary field of nanocomposites, contributing to advancements in materials science, engineering, and technology.

Approximate Hours

Item	**AppXHrs**
C l	9
LI	0
SW	1

SL	1
Total	11

Session Outcomes (SOs)	Class room Instruction (CI)	Self Learning (SL)
SO1.1 Students should gain a solid grasp of the physics behind nanocomposite materials, including concepts such as interfacial interactions, dispersion, morphology, and mechanical properties at the nanoscale. **SO1.2**The session likely covered various methods used to synthesize nanocomposites, such as sol-gel, chemical vapor deposition, and in situ polymerization. Students should understand the advantages and limitations of each technique. **SO1.3**An important aspect of the session would be introducing students to characterization techniques specific to nanocomposites, including electron microscopy, X-ray diffraction, spectroscopy (e.g., Raman, FTIR), and thermal analysis (e.g., DSC, TGA). Understanding these techniques is crucial for analyzing the structure and properties of nanocomposite materials. **SO1.4**The session should highlight the diverse range of applications of nanocomposites in various fields such as electronics, aerospace, biomedical, and energy. Students should grasp how the unique properties of nanocomposites can be leveraged to enhance performance in specific applications. **SO1.5**students should be made aware of the current challenges in the field of nanocomposites, such as scalability, reproducibility, and environmental impacts. They should also explore potential future directions for research and development in this area.	Unit-I (Physics of Nanocomposites and their Applications): 1.1 Nanocomposites: Classicification of Composites 1.2 Preparation of polymeric nanocomposites materials including solid and gel films: Solution Cast, spin coating, Hot-Press techniques etc. 1.3 Synthesis of Nanofibers: Gel spinning 1.4electrospun from a Taylor cone,electrospinning of polymeric nanocomposites 1.5 factors affecting electrospinning, redopped fibers composites. 1.6 Application of Nanocomposites: Solid state batteries 1.7 super capacitors, hybrid solar cell, fuel cell, smart windows, actuators 1.8sensors, LCD displays, electrodes, catalysts, functional textile fibers, electrolytes 1.9 drugs, biomedical materials, fabrications membranes, etc.	1.1. Basics of Nanomaterial and Nanotechnology

SW-1 Suggested Sessional Work (SW):

a. Assignments: Learn and analysis on sensors, LCD displays, electrodes, catalysts, functional textile fibers, electrolytes.

CO2: The students will be well-prepared to contribute to the advancement of knowledge and innovation in the field of advanced materials, whether through academic research, industrial

applications, or technological advancements.

Approximate Hours

Item	AppXHrs
C l	9
LI	0
SW	1
SL	1
Total	11

Session Outcomes (SOs)	Class room Instruction (CI)	Self Learning (SL)
SO2.1 Students will develop a comprehensive understanding of the properties exhibited by advanced materials, including but not limited to mechanical, electrical, magnetic, thermal, and optical properties, as well as their significance in various applications. **SO2.2**Students will become familiar with different classes of advanced materials, such as composites, polymers, ceramics, and nanomaterials, and understand how their unique properties arise from their microstructure and composition. **SO2.3**Students will acquire knowledge of a wide range of characterization techniques used to analyze the properties and structure of advanced materials, including microscopy (e.g., SEM, TEM), spectroscopy (e.g., FTIR, UV-Vis, XPS), diffraction techniques (e.g., XRD), thermal analysis (e.g., DSC, TGA), and mechanical testing (e.g., tensile, hardness). **SO2.4**Students will gain hands-on experience in using advanced instrumentation and experimental techniques for material characterization, including sample preparation, data acquisition, and analysis, enabling them to conduct independent research in the field. **SO2.5**Students will learn to critically analyze	Unit-II (Properties of advanced Materials & its characterization Techniques) 2.1 Introduction: Physical properties of matters, Necessity of characterization. 2.2 Macroscopic properties: Optical, Electrical, dielectric, magnetic. 2.3 Microscopic properties along with its characterization techniques 2.4 Bulk and nano-structure – XRD, TEM, Neutron scattering. 2.5 Surface structure and topography – SEM, STM, AFM 2.6 Microstructure – UVVIS, Raman, FTIR, Optical microscopy 2.7. Phase changes, crystalline and amorphous fractions – DSC and Thermo-gravimetric methods – TGA, DTA. 2.8 Mechanical properties: Elastic properties, strength measurements in bulk and thin films, Dynamical Mechanical Analysis (DMA), Physics of fracture – Griffith's theory of brittle fracture. 2.9 Electrical Properties: ac and dc conductivity, permittivity, dielectrics loss modulus, Arrhenius, VTF and WLF.	2.1. Mechanical and Electrical properties of material

scientific literature and research papers related to advanced materials, evaluating the strengths and limitations of different approaches and methodologies used in material characterization and property measurement.		

SW-1 Suggested Sessional Work (SW):

a. Assignments: Prepare the assignment onElectrical Properties: ac and dc conductivity, permittivity, dielectrics loss modulus, Arrhenius, VTF and WLF.

CO 3: Students will be well-equipped to engage in advanced research and scholarship in the field of relativity, contributing to our understanding of the fundamental nature of space-time and the laws of physics.

Approximate Hours

Item	AppXHrs
C l	9
LI	0
SW	1
SL	1
Total	11

Session Outcomes (SOs)	Class room Instruction (CI)	Self Learning (SL)
SO3.1 Students will develop a deep understanding of the fundamental principles of both special and general relativity, including concepts such as space-time, the equivalence principle, Lorentz transformations, and the curvature of space-time. **SO3.2**Students will acquire proficiency in the mathematical formalism used in relativity, including tensor calculus, differential geometry, and the mathematics of curved space-time, enabling them to solve complex problems and equations in the field. **SO3.3**Students will learn about the experimental evidence supporting the theories of relativity, including phenomena such as time dilation, length contraction, gravitational lensing, and the precession of Mercury's orbit, and understand how these observations validate the predictions of relativity. **SO3.4**Students will explore the applications of relativity in various areas of modern physics, including cosmology, astrophysics, particle physics, and quantum gravity, and understand how relativity	Unit-III (Relativity): 3.1 Special Relativity and Flat Space time 3.2 Recapitulation of the basics with particular emphasis on the geometric aspects of Lorentz transformation, including applications to covariant formulation of electrodynamics 3.3 Einstein equations: The Einstein equation from a variational point of view, The Einstein-Hilbert action, The matter Lagrangian and the gravitational field equations 3.4The Newtonian and the Post Newtonian limits (approximation), Linearization of the field equations. 3.5 Selected Application 3.6 The schwarzchild radius, Measuring length and time in the Schwarzchild metric	3.1 The Einstein equation from a variational point of view, The Einstein-Hilbert action

provides the theoretical framework for understanding the universe at both the largest and smallest scales. **SO3.5**Students will recognize the interdisciplinary nature of relativity and its connections to other fields of physics, such as quantum mechanics, thermodynamics, and information theory, and appreciate how insights from relativity contribute to a unified understanding of the laws of nature.	3.7 Newtonian Vs. relativistic orbit, Perihelion procession, the event horizon 3.8 Black hole, formation of black holes, Penrose diagrams – conformal infinity, charged black holes, external black holes, Rotating black holes, Black hole 3.9 Asteroids, thermodynamics (statements only).	

SW-1 Suggested Sessional Work (SW):

a. Assignments: Prepare the assignment onblack hole.

CO4: Students will be well-prepared to engage in advanced research and scholarship in the fields of astrophysics and cosmology, contributing to our understanding of the universe's origins, evolution, and fundamental properties.

Approximate Hours

Item	App X Hrs
Cl	9
LI	0
SW	1
SL	1
Total	11

Session Outcomes (SOs)	Class room Instruction (CI)	Self Learning (SL)
SO4.1. Students will develop a comprehensive understanding of the fundamental principles and theories of astrophysics and cosmology, including celestial mechanics, stellar structure and evolution, galactic dynamics, and the large-scale structure of the universe. **SO4.2.** Students will acquire knowledge of observational techniques used in astrophysics and cosmology, including ground-based and space-based telescopes, spectroscopy, photometry, radio astronomy, and gravitational wave detection, and understand how these techniques are used to study celestial objects and phenomena. **SO4.3.** Students will explore different cosmological models describing the origin, evolution, and fate of the	**Unit-IV (Astrophysics and Cosmology):** 4.1 The expansion of the Universe: Cosmological principles 4.2 Dynamics of expansion: Basics of Friedman – Roberson Walker cosmology 4.3 Cosmological parameters, Dark matters, Age of the Universe, Particle horizon, term, Luminosity distance, 4.4 Distances at large red shifts:	4.1Fundamental about expansion of the Universe 4.2 About black body radiation

universe, including the Big Bang theory, inflationary cosmology, dark matter and dark energy models, and cosmic microwave background radiation, and understand how observations constrain and refine these models. **SO4.4**Students will recognize the interdisciplinary nature of astrophysics and cosmology and understand how concepts and techniques from other fields of physics, such as quantum mechanics, general relativity, and particle physics, are applied to the study of the universe. **SO4.5** Students will learn to critically evaluate scientific research and literature in astrophysics and cosmology, assessing the validity of experimental methods, the reliability of observational data, and the implications of theoretical models for our understanding of the universe.	Accelerated expansion, Intergalactic absorption: Optical depth, Resonant absorption. 4.5 Relics of the big bang: Expectations and discovery of the microwave background radiation 4.6 Black body radiation, Rayleigh Jean's formula 4.7Balloon and Rockets experiments 4.8 COBE, FIRAS 4.9 WMAP experiments and its implication, Power spectrum of the CMB.	

SW-1 Suggested Sessional Work (SW):

a. Assignments: prepare work on Balloon and Rockets experiments.

CO5: Students will be well-prepared to conduct cutting-edge research in space science, whether in academia, government research institutions, or the private sector, and contribute to our understanding of the universe and its myriad phenomena.

Approximate Hours

Item	AppXHrs
Cl	09
LI	00
SW	01
SL	01
Total	11

Session Outcomes (SOs)	**Class room Instruction (CI)**	**Self Learning (SL)**
SO5.1. Students will develop a strong understanding of the theoretical principles underlying space science, including concepts from astrophysics, planetary science, and cosmology, providing a solid foundation for advanced research and modeling. **SO5.2.** Students will gain proficiency in mathematical and computational modeling techniques used to simulate	**Unit-V (Modelling and Observational Techniques in Space Science):** 5.1 Methodology of Space Research Telescope Observations 5.2 Optical Telescopes 5.3 Radio Telescopes	**5.1** Optical Telescopes 5.2 Radio Telescopes

and predict various phenomena in space, such as planetary motion, stellar evolution, galaxy formation, and cosmological structure. **SO5.3.**. Students will become familiar with a range of observational techniques and instrumentation used in space science, including telescopes, spectrographs, satellites, and space probes, and understand their capabilities and limitations in observing different types of celestial objects and phenomena. **SO5.4-**Students will develop advanced skills in analyzing observational data obtained from space-based and ground-based observatories, including techniques for data reduction, calibration, image processing, and statistical analysis, enabling them to extract meaningful insights from observational datasets. **SO5.5.**Students will explore the integration of observational data and theoretical models to test hypotheses, refine theoretical predictions, and validate or constrain theoretical models, fostering a holistic approach to scientific inquiry in space science.	5.4 Ground based Observations 5.5 Satellite Observations 5.6 Solar and Interplanetary parameters 5.7 Geomagnetic parameters 5.8 Cosmic Ray Detectors5.9Extracting Scientific Information from Space Data	

SW-1 Suggested Sessional Work (SW):

a. Assignments: Prepare the assignment on methodology of Space Research Telescope Observations.

Brief of Hours suggested for the Course Outcome

Course Outcomes	**Class Lecture (C l)**	**Laboratory Lecture (L I)**	**Sessional Work (SW)**	**Self Learning (S l)**	**Total hour (C l + LI+ SW +S l)**
CO-1Students will be well-prepared to pursue further research, academic, or industrial endeavors in the interdisciplinary field of nanocomposites, contributing to advancements in materials science, engineering, and technology.	9	0	1	1	11

CO 2: The students will be well-prepared to contribute to the advancement of knowledge and innovation in the field of advanced materials, whether through academic research, industrial applications, or technological advancements.	9	0	1	1	11
CO 3: Students will be well-equipped to engage in advanced research and scholarship in the field of relativity, contributing to our understanding of the fundamental nature of space-time and the laws of physics.	9	0	1	1	11
CO 4: Students will be well-prepared to engage in advanced research and scholarship in the fields of astrophysics and cosmology, contributing to our understanding of the universe's origins, evolution, and fundamental properties.	9	0	1	1	11
CO 5: Students will be well-prepared to conduct cutting-edge research in space science, whether in academia, government research institutions, or the private sector, and contribute to our understanding of the universe and its myriad phenomena.	09	0	1	1	11
Total Hours	**45**	**00**	**05**	**05**	**55**

Suggested Specification Table (For ESA)

CO	**Unit title**	**Marks Distribution**				**Total Marks**
		Ap	An	E	C	
CO-1	Physics of Nanocomposites and their Applications	03	02	03	02	10
CO-2	Properties of advanced Materials & its characterization Techniques	03	03	03	01	10
CO-3	Relativity	03	02	03	02	10
CO-4	Astrophysics and Cosmology	02	02	03	03	10
CO-5	Modelling and Observational Techniques in Space Science	02	02	03	03	10
	Total	13	11	15	11	50

Legend: Ap: Apply, An: Analyse, E: Evaluate, C: Create

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

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

Suggested Instructional/Implementation Strategies:

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

Suggested Learning Resources:

S. No.	Title	Author	Publisher	Edition & Year
01	Nanocomposites, Nanostructures, and Their Applications (eBook)	Leonid Yatsenko, OlenaFesenko	Springer International Publishing	1st& 2020
02	Material Characterization Techniques and Applications	Euth Ortiz Ortega, HamedHosseinian, Ingrid Berenice Aguilar Meza, María José Rosales López, Andrea Rodríguez Vera, Samira Hosseini	Springer Nature Singapore	1st& 2022
03	Special Theory Of Relativity	Dr. Anil Kumar, Dr. Anjani Kumar Singh, Dr. Sindhu Singh	Booksclinic Publishing	1st& 2021
04	Solar and Space Weather Radio Physics	Bin Chen, Dale E. Gary, Nicole Vilmer	Frontiers Media SA	1st& 2021

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Cos, POs and PSOs Mapping

Course Code:-151PHY02
Course Title: -Advances in Physics

Course Outcomes	PO 1	PO2	PO3	PO4	PO5	PO6	PO 7	PO8	PO 9	PO10	PO 11	PO 12	PSO1	PSO2	PSO3	PSO4	PSO5
	Engineering knowledge	**Problemanalysis**	**Design/development solutions**	**Conductinvestigationsofcomplex problems**	**Modern toolusage**	**Theengineerandsociety**	**Environment and sustainability:**	**Ethics**	**Individual and teamwork:**	**Communication:**	**Projectmanagement and finance:**	**Life-longlearning**	Identify,formulate,and solve Physicsproblems.	Designandconductexperiments, aswellastoanalyseandinterpretdata.	**Apply knowledge of Physics in a different stream of science and to communicate effectively.**	**Ability to use the techniques, skills, and modern physical tools in real world application.**	**Engage in life-long learning and will have recognition.**
CO-1 Students will be well-prepared to pursue further research, academic, or industrial endeavors in the interdisciplinary field of nanocomposites, contributing	1	1	1	1	1	3	3	1	1	1	1	1	1	1	1	3	3

to advancements in materials science, engineering, and technology.																
CO 2: The students will be well-prepared to contribute to the advancement of knowledge and innovation in the field of advanced materials, whether through academic research, industrial applications, or technological advancements.	1	1	1	1	1	3	2	1	1	1	1	1	1	1	1	2	3
CO 3: Students will be well-equipped to engage in advanced research and scholarship in the field of relativity, contributing to our understanding of the fundamental nature of space-time and the laws of physics.	1	1	1	1	1	2	3	1	1	1	1	1	1	1	1	2	2
CO 4: Students will be well-prepared to engage in	1	1	1	1	1	2	3	1	1	1	1	1	1	1	1	3	2

advanced research and scholarship in the fields of astrophysics and cosmology, contributing to our understanding of the universe's origins, evolution, and fundamental properties.																
CO 5: Students will be well-prepared to conduct cutting-edge research in space science, whether in academia, government research institutions, or the private sector, and contribute to our understanding of the universe and its myriad phenomena.	1	1	1	1	1	3	2	1	1	1	1	1	1	1	1	2	3

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map: Advances in Physics

POs & PSOs No.	COs No.& Titles	SOs No.	Classroom Instruction (CI)	Self Learning (SL)
PO 1,2,3,4,5,6,7, 8, 9, 10, 11,12 PSO 1,2, 3, 4, 5	**CO-1**Students will be well-prepared to pursue further research, academic, or industrial endeavors in the interdisciplinary field of nanocomposites, contributing to advancements in materials science, engineering, and technology.	**SO1.1** **SO1.2** **SO1.3** **SO1.4** **SO1.5**	**Unit-I (Physics of Nanocomposites and their Applications):** 1.1, 1.2, 1.3. 1.4, 1.5, 1.6, 1.7, 1.8, 1.9	As mentioned in unit-I
PO 1,2,3,4,5,6,7, 8, 9, 10, 11,12 PSO 1,2, 3, 4, 5	**CO 2:**The students will be well-prepared to contribute to the advancement of knowledge and innovation in the field of advanced materials, whether through academic research, industrial applications, or technological advancements.	**SO2.1** **SO2.2** **SO2.3** **SO2.4** **SO2.5**	**Unit-II (Properties of advanced Materials & its characterization Techniques)** 2.1, 2.2, 2.3.2.4, 2.5, 2.6, 2.7, 2.8, 2.9	As mentioned in unit-II
PO 1,2,3,4,5,6,7, 8, 9, 10, 11,12 PSO 1,2, 3, 4, 5	**CO 3:**Students will be well-equipped to engage in advanced research and scholarship in the field of relativity, contributing to our understanding of the fundamental nature of space-time and the laws of physics.	**SO3.1** **SO3.2** **SO3.3** **SO3.4** **SO3.5**	**Unit-III (Relativity)** 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8, 3.9	As mentioned in unit-III

PO 1,2,3,4,5,6,7, 8, 9, 10, 11,12 PSO 1,2, 3, 4, 5	**CO 4:**Students will be well-prepared to engage in advanced research and scholarship in the fields of astrophysics and cosmology, contributing to our understanding of the universe's origins, evolution, and fundamental properties.	**SO4.1** **SO4.2** **SO4.3** **SO4.4** **SO4.5** **SO4.6**	**Unit-IV(Astrophysics and Cosmology)** 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 4.9	As mentioned in unit-IV
PO 1,2,3,4,5,6,7, 8, 9, 10, 11,12 PSO 1,2, 3, 4, 5	**CO 5:**Students will be well-prepared to conduct cutting-edge research in space science, whether in academia, government research institutions, or the private sector, and contribute to our understanding of the universe and its myriad phenomena.	**SO5.1** **SO5.2** **SO5.3** **SO5.4** **SO5.5** **SO5.6**	**Unit-V (Modelling and Observational Techniques in Space Science)** 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7, 5.8, 5.9, 5.10	As mentioned in unit-V

Course Code:	**151 COMM 01**
Course Title:	**Advances in Commerce**
Pre-requisite:	The objectives of the study of Advances in Commerce for a researcher are to manage public funds, economic development, eliminating inequality, retaining price stability, satisfying the nation's fundamental needs, and managing the currency value in the international market

Course Outcomes: On successful completion of this course, the students will be able to**:**

CO1. Understand about basics of Financial Inclusion and Rural development

CO2. Determine the Tools and Techniques of Marketing's Digital Evolution

CO3. Determine the basics of Strategic Human Resource Management

CO4. Understand about basics of Organizational Justice, Citizenship, Performance

CO5. Understand about basics of Ethical Issues in Insurance Sector and Cyber Crime & Security issues;

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
	151 COMM 01	Advances in Commerce	3	0	2	1	6	3

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

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

Scheme of Assessment:

Theory Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			CT-1 A	CT-2 B	MINI REVIEW C	SEMINAR D	MINI PROJECT E	Total Marks (A+B+C+D+E)		
	151 COMM 01	Advances in Commerce	10	10	10	10	10	50	50	100

Course-Curriculum Detailing:

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

Topic Covered:

CO.1: Understand about basics of Financial Inclusion and Rural development

Approximate Hours

Item	Appx Hrs.
Cl	09
LI	0
SW	2
SL	1
Total	12

Session Outcomes (SOs)	**(LI)**	**Classroom Instruction (CI)**	**(SL)**
SO1.1 Understand the Concept, nature of financial inclusion **SO1.2**Understand the Role of GOI towards financial inclusion **SO1.3**Understand the Role of RBI towards financial inclusion **SO1.4**Understand the Measurement of financial inclusion **SO1.5**Understand the Rural development and financial inclusion		**Unit -I Financial Inclusion:** 1.1. Rangarajan Committee on financial inclusion 1.2. Initiatives of GOI Towards financial inclusion 1.3. Initiatives of RBI Towards financial inclusion 1.4. Prime Minister's Jan-Dhan scheme of financial inclusion 1.5. Measurement of financial inclusion 1.6. SME finance 1.7. SME finance and financial inclusion 1.8. Rural development and financial inclusion 1.9. Need and objective of financial inclusion	1.Need and objective of financial inclusion

SW-1 Suggested Sessional Work (SW):

a. Assignments: Role of RBI towards financial inclusion

b. Mini Project: Prime Minister's Jan-Dhan scheme of financial inclusion

CO.2:Determine the Tools and Techniques of Marketing's Digital Evolution

Approximate Hours

Item	Appx Hrs.
Cl	09
LI	0
SW	2
SL	1
Total	12

Session Outcomes (SOs)	(LI)	Classroom Instruction (CI)	(SL)
SO2.1 Concept Meaning &terminology of Digital Marketing **SO2.2** Understanding the Concept of Display Advertising and Email Marketing **SO2.3**Understanding the Search Engine Optimization **SO2.4**Understanding the Concept of Inbound Marketing, Content Marketing **SO2.5**Understanding the Legal Framework for control of social media	.	**Unit-2 Digital Marketing:** 2.1. Concept of Marketing's Digital Evolution, 2.2. Search Engine Optimization 2.3. Concept of Display Advertising and Email Marketing 2.4. Pay Per Click; Mobile marketing 2.5. Inbound Marketing, Content Marketing 2.6. Internet Marketing, Google, Blogs and social media, Acquiring Customers on the Web 2.7. Goals of Social Media Marketing 2.8. Legal Framework for control of social media 2.9. Social Media Strategy: Approach, Audience, Activity	1. Building Customer Engagement Through Social Media Marketing

SW-2 Suggested Sessional Work (SW):

a. Assignments: Goals of Social Media Marketing

b. Mini Project: Understanding Internet Marketing, Google, Blogs and social media, Acquiring Customers on the Web

CO3.Determine the basics of Strategic Human Resource Management

Approximate Hours

Item	Appx Hrs.
Cl	09
LI	0
SW	2
SL	1
Total	12

Session Outcomes (SOs)	(LI)	Classroom Instruction (CI)	(SL)
SO3.1 Understanding the Concept Meaning and Definition of International Human Resource Management **SO3.2** Understanding about Principles of Labour Administration **SO3.3** Understanding the Organizational Change and Development Through HRM **SO3.4**Understanding about the concept of Strategic Human Resource Management **SO3.5**Role of HR in Knowledge Management	.	**Unit -3 HRM in Changing Situations:** 3.1. Concept Meaning and Definition of International Human Resource Management 3.2. Managerial Competencies and Career Development 3.3. Managerial Counselling, Managing Diversity in the Workplace 3.4. Managing Redundancy, Measuring HR, Occupational Testing 3.5. Organizational Change and Development Through HRM 3.6. Concept of Participative Management 3.7. Principles of Labour Administration 3.8. Role of HR in Knowledge Management 3.9. Strategic Human Resource Management	1. Role of HRM in Management

SW-3 Suggested Sessional Work (SW):

a. Assignments: Concept of Participative Management

b. Mini Project: Improving their problem-solving skills, reasoning, and planning skills, etc Through HRM

CO4.Understand about basics of Organizational Justice, Citizenship, Performance

Approximate Hours

Item	Appx Hrs.
Cl	09
LI	0
SW	2
SL	1
Total	12

Session Outcomes (SOs)	**(LI)**	**Classroom Instruction (CI)**	**(SL)**
SO4.1 Understanding the Meaning and Concept of Positive Psychology at Workplace **SO4.2**Understand the Fundamental of Personality and Individual Differences **SO4.3** Understanding the process of Decision Making **SO4.4**Interpersonal Relations & Transactional Analysis **SO4.5** Understand the Organizational Justice		**Unit -4 Organizational Climate:** 4.1. Meaning and Concept of Positive Psychology at Workplace 4.2. Fundamental of Personality and Individual Differences 4.3. Decision Making process 4.4. Effect of Antisocial Behaviour 4.5. Interpersonal Relations & Transactional Analysis 4.6. Meaning of Groups and Teams Studies 4.7. Self, Social, and Organizational Identity 4.8Organizational Justice 4.9. Process of organizational justice	1.Factor affecting organizational working climate

SW-4 Suggested Sessional Work (SW):

a. Assignments: Determine those factors which have positive impact on workplace environment

b. Mini Project: Organizational Justice System

CO5. Understand about basics of Ethical Issues in Insurance Sector and Cyber Crime & Security issues;

Approximate Hours

Item	Appx Hrs.
Cl	09
LI	0
SW	2
SL	1
Total	12

Session Outcomes (SOs)	**(LI)**	**Classroom Instruction (CI)**	**(SL)**
SO5.1 Understand the concept of Ethical Issues in Insurance Sector **SO5.2**learn Risk Based Capital (RBC) **SO5.3**Understand the concept of Remonetisation **SO5.4**learn the corporate governance in Banks, Green Banking **SO5.5** Understand the concept of Demonetization		**Unit-5 Indian Insurance and Banking Industry-Contemporary Issues:** crop insurance, distribution channels, Micro Finance Institutions (MFIs), Forex &Securities Settlement. 5.1. Concept of Ethical Issues in Insurance Sector 5.2. Risk Based Capital (RBC) Approach and Market Consistent Valuation of Liabilities (MCVL) of Indian Insurance Business 5.3. Micro Finance Institutions (MFIs) 5.4. Non-Banking Financial Companies (NBFCs) 5.5History of Demonetization in India 5.6. Corporate governance in Banks, Green Banking 5.7. Demonetization –Black Money, Cash Less Economy, Remonetisation 5.8. Digital Financial Transactions; National Financial Corporation 5.9Social Banking, Cyber Crime & Security issues.	**1.** Securities Settlement; FDI, Merger, & Privatization

SW-5 Suggested Sessional Work (SW):

a. Assignments: Analysis of Digital Financial Transactions; National Financial Corporation

b. **Mini Project:** Make a list of Non-Banking Financial Companies (NBFCs)

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+SW+Sl)
CO-1: Understand about basics of Financial Inclusion and Rural development	09	2	1	12
CO.2: Determine the Tools and Techniques of Marketing's Digital Evolution	09	2	1	12
CO3.Determine the basics of Strategic Human Resource Management	09	2	1	12
CO4. Understand about basics of Organizational Justice, Citizenship, Performance	09	2	1	12
CO5. Understand about basics of Ethical Issues in Insurance Sector and Cyber Crime & Security issues	09	2	1	12
Total Hours	45	10	05	60

Suggestion for End Semester Assessment

Suggested Specification Table (ForESA)

CO	**Unit Titles**	**Marks Distribution**				**Total Marks**
		A	**A**	**E**	**C**	
CO-1	Understand about basics of Financial Inclusion and Rural development	01	02	03	4	10
CO-2	Determine the Tools and Techniques of Marketing's Digital Evolution	01	01	02	3	07
CO-3	Determine the basics of Strategic Human Resource Management	03	03	03	4	13
CO-4	Understand about basics of Organizational Justice, Citizenship, Performance	01	02	03	5	11
CO-5	Understand about basics of Ethical Issues in Insurance Sector and Cyber Crime & Security issues	01	02	03	03	09
Total		07	10	14	19	50

Legend: A: Apply, A: Analyze, E: Evaluate C: Create

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

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

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Brainstorming

Suggested Learning Resources:

(a) Books:

S. No.	Title	Author	Publisher	Edition & Year
1	Financial Management	Ravi M. Kishore Padma Sai Arora	TAXMANN'S	9th Edition, September, 2023
2	Digital Marketing	Seema Gupta	McGraw Hill	3rd Edition, August 2022
3	Human Resource Management	Indian Institute of Banking and Finance	Macmillan Education	1st Edition, January 2023
4	Journal of organizational behaviour review		Seema Polatci	2024 - Volume: 6 Issue: 2
5	Elements of Banking and Insurance	Jyotsna Sethi Nishwan Bhatia	PHI Learning Pvt. Ltd	3rd Edition, January, 2023
5	Lecture note provided by Dept. of Commerce AKS University, Satna .			

Cos, POs and PSOs Mapping

Course Title: Ph.D. COURSE WORK
Course Code:151 COMM 01
Course Title: Advances in Commerce

Course Outcomes	Program Outcomes										Program Specific Outcome				
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
	Commerce and business-related areas	Solving the problems	Profession related scenarios	Start-ups and entrepreneurial ventures	Leadership qualities	Communication through different modes	Advance research in the field of commerce	Decision making	Pathways programs	Environment and sustainability:	Paraphrase the field of E Commerce and digital platforms	Articulate in the area of corporate sectors and its operations.	Enhance the skills of Entrepreneurial attitude and create an impact on social life	Demonstrate knowledge in setting up e-commerce platforms	Design the system and processes essentially required for e-commerce
CO-1: Understand about basics of Financial Inclusion and Rural development	3	2	1	1	1	1	2	2	1	1	1	2	1	1	1
CO.2: . Determine the Tools and Techniques of Marketing's Digital Evolution	3	3	1	1	1	2	2	1	1	1	1	2	1	1	1
CO3.Determine the basics of Strategic Human Resource Management	3	3	1	1	1	2	3	1	1	1	1	3	1	1	1
CO4. Understand about basics of Organizational Justice, Citizenship, Performance	2	2	1	1	1	2	1	1	1	1	**1**	**1**	**1**	**1**	**1**

CO5. Understand about basics of Ethical Issues in Insurance Sector and Cyber Crime & Security issues:	3	3	1	1	1	2	2	2	1	1	2	1	1	1	1

Legend:1–Slight (Low),2–Medium, 3–High

Course Curriculum Map:

POs &PSOs No.	Cos No. & Titles	SOs No.	(LI)	Classroom Instruction (CI)
PO1,2,3,4,5,6 7,8,9,10, PSO 1,2, 3, 4, 5	CO-1: Understand about basics of Financial Inclusion and Rural development	SO1.1SO1.2 SO1.3SO1.4 SO1.5		Unit 1. **Financial inclusion** 1.1, 1.2,1.3,1.4,1.5,1.6,1.7,1.8 1.9,
PO1,2,3,4,5,6 7,8,9,10, PSO 1,2, 3, 4, 5	CO.2: Determine the Tools and Techniques of Marketing's Digital Evolution	SO2.1SO2.2 SO2.3 SO2.4 SO2.5		Unit-2 **Digital marketing** 2.1,2.2,2.3,2.4,2.5,2.6, 2.7, 2.8,2.9,
PO1,2,3,4,5,6 7,8,9,10, PSO 1,2, 3, 4, 5	CO3.Determine the basics of Strategic Human Resource Management	SO3.1SO3.2 SO3.3 SO3.4 SO3.5		Unit-3 : **HRM** in **changing Situations** 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8, 3.9,

PO1,2,3,4,5,6 7,8,9,10, PSO 1,2, 3, 4, 5	CO4. Understand about basics of Organizational Justice, Citizenship, Performance	SO4.1SO4.2 SO4.3SO4.4 SO4.5		Unit-4**Organizational Climate** 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9
PO1,2,3,4,5,6 7,8,9,10, PSO 1,2, 3, 4, 5	CO 5:Understand about basics of Ethical Issues in Insurance Sector and Cyber Crime & Security issues;	SO5.1SO5.2 SO5.3SO5.4 SO5.5		Unit 5: **Indian Insurance and Banking Industry-Contemporary Issues** 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9,

CourseCode:	151CAS02
CourseTitle:	Advances in Computer Application & Science
Pre-requisite:	Student should have basic knowledge of Computer fundamentals andprogramming.
Rationale:	This enables them to keep up with the rapidly evolving technology andusethenewestinnovations tobenefittheirresearch.

Course Outcomes:

151CAS02-1Illustrate the basic concepts of data structures and their applications.

151CAS02-2Apply step by step approach in solving problems with the help of fundamental data structures

151CAS02-3Analyse the fundamental concepts and techniques of Operating Systems.

151CAS02-4Design data base system.

151CAS02-5Use valuable skills in computer networks and network security.

Scheme of studies

Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
		Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
151CAS02	Advances in Computer Application & Science	3	0	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, miniproject etc.),

SL: Self Learning,

C: Credits.

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

Scheme of Assessment:

Course Code		Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks
			Class Test_1 (A)	Class Test_2 (B)	Mini Review (C)	Seminar (D)	Mini Project (E)	Total(A+B+C+D+E)		
151CAS02		Advances in Computer Application & Science	10	10	10	10	10	50	50	100

Course-Curriculum Detailing:

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

151CAS02-1 Illustrate the basic concepts of data structures and their applications.

Approximate Hours

Item	Appx Hrs.
C l	9
LI	0
SW	1
SL	1
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO1.1 UnderstandArrays **SO1.2**LearnaboutStack **SO1.3** Understand the concept and types of queues **SO1.4** Learn about types of Linked lists **SO1.5** Understand concepts and types of Trees **SO1.6**UnderstandGraphs **SO1.7**Learn about sorting, searching and hashing		**Module1: Data Structures** 1.1 Operations on Array 1.2 Operations on stack and its applications 1.3 Operations on queue and its types 1.4 Operations on singly, doubly and circular linked list 1.5 Binary tree, Binary Search tree, 1.6 AVL tree, B-tree 1.7 Representation of graph, Minimum Spanning Tree, Dijkstra's algorithm 1.8 Sorting and Searching techniques; 1.9 Hashing	Study about real world applications of Data Structures.

SW-1 Suggested Sessional Work (SW): Assignments

151CAS022: Apply step by step approach in solving problems with the help of fundamental data structures

Approximate Hours

Item	Appx. Hrs
C l	9
LI	0
SW	1
SL	1
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO2.1 Student will able to understand Ethics with respect to science and research **SO2.2.** Understand the concept of Intellectual honesty and research integrity **SO2.3.** Understand the concept of Scientific misconducts: Falsification, Fabrication, and Plagiarism **SO2.4-** Develop insights about the Redundant Publication: duplicate and overlapping publications, salamislicing **SO2.5.** Developed the learning capacity to understand selective Reporting and misinterpretation of data		**Module2: Algorithms** 2.1 Introduction to Algorithm, analyzing algorithm 2.2 Brute-force approach: Insertion sort 2.3 Divide and Conquer approach: Quick-sort 2.4 Merge sort, Binary search, Strassen's Matrix multiplication 2.5 Dynamic Programming: Matrix-chain multiplication 2.6 Greedy Algorithm: Knapsack problem 2.7 Backtracking: n-Queen Problem 2.8 Branch and Bound strategy: 2.9 Travelling Salesman Problem	**2.1.** Intellectual honesty and research integrity **2.2** Selective reporting and misinterpretation of data

SW-1 Suggested Sessional Work(SW):

a. Assignments:

151CAS02-3Analyse the fundamental concepts and techniques of Operating Systems.

Approximate Hours

Item	Appx Hrs.
C l	9
LI	0
SW	1
SL	1
Total	11

Session Outcomes (SOs)	Laboratory Instructio (LI)	Class room Instruction (CI)	Self Learning (SL)
SO3.1 Learnabout Operating Systems and System calls **SO3.2**Understand Operating system Architecture **SO3.3**Learnabout Processes **SO3.4**Learnabout process synchronization and deadlock **SO3.5**Learnabout Deadlocks **SO3.6**Learnabout Congestion Control **SO3.7**Learnabout Paging and Segmentation **SO3.8**Learnabout Virtual Memory and Page replacement algorithms **SO3.9** Learn about Secondary storage Structure, disk Scheduling		**Unit-3** **Operating System** 3.1. What is operating system? System calls, types of system calls 3.2. Operating system architecture 3.3. Process concept, process Scheduling, Inter-process Communication 3.4. Process synchronization, Deadlock-definition 3.5. Deadlock prevention, avoidance, detection and recovery 3.6. Memory Management-Logical Vs. Physical Address Space 3.7. Paging, Segmentation 3.8. Virtual Memory, 3.9. Page replacement algorithm	**3.1**Studyaboutdifferent Types of Operating Systems.

SW-1 Suggested Sessional Work(SW): Assignments:
CO-4Design Database System.

Approximate Hours

Item	Appx. Hrs.
Cl	9
LI	0
SW	1
SL	1
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO4.1 Introduction to DBMS **SO4.2**Learnabo ut DBMS Architecture **SO4.3** Understand about Data modeling using ER model **SO4.4** Learn about Relational Algebra, Relational Calculus **SO4.5** Learn about various Normalization forms **SO4.6** Learn SQL Commands **SO4.7** Understand ACID properties **SO4.8** Learn about Serializability, Recoverability, Concurrency Control		**Unit-4.0** **Base Management Systems** 4.1 Advantages of DBMS 4.2 DBMS architecture and data independence 4.3 Data modeling using ER model, various types of Keys 4.4 Relational Algebra, Relational Calculus 4.5 Introduction to Normalization,1NF,2NF,3 NF, BCNF, 4NFand 5NF 4.6 Basic SQL-DDL, 4.7 DML and 4.8 DCL 4.9 ACID properties of transaction	**4.1**-SHERPA/Ro MEO online resource to check publisher copyright & self-archiving policies **4.2**. Software tool to Identify predatory publications developed by SPPU

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

151CAS02-5Use valuable skills in computer networks and network security.

Approximate Hours

Item	Appx. Hrs.
Cl	9
LI	0
SW	1
SL	1
Total	11

Session Outcomes(SOs)	Laboratory Instruction (LI)	Class room Instruction(CI)	Self-Learning (SL)
SO5.1 Introduction to Computer Networks **SO5.2** Understand OSI &TCP/IP model **SO5.3** Learn about Physical and Data link layer issues **SO5.4** Understand Network layer and IP protocol **SO5.5** Understand Routing protocols, Transport layer Protocols and related Issues **SO5.6** Understand different Application layer protocols like ftp, telnet, mail (SMTP), HTTP, DNS, DHCP		**Unit 5: Computer Network** 5.1 Introduction, Fundamental requirements of network 5.2 OSI&TCP/IP model 5.3 Physical and Data link layer issues 5.4 Network layer: IP and Other protocols 5.5 Routing protocols, Transport layer Protocols and related Issues 5.6 Introduction to different Application layer protocols like ftp, telnet, 5.7 Mail (SMTP), 5.8 HTTP, DNS, 5.9 DHCP	Study about different types of Network and data transfer between them.

SW-1 Suggested Sessional Work (SW):

Assignments: Prepare the assignment on Metrics: h-index, g-index, i10index, altimetric.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lectur (Cl)	Laboratoy Lecture(LI)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+ LI+SW +Sl)
151CAS02-1Illustrate the basic concepts of data structures and their applications.	09	00	01	01	11
151CAS02-2Apply step by step approach in solving problems with the help of fundamental data structures	09	00	01	01	11
151CAS02-3Analyse the fundamental concepts and techniques of Operating Systems.	09	00	01	01	11
151CAS02-4 Design data base system.	09	00	01	01	11

151CAS02-5Use valuable skills in computer networks and network security.	09	00	01	01	11
Total Hours	**45**	**00**	**05**	**05**	**55**

Suggested Specification Table (ForESA)

CO	**Course Outcome**	**Marks Distribution**				**Total Marks**
		Apply	**Analyse**	**Evaluate**	**Create**	
CO-1	151CAS02-1 Illustrate the basic concepts of data structures and their applications.	02	04	02	02	10
CO-2	151CAS02-2Apply step by step approach in solving problems with the help of fundamental data structures	02	03	02	03	10
CO-3	151CAS02-3Analyse the fundamental concepts and techniques of Operating Systems.	03	03	02	02	10
CO-4	151CAS02-4 Design data base system.	02	03	02	03	10
CO-5	151CAS02-5Use valuable skills in computer networks and network security.	03	02	02	03	10
	Total	12	15	10	13	50

The end of semester assessment for Advances in Computer Application and 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. No.	Title	Author	Publisher	Edition& Year
01	Introduction to Algorithm	Cormen, Leiserson, Rivest, Stein	PHI	4th edition &2022
02	Modern Operating Systems	Andrew S. Tanenbaum	PHI	5th edition& 2022
03	Fundamentals of Database Systems	Elmasri and Navathe	Addision Wesley	7th Edition,2021
04	Data Communications and Networking	B.A. Forouzan	TMH	6th Edition& 2022

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6. Mr. Vinay Kumar Dwivedi, Assistant Professor, Department of Computer Science and Engineering.
7. Dr. Pinki Sharma, Assistant Professor, Department of Computer Science and Engineering.

Cos, POs and PSOs Mapping

CourseCode:151CAS02

Course Title:-Advances in Computer Application & Science

Course Out comes	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO 7	PSO1	PSO2	PSO3	PSO4
151CAS02-1 Illustrate the basic concepts of data structures and their applications.	2	2	1	3	1	2	2	1	1	3	1
151CAS02-2Apply step by step approach in solving problems with the help of fundamental data structures	2	1	2	3	3	2	2	3	2	3	1
151CAS02-3Analyse the fundamental concepts and techniques of Operating Systems.	2	1	1	3	1	2	2	1	1	3	1
151CAS02-4 Design data base system.	2	1	1	3	1	2	2	1	1	3	1
151CAS02-5Use valuable skills in computer networks and network security.	2	1	1	3	1	2	2	1	1	3	1

Legend:1–Low,2–Medium,3– High

Course Curriculum Map: Advances in Computer Application& Science

POs & PSOs No.	COs No. &Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO 1,2,3,4,5,6,7 PSO 1,2,3, 4, 5, 6, 7, 8, 9, 10,11	151CAS02-1 Illustrate the basic concepts of data structures and their applications..	**SO1.1 SO1.2 SO1.3 SO1.4 SO1.5**		Unit 1: 1.1, 1.2, 1.3, 1.4, 1.5, 1.6,1.7,1.8,1.9	As mentioned in above page number
PO 1,2,3,4,5,6,7 PSO 1,2,3, 4, 5, 6, 7, 8, 9, 10,11	151CAS02-2Apply step by step approach in solving problems with the help of fundamental data structures	**SO2.1 SO2.2 SO2.3 SO2.4 SO2.5**		Unit 2: 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9	
PO 1,2,3,4,5,6,7 PSO 1,2,3, 4, 5, 6, 7, 8, 9, 10,11	151CAS02-3Analyse the fundamental concepts and techniques of Operating Systems.	**SO3.1 SO3.2 SO3.3 SO3.4 SO3.5 SO3.6 SO3.7**		Unit 3: 3.1,3.2, 3.3, 3.4, 3.5,3.6, 3.7, 3.8,3.9	
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4, 5, 6, 7, 8, 9, 10, 11	151CAS02-4 Design data base system.	**SO4.1 SO4.2 SO4.3 SO4.4**		Unit 4: 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7,4.8,4.9	
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4, 5, 6, 7, 8, 9, 10, 11	151CAS02-5Use valuable skills in computer networks and network security.	**SO5.1 SO5.2 SO5.3 SO5.4**		Unit 5: 5.1, 5.2, 5.3, 5.4, 5.5, 5.6,5.7,5.8,5.9	

Course Code:	151CSE02
Course Title:	Advances in Computer Science& Engineering
Pre-requisite:	Student should have basic knowledge of Computer fundamentals and programming.
Rationale:	This enables them to keep up with the rapidly evolving technology and use the newest innovations to benefit their research.

Course Outcomes:

151CSE02-1Illustrate the basic concepts of data structures and their applications.

151CSE02-2Apply step by step approach in solving problems with the help of fundamental data structures

151CSE02-3Analyse the fundamental concepts and techniques of Operating Systems.

151CSE02-4Design data base system.

151CSE02-5Use valuable skills in computer networks and network security.

Scheme of studies

Cours Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
		Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
151CSE02	Advances in Computer Science & Engineering	3	0	1	1	5	3

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:

Course Code	Course Title	Scheme of Assessment (Marks)							
		Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks
		Class Test_1 (A)	Class Test_2 (B)	Mini Review (C)	Seminar (D)	Mini Project (E)	Total(A+B+C+D+E)		
151CSE02	Advances in Computer Science & Engineering	10	10	10	10	10	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Class room 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.

151CSE02-1 Illustrate the basic concepts of data structures and their applications.

Approximate Hours

Item	Appx Hrs.
C l	9
LI	0
SW	1
SL	1
Total	11

Session Outcomes (SOs)	Laborator Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO1.1 UnderstandArrays **SO1.2**LearnaboutStack **SO1.3** Understand the concept and types of queues **SO1.4** Learn about types of Linked lists **SO1.5** Understand concepts and types of Trees **SO1.6**UnderstandGraphs **SO1.7**Learn about sorting, searching and hashing		**Module1: Data Structures** 1.1 Operations on Array 1.2 Operations on stack and its applications 1.3 Operations on queue and its types 1.4 Operations on singly, doubly and circular linked list 1.5 Binary tree, Binary Search tree, 1.6 AVL tree, B-tree 1.7 Representation of graph, Minimum Spanning Tree, Dijkstra's algorithm 1.8 Sorting and Searching techniques; 1.9 Hashing	Study about real world applications of Data Structures.

SW-1 Suggested Sessional Work (SW): Assignments

151CSE022: Apply step by step approach in solving problems with the help of fundamental data structures

Approximate Hours

Item	Appx. Hrs
C l	9
LI	0
SW	1
SL	1
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO2.1 Student will able to understand Ethics with respect to science and research **SO2.2.** Understand the concept of Intellectual honesty and research integrity **SO2.3.** Understand the concept of Scientific misconducts: Falsification, Fabrication, and Plagiarism **SO2.4-** Develop insights about the Redundant Publication: duplicate and overlapping publications, salamislicing **SO2.5.** Developed the learning capacity to understand selective Reporting and misinterpretation of data		**Module2: Algorithms** 2.1 Introduction to Algorithm, analyzing algorithm 2.2 Brute-force approach: Insertion sort 2.3 Divide and Conquer approach: Quick-sort 2.4 Merge sort, Binary search, Strassen's Matrix multiplication 2.5 Dynamic Programming: Matrix-chain multiplication 2.6 Greedy Algorithm: Knapsack problem 2.7 Backtracking: n-Queen Problem 2.8 Branch and Bound strategy: 2.9 Travelling Salesman Problem	**2.1.** Intellectual honesty and research integrity **2.2** Selective reporting and misinterpretation of data

SW-1 Suggested Sessional Work (SW):

a. Assignments:

151CSE02-3Analyse the fundamental concepts and techniques of Operating Systems.

Approximate Hours

Item	Appx Hrs.
C l	9
LI	0
SW	1
SL	1
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO3.1 Learna bout Operating Systems and System calls **SO3.2**Understand Operating system Architecture **SO3.3**Learnabout Processes **SO3.4**Learnabout process synchronization and deadlock **SO3.5**Learnabout Deadlocks **SO3.6**Learnabout Congestion Control **SO3.7**Learnabout Paging and Segmentation **SO3.8**Learnabout Virtual Memory and Page replacement algorithms **SO3.9** Learn about Secondary storage Structure, disk Scheduling		**Unit-3** **Operating System** 3.1. What is operating system? System calls, types of system calls 3.2. Operating system architecture 3.3. Process concept, process Scheduling, Inter-process Communication 3.4. Process synchronization, Deadlock-definition 3.5. Deadlock prevention, avoidance, detection and recovery 3.6. Memory Management-Logical Vs. Physical Address Space 3.7. Paging, Segmentation 3.8. Virtual Memory, 3.9. Page replacement algorithm	**3.1**Study about different Types of Operating Systems.

SW-1 Suggested Sessional Work (SW): Assignments:
CO-4Design Database System.

Approximate Hours

Item	Appx. Hrs.
Cl	9
LI	0
SW	1
SL	1
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO4.1 Introduction to DBMS **SO4.2**Learn about DBMS Architecture **SO4.3** Understand about Data modeling using ER model **SO4.4** Learn about Relational Algebra, Relational Calculus **SO4.5** Learn about various Normalization forms **SO4.6** Learn SQL Commands **SO4.7** Understand ACID properties **SO4.8** Learn about Serializability, Recoverability, Concurrency Control		**Unit-4.0** **Base Management Systems** 4.1 Advantages of DBMS 4.2 DBMS architecture and data independence 4.3 Data modeling using ER model, various types of Keys 4.4 Relational Algebra, Relational Calculus 4.5 Introduction to Normalization,1NF,2NF,3 NF, BCNF, 4NFand 5NF 4.6 Basic SQL-DDL, 4.7 DML and 4.8 DCL 4.9 ACID properties of transaction	**4.1**-SHERPA/Ro MEO online resource to check publisher copyright & self-archiving policies **4.2**. Software tool to Identify predatory publications developed by SPPU

SW-1SuggestedSessionalWork (SW): Assignments:

151CSE02-5Use valuable skills in computer networks and network security.

Approximate Hours

Item	Appx. Hrs.
Cl	9
LI	0
SW	1
SL	1
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO5.1 Introduction to Computer Networks **SO5.2** Understand OSI &TCP/IP model **SO5.3** Learn about Physical and Data link layer issues **SO5.4** Understand Network layer and IP protocol **SO5.5** Understand Routing protocols, Transport layer Protocols and related Issues **SO5.6** Understand different Application layer protocols like ftp, telnet, mail (SMTP), HTTP, DNS, DHCP		**Unit 5: Computer Network** 5.1 Introduction, Fundamental requirements of network 5.2 OSI&TCP/IP model 5.3 Physical and Data link layer issues 5.4 Network layer: IP and Other protocols 5.5 Routing protocols, Transport layer Protocols and related Issues 5.6 Introduction to different Application layer protocols like ftp, telnet, 5.7 Mail (SMTP), 5.8 HTTP, DNS, 5.9 DHCP	Study about different types of Network and data transfer between them.

SW-1 Suggested Sessional Work (SW):

Assignments: Prepare the assignment on Metrics: h-index,g-index,i10index,altimetric.

Brief of Hours suggested for the Course Outcome

Course Out comes	Class Lecture (Cl)	Laboratory Lecture (LI)	Sessional Work (SW)	Self-Learning (Sl)	Total hour (Cl+ LI+SW +Sl)
151CSE02-1 Illustrate the basic concepts of data structures and their applications.	09	00	01	01	11
151CSE02-2 Apply step by step approach in solving problems with the help of fundamental data structures	09	00	01	01	11
151CSE02-3 Analyse the fundamental concepts and techniques of Operating Systems.	09	00	01	01	11
151CSE02-4 Design database system.	09	00	01	01	11
151CSE02-5Use valuable skills in computer networks and network security.	09	00	01	01	11
Total Hours	**45**	**00**	**05**	**05**	**55**

Suggested Specification Table (ForESA)

CO	Course Outcome	Marks Distribution				Total Marks
		Apply	Analyse	Evaluate	Create	
CO-1	151CSE02-1 Illustrate the basic concepts of data structures and their applications.	02	04	02	02	10
CO-2	151CSE02-2 Apply step by step approach in solving problems with the help of fundamental data structures	02	03	02	03	10
CO-3	151CSE02-3 Analyse the fundamental concepts and techniques of Operating Systems.	03	03	02	02	10
CO-4	151CSE02-4 Design database system.	02	03	02	03	10
CO-5	151CSE02-5Use valuable skills in computer networks and network security.	03	02	02	03	10
	Total	12	15	10	13	50

The end of semester assessment for Advances in Computer Application and 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. No.	Title	Author	Publisher	Edition& Year
01	Introduction to Algorithm	Cormen, Leiserson, Rivest, Stein	PHI	4th edition &2022
02	Modern Operating Systems	Andrew S. Tanenbaum	PHI	5th edition& 2022
03	Fundamentals of Database Systems	Elmasri and Navathe	Addision Wesley	7th Edition,2021
04	Data Communications and Networking	B.A. Forouzan	TMH	6th Edition & 2022

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Cos, POs and PSOs Mapping

Course Code: 151CSE02

Course Title:- Advances in Computer Science & Engineering

Course Outcomes	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO 7	PSO1	PSO2	PSO3	PSO4
151CSE02-1 Illustrate the basic concepts of data structures and their applications.	2	2	1	3	1	2	2	1	1	3	1
151CSE02-2 Apply step by step approach in solving problems with the help of fundamental data structures	2	1	2	3	3	2	2	3	2	3	1
151CSE02-3 Analyse the fundamental concepts and techniques of Operating Systems.	2	1	1	3	1	2	2	1	1	3	1
151CSE02-4 Design database system.	2	1	1	3	1	2	2	1	1	3	1
151CSE02-5Use valuable skills in computer networks and network security.	2	1	1	3	1	2	2	1	1	3	1

Legend:1–Low,2–Medium,3– High

Course Curriculum Map: Advances in Computer Science & Engineering

POs & PSOs No.	COs No. & Titles	SOs No.	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
PO 1,2,3,4,5,6,7 PSO 1,2,3, 4, 5, 6, 7, 8, 9, 10,11	151CSE02-1 Illustrate the basic concepts of data structures and their applications.	**SO1.1 SO1.2 SO1.3 SO1.4 SO1.5**		Unit 1: 1.1, 1.2, 1.3, 1.4, 1.5, 1.6,1.7,1.8,1.9	As mentioned in above page number
PO 1,2,3,4,5,6,7 PSO 1,2,3, 4, 5, 6, 7, 8, 9, 10,11	151CSE02-2 Apply step by step approach in solving problems with the help of fundamental data structures	**SO2.1 SO2.2 SO2.3 SO2.4 SO2.5**		Unit 2: 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9	
PO 1,2,3,4,5,6,7 PSO 1,2,3,4, 5, 6, 7, 8, 9, 10,11	151CSE02-3 Analyse the fundamental concepts and techniques of Operating Systems.	**SO3.1 SO3.2 SO3.3 SO3.4 SO3.5 SO3.6 SO3.7**		Unit 3: 3.1,3.2, 3.3, 3.4, 3.5,3.6, 3.7, 3.8,3.9	
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4, 5, 6, 7, 8, 9, 10, 11	151CSE02-4 Design database system.	**SO4.1 SO4.2 SO4.3 SO4.4**		Unit 4: 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7,4.8,4.9	
PO 1,2,3,4,5,6,7 PSO 1,2, 3, 4, 5, 6, 7, 8, 9, 10, 11	151CSE02-5Use valuable skills in computer networks and network security.	**SO5.1 SO5.2 SO5.3 SO5.4**		Unit 5: 5.1, 5.2, 5.3, 5.4, 5.5, 5.6,5.7,5.8,5.9	

Course Code:-151MT02

Course Title:-Advances in Manufacturing Technology

Prerequisite:-Fundamental knowledge of manufacturing processes, material science,and basic Mechanical engineering principles, including machining and tooling techniques.

Rationale: - This subject equips students with cutting-edge manufacturing technologies and techniques, enhancing their ability to innovate, optimize processes, and solve complex engineering challenges in modern industrial environments.

Course Outcomes:

151MT02.1:Analyze and apply advanced Mechanical engineering concepts to solve complex engineering problems.

151MT02.2: Master advanced special machining techniques for enhanced precision and efficiency in manufacturing.

151MT02.3: Understand and apply unconventional machining techniques for advanced material processing applications.

151MT02.4:Utilize rapid prototyping techniques and optimize surface roughness for advanced manufacturing processes.

151MT02.5:Apply AI and expert systems for advanced problem-solving in manufacturing processes

Scheme of studies

Categories of course	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
	151MT02	Advances in Manufacturing Technology	03	00	02	01	06	03

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, miniproject etc.),

SL: Self Learning,

C: Credits.

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

Scheme of Assessment:

Categories of course	Course Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class Test 1 (A)	Class Test 2 (B)	Mini Review (C)	Seminar (D)	Mini Project (E)	Total Marks (A +B + C +D + E)		
	151MT02	**Advances in Manufacturing Technology**	10	10	10	10	10	50	50	100

Course-Curriculum Detailing:

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

151MT02.1 Analyze and apply advanced Mechanical engineering concepts to solve complex engineering problems.

Approximate Hours

Item	Appx Hrs.
Cl	9
LI	0
SW	1
SL	1
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self -Learning (SL)
SO1.1. Evaluate tool wear mechanisms and predict tool life for various materials. **SO1.2.** Analyze cutting Forces and vibrations to optimize machine parameters and tool selection. **SO1.3.** Apply knowledge of different tool materials and techniques to specific machining operations, including gundrill sand boring.		**Unit-I METAL CUTTING AND TOOL MATERIALS (9 Hours)** 1.1 Orthogonal and oblique cutting Types of tool wear 1.2 Abrasion. Diffusion, Oxidation 1.3 Fatigue and Adhesive wear - Prediction of Tool materials 1.4 cemented tool life 1.5 Monitoring of tool wear 1.6 Cutting forces and vibration carbide, Coated carbide 1.7 Cermet, Ceramic, CBN 1.8 PCD - Selection of machine parameters 1.9 Tools	1.1Gundrills

SW-1Suggested Sessional Work (SW):

a. Assignments: Impact of Technological Changes on Gun boring

151MT02.2: Master advanced special machining techniques for enhanced precision and efficiency in manufacturing.

Approximate Hours

Item	Appx Hrs.
Cl	8
LI	0
SW	1
SL	1
Total	10

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO2.1 Identify and apply specialized machining techniques for precision and surface finish improvement.		**Unit-II: SPECIAL MACHINING (8 Hours)** 2.1 Deep hole drilling 2.2 Trepanning 2.3 Honing 2.4 Lapping 2.5 Super finishing 2.6 Burnishing 2.7 Broaching 2.8 High speed machining	2.1. Lapping
SO2.2. Analyze the processes and applications of deep hole drilling, trepanning, and high-speed machining.			
SO2.3. Utilize methods like honing, lapping, and burnishing to achieve advanced surface quality and functionality. .			

SW-2Suggested Sessional Work (SW):

a. Assignments: Prepare the assignment on Deep hole drilling Trepanning

151MT02.3: Understand and apply unconventional machining techniques for advanced material processing applications.

Approximate Hours

Item	Appx Hrs.
Cl	8
LI	0
SW	1
SL	1
Total	10

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
SO3.1. Understand principles and processes of unconventional machining techniques For diverse applications. **SO3.2** Evaluate and Apply ultrasonic, EDM, And chemical machining methods based on material and process requirements. **SO3.3.** Implement electron, laser beam, Plasma arc, and waterjet Machining for complex and precise material removal.		**Unit-3 UNCONVENTIONAL MACHINING. (8Hours)** 3.2: Principles, processes 3.2 Various influencing Ultrasonic 3.3 machining, Electro Discharge Machining 3.4 Electroparameters and Applications of Chemical Machining 3.5 Electron and Laser Beam Machining 3.6 Plasma Arc 3.7 Plasma Arc Machining 3.8 Water Jet Machining	**3.1**Electro Discharge Machining

SW-3 Suggested Sessional Work (SW):

a. Assignments: Prepare the assignment on Electro parameters and Applications of Chemical Machining

151MT02.4: Utilize rapid prototyping techniques and optimize surface roughness for advanced manufacturing processes.

Approximate Hours

Item	Appx Hrs.
Cl	9
LI	0
SW	1
SL	1
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
SO4.1. Apply rapid prototyping techniques like stereolithography and lasers intering for innovative design and manufacturing. **SO4.2.** Analyze surface roughness and its impact on prototype quality Using various manufacturing methods.		**Unit-4.0 RAPID PROTOTYPING (9Hours)** 4.1 Stereolithography 4.2 Laminated object manufacturing 4.3 Selective lasers intering 4.4 solider 4.5 Vacuum casting 4.6 Resin injection 4.7 Applications of RPT-Surface roughness terms	**4.1-** Laminated object manufacturing

SO4.3. Utilize vacuum casting and resin injection for efficient prototype development and refinement.		4.8 Influence of machining' parameters on surface roughness 4.9 Microfinishing process	

SW-4 Suggested Sessional Work (SW):

a. Assignments: Applications of RPT

151MT02.5: Apply AI and expert systems for advanced problem-solving in manufacturing processes

Approximate Hours

Item	Appx Hrs.
Cl	11
LI	00
SW	01
SL	01
Total	13

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
SO5.1. Implement AI techniques like pattern recognition and control strategies in manufacturing applications. **SO5.2.** Apply heuristic search and reasoning methods to develop and optimize expert systems. **SO5.3.** Utilize knowledge representation and structural algorithms to enhance decision-making in manufacturing processes.		**Unit-5.0 ARTIFICIALINTELLIGENCE AND EXPERT SYSTEMS (11Hours)** **5.1**. Introduction **5.2** Control strategies **5.3** Heuristic search **5.4** Forward and Backward reasoning **5.5** Search Knowledge representation **5.6** Structural representation **5.7** structural representation of algorithms **5.8** Gameplaying **5.9** knowledge **5.10** Expert systems in manufacturing	**5.1**Forward and Back ward reasoning

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Laboratory Lecture (LI)	Sessional Work (SW)	Self Learning (Sl)	Total hour (Cl + LI+SW +Sl)
CO1: Analyze and apply advanced Mechanical engineering concepts to solve complex engineering problems.	9	0	1	1	11
CO2 : Master advanced special machining techniques for enhanced precision and efficiency in manufacturing	8	0	1	1	10
CO3 : Understand and apply unconventional machining techniques for advanced material processing applications.	8	0	1	1	10
CO4 : Utilize rapid prototyping techniques and optimize surface roughness for advanced manufacturing processes	9	0	1	1	11
CO5: Apply AI and expert systems for advanced problem-solving in manufacturing processes	11	0	1	1	13
Total Hours	**45**	**00**	**05**	**05**	**55**

CO	Unit title	Marks Distribution				Total Marks
		App	An	Ev	Cr	
CO-1	METAL CUTTING AND TOOL MATERIALS	02	03	02	03	10
CO-2	SPECIAL MACHINING	04	01	03	02	10
CO-3	UNCONVENTIONAL MACHINING	03	02	02	03	10
CO-4	RAPID PROTOTYPING	03	03	02	02	10
CO-5	ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS	02	04	02	02	10
	Total	14	13	11	12	**50**

Legend: App: Apply An: Analyze Ev: Evaluate Cr: Create

The end of semester assessment for **Advances in Manufacturing Technology** will be held with written examination of 50 marks

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

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

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial

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

Suggested Learning Resources:

S. No.	Title	Author	Publisher	Edition& Year
01	The machining of metals	K Shirase, S Fujii	Springer	2023
02	Artificial Intelligence	Rich E. and Knight K	TMH	2021
03	Cutting tools for Productive Machining	Viktor P. Astakhov	CRC Press	2024
04	Rapid Prototyping	Agarwal R, Sharma S, Gupta V, Singh J, Singh KK	CRC Press	2023

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Cos, Pos and PSOs Mapping
Course Code:- 151MT02
Course Title:-Advances in Manufacturing Technology

Course Outcomes	Program Outcomes												Program Specific Outcome			
	PO1	PO 2	PO 3	PO4	PO5	PO6	PO7	PO 8	PO9	PO 10	PO 11	PO 12	PSO1	PSO 2	PSO 3	PSO 4
	Engineering knowledge	Problem analysis	Design /development of solutions	Conduct investigations of complex problems	Modern Tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life long learning	Mechanical System Design and Analysis	Manufacturing Processes and Automation	Computational Modeling and Simulation	Product Innovation and Development
CO1: Analyze and apply advanced Mechanical engineering concepts to solve complex engineering problems.	3	3	2	3	2	3	3	2	3	2	3	3	3	3	3	3
CO2: Master advanced special machining techniques for enhanced precision and efficiency in manufacturing	3	3	3	3	2	2	2	2	3	2	2	2	3	2	2	3

CO3: Understand and apply unconventional machining techniques for advanced material processing applications.	**3**	**2**	**2**	**3**	**2**	**2**	**3**	**3**	**3**	**3**	**2**	**3**
CO4: Utilize rapid prototyping techniques and optimize surface roughness for advanced manufacturing processes.	**3**	**3**	**2**	**2**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**3**
CO5: Apply AI and expert systems for advanced problem-solving in manufacturing processes.	**2**	**3**	**3**	**2**	**3**	**3**	**2**	**2**	**3**	**3**	**3**	**3**

Course Curriculum Map: Advances in Manufacturing Technology

Pos & PSOs No.	Cos No. & Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO 1,2,3,4,5,6,7,8 PSO1,2,3, 4	CO1: Analyze and apply advanced Mechanical engineering concepts to solve complex engineering problems.	**SO1.1** **SO1.2** **SO1.3** **SO1.4** **SO1.5** **SO1.6**		Unit-1METALCUTTINGANDTOOLMATERIALS 1.1,1.2,1.3.1.4,1.5,1.6,1.7,1.8,1.9	As mentioned in Page number ……..
PO1,2,3,4,5,6, 7,8 PSO1,2,3, 4	CO2 : Master advanced special machining techniques for enhanced precision and efficiency in manufacturing	**SO2.1** **SO2.2** **SO2.3** **SO2.4** **SO2.5**		**Unit-2.0**–SPECIALMACHINING 2.1,2.2,2.3.2.4,2.5,2.6, 2.7,2.8	As mentioned in Page number ……..
PO 1,2,3,4,5,6,7,8 PSO1,2,3, 4	CO3 : Understand and apply unconventional machining techniques for advanced material processing applications.	**SO3.1** **SO3.2** **SO3.3** **SO3.4**		**Unit-3.0UNCONVENTIONALMACHINING**. 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8	As mentioned in Page number ……..

PO 1,2,3,4,5,6,7,8 PSO1,2,3,4	**CO4 :** Utilize rapid prototyping techniques and optimize surface roughness for advanced manufacturing processes	**SO4.1** **SO4.2** **SO4.3** **SO4.4** **SO4.5** **SO4.6**		**Unit-4.0RAPIDPROTOTYPING** 4.1,4.2,4.3, 4.4, 4.5,4.6,4.7,4.8,4.9	As mentioned in Page number
PO 1,2,3,4,5,6,7,8 PSO1,2,3,4	CO5: Apply AI and expert systems for advanced problem-solving in manufacturing processes	**SO5.1** **SO5.2** **SO5.3** **SO5.4** **SO5.5** **SO5.6**		**Unit-5.0**ARTIFICIALINTELLIGENCEAND EXPERT SYSTEMS 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9,5.10,5.11	As mentioned in Page number ……..

Course Code: 151MINE02

Course Title: Advances in Mining

Pre requisite: Student should have basic knowledge of scientific methods of role of mining in economic growth in India, CSR as used in mining industry, role of AI and Robotics in mining industries.

Rationale: - The students study scientific methods of role of mining in economic growth in India, CSR as used in mining industry, role of AI and Robotics in mining industries.

Course Outcomes:

151MINE02.1: Students will be able to understand and comprehend the basics in AI, robotics and CSR.

151MINE02.2: The student will gain the knowledge of GPS and GIS.

151MINE02.3: Develop insights about the work study, motion study and project management.

151MINE02.4: To explain the art of sustainable development.

151MINE02.5: Evaluate the role and functioning of computer software in real mining problem industries.

Scheme of studies

Categories of course	CourseCode	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			C l	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
	151MINE02	Advances in Mining	03	00	02	01	06	03

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

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

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

SL: Self Learning,

C: Credits.

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

Scheme of Assessment:

Categories of course	Course Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (a+b c+d+ e +ESA)
			Class Test 1	Class Test 2	Mini Seminar (c)	Mini Review (d)	Mini Project (e)	Total Marks (a+b c+d+ e)		
	151MINE02	**Advances in Mining**	10	10	10	10	10	50	**50**	**100**

Course-Curriculum Detailing:

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

151MINE02.1: Students will be able to understand and comprehend the basics in AI, robotics and CSR.

Approximate Hours

Item	Appx Hrs
C l	9
LI	0
SW	1
SL	1
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO1.1. Understand the role of mining in economic development **SO1.2.** The student will be able to identify various problems in mining field **SO1.3.** Understand the basic criteria for GDP **SO1.4.** Develop scientific aatmnirbhar bharat **SO1.5.** Student will able to explain various CSR in mining		**Unit: 1** **INDIAN & GLOBAL MINING SCENARIO** 1.1 Role of Mining in Economic Development, 1.2 GDP, 1.3 Mineral Administration in India and Mineral Resource distribution 1.4 status of Development., 1.5 Minerals and Aatmanirbhar Bharat, 1.6 Policy initiatives for enhancing mineral exploration, exploitation, 1.7 CSR, 1.8 Star Rating of Non-coal and Coal Mining, 1.9 Current trends of Mineral Exploration.	**1.1.** Explain GDP

SW-1 Suggested Sessional Work (SW):

a. Assignments: CSR

151MINE02.2: The student will gain the knowledge of GPS and GIS.

Approximate Hours

Item	Appx. Hrs
C l	9
LI	0
SW	1
SL	1
Total	11

SO1.1. Understand the role of mining in geoinformatics **SO1.2.** The student will be able to identify various geoinformatics problems in mining field **SO1.3.** Understand the basic knowledge of MIS **SO1.4.** Develop role of GIS **SO1.5.** Student will able to explain GPS		**Unit-2** **GEO-INFORMATICS** 2.1 Introduction to Geo-informatics and 2.2 Its Application to Mining Engineering. 2.3 Management information systems (MIS) and 2.4 expert systems in mining. 2.5 Role of geo-informatics in micro- mechanics. 2.6 Geological Discontinuities, remote sensing system, 2.7 sensors, 2.8 Geographic Information System (GIS), 2.9 Global Positioning System (GPS).	**2.1.** MIS & GIS

SW-2 Suggested Sessional Work (SW):

a. Assignments: GPS

151MINE02.3: Develop insights about the work study, motion study and project management.

Approximate Hours

Item	Appx. Hrs
C l	9

LI	0
SW	1
SL	1
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO3.1. Student will able to financial analysis **SO3.2** Choose an appropriate methodology for work study		**Unit-3** **PROJECT MANAGEMENT** 3.1 Financial Analysis, 3.2 Personnel Management, 3.3 Work Study, 3.4 Inventory Planning and	**3.1** Work study

SO3.3. The Students will develop skills in inventory management **SO3.4.** Understand about the measures of different project monitoring systems **SO3.5**. Describe the problems in data interpretation.		3.5 Management 3.6 Purchasing and Tendering, 3.7 Project Monitoring, 3.8 Industrial Disputes, 3.9 Quality Management.	

SW-3 Suggested Sessional Work (SW):

a. Assignments: Project management

151MINE02.4: To explain the art of sustainable development.

Approximate Hours

Item	Appx. Hrs
Cl	9
LI	0
SW	1
SL	1
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO4.1. The Students will develop sustainable development **SO4.2.** Understand the basic idea of MMRD **SO4.3.** To explain carrying out a waste management **SO4.4.** Students will be able to policies and laws **SO4.5** Able to understand the environment		**Unit-4** **SUSTAINABLE DEVELOPMENT** 4.1 Overview, 4.2 Basic concept of Sustainable Development. UN Framework, 4.3 As per provisions of MMRD Act. 4.4 Mine Closure Planning, 4.5 Selection of eco-friendly equipment and exploitation operations. 4.6 Environmental Parameters, 4.7 Waste Management, 4.8 Mine Closure, Environmental, 4.9 Policies and Laws.	**4.1-** Policies and law

SW-4 Suggested Sessional Work (SW):

a. Assignments: Mine Closure, Environmental

151MINE02.5: Evaluate the role and functioning of computer software in real mining problem industries.

Approximate Hours

Item	Appx. Hrs
Cl	09
LI	00
SW	01
SL	01
Total	11

Session Outcomes(SOs)	Laboratory Instruction(LI)	Class room Instruction(CI)	Self Learning (SL)
SO5.1. To understand about various computer application in mining such as AI, Robotics **SO5.2.** Able to survey the bench geometry design **SO5.3.**. Ease to data analysis using different analysis by mining software. **SO5.4-** Develop the skill on appropriate preparation and presentation of software in mining industry **SO5.5.** To understand about method to avoid real mining problem		**Unit-5** **Role of IT in Mining** 5.1Importance of computer application in mining, 5.2 Artificial Intelligence, Robotics, 5.3 Bench geometry design, Haul road design, 5.4 Drainage, Waste dump design and monitoring. 5.5 Role of computer in environment management in mining. Inventory control and management. 5.6 Different mining software like DATAMINE, 5.7 SURPAC Software for various applications: Basic introduction, salient features and application of software like 5.8 BLASTWARE, 5.9 FRAGLYST, GALENA, FLAC.	**5.1** Artificial Intelligence, Robotics

SW-5 Suggested Sessional Work (SW):

a. Assignments: Various mining software

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (C l)	Laboratory Lecture (L I)	Sessional Work (SW)	Self Learning (S l)	Total hour (C l + LI+ SW +S l)
CO-1 Students will be able to understand and comprehend the basics in AI, robotics and CSR.	9	0	1	1	11
CO 2: The student will gain the knowledge of GPS and GIS.	9	0	1	1	11
CO 3: Develop insights about the work study, motion study and project management.	9	0	1	1	11
CO 4: To explain the art of sustainable development.	9	0	1	1	11
CO 5: Evaluate the role and functioning of computer software in real mining problem industries.	9	0	1	1	11
Total Hours	**45**	**00**	**05**	**05**	**55**

Suggested Specification Table (For ESA)

CO	Unit title	Marks Distribution				Total Marks
		App	An	Ev	Cr	
CO-1	INDIAN & GLOBAL MINING SCENARIO	1	2	3	4	10
CO-2	GEO-INFORMATICS	1	2	3	4	10
CO-3	PROJECT MANAGEMENT	1	2	3	4	10
CO-4	SUSTAINABLE DEVELOPMENT	1	2	3	4	10
CO-5	Role of IT in Mining	1	2	3	4	10
	Total	5	10	15	20	50

Legend: App: Apply AN: Analyze Ev: Evaluate Cr: Create

The end of semester assessment for Advances in Mining will be held with written examination of 100 marks

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

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial

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

Suggested Learning Resources:

S. No.	Title	Author	Publisher	Edition & Year
01	Wills' Mineral Processing Technology: An Introduction to the Practical Aspects of Ore Treatment and Mineral Recovery	Barry A. Wills , James Finch	Butterworth-Heinemann	8th and 24 September 2015
02	Topics in Mining, Metallurgy and Materials Engineering	Serhii Fomichov, Olga Linyucheva, Georgii, Vasyliev Yevgenia Chvertko	Springer	2025
03	GEOTECHNICAL ENGINEERING	A. K. Raji, K. K. Babu, K.S. Beena	IK International Pvt. Ltd	30 August 2022
04	Mining and Scientific Press	Anonymous	Wentworth Press	28 August 2016

Curriculum Development Team:

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3. Prof G. K. Pradhan, Dean, Faculty of Engineering Technology, AKS University, Satna.

Cos, POs and PSOs Mapping

Programme Title:
Ph.D. in Mining
Engineering Course
Code: 151MINE02
Course Title: Advances
in Mining

	Program Outcomes						Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
Course Outcome	Develop the skilled knowledge of communi-cation in verbal and written forms	Apply the complex systems as part of research projects	Create, select & apply appropriate techniques, resources & modern engineering & IT tools	Understand the impact of professional engineering solutions in societal & environmental practices	Apply ethical principles & commit to professional ethics & responsibilities and norms of the engineering practice	The ability to engage in self-directed, reflective & lifelong learning for the benefit of the society	Theoretical as well as practical knowledge	Work in various functional areas	Work in various industries	To set up business enterprise
CO-1 Students will be able to understand and comprehend the basics in AI, robotics and CSR.	2	2	1	1	2	1	2	1	1	1
CO 2: The student will	1	-1	-2	-3	2	1	1	1	2	2

gain the knowledge of GPS and GIS.										
CO 3: Develop insights about the work study, motion study and project management.	2	3	1	1	3	2	2	1	3	1
CO 4: To explain the art of sustainable development.	2	3	2	3	1	2	2	1	3	1
CO 5: Evaluate the role and functioning of computer software in real mining problem industries.	1	1	2	1	3	2	2	2	3	2

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map: Advances in Mining

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
PO 1,2,3,4,5,6 PSO 1,2, 3, 4	**CO-1** Students will be able to understand and comprehend the basics in AI, robotics and CSR.	**SO1.1SO1.2 SO1.3SO1.4 SO1.5**		**Unit-1.0 INDIAN & GLOBAL MINING SCENARIO** 1.1, 1.2, 1.3. 1.4, 1.5, 1.6, 1.7, 1.8, 1.9	As mentioned in page number ……..
PO 1,2,3,4,5,6 PSO 1,2, 3, 4	**CO 2:** The student will gain the knowledge of GPS and GIS.	**SO2.1SO2.2 SO2.3SO2.4 SO2.5**		**Unit-2.0 – GEO-INFORMATICS** 2.1, 2.2, 2.3.2.4, 2.5, 2.6, 2.7, 2.8, 2.9	As mentioned in page number ……..
PO 1,2,3,4,5,6 PSO 1,2, 3, 4,	**CO 3:** Develop insights about the work study, motion study and project management.	**SO3.1SO3.2 SO3.3SO3.4 SO3.5**		**Unit-3.0 PROJECT MANAGEMENT** 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8,3.9	As mentioned in page number ……..
PO 1,2,3,4,5,6 PSO 1,2, 3, 4	**CO 4:** To explain the art of sustainable development.	**SO4.1SO4.2 SO4.3SO4.4 SO4.5**		**Unit-4.0 SUSTAINABLE DEVELOPMENT** 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 4.9	As mentioned in page number ……..
PO 1,2,3,4,5,6 PSO 1,2, 3, 4	**CO 5:** Evaluate the role and functioning of computer software in real mining problem industries.	**SO5.1SO5.2 SO5.3SO5.4 SO5.5**		**Unit-5.0 Role of IT in Mining** 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7, 5.8, 5.9	As mentioned in page number ……..

Course Code: - 151LWC02

Course Title: - Advance Legal Studies

Pre requisite: -Through a comprehensive exploration of foundational legal concepts such as Indian Constitution & Federalism, Law, Justice, and Social Change, Sources of Law, Legal Personality, and Liability, students develop advanced research skills, critical thinking abilities, and expertise in specialized areas of law. Emphasizing ethical research conduct, effective communication, and a commitment to social justice, the program equips graduates to make significant contributions to legal scholarship, influence policy, and address pressing societal challenges, thereby preparing them for leadership roles in legal academia and beyond.

Rationale: - The course design is intended to give Ph.D. students a solid grounding in legal theory as well as useful perspectives on applying legal doctrine to actual circumstances. Students are better prepared to make significant contributions to legal studies and successfully handle current legal concerns by interacting with a variety of legal topics and issues.

Course Outcomes:

CO1: Upon completing the unit on Indian Constitution & Federalism, students will be able to demonstrate a comprehensive understanding of the historical evolution of federalism in India, including the distribution of powers and responsibilities between the Centre and the states, and analyze the constitutional provisions and implications of the Centre's responsibilities in managing internal disturbances within states.

CO2: Upon completing the unit on Law, Justice, and Social Change, students will be equipped to critically evaluate and apply various legal theories, including Natural Law, Analytical School, and Modern Theories of Justice, to analyze legal issues and their implications for social change, demonstrating an understanding of the dynamic relationship between law and societal transformation.

CO3: Upon completing the unit on Sources of Law, students will be proficient in identifying and analyzing the various sources of law, including legislation, precedents

(stare decisis), and customs, and will be able to effectively use these sources to conduct legal research and formulate well-founded legal arguments in diverse legal contexts.

CO4: Upon completing the unit on Legal Personality, students will be able to critically examine and understand the dimensions of modern legal personality, including its application to both human and non-human entities. They will demonstrate the ability to assess and analyze legal issues related to legal personality in various legal contexts, facilitating a nuanced understanding of this fundamental aspect of legal theory and practice.

CO5: Upon completing the unit on Liability, students will be proficient in assessing and understanding the conditions for imposing liability, including strict liability and vicarious liability, in a variety of legal situations. They will demonstrate the ability to analyze and apply liability principles effectively, enabling them to navigate complex legal scenarios and provide sound legal advice in different areas of law.

Scheme of studies

Course Category	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			CI	LI	SW	SL	Total Study Hours (CI+LI+SW+ SL)	
MD	**151LWC02**	**Advance Legal Studies**	03	00	01	01	05	03

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

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

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

SL: Self Learning,

C: Credits.

MD: Main Discipline

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:

Course Category	Course Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						END SEMESTER ASSESSMENT (ESA)	TOTAL MARKS (PRA+ ESA)
			A	B	C	D	E	TOTAL MARKS (A+ B+C+D+E)		
			CLASS TEST- I	CLASS TEST- II	MINI REVIEW	SEMINAR	MINI PROJECT			
MD	151LWC02	Advance Legal Studies	10	10	10	10	10	50	50	100

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Midterm (MT), 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.

CO1: Upon completing the unit on Indian Constitution & Federalism, students will be able to demonstrate a comprehensive understanding of the historical evolution of federalism in India, including the distribution of powers and responsibilities between the Centre and the states, and analyze the constitutional provisions and implications of the Centre's responsibilities in managing internal disturbances within states.

Approximate Hours

Item	Approx Hrs
C l	9
LI	0
SW	1
SL	1
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO1.1Understanding the Evolution of Federalism in India SO1.2Exploring Central Government Powers and Responsibilities SO1.3Assessing Management of Internal Disturbances SO1.4Understanding Constitutional Provisions for Center-State Relations SO1.5Exploring Freedom of Expression and Media Rights		**UNIT-I** **INDIAN CONSTITUTION & FEDERALISM** 1.1. Historical Development of Federalism in India 1.2. Powers and Responsibilities of the Central Government 1.3. Management of Internal Disturbances: Role and Scope 1.4. Constitutional Provisions for Center-State Relations: Articles 356 and 365 1.5. Freedom of Expression: Legal Framework and Constitutional Safeguards 1.6. Media Rights: Broadcasting, Telecasting, and Regulatory Framework 1.7. Access to Justice: Constitutional Remedies and Article 32 1.8. Labor Rights: Legal Framework and Regulation of Strikes 1.9. Educational Rights: Constitutional Guarantees and Policy Framework	Constitutional Provisions for Center-State Relations: Articles 356 and 365

CO2: Upon completing the unit on Law, Justice, and Social Change, students will be equipped to critically evaluate and apply various legal theories, including Natural Law, Analytical School, and Modern Theories of Justice, to analyze legal issues and their implications for social change, demonstrating an understanding of the dynamic relationship between law and societal transformation.

Approximate Hours

Item	Approx Hrs
C l	9
LI	0
SW	1
SL	1
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO2.1Comprehensive Understanding of Natural Law and Analytical Jurisprudence SO2.2Proficiency in Modern Theories of Justice SO2.3Understanding Law as an Instrument of Social Change SO2.4Exploring Sustainable Development and Environmental Law SO2.5Critical Analysis of Corporate Social Responsibility and Legal Obligations		**UNIT-II** **LAW, JUSTICE AND SOCIAL CHANGE** 2.1. Foundations of Natural Law Theory: Origins and Historical Development Key Tenets and Principles Relationship between Natural Law and Morality 2.2. Analytical Jurisprudence: Origins and Evolution of Analytical School Conceptual Analysis and Logical Positivism Critiques and Contemporary Perspectives 2.3. Modern Theories of Justice: John Rawls' Theory of Justice as Fairness Robert Nozick's Libertarian Theory of Justice	Sustainable Development and Environmental Law: • Principles of Sustainable Development • International Environmental Law and Sustainable Development Goals (SDGs) • Legal Mechanisms for Promoting Environmental Sustainability

		Germain Grisez's Natural Law Theory Evaluating Ronald Dworkin's Theory of Justice 2.4. Comparative Analysis of Justice Theories: Contrasting Rawlsian and Nozickian Approaches Examining Overlapping Consensus and Entitlement Theory Critiquing Different Conceptions of Distributive Justice 2.5. Law as an Instrument of Social Change: Role of Law in Shaping Societal Norms and Values Legal Activism and Progressive Law Reform Impact Litigation and Strategic Public Interest Litigation 2.6. Historical Perspectives on Law and Social Change: Landmark Legal Cases and Social Movements Civil Rights Movement and Legal Change in the United States Feminist Legal Theory and Gender Justice Advocacy 2.7. Sustainable Development and Environmental Law: Principles of Sustainable Development International Environmental Law and Sustainable Development Goals (SDGs) Legal Mechanisms for Promoting Environmental Sustainability 2.8. Corporate Social	

		Responsibility and Legal Obligations: Ethical Frameworks for Corporate Behavior Legal Requirements and Compliance Standards Corporate Governance and Social Accountability 2.9. Challenges in Implementing Sustainable Development Goals (SDGs): Legal and Institutional Barriers to Sustainable Development Role of Law in Addressing Global Challenges such as Climate Change and Poverty Strategies for Enhancing Legal Mechanisms for Sustainable Development	

CO3: Upon completing the unit on Sources of Law, students will be proficient in identifying and analyzing the various sources of law, including legislation, precedents (stare decisis), and customs, and will be able to effectively use these sources to conduct legal research and formulate well-founded legal arguments in diverse legal contexts.

Approximate Hours

Item	Approx Hrs
C l	9
LI	0
SW	1
SL	1
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO3.1 Integration and Application of Legal Sources SO3.2 Understanding Legal Sources and Legislation SO3.3 Mastery of Precedents and Stare Decisis SO3.4 Appreciation of Customary Law and Practices SO3.5 Critical Analysis of International Customary Law		**UNIT-3** **SOURCES OF LAW** 3.1. Sources of Legislation: Types of Legislation: Statutory Law, Regulatory Law, and Delegated Legislation Legislative Process: Drafting, Enactment, and Amendment of Laws 3.2. Role of Parliament and State Legislatures in Lawmaking Interpretation of Statutes: Principles of Statutory Interpretation Literal, Golden, Mischief, and Purposive Rules of Interpretation Judicial Approach to Ambiguity and Legislative Intent 3.3. Hierarchy of Laws: Understanding the Pyramid of Legal Authority Constitutional Supremacy and the Rule of Law Conflict Resolution between Different Sources of Law 3.4. Case Law and Precedents: Concept of Stare Decisis and Binding Precedents Ratio Decidendi vs. Obiter Dicta Application of Precedents in	Legislative Process: Drafting, Enactment, and Amendment of Laws

		Judicial Decision-making 3.5. Evolution of Legal Precedents: Historical Development of Common Law Precedents Landmark Cases and Legal Milestones Role of Judicial Activism in Shaping Legal Precedents 3.6. Customary Law and Practices: Nature and Characteristics of Customary Law Recognition and Enforcement of Customary Practices Relationship between Customary Law and Statutory Law 3.7. International Customary Law: Customary International Law vs. Treaty Law Formation and Recognition of Customary Norms in International Relations Examples of Customary Practices in Diplomacy and International Law 3.8. Challenges in Applying Customary Law: Conflicts between Customary Law and Modern Legal Systems Issues of Cultural Relativism and Human Rights Strategies for Harmonizing Customary Practices with Legal Standards 3.9. Future Trends in	

		Legislation and Precedents: Impact of Technological Advancements on Legal Regulation Emerging Areas of Legislation: Cyber Law, Biotechnology Law, etc. Evolution of Precedents in Response to Societal Changes and Global Challenges	

CO4: upon completing the unit on Legal Personality, students will be able to critically examine and understand the dimensions of modern legal personality, including its application to both human and non-human entities. They will demonstrate the ability to assess and analyze legal issues related to legal personality in various legal contexts, facilitating a nuanced understanding of this fundamental aspect of legal theory and practice.

Approximate Hours

Item	Approx Hrs
C l	9
LI	0
SW	1
SL	1
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO4.1 Understanding the Dimensions of Modern Legal Personality SO4.2 Analyzing the Legal Personality of Non-Human Entities SO4.3 Examining Judicial Interpretations and Precedents SO4.4 Assessing Legislative Frameworks		**UNIT-4** **LEGAL PERSONALITY** 4.1. Historical Evolution of Legal Personality: Origins of the Concept in Legal History Development of Legal Personality in Different Legal Systems Evolution from Traditional to Modern Notions of Legal Personality	Legal Personality in Contemporary Legal Systems: • Examination of Legal Personality in Civil Law and Common Law Systems • Variations in Legal Recognition of Personality

and Initiatives SO4.5 Exploring Future Trends and Prospects		4.2. Attributes and Characteristics of Legal Personality: Essential Elements Defining Legal Personality Rights, Duties, and Capacities Associated with Legal Personality Conceptual Framework for Understanding Legal Personality 4.3. Legal Personality in Contemporary Legal Systems: Examination of Legal Personality in Civil Law and Common Law Systems Variations in Legal Recognition of Personality Attributes Across Jurisdictions Comparative Analysis of Legal Personality Frameworks 4.4. Corporate Legal Personality: Legal Personality of Corporations and Other Artificial Entities Separation of Corporate and Individual Personality Liability and Accountability of Corporate Entities 4.5. Legal Personality of Non-Human Entities: Recognition of Legal Personality for Non-Human Beings such as Animals, Rivers, and Ecosystems Legal and Ethical Implications of Extending	Attributes Across Jurisdictions • Comparative Analysis of Legal Personality Frameworks

		Personality Rights to Non-Human Entities Case Studies and Examples of Legal Recognition of Non-Human Personality 4.6. Challenges and Controversies in Recognizing Legal Personality: Ethical Considerations in Granting Legal Personality to Non-Human Entities Balancing Rights and Responsibilities in Legal Personality Determination Legal and Practical Implications of Expanding the Scope of Legal Personality 4.7. Judicial Interpretation and Legal Precedents on Legal Personality: Landmark Cases Shaping the Concept of Legal Personality Judicial Approaches to Extending Legal Personality to Non-Human Entities Role of Stare Decisis in Defining Legal Personality Boundaries 4.8. Legislative Frameworks for Recognizing Legal Personality: Statutory Provisions and Legal Instruments Granting Legal Personality Legislative Initiatives Addressing Legal Personality Rights and Obligations	

		Challenges and Debates in Legislative Efforts to Expand Legal Personality 4.9. Future Trends and Prospects in Legal Personality Jurisprudence: Emerging Issues and Debates in Legal Personality Law Potential Implications of Technological Advancements on Legal Personality Prospects for Further Expansion or Restriction of Legal Personality Rights	

CO5: Upon completing the unit on Liability, students will be proficient in assessing and understanding the conditions for imposing liability, including strict liability and vicarious liability, in a variety of legal situations. They will demonstrate the ability to analyze and apply liability principles effectively, enabling them to navigate complex legal scenarios and provide sound legal advice in different areas of law.

Approximate Hours

Item	Approx Hrs
C l	9
LI	0
SW	1
SL	1
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO5.1 Understanding the Foundations of Liability Law SO5.2 Proficiency in Different Types of Liability		**Unit-5** **LIABILITY** 5.1. Foundations of Liability Law: Historical Evolution of Liability Principles Theories of Liability: Fault	Corporate Liability: • Legal Theories of Corporate Liability: Direct vs. Vicarious Liability

SO5.3 Mastery of Strict Liability Doctrine SO5.4 Understanding Vicarious Liability SO5.5 Exploring Emerging Issues in Liability Law		vs. No-Fault Systems Role of Liability Law in Civil and Criminal Justice Systems 5.2. Elements of Liability: Analysis of Legal Elements Required for Imposing Liability Causation, Duty of Care, Breach, and Damages Standard of Proof in Establishing Liability 5.3. Negligence Liability: Understanding the Concept of Negligence in Liability Law Standard of Care and Reasonable Foreseeability Defenses to Negligence Claims: Contributory and Comparative Negligence 5.4. Intentional Torts and Liability: Types of Intentional Torts: Assault, Battery, Trespass, etc. Mental States and Intent Requirements Vicarious Liability for Intentional Acts of Agents 5.5. Product Liability: Legal Framework for Imposing Liability in Product-related Cases Strict Product Liability vs. Negligence-based Product Liability Defenses and Remedies in Product Liability Cases 5.6. Strict Liability Doctrine: Concept and Scope of Strict Liability in Tort Law Application of Strict Liability	• Corporate Criminal Liability and Prosecution • Corporate Social Responsibility and Liability Management

		in Various Contexts: Products, Ultrahazardous Activities, and Animals Critiques and Controversies Surrounding Strict Liability 5.7. Vicarious Liability: Principles of Vicarious Liability and Respondeat Superior Employer-Employee Relationship and Agency Law Scope and Limitations of Vicarious Liability in Different Jurisdictions 5.8. Corporate Liability: Legal Theories of Corporate Liability: Direct vs. Vicarious Liability Corporate Criminal Liability and Prosecution Corporate Social Responsibility and Liability Management 5.9. Emerging Issues in Liability Law: Liability in the Digital Age: Cybersecurity, Data Breaches, and Online Misconduct Liability for Environmental Harm and Climate Change Liability Implications of Artificial Intelligence and Autonomous Systems	

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Instruction (C l)	Laboratory Instruction (L I)	Sessional Work (SW)	Self Learning (S L)	Total hour (C l + LI+ SW +S L)
CO1: Upon completing the unit on Indian Constitution & Federalism, students will be able to demonstrate a	9	0	1	1	11

comprehensive understanding of the historical evolution of federalism in India, including the distribution of powers and responsibilities between the Centre and the states, and analyze the constitutional provisions and implications of the Centre's responsibilities in managing internal disturbances within states.					
CO2: Upon completing the unit on Law, Justice, and Social Change, students will be equipped to critically evaluate and apply various legal theories, including Natural Law, Analytical School, and Modern Theories of Justice, to analyze legal issues and their implications for social change, demonstrating an understanding of the dynamic relationship between law and societal transformation.	9	0	1	1	11
CO3: Upon completing the unit on Sources of Law, students will be proficient in identifying and analyzing the various sources of law, including legislation, precedents (stare decisis), and customs, and will be able to effectively use these sources to conduct legal research and formulate well-founded legal arguments in diverse legal contexts.	9	0	1	1	11
CO4: Upon completing the unit on Legal Personality, students will be able to critically examine and understand the dimensions of modern legal personality, including its application to	9	0	1	1	11

both human and non-human entities. They will demonstrate the ability to assess and analyze legal issues related to legal personality in various legal contexts, facilitating a nuanced understanding of this fundamental aspect of legal theory and practice.					
CO5: Upon completing the unit on Liability, students will be proficient in assessing and understanding the conditions for imposing liability, including strict liability and vicarious liability, in a variety of legal situations. They will demonstrate the ability to analyze and apply liability principles effectively, enabling them to navigate complex legal scenarios and provide sound legal advice in different areas of law.	9	0	1	1	11
Total Hours	**45**	**00**	**05**	**05**	**55**

Suggested Specification Table (For ESA)

Course Outcome	UNIT TITLE	Apply	Analyze	Evaluate	Create	Total Marks
CO-1	INDIAN CONSTITUTION & FEDERALISM	1	2	3	4	10
CO-2	LAW, JUSTICE AND SOCIAL CHANGE	1	2	3	4	10
CO-3	SOURCES OF LAW	1	2	3	4	10
CO-4	LEGAL PERSONALITY	1	2	3	4	10
CO-5	LIABILITY	1	2	3	4	10
	Total	**5**	**10**	**15**	**20**	**50**

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

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method

4. Group Discussion
5. Role Play
6. Demonstration
7. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Face book, Twitter, Whatsapp, Mobile, Online sources)
8. Brainstorming

Suggested Learning Resources:

S. No.	Title	Author	Publisher	Edition & Year
01	Evolution of Indian Federalism	Mahendra Prasad Singh	Kitab Mahal	2016
02	Natural Law and Natural Rights	John Finnis	Oxford University Press	1980
03	A Theory of Justice	John Rawls	Harvard University Press	1971
04	Principles of Tort Law	Peter T. Burns	Pearson	2019
05	The Constitution of India	P.M. Bakshi	Universal Law Publishing	2022
06	Law and Justice in a Globalized World	Rajendra Kumar	Routledge	2021
07	The Federal Idea: A Global Perspective	David M. McGrane	Cambridge University Press	2021
08	The Nature of Law	M. P. Jain	LexisNexis	2021
09	Administrative Law: A Comprehensive Study	J. P. Singhal	Eastern Book Company	2022
10	Law, Justice and the State	S. P. Gupta	Sage Publications	2021
11	International Human Rights Law	I. A. Ahmed	Oxford University Press	2022
12	Environmental Law: Text and Materials	Richard G. Copeland	Routledge	2020
13	Social Justice: Theories and Movements	R. M. Dhanraj	Sage Publications	2021
14	Law and Ethics in the Business Environment	A. M. Singh	Pearson	2023
15	Comparative Constitutional Law	V. R. Reddy	Cambridge University Press	2022
16	Gender and the Law	K. R. Kapoor	Routledge	2023
17	Rights and Duties of Citizens	H. L. M. K. Verma	Universal Law Publishing	2022

Review Journals

S. No.	Title	Publisher
1	Harvard Law Review	Harvard Law Review Association
2	Yale Law Journal	Yale Law School
3	Stanford Law Review	Stanford Law School
4	Columbia Law Review	Columbia Law School
5	University of Chicago Law Review	University of Chicago Law School
6	California Law Review	University of California, Berkeley
7	New York University Law Review	New York University School of Law
8	Michigan Law Review	University of Michigan Law School
9	Texas Law Review	University of Texas School of Law
10	Georgetown Law Journal	Georgetown University Law Center
11	Virginia Law Review	University of Virginia School of Law
12	William & Mary Law Review	William & Mary Law School
13	Duke Law Journal	Duke University School of Law
14	Emory Law Journal	Emory University School of Law
15	Tulane Law Review	Tulane University Law School
16	Indian Journal of Law and Technology	National Law University, Delhi
17	The Indian Bar Review	Bar Council of India
18	Journal of the Indian Law Institute	Indian Law Institute
19	The Indian Journal of Criminal Law	University of Delhi
20	National Law School of India Review	National Law School of India

Curriculum Development Team:

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COs, POs and PSOs Mapping
Course Code: - 151LWC02
Course Title: - Advance Legal Studies

COURSE OUTCOMES	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
	Advanced Research Skills	Expertise in a Specialized Area	Critical Thinking and Theoretical Proficiency	Publication and Dissemination	Interdisciplinary Knowledge	Ethical Research Conduct	Specialized Knowledge Acquisition	Innovative Legal Research	Advanced Legal Methodologies	Policy and Legal Reform Advocacy	Interdisciplinary and Comparative Analysis	Legal Education Enhancement	Ethical Leadership in Legal Practice
CO1: Upon completing the unit on Indian Constitution & Federalism, students will be able to demonstrate a comprehensive understanding of the historical evolution of federalism in India, including the distribution of powers and responsibilities	**2**	**2**	**3**	**1**	**1**	**2**	**3**	**2**	**2**	**2**	**2**	**1**	**1**

between the Centre and the states, and analyze the constitutional provisions and implications of the Centre's responsibilities in managing internal disturbances within states.												

CO2: Upon completing the unit on Law, Justice, and Social Change, students will be equipped to critically evaluate and apply various legal theories, including Natural Law, Analytical School, and Modern Theories of Justice, to analyze legal issues and their implications for social change, demonstrating an understanding of the dynamic relationship between law and societal transformation.	**2**	**2**	**3**	**1**	**2**	**2**	**3**	**2**	**2**	**2**	**3**	**2**	**2**
CO3: Upon completing the unit on Sources of Law, students will be proficient in	**3**	**2**	**2**	**2**	**2**	**2**	**2**	**3**	**3**	**1**	**2**	**2**	**2**

identifying and analyzing the various sources of law, including legislation, precedents (stare decisis), and customs, and will be able to effectively use these sources to conduct legal research and formulate well-founded legal arguments in diverse legal contexts.													
CO4: Upon completing the unit on Legal Personality, students will be able to critically examine and understand the dimensions of modern legal	**2**	**2**	**3**	**1**	**2**	**2**	**3**	**2**	**2**	**2**	**3**	**1**	**2**

personality, including its application to both human and non-human entities. They will demonstrate the ability to assess and analyze legal issues related to legal personality in various legal contexts, facilitating a nuanced understanding of this fundamental aspect of legal theory and practice.													
CO5: Upon completing the unit on Liability, students will be proficient in assessing and understanding the conditions for	**3**	**2**	**3**	**2**	**2**	**2**	**2**	**3**	**3**	**3**	**2**	**2**	**2**

imposing liability, including strict liability and vicarious liability, in a variety of legal situations. They will demonstrate the ability to analyze and apply liability principles effectively, enabling them to navigate complex legal scenarios and provide sound legal advice in different areas of law.													

Legend: 1 – Low, 2 – Medium, 3 – High

COURSE CURRICULUM MAP: ADVANCE LEGAL STUDIES

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
PO 1,2,3,4,5,6 PSO 1,2, 3, 4,5,6,7	**CO1:** Upon completing the unit on Indian Constitution & Federalism, students will be able to demonstrate a comprehensive understanding of the historical evolution of federalism in India, including the distribution of powers and responsibilities between the Centre and the states, and analyze the constitutional provisions and implications of the Centre's responsibilities	**SO1.1** **SO1.2** **SO1.3** **SO1.4** **SO1.5**		**Unit-1.** **INDIAN CONSTITUTION & FEDERALISM** 1. Evolution of Federalism in India 2. Centre's responsibility and internal disturbance within states. 3. Directions of the Center to the State under Article 356 and 365. 4. Freedom of Speech and Rights to broadcast and telecast. 5. Right to Constitutional Rernedies (Article 32). 6. Rights to strikes. 7. Right to education. 1.1, 1.2, 1.3, 1.4, 1.5	As mentioned in page number ……..

	in managing internal disturbances within states.				
PO 1,2,3,4,5,6 PSO 1,2, 3, 4,5,6,7	**CO 2:** The student will enable to collect the data, edit it properly and analyse it accordingly. Thus, it will facilitate their prosperity in higher education.	**SO2.1 SO2.2 SO2.3 SO2.4 SO2.5**		**Unit-2.** **LAW, JUSTICE AND SOCIAL CHANGE** 1. Natural law school. 2. Analytical school. 3. Modern Theories of Justice with specific reference to Nozick, Rawls,and Finnis. 4. Law as an instrument of social change. 5. Sustainable Development. 2.1, 2.2, 2.3, 2.4, 2.5	As mentioned in page number ……..
PO 1,2,3,4,5,6 PSO 1,2, 3, 4,5,6,7	**CO 3:** Develop insights about the statistical analysis tools and techniques for better research outcomes**.**	**SO3.1 SO3.2 SO3.3 SO3.4 SO3.5**		**Unit-3.** **SOURCES OF LAW** 1. Legislation. 2. Precedents: concept of stare decisis. 3. Customs. 3.1, 3.2, 3.3, 3.4, 3.5	As mentioned in page number ……..
PO 1,2,3,4,5,6 PSO 1,2, 3, 4,5,6,7	**CO 4:** To explain the art of interpretation and the art of writing research reports	**SO4.1 SO4.2 SO4.3 SO4.4 SO4.5**		**Unit-4.** **LEGAL PERSONALITY** 1. Dimension of the modern legal personality. 2. Legal personality of non-human beings. 4.1, 4.2, 4.3, 4.5,	As mentioned in page number ……..

PO 1,2,3,4,5,6 PSO 1,2, 3, 4,5,6,7	**CO 5:** Evaluate the role and functioning of computer in research	**SO5.1** **SO5.2** **SO5.3** **SO5.4** **SO5.5**		**Unit-5.** **LIABILITY** 1. Condition for imposing liability. 2. Strict liability. 5.1, 5.2, 5.3, 5.4, 5.5	As mentioned in page number ……..

Program Name	**Doctorate of Philosophy in Biotechnology (Ph.D. in Biotechnology)**	
Semester	COURSE WORK	
CourseCode:	151BT02	
Coursetitle:	Advances in Biotechnology	**Curriculum Developer**: Dr. Kamlesh Choure (Prof. and Head, Department of Biotechnology), Dr Ashwini A. Waoo (Prof. Department of Biotechnology)
Pre-requisite:	Students should have basic& conceptual knowledge of Biotechnology (Master's Level)	
Rationale:	Ph.D. in Biotechnology offers an opportunity to conduct cutting-edge research in a rapidly advancing field that intersects biology, technology, and medicine. This program equips students with the skills to develop innovative solutions to global challenges, such as disease treatment, agricultural sustainability, and environmental conservation. By fostering a deep understanding of molecular biology, genetics, and bioengineering, the program prepares graduates for careers in academia, industry, and government. It also promotes interdisciplinary collaboration, critical thinking, and technological proficiency, enabling students to contribute significantly to scientific knowledge and societal well-being.	
Course Outcomes (COs):	**CO1-151BT02.1**. Apply gene technology principles, analyze vectors and enzymes, evaluate sequencing methods, and discuss the implications of gene editing in biotechnology. **CO2-151BT02.2**. Students will evaluate immunology principles, analyze various vaccine types, and create a detailed understanding of the mechanisms behind hypersensitivity and autoimmune diseases. **CO3-151BT02.3**. Evaluate animal and plant culture techniques, analyze various culture methods and their advantages, and discuss applications such as Agrobacterium-mediated gene transfer and protoplast fusion. **CO4-151BT02.4**. Analyze the role of biofertilizers and biofuels, evaluate recent advances in bacterial taxonomy and identification techniques, and discuss the applications of microbes in bioremediation and pharmaceutical compound production. **CO5-151BT02.5**. Apply molecular biology techniques to identify biomolecules, analyze separation and microscopy methods, and utilize	

	bioinformatics tools for sequence alignment and phylogenetic analysis

Scheme of Studies:

Board ofStudy	CourseCode	CourseTitle	Scheme ofstudies (Hours/Week)					Total Credits(C)
			Cl	LI	SW	SL	Total Study Hours(CI+LI+SW+SL)	
ProgramCommon(PC)	151BT02	Advances in Biotechnology	3	00	02	1	06	03

Legends: 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 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 achieve course outcome.

Scheme of Assessment: Theory

Board of Study	Couse Code	Course Title		Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class Test 1 (A)	Class Test 2 (B)	Mini Review (C)	Seminar (D)	Mini project (E)	Total Marks (A+B+C+D+E)		
PC	151BT02	Advances in Biotechnology	**10**	**10**	**10**	**10**	**10**	**50**	**50**	**100**

Course-Curriculum:

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.	**ApproximateHours** **Item** | Cl | SW | SL | Total **Approx.Hrs** | 09 | 01 | 09 | 19

Session Outcomes (SOs)	Class room Instruction (CI)	Self-Learning (SL)
SO1.1 Interpret the technical aspects of Genes	**Unit-1** **CI1.1** Gene Technology: Introduction	**SL1.1** Researchers must read new papers on gene technology
SO1.2 Recall the applications of different enzymes	**CI1.2** Enzymes: DNA Polymerase, Restriction enzymes	**SL1.2** Researchers must revise the applications of different enzymes used in gene engineering
SO1.3 Recall the applications of different enzymes	**CI1.3** DNA Ligase; Reverse transcriptase, Alkaline Phosphatase, RNAse, H	**SL1.3** Researchers must revise the applications of different enzymes used in gene engineering
SO1.4 Recognize the role of plasmids	**CI1.4** Host Vector Plasmid (Ti/Ri)	**SL1.4** Researchers must study different kinds of plasmids
SO1.5 Interpret the role of M13 Vectors, BAC (Bacterial Artificial Chromosomes)	**CI1.5** M13 Vectors, BAC (Bacterial Artificial Chromosomes)	**SL1.5** Researchers must study different kinds of vectors
SO1.6 Compare different DNA sequencing techniques	**CI1.6** DNA Sequencing, Dideoxy SANGER Sequencing, +/- Methods	**SL1.6** Researchers must study different kinds of sequence platforms
SO1.7 Analyse the process of gene cloning and its mechanisms	**CI1.7** Gene Cloning: General Strategy for Gene cloning, Transformation	**SL1.7** Researchers must study gene cloning techniques
SO1.8 Explain gene silencing technique and its applications	**CI1.8** Applications of Gene Technology and Gene Silencing	**SL1.8** Researchers must study gene-silencing techniques
SO1.9 Elaborate the different domains of gene technology and gene editing and its applications,	**CI1.9** Applications of Gene technology, Overview of Gene Editing Technologies (CRISPR, TALEN, ZFNs)	**SL1.9** Researchers must study new papers on gene technology

Suggested Sessional Work (SW): *anyone*	**SW1.1** Assignments	Describe in detail about the role of Gene technology in Product development
	SW1.2 Mini Project	Differentiate between Ti/Ri plasmid processing
	SW1.3 Other Activities (Specify)	Draw a flowchart compiling all procedures used in Gene cloning

Session Outcomes (SOs)	Class room Instruction (CI)	Self-Learning (SL)
SO2.1 Recall the basic concepts of Immunology	**Unit-2** **CI2.1** Introduction to Immunology: Defence Mechanism	**SL2.1** Researchers must revise the concepts of immunology
SO2.2 Interpret the Complement System fixation and arrangement	**CI2.2** Complement fixation	**SL2.2** Researchers must recognize the complement system in immunology
SO2.3 Explain the Structures and classes of antibodies	**CI2.3** Structures and classes of antibodies	**SL2.3** Draw and revise different classes of immunoglobulins
SO2.4	**CI2.4**	**SL2.4**

Interpret the working of vaccines	Vaccines live and attenuated, killed	Researchers must read latest Vaccine designing papers related to SARS-CoV-2
SO2.5 Interpret the working of vaccines	**CI2.5** Multi-subunit and DNA vaccines	**SL2.5** Researchers must read latest Vaccine designing papers Covaxin and Covishield
SO2.6 Interpret the mechanism of Hypersensitivity	**CI2.6** Hypersensitivity	**SL2.6** Researchers must read latest papers on Hypersensitivity and its clinical diagnosis
SO2.7 Analyze the conditions of Autoimmune diseases	**CI2.7** Autoimmune diseases	**SL2.7** Researchers must read papers and clear basic concepts of auto immune disorders and related techniques
SO2.8 Interpret the working of ELISA, RIA and its types	**CI2.8** ELISA	
SO2.9 Describe the working and applications ofHybridoma technology	**CI2.9** Hybridoma technology	

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.

ApproximateHours

Item	Cl	SW	SL	Total
Approx.Hrs	09	01	07	17

Suggested Sessional Work (SW): *anyone*	**SW2.1** Assignments	Describe Vaccines and its application in biomedical sciences
	SW2.2 Mini Project	Make a project on Autoimmune disease
	SW2.3 Other Activities (Specify)	Make Power point presentation on production of Vaccines

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.

ApproximateHours

Item	Cl	SW	SL	Total
Approx.Hrs	09	01	06	17

Session Outcomes (SOs)	**Class room Instruction (CIs)**	**Self-Learning (SL)**

SO3.1 Illustrate animal cell culture	**CI3.1** Animal culture, Media requirements, and sterilization techniques	**SL3.1** Search various reference books and other study materials to learn about Animal cell culture.
SO3.2 Explain in detailthe Primary and established lines	**CI3.2** Primary and established lines,	
SO3.3 Describe/Study and differentiate available Culture methods and explain in detail pros & cons of each culture method.	**CI3.3** Culture methods: Hanging Drop, monolayer and suspension, Advantages and disadvantages	**SL3.2** Learn in detail culture methods and advanced equipment
SO3.4 Explain in detail about scale-up technique for the development of cell culture.	**CI3.4**Scale-up methods. Roux Tubes, Roller bottles	**SL3.3** Learn about scale-up technique.
SO3.5 Explainindetail plant tissue culture techniques	**CI3.5**Plant tissue culture, Cell, and callus culture	
SO3.6 Describe the anther culture and micropropagation.	**CI3.6**Anther culture, Micropropagation	**SL3.4** Learn in detail techniques and applications of micropropagation.
SO3.7 Evaluate somatic cell hybridization technique and analyzeprotoplast fusion techniques its uses and limitations	**CI3.7**Somatic cell hybridization, Protoplast fusion	**SL3.5** Learn in detail about protoplast isolation protocol
SO3.8 Illustrate the importance of cybrids, understand the protocol of production of artificial seeds	**CI3.8**Cybrids, artificial seeds	
SO3.9 Understood the role of agrobacterium as natural genetic engineer and structure of Ti	**CI3.9**Agrobacterium-mediated gene transfer, Use of Ti plasmid	**SL3.6** Learn in detail Agrobacterium life cycle

Suggested Sessional Work (SW): *anyone*	**SW3.1** Assignment	Describe cloning and selection of cells and characterization and preservation methods for animal cells. And plant cells
	SW3.2 Mini Project	Describe the methods to scale up animal cell culture.
	SW3.3 Other Activities (Specify)	Prepare one review article on artificial seeds

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.

ApproximateHours

Item	Cl	SW	SL	Total
Approx.Hrs	09	01	03	13

Session Outcomes (SOs)	**Class room Instruction (CI)**	**Self-Learning (SL)**

SO4.1 Elucidate the application of various kinds of separation process	**Unit-4** **CI4.1** Biofertilizers, symbiotic, free nitrogen fixers, asymbiotic, free nitrogen fixers	**SL4.1** List down the different biofrtilizers produced through the RDT process in India
SO4.2 Determine the role of endomycorrhiza	**CI4.2** Algal phosphate solubilizing, mycorrhizae and green manure	**SL4.2** Read the process of green mannure
SO4.3 Analyse the Biofuel and its applications	**CI4.3** Biofuel production, biomass conversion (plants, algae, waste) into biofuels via fermentation, transesterification.	**SL4.3** Find out the role and advantages of Biofuels
SO4.4 Distinguish among the major bacterial genus	**CI4.4** Recent advances in bacterial taxonomy	
SO4.5 Evaluate different methods of identification of bacteria, Analyse phylogenetic tree	**CI4.5** i. Identification of Procaryotes ii. A phylogenetic backbone and taxonomic framework for prokaryotic systems	
SO4.6 Demonstrate the 16S rRNA fingerprinting	**CI4.6** iii. 16S rRNA fingerprinting and	
SO4.7 Demonstrate the working of GLC for lipid profiling	**CI4.7** lipid profile by GLC,	
SO4.8 List out some important microorganisms producing pharmaceutically important compounds	**CI4.8** Microbial sources of pharmaceutically important compounds.	
SO4.9 Describe the bioremediation process and its types	**CI4.9** Microbes for Bioremediation	

Suggested Sessional Work (SW): *anyone*	**SW1.1** Assignments	Describe in detail "Applications of Microorganisms in various Sectors"
	SW1.2 Mini Project	Create various phylogenetic tree and describe them
	SW1.3 Other Activities (Specify)	Make a power point presentation on "Role of Microorganisms in Industry"

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.

ApproximateHours

Item	Cl	SW	SL	Total
Approx.Hrs	09	01	05	15

Session Outcomes (SOs)	Class room Instruction (CI)	Self-Learning (SL)
SO5.1 Identify and characterize DNA, RNA, and plasmids using molecular biology techniques.	**Unit-5** **CI5.1** Techniques in Molecular Biology: Identification and characterization of DNA, RNA, plasmids.	**SL5.1** Summarize the techniques for identifying and characterizing DNA, RNA, and plasmids, including their applications and methodologies.

SO5.2 learn to apply agarose gel electrophoresis and blotting techniques for the separation, identification, and analysis of nucleic acids.	**CI5.2** Agarose gel electrophoresis, Blotting Techniques,	**SL5.2** Research agarose gel electrophoresis principles and protocols, then analyze DNA fragment sizes using a virtual lab simulation.
SO5.3 Understand and apply molecular techniques for DNA fingerprinting, genetic variation analysis, and mutation detection.	**CI5.3** RAPD, RFLP, DGGE, TGGE, PCR	**SL5.3** Explore and summarize the principles and applications of RAPD, RFLP, DGGE, TGGE, and PCR techniques, highlighting their roles in genetic analysis and research.
SO5.4 Learn to perform enzyme assays and determine enzyme activity and specific activity.	**CI5.4** Enzyme assay, enzyme activity and specific activity determination.	**SL5.4** Design an interactive infographic that illustrates the steps and significance of enzyme assays, enzyme activity, and specific activity determination, incorporating real-life examples
SO5.5 Evaluate cell disintegration and extraction techniques, and separate proteins	**CI5.5** Cell disintegration and extraction techniques, separation of proteins by fractionation ammonium sulphate, organic solvents).	**SL5.5** Create a multimedia presentation that showcases various cell disintegration and extraction techniques
SO5.6 Evaluate and Apply chromatography techniques for the separation and analysis of biomolecules.	**CI5.6** Chromatography techniques,	
SO5.7 Analyze and Apply compound and electron microscopy techniques for the observation and characterization of cellular structures.	**CI5.7** Compound Microscopy, Electron microscopy,	
SO5.8 Apply FTIR, NMR, and AAS techniques for the identification and quantification of chemical compounds.	**CI5.8** FTIR, NMR, AAS.	
SO5.9 Understand and Apply bioinformatics principles, explore biological databases and their types, and utilize tools like BLAST and FASTA for sequence analysis. Analyze and apply multiple sequence alignment and phylogenetic analysis techniques,	**CI5.9** Bioinformatics principles, biological databases and their types, BLAST, FASTA, Multiple sequence Alignment. Phylogenetic analysis, Tools used for phylogenetic analysis.	

Suggested Sessional Work (SW): *anyone*	**SW5.1** Assignments	Explain the working principle behind BLAST and MSA
	SW5.2 Mini Project	Describe the role of Entrepreneurship in Biotechnology
	SW5.3 Other	Prepare one article on the “Role of AI-ML in Bioinformatics”

	Activities (Specify)	

Course duration (in hours)to attain Course Outcomes:

Course Title: Advance in Biotechnology **Course Code:**151BT02

Course Outcomes (COs)	Class lecture (CI)	Self-Learning (SL)	Sessional work (SW)	Total Hours (CI+SL+SW)
CO1-151BT02.1. Apply gene technology principles, analyze vectors and enzymes, evaluate sequencing methods, and discuss the implications of gene editing in biotechnology.	09	09	1	19
CO2-151BT02.2. Students will evaluate immunology principles, analyze various vaccine types, and create a detailed understanding of the mechanisms behind hypersensitivity and autoimmune diseases.	09	07	1	17
CO3-151BT02.3. Evaluate animal and plant culture techniques, analyze various culture methods and their advantages, and discuss applications such as Agrobacterium-mediated gene transfer and protoplast fusion.	09	06	1	16
CO4-151BT02.4. Analyze the role of biofertilizers and biofuels, evaluate recent advances in bacterial taxonomy and identification techniques, and discuss the applications of microbes in bioremediation and pharmaceutical compound production.	09	03	1	13
CO5-151BT02.5. Apply molecular biology techniques to identify biomolecules, analyze separation and microscopy methods, and utilize bioinformatics tools for sequence alignment and phylogenetic analysis.	09	05	1	15
Total Hours	45	30	05	80

End semester Assessment Scheme for setting up question paper and assessment to evaluate the Course Outcome:

Course Title: Advance in Biotechnology **Course Code: 151BT02**

Course Outcomes	Marks Distribution				Total Marks
	A	An	E	C	
CO1-151BT02.1. Apply gene technology principles, analyze vectors and enzymes, evaluate sequencing methods, and discuss the implications of gene editing in biotechnology.	2	1	2	5	10
CO2-151BT02.2. Students will evaluate principles of immunology, analyze various vaccine types, and create a detailed understanding of the mechanisms behind hypersensitivity and autoimmune diseases.	2	4	2	2	10

CO3-151BT02.3. Evaluate animal and plant culture techniques, analyze various culture methods and their advantages, and discuss applications such as Agrobacterium-mediated gene transfer and protoplast fusion**.**	3	4	1	2	10
CO4-151BT02.4. Analyze the role of biofertilizers and biofuels, evaluate recent advances in bacterial taxonomy and identification techniques, and discuss the applications of microbes in bioremediation and pharmaceutical compound production.	1	3	5	1	10
CO5-151BT02.5. Apply molecular biology techniques to identify biomolecules, analyze separation and microscopy methods, and utilize bioinformatics tools for sequence alignment and phylogenetic analysis.	3	4	1	2	10
Total Marks	**11**	**16**	**11**	**12**	**50**

***Legend*:A,** Apply;**An,** Analyze;**E,** Evaluate;**C,** Create

Suggested instructions/Implementation strategies:

1. Improved lecture
2. Tutorial
3. Case method
4. Group Discussion
5. Role play
6. Visit to Waste water/Effluent Treatment plant and downstream pharmaceutical plants
7. Demonstration
8. ICT Based teaching Learning
9. Brainstorming

Suggested learning Resources:

(a) Books:

S No	Title	Author	Publisher	Edition and Year
1	Lehninger Principles of Biochemistry	Nelson and Cox	W H Freeman & Co	8th Edition, 2021
2	Freshney's Culture of Animal Cells: A Manual of Basic Technique and Specialized Applications,	Amanda Capes-Davis, R. Ian Freshney	Wiley-Blackwell	8th Edition. 2021
3	Gene Cloning and DNA Analysis An Introduction An Indian Adaptation,	T A Brown	Wiley India Pvt Ltd	8th Edition, 2022
	Plant Tissue Culture Theory and Practice, a Revised Edition	S.S. Bhojwani - M.K. Razdan	Springer	2003

(b) Online Resources:

- **ResearchGate**
- **Springer**
- **Science Direct**

Curriculum Development Team

- **Dr. Kamlesh Choure, Professor and Head Department of Biotechnology**
- **Dr. Ashwini A. Waoo, Professor, Department of Biotechnology**

CO, PO and PSO Mapping

Program Name: Ph.D. in Biotechnology
Semester: Course Work
Course Title: Advance in Biotechnology
Course Code: 151BT02

CO-PO Mapping						PSO				
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSo5**
CO1-151BT02.1. Apply gene technology principles, analyze vectors and enzymes, evaluate sequencing methods, and discuss the implications of gene editing in biotechnology.	2	1	2	3	3	1	2	3	3	2

CO2-151BT02.2. Students will evaluate immunology principles, analyze various vaccine types, and create a detailed understanding of the mechanisms behind hypersensitivity and autoimmune diseases.	1	2	1	3	3	2	3	3	2	1
CO3-151BT02.3. Evaluate animal and plant culture techniques, analyze various culture methods and their advantages, and discuss applications such as Agrobacterium-mediated gene transfer and protoplast fusion.	3	3	2	2	1	2	2	3	3	3
CO4-151BT02.4. Analyze the role of biofertilizers and biofuels, evaluate recent advances in bacterial taxonomy and identification techniques, and discuss the applications of microbes in bioremediation and pharmaceutical compound production.	1	2	3	3	2	1	2	3	2	3
CO5-151BT02.5. Apply molecular biology techniques to identify biomolecules, analyze separation and microscopy methods, and utilize bioinformatics tools for sequence alignment and phylogenetic analysis.	2	1	1	3	3	1	2	3	2	3

Legends: CO/PO/PSO Mapping Range: Low, 1; Medium, 2; High, 3

Course Curriculum:

POs & PSOs No.	COs	SOs No.	Classroom Instruction (CI)	Self-Learning (SL)
PO 1,2,3,4, 5 PSO 1,2, 3, 4, 5	**CO1-151BT02.1.** Apply gene technology principles, analyze vectors and enzymes, evaluate sequencing methods, and discuss the implications of gene editing in biotechnology.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5 SO1.6 SO1.7 SO1.8 SO1.9	1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8, 1.9	**1SL-1,2,3,4,5,6,7,8,9**
PO 1,2,3,4,	**CO2-151BT02.2.** Students will evaluate	SO2.1 SO2.2 SO2.3 SO2.4	2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9	**2SL-1,2,3,4,5,6,7**

5 PSO 1,2, 3, 4, 5	immunology principles, analyze various vaccine types, and create a detailed understanding of the mechanisms behind hypersensitivity and autoimmune diseases.	SO2.5 SO2.6 SO2.7 SO2.8 SO2.9		
PO 1,2,3,4, 5 PSO 1,2, 3, 4, 5	**CO3-151BT02.3**. Evaluate animal and plant culture techniques, analyze various culture methods and their advantages, and discuss applications such as Agrobacterium-mediated gene transfer and protoplast fusion.	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5 SO3.6 SO3.7 SO3.8 SO3.9	3.1,3.2,3.3,3.4,3.5, 3.6,3.7,3.8,3.9	**3SL-1,2,3,4,5,6**
PO 1,2,3,4, 5 PSO 1,2, 3, 4, 5	**CO4-151BT02.4.** Analyze the role of biofertilizers and biofuels, evaluate recent advances in bacterial taxonomy and identification techniques, and discuss the applications of microbes in bioremediation and pharmaceutical compound production.	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5 SO4.6 SO4.7 SO4.8 SO4.9	4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8, 4.9	**4SL-1,2,3**
PO 1,2,3,4, 5 PSO 1,2, 3, 4, 5	**CO5-151BT02.5.** Apply molecular biology techniques to identify biomolecules, analyze separation and microscopy methods, and utilize bioinformatics tools for sequence alignment and phylogenetic analysis.	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5 SO5.6 SO5.7 SO5.8 SO5.9	5.1,5.2,5.3,5.4,5.5, 5.6, 5.7, 5.8,5.9	**5SL-1,2,3,4,5**

Course Code: 151EVS02

Course Title: Advances in Environmental Sciences

Pre- requisite: In the Ph.D. program in Environmental Science include a foundational knowledge base in environmental science and related disciplines such as ecology, biology, chemistry, or engineering. Student should have basic knowledge in research methodologies, data analysis, and scientific writing, typically gained through prior coursework or research experience at the graduate level. Strong critical thinking skills are essential to evaluate complex environmental issues and contribute effectively to discussions and research activities within the course.

Rationale: Environmental Science is strategically designed to immerse doctoral candidates in the forefront of environmental research and innovation. This course aims to deepen students' understanding of emerging environmental challenges, advanced analytical techniques, and sustainable solutions. By exploring cutting-edge methodologies and interdisciplinary approaches, it equips students with the expertise needed to conduct pioneering research that addresses critical environmental issues effectively. The course fosters critical thinking, encourages the integration of diverse scientific disciplines, and prepares students to contribute meaningfully to environmental policy, practice, and sustainable development initiatives on both local and global scales.

Course Outcomes:

151EV S02.1: Demonstrate a comprehensive understanding of cutting-edge concepts and theories in environmental science, including emerging technologies, methodologies, and scientific advancements.

151EV S02.2: Apply advanced analytical techniques, such as remote sensing, GIS, molecular biology, and environmental modeling, to analyze and solve complex environmental problems effectively.

151EV S02.3: Critically evaluate recent environmental research literature, identifying gaps, strengths, and limitations to contribute to the advancement of knowledge in the field.

151EV S02.4: Design and propose innovative and sustainable solutions to environmental challenges, considering interdisciplinary approaches and integrating insights from multiple scientific disciplines.

151EV S02.5: Effectively communicate research findings, both orally and in writing, to diverse audiences including peers, stakeholders, and policymakers, demonstrating clarity, coherence, and relevance in presenting scientific information.

Scheme of Studies:

Board of Study	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits (C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Program Core (PCC)	**151EV S02**	Advances in Environmental Sciences	3+1	0	1	1	5	4

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

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

Scheme of Assessment:

Theory

Board of Study	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment	Total Marks
			Class Test 1 (A)	Class Test 2 (B)	Mini Review (C)	Seminar (D)	Mini Project (E)	Total Marks (A+B+C+D+E)	(ESA)	(PRA+ ESA)
PCC	151EV S02	Advances in Environmental Sciences	10	10	10	10	10	50	50	100

Course-Curriculum Detailing:

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

151EV S02.1: Demonstrate a comprehensive understanding of cutting-edge concepts and theories in environmental science, including emerging technologies, methodologies, and scientific advancements.

Approximate Hours

Item	AppX Hrs.
Cl	7
LI	0
SW	1
SL	1
Total	9

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO1.1 Understand the concept of Ecosystem. SO1.2 Learn about Nutrient cycling. SO1.3 Describe climate change. SO1.4 Know the Effects of pollutant on ecosystem. SO1.5 Know about biodiversity.		**Unit-1 Fundamentals of Environmental Science** 1.1 Core Concepts: Ecosystems, biodiversity, sustainability 1.2 Ecosystem Dynamics: Structure and function, energy flow, nutrient cycling 1.3 Environmental Challenges: Climate change, pollution, habitat destruction 1.4 Pollutants and Contaminants: Sources, types, and effects on ecosystems 1.5 Biodiversity**:** types, importance, consequences, and conservation measures. 1.6 Natural Resources: renewable and non-renewable resources, 1.7 Natural resource management	1. Components of environment.

SW-1 Suggested Sessional Work (SW):

a. **Mini Project:**
Make a chart showing energy flow in Ecosystem.

b. **Other Activities (Specify):**
Prepare Mini review.

151EV S02.2: Apply advanced analytical techniques, such as remote sensing, GIS, molecular biology, and environmental modeling, to analyze and solve complex environmental problems effectively.

Approximate Hours

Item	AppX Hrs
Cl	9
LI	0
SW	1
SL	1
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO2.1 Understand the concept of Remote sensing. SO2.2 Learn about Environmental monitoring. SO2.3 Describe Sampling methods. SO2.4 Know Remediation Technologies. SO2.5 Know Environmental Modeling.		**Unit-2 Advanced Analytical Techniques** 2.1 Remote Sensing and GIS: Environmental monitoring and management applications -1 2.2 Remote Sensing and GIS: Environmental monitoring and management applications - 2 2.3 Analytical Techniques: Sampling methods, Monitoring of Air, Water and Soil. **2.4 Tutorial 1** 2.5 Pollutants and Remediation Technologies: Strategies for pollution mitigation and cleanup, Biotechnological approaches - 1 2.6 Remediation Technologies: Strategies for pollution mitigation and cleanup, Biotechnological approaches -2 2.7 Environmental Modeling: Predictive models for climate change, pollution dispersion -1	1. Importance of Remote sensing.

		2.8 Environmental Modeling: Predictive models for climate change, pollution dispersion -2 2.9 Analytical Techniques: Techniques such as AAS, Spectrometry for environmental analysis.	

SW-2 Suggested Work (SW):

a. Presentation:
Preparation of PPt on selected topics.

151EV S02.3: Critically evaluate recent environmental research literature, identifying gaps, strengths, and limitations to contribute to the advancement of knowledge in the field.

Approximate Hours

Item	AppX Hrs
Cl	10
LI	0
SW	1
SL	1
Total	12

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO3.1 Understand the sources of Energy. **SO3.2** Learn about Waste management. **SO3.3** Describe application of green chemistry. SO3.4 Know Sustainable development. **SO3.5** Implement sustainable agriculture technologies.		**Unit-3 Sustainable Technologies** 3.1 Renewable Energy: Technologies and their environmental impact -1 3.2 Renewable Energy: Technologies and their environmental impact -2 3.3 Waste Management: Advanced solid waste, hazardous waste, and wastewater treatment-1 3.4 Waste Management: Advanced solid waste, hazardous waste, and wastewater treatment-2 3.5 Green Chemistry: Principles and applications in environmental protection. 3.6 Sustainable Agriculture:	1. Energy resources

		Practices for sustainable crop production and soil health-1 3.7 Sustainable Agriculture: Practices for sustainable crop production and soil health-2 3.8 Sustainable Practices: Energy efficiency, waste reduction, and lifecycle analysis-1 3.9 Sustainable Practices: Energy efficiency, waste reduction, and lifecycle analysis-2 3.10 Sustainable Development Goals (SDGs**):** Progress and implementation strategies.	

SW-3 Suggested Work (SW):

a. Seminar presentation:
Preparation of seminar report and presentation of seminar in given topics.

151EV S02.4: Design and propose innovative and sustainable solutions to environmental challenges, considering interdisciplinary approaches and integrating insights from multiple scientific disciplines.

Approximate Hours

Item	AppX Hrs
Cl	10
LI	0
SW	1
SL	1
Total	14

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO4.1 Enhanced Understanding of Environmental Regulations. **SO4.2** Skills in Policy Analysis and Development. **SO4.3** Strategic Implementation of Environmental Management Practices. **SO4.4** Awareness of Global Environmental Challenges and Solutions. **SO4.5** Improved Stakeholder Engagement and Communication.		**Unit-4 Environmental Policies & Management** 4.1 Environmental Legislation: National legislation, policies and regulations and international levels -1 4.2 Environmental Legislation: National legislation, policies and regulations and international levels -2 4.3 Environmental Impact Assessment (EIA): Processes, methodologies, and case studies-1 4.4 Environmental Impact Assessment (EIA): Processes, methodologies, and case studies -2 4.5 Environmental Auditing: Types of audits, auditing processes, compliance audits-1 4.6 Environmental Auditing: Types of audits, auditing processes, compliance audits-2 4.7 Environmental Auditing: Types of audits, auditing processes, compliance audits-3 4.8 Environmental Movements, Regulatory Authorities MoEF&CC, CPCB-1 4.9 Environmental Movements, Regulatory Authorities MoEF&CC, CPCB-2 4.10 Future Directions in Environmental Policies and Management	1. What is EIA?

SW-4 Suggested Work (SW):

a. Mini Review:

Preparation of review on some topics

151EV S02.5: Effectively communicate research findings, both orally and in writing, to diverse audiences including peers, stakeholders, and policymakers, demonstrating clarity, coherence, and relevance in presenting scientific information.

Approximate Hours

Item	AppX Hrs
Cl	9
LI	0
SW	1
SL	1
Total	11

Session Outcomes (SOs)	**Laboratory Instruction (LI)**	**Class room Instruction (CI)**	**Self-Learning (SL)**
SO5.1 Iidentify and differentiate between various research methodologies used in case studies, such as qualitative, quantitative, and mixed methods. **SO5.2** Learn how to apply theoretical frameworks to real-world scenarios through the analysis of case studies. **SO5.3** Develop the skills to critically analyze case studies, identifying key issues, evaluating evidence, and drawing informed conclusions. **SO5.4** Gain the ability to design their own case		**Unit-5 Case Studies and Research Applications** 5.1 Case Studies: In-depth analysis of recent environmental incidents and their management-1 5.2 Case Studies: In-depth analysis of recent environmental incidents and their management-2 5.3 Interdisciplinary Research: Integration of social, economic, and environmental aspects in research. Case studies on interdisciplinary research projects-1 5.4 Interdisciplinary Research: Integration of social, economic, and environmental aspects in research. Case studies on interdisciplinary research projects-2 5.5 Research Ethics: Ethical considerations in environmental research. Case studies on ethical	1. Case studies

studies, including formulating research questions, selecting appropriate methodologies. **SO5.5** Understand the ethical considerations and challenges involved in conducting case study research.		dilemmas and best practices. 5.6 Current Research: Review and critique of recent high-impact environmental research papers-1 5.7 Current Research: Review and critique of recent high-impact environmental research papers-2 5.8 Sustainable Development: Case studies on sustainable cities, green infrastructure, and circular economy. Assessment of sustainable development initiatives-1 5.9 Sustainable Development: Case studies on sustainable cities, green infrastructure, and circular economy. Assessment of sustainable development initiatives-2	

SW-5 Suggested Sessional Work (SW):

a. Assignments:

Review and critique of recent high-impact environmental research papers.

Brief of Hours suggested for the Course Outcome

Course Outcomes	**Class Lecture (C l)**	**Laboratory Lecture (L I)**	**Sessional Work (SW)**	**Self Learning (S l)**	**Total hour (C l + LI+ SW +S l)**
CO-1 Demonstrate a comprehensive understanding of cutting-edge concepts and theories in environmental science, including emerging technologies, methodologies, and scientific advancements.	7	0	1	1	9
CO 2: Apply advanced analytical techniques, such as remote sensing, GIS, molecular biology, and environmental modeling, to analyze and solve complex environmental	9	0	1	1	11

problems effectively.					
CO 3: Critically evaluate recent environmental research literature, identifying gaps, strengths, and limitations to contribute to the advancement of knowledge in the field.	10	0	1	1	12
CO4: Design and propose innovative and sustainable solutions to environmental challenges, considering interdisciplinary approaches and integrating insights from multiple scientific disciplines.	10	0	1	1	12
CO5: Effectively communicate research findings, both orally and in writing, to diverse audiences including peers, stakeholders, and policymakers, demonstrating clarity, coherence, and relevance in presenting scientific information.	9	0	1	1	11
Total Hours	**45**	**00**	**05**	**05**	**55**

Suggested Specification Table (For ESA)

CO	**Unit title**	**Marks Distribution**				**Total Marks**
		App	**An**	**Ev**	**Cr**	
CO-1	Fundamentals of Environmental Science	2	3	3	2	10
CO-2	Advanced Analytical Techniques	3	2	2	3	10
CO-3	Sustainable Technologies	3	2	2	3	10
CO-4	Environmental Policies & Management	3	3	3	1	10
CO- 5	Case Studies and Research Applications	2	2	3	3	10
	Total	13	12	13	12	50

Legend: App: Apply AN: Analyze Ev: Evaluate Cr: Create

The end of semester assessment for Research Methodology will be held with written examination of 100 marks

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

Suggested Instructional/Implementation Strategies:

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

Suggested Learning Resources:

S. No.	Title	Author	Publisher	Edition & Year
01	Advances in Environmental Sciences and Engineering	Aditya Kishore & Mira Das Das	Daya Publishing Hous	2020
02	Multidimensional Analytical Techniques in Environmental Research	Regina Duarte (Editor), Armando C. Duarte	Elsevier Science Publishing Co Inc	2020
03	Conservation, Management and Monitoring of Forest Resources in India	Shyam Divan and Armin Rosencranz Editors Mehebub Sahana Gopala Areendran Krishna Raj	Oxford University Press Springer Nature Switzerland AG	2023
04	Environmental Problem Solving in an Age of Climate Change: Volume One: Basic Tools and Techniques (Springer Textbooks in Earth Sciences, Geography and Environment)	Basudeb Bhatta Jennifer Pontius (Author), Alan McIntosh	Springer International Publishing AG	2024
5	Remote Sensing & GIS	Basudeb Bhatta	Oxford university	2021
6	Environmental Law & Policy India Cases And Materials, 3e	Shyam Divan (Author), Armin Rosencranz	Oxford Univ Pr	2023

7	Environmental Law and Policy in India	Sairam Bhat	Routledge	2024
8	Environmental Impact Assessment - EIA	Jefferson Alex Maciel Cavalcante	Our Knowledge Publishing	2024
9	Environmental Management	Louis Theodore , R. Ryan Dupont , Terry E. Baxte	CRC press Taylor & Fransis group	2020
10	Sustainable and Cleaner Technologies for Environmental Remediation: Avenues in Nano and Biotechnology (Environmental Science and Engineering)	Aravind Jeyaseelan , Kamaraj Murugasen , Karthikeyan Sivashanmugam (	Springer International Publishing AG	2024

Curriculum Development Team:

1. Professor (Dr.) G P Richariya, Dean, Faculty of Life Science & Technology, AKS University
2. Dr. Mahendra Kumar Tiwari , Head of the Department, Dept. of Environmental Science
3. Dr RLS Sikarwar Professor Dept of Environmental Science
4. Mrs. Suman Patel , Assistant Professor Dept of Environmental Science

CourseCode:-151MT02

CourseTitle: - Advances in Management

Pre requisite: -Research scholars should have applied knowledge of recent trends in management. This includes knowledge of key players, market dynamics, and industry-specific challenges.

Rationale: - Research scholarswill adapt recent research facts of managementand will possess understanding about the study of recent trends in managementwhich are essential for several reasons. These trends reflect the evolving dynamics of the business world, and understanding them is crucial for individuals and organizations aiming to stay competitive and relevant. Will solve corporate problems.

Course Outcomes:

151MT02.1:Research scholars will identify key concepts and terminology associated with contemporary business practices.

151MT02.2:Explain the cause-and-effect relationships between emerging trends in human resource and their impact on businesses.

151MT02.3:Evaluate the strengths and weaknesses of businesses in adapting to or leveraging the new trends of marketing.

151MT02.4:Assess the effectiveness of strategies employed by businesses in response to recent trends in accounting.

151MT02.5: Generate innovative solutions or strategies based on an understanding of recent trends and analytics.

Schemeofstudies

Categoryof course	Course Code	CourseTitle	Schemeofstudies(Hours/Week)					Total Credit (C)
			Cl	LI	SW	SL	TotalStudy Hours (CI+LI+SW+SL)	
MCC	151MT02	Advances in Management	03	00	02	01	06	03

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

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

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

SL: Self Learning,

C:Credits.

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

SchemeofAssessment:

Categories of course	Course Code	CourseTitle	**SchemeofAssessment(Marks)**							
			ProgressiveAssessment(PRA)						**End Semester Assessment(ESA)**	**Total Marks** (PRA+ ESA)
			Class Test 1 (A)	**Class Test 2 (B)**	**Mini Review (C)**	**Seminar (D)**	**Mini Project (E)**	**Total Marks (A+B+C+D+E)**		
MCC	**151MT02**	**Advances in Management**	**10**	**10**	**10**	**10**	**10**	**50**	**50**	**100**

Course-CurriculumDetailing:

This course illustrates the expected learning achievements, both at the course and sessionlevels, whichstudentsareanticipatedto accomplishthroughvarious modesofinstruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their masteryofSession Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

151MT02.1 Research scholars will identify key concepts and terminology associated with contemporary business practices.

Approximate Hours

Item	Approximate Hours
Cl	9
LI	0
SW	1
SL	1
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
SO1.1. Identifyand list the primary components ofthe business environment, including economic, legal, and social factors. **SO1.2.** Describe how changes in economic policies can impact legal regulations and, in turn, affect business operations. **SO1.3.** Apply knowledge of the business environment to analyze a case study. **SO1.4.** Evaluate how globalization has affected the supply chain and market reach of a local business, considering economic and cultural aspects. **SO1.5.** Evaluateabusiness decision in light of environmental sustainability, social responsibility, and legal compliance.		**Unit-IBusinessEnvironment (9 Hours)** 1.1 Liberalization 1.2 Structuralreforms, 1.3 De-regulation 1.4 Privatization 1.5 Changeinthetop management of public sector 1.6 Disinvestment of public enterprises 1.7 Entry into MOUs & Navaratnas 1.8 Globalization:Indianeconomy into the global economy 1.9 FreeTradeAreas	1.1 Consumer Behaviorinthe Business Environment

SO1.6. Devise a strategic plan for a startup, considering economic forecasts, legal constraints,andsocial trends.			

SW-1SuggestedSessionalWork(SW):

a.Assignments: The impact of digital technologies on business operations and recreation of new production unit.

151MT02.2:Explain the cause-and-effect relationships between emerging trends in human resource and their impact on businesses.

Approximate Hours

Item	Approximate Hours
Cl	8
LI	0
SW	1
SL	1
Total	10

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
SO2.1 List and define terms such as recruitment, training, and performance appraisal in human resource management **SO2.2.** Describe the psychological theories that influence employee motivation and how they relate to HRM strategies.		**Unit-II: Emerging Areas in Human Resource Management and Organizational Behavior (8 Hours)** **2.1.** Personal Management Vs Human Resource Management **2.2.** Socialmedia in HR functions **2.3.** Jobanalysis-Recruitment **2.4.** Changes in Emphasis from Personnel to Human Resources Management **2.5.** Human Capital Management **2.6.** The Changing dynamics of talent management **2.7.** Roleofpsychologyin HRD	2.1.Performance ManagementSystems and Employee Productivity

SO2.3. Develop a recruitment plan for a specific job role, considering legal and Ethical considerations.		**2.8**. Role of psychology in Management	
SO2.4. Evaluate the diversityand inclusion policies of a company, considering their impact on employee satisfaction and organizational culture. **SO2.5.** Evaluate how a performance management system affects employee productivity and morale within a given organizationalcontext.			

SW-2SuggestedSessionalWork (SW):

a. Assignments: Aligning HR practices with CSR initiatives to attract socially conscious employees.

151MT02.3: Evaluate the strengths and weaknesses of businesses in adapting to or leveraging the new trends of marketing.

Approximate Hours

Item	Approximate Hours
Cl	8
LI	0
SW	1
SL	1
Total	10

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
SO3.1. Define key terms such as market segmentation, product positioning, and the marketing mix. **SO3.2** Describe the concept of consumer behavior and how it influencesmarketing decision making.		**Unit-3Emerging Marketing concepts & functions (8 Hours)** **3.1.** Emerging issues in marketing **3.2.** Integrated marketing **3.3.** Market targeting **3.4.** Market positioning **3.5.** Product Mix, PLC **3.6.** Branding, Packaging & labeling **3.7.** Pricing policies and strategies	**3.1**Integrated Marketing Communications (IMC)
SO3.3. Develop a marketing plan for a specific product, considering target audience, pricing, and promotional strategies. **SO3.4.** Assess the success of a recent marketing campaign by analyzing customer feedback, sales data, and brand perception. **SO3.5**. Create a comprehensive marketing plan that includes target market analysis, positioning strategy, and a promotional campaign foranew product.		**3.8.**Logistic & supply chain management	

SW-3SuggestedSessionalWork (SW):

a.Assignments: Prepare the assignment on Consumer Behavior and its Impact on Marketing Strategies

151MT02.4:Assess the effectiveness of strategies employed by businesses in response to recent

trends in accounting.

Approximate Hours

Item	Approximate Hours
Cl	9
LI	0
SW	1
SL	1
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
SO4.1. Memorize key definitions and concepts outlined in accounting standards. **SO4.2.** Interpret the requirements of accounting standards in various scenarios **SO4.3.** Demonstrate the application of accounting standards in solving practical accounting problems **SO4.4.**Critically evaluate the implications of accounting standards on financial decision-making. **SO4.5** Design financial reporting systems that align with the requirements of accounting standards		**Unit-4.0Emerging Areas in Accounting & Finance(9 Hours)** **4.1.** corporate valuation, financial engineering **4.2.** commercial banking **4.3.** International Accounting Standards **4.4.** International Financial **4.5.** Reporting Standards **4.6.** Analysis of financial statements **4.7.** Corporate governance **4.8.** Accounting for price level changes **4.9.** Human resource accounting	**4.1**-Types of accounting standard

SW-4Suggested Sessional Work (SW):

a.Assignments: The Role and use of automation tools for routine tasks like invoicing, payroll, and reconciliations to improve efficiency and accuracy.

151MT02.5:Generate innovative solutions or strategies based on an understanding of recent trends and analytics

Approximate Hours

Item	**Approximate Hours**
Cl	11
LI	00
SW	01
SL	01
Total	13

SessionOutcomes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self Learning(SL)**
SO5.1. Explain the basic principles of analytics, business analytics,and economic concepts. **SO5.2.** Use business models to analyze and solve practical problems of firms **SO5.3.** Analyze to evaluate the health of an organization by using business analytics. **SO5.4.** Evaluate the uses of business intelligence. **SO5.5.** Design a market research model.		**Unit-5.0Business Analytics (11 Hours)** **5.1**. Business Intelligence **5.2**Data visualization **5.3.** Data for business Environment **5.4.** Basics of business analytics **5.5.** Balanced Scorecard for research **5.6.** Data Management **5.7.** Overview of DBMS **5.8.** Roles of software in business analytics **5.9 Financial Analytics** 5.10 Marketing Research 5.11 HR Analytics	**5.1** Cases of Business Analytics

SW-5Suggested Sessional Work (SW):

a.Assignments:Empowering non-technical users with tools to analyze data and generate insights independently.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Laboratory Lecture (LI)	Sessional Work (SW)	Self Learning(Sl)	Totalhour (Cl + LI+ SW +Sl)
CO-1:Research scholars will identify key concepts and terminology associated with contemporary business practices.	9	0	1	1	11
CO2: Explain the cause-and-effect relationships between emerging trends in human resource and their impact on businesses.	8	0	1	1	10
CO3: Evaluate the strengths and weaknesses of businesses in adapting to or leveraging the new trends of marketing.	8	0	1	1	10
CO4:Assess the effectiveness of strategies employed by Businesses in response to recent trends in accounting.	9	0	1	1	11
CO5:Generate innovative solutions or strategies based on an understanding of recent trends and analytics	11	0	1	1	13
Total Hours	**45**	**00**	**05**	**05**	**55**

SuggestedSpecificationTable(ForESA)

CO	Unittitle	Marks Distribution				Total Marks
		App	An	Ev	Cr	

CO-1	**BusinessEnvironment** Liberalization, structural reforms, de-regulation, Privatization, Changein the top management of public sector, disinvestment of Public enterprises, entry into MOUs & Navaratnas, Globalization, Indian economy, into the global economy, free trade areas	2	3	3	2	10
CO-2	**Emerging Areas in Human Resource Management and Organizational Behavior** Personal Management Vs Human Resource Management, Socialmedia in HR functions, Jobanalysis-Recruitment, Changes in Emphasis from Personnel to Human ResourcesManagement, Human Capital Management, The Changing dynamics of talent management, Roleofpsychologyin HRD, Role of psychology in management	3	3	2	2	10
CO-3	**Emerging Marketingconcepts& functions**. Emerging issues in marketing, Integrated marketing, Market targeting**,** Market positioning, Product Mix, PLC**,** Branding, Packaging & labeling Pricing policies and strategies**,** Logistic & supply chain management	3	2	2	3	10
CO-4	**Emerging Areas in Accounting & Finance** corporate valuation, financial engineering, commercial banking**,** International Accounting Standards**,** International Financial**,** Reporting Standards, Analysis of financial statements, Corporate governance, Accounting for price level changes**,** Human resource accounting	2	2	3	3	10
CO-5	**Business Analytics** Business Intelligence,Data visualization, Data for business Environment, Basics of business analytics, Balanced Scorecard for research, Data Management, Overview of DBMS, Roles of software's in business analytics, Financial Analytics, Marketing Research, HR Analytics	2	3	3	2	10
Total		12	13	13	12	50

Legend: App: Apply An: Analyze Ev: Evaluate Cr: Create

The end of semester assessment for **Advances in Management** will be held with written examination of 50 marks

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

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, Online sources)
8. Brainstorming

SuggestedLearningResources:

S. No.	Title	Author	Publisher	Edition& Year
01	IndianEconomy	Ramesh Singh	Mcgraw hill edge	2024
02	Businesstrends inpractices	BernardMarr	Wiley	2021
03	Management Principles and Practice	Dr. R. Panneerselvam, Dr. P. Sivasankaran	Vijay Nicole Imprints Private Limited	2023
04	Business Analytics	HK Dangi ,Gurveen Kaur	Taxmann	2024

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7. **Mr. Pramod Kumar Dwivedi, Assistant Professor, Dept. of Business Administration**

Cos,POsandPSOsMapping Course
Code:- 151MT02
CourseTitle:-Advances inManagement

CourseOutcomes	ProgramOutcomes								ProgramSpecificOutcome			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO 1	PSO2	PSO 3	PSO 4
	Business Environment and Domain Knowledge	Critical &Analytical thinking,Business Analysis,Problem SolvingandLogical Solutions	International Exposure andCross-CulturalUnderstanding	Social Responsiveness and Ethos	Effective Business Communication	Leadership Development and Synergy	R&D Aptitude	Contemporary issues	Theoretical knowledge as well as practical knowledge	Working various functional area	Work in various industries	To set up business enterprise
CO-1 Students scholarswill identify key concepts and terminology associated with contemporary business practices.	3	3	2	3	2	3	3	2	3	3	3	3
CO2: Explain the cause-and-effect relationships between emerging trends in human resource and their impact on businesses.	3	3	3	3	2	2	2	2	3	2	2	3
CO3: Evaluatethestrengthsandweaknessesof businessesinadaptingtoorlevera	3	2	2	3	2	2	3	3	3	3	2	3

gingthe new trends of marketing.												
CO4: Assessthe effectiveness of strategies employed by businesses in response to recent trends in accounting.	**3**	**3**	**2**	**2**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**3**
CO5: Generate innovative solutions or strategies based on an understanding of recent trends and analytics	**2**	**3**	**3**	**2**	**3**	**3**	**2**	**2**	**3**	**3**	**3**	**3**

CourseCurriculumMap:Recent Trendsin Commerce&Management

POs& PSOsNo.	**COsNo.&Titles**	**SOsNo.**	**Laboratory Instruction(LI)**	**ClassroomInstruction(CI)**	**SelfLearning(SL)**
PO 1,2,3,4,5,6,7 ,8 PSO1,2,3, 4	**CO-1**Students scholars Willidentify key concepts and terminology associated with contemporary businesspractices.	**SO1.1 SO1. 2 SO1. 3 SO1.4 SO1.5 SO1.6**		**Unit-1.0BusinessEnvironment** Liberalization, structural reforms, de-regulation, Privatization, Changeinthetop management ofpublicsector, disinvestment of public enterprises, entry into MOUs & Navaratnas, Globalization, Indian economy, into the global economy, free trade areas. 1.1,1.2,1.3.1.4,1.5,1.6,1.7,1.8,1.9	Asmentionedin pagenumber ……..
PO	**CO2:**Explain the cause-and-effect relationships	**SO2.1**		**Unit-2.0–Emerging Areas in Human Resource Management and Organizational Behavior**	Asmentionedin pagenumber

	between emerging trends in human resource				

1,2,3,4,5,6,7,8 PSO1,2,3,4	and their impact on businesses.	**SO2.2** **SO2.3** **SO2.4** **SO2.5**		PersonalManagementVs Human Resource Management, Socialmedia in HR functions, Jobanalysis-Recruitment, Changes in Emphasis from Personnel to Human ResourcesManagement, Human Capital Management, The Changing dynamics of talent management, Roleofpsychologyin HRD, Role of psychology in management 2.1,2.2,2.3.2.4,2.5,2.6,2.7,2.8	……..
PO 1,2,3,4,5,6,7,8 PSO1,2,3,4	**CO3:** Evaluate the strengths and weaknesses of businesses in adapting to or leveraging the new trends of marketing.	**SO3.1** **SO3.2** **SO3.3** **SO3.4** **SO3.5**		**Unit-3.0 emergingmarketingconcepts&functions**. Emerging issues in marketing, Integrated marketing, Market targeting**,** Market positioning, Product Mix, PLC**,** Branding, Packaging& labeling Pricing policies and strategies**,** Logistic & supply chain management 3.1,3.2,3.3, 3.4,3.5,3.6,3.7,3.8	Asmentionedin pagenumber ……..
PO 1,2,3,4,5,6,7,8 PSO1,2,3,4	**CO4:**Assessthe effectiveness of strategies employed by businesses in response to recent trends in accounting.	**SO4.1** **SO4.2** **SO4.3** **SO4.4** **SO4.5** **SO4.6**		**Unit-4.0Emerging Areas in Accounting & Finance** corporate valuation, financial engineering, commercial banking,International Accounting Standards**,** International Financial,Reporting Standards Analysis of financial statements, Corporate governance, Accounting for price level changes**,** Human resource accounting 4.1,4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9	Asmentionedin pagenumber ……..
PO 1,2,3,4,5,6,7,8 PSO1,2,3,4	**CO5:** Generate Innovative solutions or strategies based on an understanding of recent trends and analytics	**SO5.1** **SO5.2** **SO5.3** **SO5.4** **SO5.5** **SO5.6**		**Unit-5.0:** **Business Analytics** Business Intelligence,Data visualization, Data for business Environment, Basics of business analytics, BalancedScorecard for research, DataManagement, Overview of DBMS Roles of software in business analytics **Financial Analytics,** Marketing Research, HR Analytics 5.1,5.2,5.3,5.4, 5.5,5.6,5.7,5.8,5.9,5.10,5.11	Asmentionedin pagenumber ……..

Course Code: - 151PY02

Course Title: - Advances in Pharmaceutical Sciences

Pre requisite: -Research Scholar should have learn basic knowledge about Advances in Pharmacological and Pharmaceutical Sciences in a peer-reviewed journal and Open Access journal that publishes original research articles, and review articles in all areas of experimental and clinical pharmacology, pharmaceutics, medicinal chemistry and drug delivery.

Rationale: - The students are studying Biochemical pharmacology, drug mechanism of action, pharmacodynamics, pharmacogenetics, pharmacokinetics, and toxicology. The design and preparation of new drugs and their safety and efficacy in humans including descriptions of drug dosage forms.

Course Outcomes:

CO 1: Students will be able to analyze the Introduction and Applications of New Drug Development strategies, Extraction methods for Herbal Drugs and Applications of Nanotechnology in Pharmaceutical Science.

CO 2: The student will be able to utilize the GMP Guidelines.

CO 3: Analyze the Drug discovery and Development.

CO 4: Apply the Polymers and Modern synthetic methods.

CO 5: Student will be able to explore Methods of extraction, isolation and purification of plant constituent's, novel solvent extraction methods, modern chromatographic methods (HPLC, HPTLC and GLC).

Scheme of studies

Categories of course	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			C l	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
PC	151PY02	**Advances in Pharmaceutical Sciences**	03	00	02	01	06	03

Legend: CI:
Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C: Credits.
Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

Categories of course	Course Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class Test 1 (A)	Class Test 2 (B)	Mini Review (C)	Seminar (D)	Mini Project (E)	Total Marks (A+B+C+D+E)		
PC	151PY02	**Advances in Pharmaceutical Sciences**	10	10	10	10	10	50	50	100

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

CO-1 Students will be able to analyze the Introduction and Applications of New Drug Development strategies, Extraction methods for Herbal Drugs and Applications of Nanotechnology in Pharmaceutical Science.

Approximate Hours

Item	AppX Hrs
C I	09
LI	0
SW	1
SL	1
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO1.1. New Drug Development strategies.		**Unit-I** **1. Introduction and Applications of following:**	**1.1.** Preparation of Dosage form based on

SO1.2. Drug bio-screening and evaluation. **SO1.3.** High Throughput screening. **SO1.4.** Extraction methods for Herbal Drugs. **SO1.5.** Applications of Nanotechnology in Pharmaceutical Science.		1.1. New Drug Development strategies. 1.2. Definitions and basic principles only. 1.3. Combinatorial Chemistry. 1.4. QSAR/SAR. 1.5. Drug bio-screening and evaluation. 1.6. Preclinical and Clinical. 1.7. High Throughput screening. 1.8. Extraction methods for Herbal Drugs. 1.9. Applications of Nanotechnology in Pharmaceutical Science.	Nanotechnology.

SW-1 Suggested Sessional Work (SW):

a. Assignments: Importance of Nanotechnology drug delivery system.

CO 2: The student will enable to utilize the GMP Guidelines.

. **Approximate Hours**

Item	AppX Hrs
C I	09
LI	0
SW	1
SL	1
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO2.1 Guidelines **SO2.2.** Personnel, Raw Materials **SO2.3.**Complaints		**Unit-II** **GMP:** Guidelines- **2.1.** Guidelines **2.2.** Building and facilities **2.3.** Equipment **2.4.** Personnel and Raw Materials **2.5.** Production **2.6.** Laboratory Controls **2.7.** Records **2.8**. Labeling **2.9** .Complaints	**2.1.** Comparative study of two different companies GMP profile.

SW-1 Suggested Sessional Work (SW):

a. Assignments: 1. Details study of Production, Laboratory Controls, and Records.

CO 3: Analyze the Drug discovery and Development.

Approximate Hours

Item	AppX Hrs
C l	08
LI	0
SW	1
SL	1
Total	10

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO3.1. Pre-discovery **SO3.2** New Drug (NDA) Application and Safety. **SO3.3.** New Drug Application (NDA) and Approval**.**		**Unit-III** **Drug discovery and Development:** **3.1.** Pre-discovery, **3.2.** Drug Discovery **3.3.** Early Safety Tests **3.4.** preclinical Testing **3.5**. investigational New Drug (NDA) **3.6.** Application and Safety **3.7.** New Drug Application (NDA) and Approval Manufacturing **3.8** Ongoing Studies and Phase 4 Trials	**3.1** New Drug Application (NDA) importance in Pharmacy field.

SW-1 Suggested Sessional Work (SW):

a. Assignments: New Drug Applications (NDA) and Approval

CO 4: Apply the Polymers and Modern synthetic methods.

Approximate Hours

Item	App X Hrs
CI	09
LI	0
SW	1
SL	1
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO4.1. Natural and synthetic polymers. **SO4.2.** Polymers drug interactions. **SO4.3.** Microwave assisted organic synthesis. **SO4.4.** Case studies.		**Unit-IV** **Polymers and Modern synthetic methods:** **4.1.** Natural and synthetic polymers **4.2**. Respect to their pharmaceutical applications **4.3.** Characterization methods of polymers **4.4.** Polymers drug interactions **4.5.** Asymmetric synthesis of chiral drugs, **4.6**. Microwave assisted organic synthesis **4.7.** Concepts **4.8.** Applications **4.9** Case studies.	**4.1** Study about the Natural and synthetic polymers difference, objective, uses, benefits.

SW-1 Suggested Sessional Work (SW):

a. Assignments: Illustrate about characterization methods of polymers.

CO 5: Student will be able to explore Methods of extraction, isolation and purification of plant constituent's novel solvent extraction methods, modern chromatographic methods (HPLC, HPTLC and GLC).

Approximate Hours

Item	AppX Hrs
CI	10
LI	0
SW	1
SL	1
Total	12

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO5.1. Methods of extraction, isolation and purification of plant constituents. **SO5.2.** HPLC, HPTLC and GLC **SO5.3.**. Pharmacology of drugs in neurodegenerative disorders **SO5.4-** Alzheimer's disease,		**Unit-V** **5.1.** Methods of extraction **5.2.** isolation and purification of plant constituents **5.3**. novel solvent extraction methods, **5.4.** modern	**5.1** HPLC, HPTLC

Parkinson's disorders Huntington's disease.		chromatographic methods HPLC **5.5.** HPTLC and GLC **5.6.** Pharmacology of drugs in neurodegenerative disorders (Mechanism) **5.7.** Neurodegeneration dementia **5.8.** Alzheimer's disease, **5.9.** Parkinson's disorders. **5.10.** Huntington's disease including case studies on newer agents and drugs.	

SW-1 Suggested Sessional Work (SW):

a. Assignments: HPLC, HPTLC and GLC

Brief of Hours suggested for the Course Outcome:-

Course Outcomes	Class Lecture (C l)	Laboratory Lecture (L I)	Sessional Work (SW)	Self Learning (S l)	Total hour (C l + LI+ SW +S l)
CO-1 Students will be able to analyze the Introduction and Applications of New Drug Development strategies, Extraction methods for Herbal Drugs and Applications of Nanotechnology in Pharmaceutical Science.	9	0	1	1	11
CO 2: The student will be able to utilize the GMP Guidelines.	9	0	1	1	11
CO3: Analyze the Drug discovery and Development.	8	0	1	1	10
CO 4: Apply the Polymers and Modern synthetic methods.	9	0	1	1	11
CO 5: Student will be able to explore Methods of extraction, isolation and purification of plant constituent's, novel solvent extraction methods, modern chromatographic methods (HPLC, HPTLC and GLC).	10	0	1	1	12
Total Hours	**45**	**00**	**05**	**05**	**55**

Suggested Specification Table (For ESA):-

CO	Unit title	Marks Distribution				Total Marks
		Ap	An	E	C	
CO-1	Introduction and Application of following: a) New Drug Development strategies b) Extraction methods for Herbal Drugs. c) Applications of Nanotechnology in Pharmaceutical Science	02	03	02	03	10
CO-2	GMP: Guidelines of Building and facilities Equipment	04	02	03	01	10
CO-3	Drug discovery and Development	03	02	03	02	10
CO-4	Polymers and Modern synthetic methods	02	02	03	03	10
CO-5	Methods of extraction, isolation and purification of plant constituents novel solvent extraction methods	02	03	02	03	10
	Total	13	12	13	12	50

Legend: A: Apply, A: Analyze, E: Evaluate, C: Create

The end of semester assessment for Advances in Pharmaceutical Sciences will be held with written examination of 50 marks

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

Suggested Instructional/Implementation Strategies:

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

Brainstorming

Suggested Learning Resources:

S. No.	Title	Author	Publisher	Edition & Year
01	Textbook of Drug Design and Discovery	Dr Anant N. Deshpande	Publisher By Nirali Prakashan	1st edition 2023
02	Nanotechnology and Drug Delivery: Principles and Applications	Edited By Rakesh K. Sindhu	by Jenny Stanford Publishing	1st edition 2024
03	Handbook of Natural Polymers, Volume 1	M.S. Sreekala, Lakshmipriya	CRC Press, Apple	1st Edition - May 31,

		Ravindran, Koichi Goda, Sabu Thomas	Academic Press Inc.	2023.
04	Recent Advances in Drug Discovery and Development (Volume - 1)	Dr. Mithun Rudrapal	Raymond G Hill and Duncan Richards	3rd edition 2022

Curriculum Development Team:

1. Dr. Surya Prakash Gupta, Professor, Faculty of Pharmaceutical Science and Technology, AKS University.
2. Mrs Neelam Singh, Assistant Professor, Faculty of Pharmaceutical Science and Technology, AKS University.
3. Ms Shikha Singh, Assistant Professor, Faculty of Pharmaceutical Science and Technology, AKS University.

Cos, POs and PSOs Mapping
Course Code:-
Course Title: - Advances in Pharmaceutical Sciences

Course Outcomes	PO 1	PO 2	PO-3	PO-4	PO-5	PO-6	PO 7	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10	PSO11
	Student will identify the current scenario, crop diversity, climatic requirement and breeding techniques of different vegetable and flower crops.	Student will expertise in latest vegetable production technologies, vegetable breeding techniques and post-harvest management of vegetables	The student will have expertise in nursery-raising techniques and protected cultivation of vegetables and flower crops.	The student will have expertise in different climatic conditions required for common vegetable as well as underutilized vegetable cultivation.	Student will plan about the big scale commercial project and also manage the research trails under vegetable and flower crops	Student will apply various statistical methods to analyze their master research work	Student will understand about library techniques, technical writing skill, IPR, laboratory techniques and research ethics in manuscript writing	Student will identify different cool season, warm season and underutilized vegetable crops	Student will practice different breeding techniques used in vegetable and flower production	Student will recognize different underutilized vegetable and spice crops	Student will apply different vegetable processing and post - harvest - handling methods for vegetables and flowers	Student will understand role of microclimate in vegetable and flower crop production under different protected structures	After gaining experience, they will get the positions of specialists for handling plantation, nurseries and other protected cultivation projects	Student will recognize different flower, ornamental crops and their nursery management	Student will practice turf grass, indoor plant and interioscaping management	Student will apply various information services, technical writings and communication skills in their academics	Student will apply basic concepts in laboratory techniques during their research work	Student will apply basic statistical tools during their research work
CO-1 Students will be able to understand the Introduction and Applications of New Drug Development	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	3	2	1

strategies, Extraction methods for Herbal Drugs and Applications of Nanotechnology in Pharmaceutical Science.																		
CO 2: The student will be able to utilize the GMP Guidelines.	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	2	2	1
CO 3: Analyse the Drug discovery and Development.	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	2	2	1
CO 4: Apply the Polymers and Modern synthetic methods.	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	3	2	1
CO 5: Student will be able to explore Methods of extraction, isolation and purification of plant constituent's novel solvent extraction methods, modern chromatographic methods (HPLC, HPTLC and GLC).	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	2	2	1

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map: Advances in Pharmaceutical Sciences

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
PO 1,2,3,4,5,6,7 **PSO 1,2, 3, 4, 5, 6, 7, 8, 9, 10, 11**	**CO-1** Students will be able to Analyze the Introduction and Applications of New Drug Development strategies, Extraction methods for Herbal Drugs and Applications of Nanotechnology in Pharmaceutical Science.	**SO1.1** **SO1.2** **SO1.3** **SO1.4** **SO1.5**		**Unit-1.0** **Introduction and Applications of following**: a) New Drug Development strategies (Definitions and basic principles only) i. Combinatorial Chemistry ii. QSAR/SAR iii Drug bio-screening and evaluation (Preclinical and Clinical) iv. High Throughput screening b) Extraction methods for Herbal Drugs. c) Applications of Nanotechnology in Pharmaceutical Science. 1.1, 1.2, 1.3. 1.4, 1.5, 1.6, 1.7, 1.8, 1.9	SI:- 1.1
PO 1,2,3,4,5,6,7 **PSO 1,2, 3, 4, 5, 6, 7, 8, 9, 10, 11**	**CO 2:** The student will be able to utilize the GMP Guidelines.	**SO2.1** **SO2.2** **SO2.3**		**Unit-2.0** GMP: Guidelines- Building and facilities Equipment, Personnel, Raw Materials Production, Laboratory Controls, Records, Labeling, Complaints 2.1, 2.2, 2.3.2.4, 2.5, 2.6, 2.7, 2.8, 2.9	SI:- 2.1
PO 1,2,3,4,5,6,7 **PSO 1,2, 3, 4, 5, 6, 7, 8,**	**CO 3:** Analyse the Drug discovery and Development	**SO3.1** **SO3.2** **SO3.3**		**Unit-3.0** Drug discovery and Development: Pre-discovery, Drug Discovery, Early Safety Tests, preclinical Testing, investigational New Drug (NDA) Application and Safety, New Drug Application (NDA) and Approval.	SI:- 3.1

9, 10, 11				Manufacturing, Ongoing Studies and Phase 4 Trials 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8	
PO 1,2,3,4,5,6,7 **PSO 1,2, 3, 4, 5, 6, 7, 8, 9, 10, 11**	**CO 4:** Apply the Polymers and Modern synthetic methods.	**SO4.1** **SO4.2** **SO4.3** **SO4.4**		**Unit-4.0** Polymers- Natural and synthetic polymers with respect to their pharmaceutical applications, characterization methods of polymers, polymers drug interactions. Modern synthetic methods: Asymmetric synthesis of chiral drugs, Microwave assisted organic synthesis – concepts, applications and case studies 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 4.9	SI:- 4.1
PO 1,2,3,4,5,6,7 **PSO 1,2, 3, 4, 5, 6, 7, 8, 9, 10, 11**	**CO 5:** Student will be able to explore Methods of extraction, isolation and purification of plant constituent's novel solvent extraction methods, modern chromatographic methods (HPLC, HPTLC and GLC).	**SO5.1** **SO5.2** **SO5.3** **SO5.4**		**Unit-5.0** Methods of extraction, isolation and purification of plant constituents novel solvent extraction methods, modern chromatographic methods (HPLC, HPTLC and GLC) Pharmacology of drugs in neurodegenerative disorders (Mechanism) neurodegeneration dementia and Alzheimer's disease, Parkinson's disorders Huntington's disease) including case studies on newer agents and drugs. 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7, 5.8, 5.9, 5.10	SI:- 5.1

Course Code:	**151ECO02**
Course Title :	**Advances in Economic Theory and Policies**
Pre-requisite:	Develop the ability to explain core economic terms, concepts and theories (explain the function of market and prices as allocative mechanisms, apply concepts of equilibrium, identify and discuss the key concepts underlying comparative advantage, identify and explain major types of market failures.)
Rationale:	This course also illustrates the structure and functions of social welfare administration and critically examines the effectiveness of welfare programs in India

Course Outcomes:

CO.1 Students will learn measures of central tendency, dispersion, correlation and regression to measure and analyze statistical data in order to draw conclusions about various socio economic problems

CO 2 Students will develop necessary skills for preparing questionnaires, collection and classification of data and presentation in charts and graphs.

CO3: : Enable students to comprehend various concepts in international economics and analyze various theories of international trade

CO4 : Students gain a comprehensive understanding of how monetary systems function, including the role of central banks, money creation, and the various forms of money in modern economies.

CO5 Describe economic development strategies since independence and explain the performance of Indian economy before and after the economic reforms

Scheme of studies

Categories of course	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			C l	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
	CO02	**Advances in Economic Theory and Policies**	03	00	02	01	06	03

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

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

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

SL: Self Learning,

C: Credits.

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

Scheme of Assessment:

Categories of course	Course Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						End Semester Assessment (ESA)	Total Marks (a+b c+d+ e +ESA)
			Class Test 1	Class Test 2	Mini Seminar (c)	Mini Review (d)	Mini Project (e)	Total Marks (a+b c+d+ e)		
	ECO02	Advances in Economic Theory and Policies	10	10	10	10	10	50	**50**	**100**

Course-Curriculum Detailing:

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

CO02.1 : Understanding the application of different functions/models and their usefulness in economics

Approximate Hours

Item	App X Hrs.
C l	9
LI	0
SW	1
SL	1
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self - Learning (SL)
SO1. Discover the meaning and rationale of Indian economic planning and appraise the strategies followed by NITI Aayog in economic development **SO1.2.** Identify, solve and interpret the characteristics of polynomial, exponential and logarithmic functions **SO1.3.** - Acquire knowledge about the subject of economics and define basic economic concepts **SO1.4.** - Differentiate the role of State and market and interpret concepts of public revenue, public expenditure and taxation policies		• **Unit-I Advances in Microeconomic Theory** 1.Analyze the different methods of national income calculation in India 2.Evaluate the different classical theories of employment and money 3.Understand how saving and investment is determined in Keynesian theory 4. Evaluate the two sector ,three sector and four sector Keynesian cross models of income determination and multiplier concepts. 5.Public Economics understand the working of public finance system in India	
SO1.5. - Explain the Indian financial system and concepts of international trade.			
SO1.6. Generalize the changing pattern of India's industrialization and compare the Kerala Model of Development			

SW-1 Suggested Sessional Work (SW):

a. Assignments: Impact of Technological Changes on Business Environment

CO02.2 Knowing agriculture development in different countries under social, political and economic system.

Approximate Hours

Item	App X Hrs.
C l	8
LI	0
SW	1
SL	1
Total	10

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO1.1 Classify various revenue generating system and relate taxation system		● **Unit-II: Advances in Microeconomic Theory !!** 1. Students can formulate the linear programming problems 2. Students can determine a solution to his routine or repetitive problems. 3 They can obtain optimum solution on the basis of various equations. 4 Draw diagrams to show relations between different variables 5 Analyze the Union Budget, fiscal policy of the country etc.	

SO2.2 - Appraise the budget preparation process and outline classification of budget and budgetary procedure in India **SO2.3.** Evaluate the theories of public expenditure and analyze the growth and pattern of public expenditure in Indi		6.Understand the effect of different policies made by government. 7.Compare the growing trend of public sector with private sector.	
SO2.4. Critically examine various theories of Consumption and Investmen **SO2.5** Analyse and evaluate classical and Keynesian perspectives of Money, Inflation, and Unemployment			

SW-2 Suggested Sessional Work (SW):

a. Assignments: Prepare the assignment on HR strategy for a hypothetical organization

CO02.3: Getting deep insight of basic concepts of agricultural marketing viz; market structure, conduct and performance, the factors affecting marketable/ marketed surplus, the market integration, costs & margins, the marketing efficiency, etc..

Approximate Hours

Item	Appx Hrs.
C l	8
LI	0
SW	1
SL	1
Total	10

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO3.1. Acquire knowledge about the subject of economics and define basic economic concepts **SO3.2** Differentiate the role of State and market and interpret concepts of public revenue, public expenditure and taxation policies.		● **Unit-3 Trade and Development Dynamics** 1.Communication – to present finding and explain complex data. 2.Problem solving – to extract information, draw conclusions and make recommendations	
SO3.3. - Generalize the changing pattern of India's industrialization and compare the Kerala Model of Development **SO3.4.** Apply integration and differential techniques in economic analysis **SO3.5**. Understand various economic sectors and classify the role of agriculture, industry and service sectors in Indian economic development		3.Students will be able to handle data more effectively 4.Understand the effect of different policies made by government 5. Students can do forecasting. 6.Students can find the trend values which will provide them rough estimates of the value of the phenomenon in near future. 7. They can draw conclusions about the population on the basis of sample	

SW-3 Suggested Sessional Work (SW):

a. Assignments: Prepare the assignment on Consumer Behavior and its Impact on Marketing Strategies

CO02.Understanding alternative approaches to demand supply analysis. Measurement of supply response through Nerlovian mode.

Approximate Hours

Item	Appx Hrs.
Cl	9
LI	0

SW	1
SL	1
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO4.1. This course will equip the students with basic mathematical tools for analysing economic problems **SO4.2** Students will learn differential calculus and its application in economics.. **SO4.3** Understanding the basic mathematical tools like Set theory and Matrix **SO4.4** Enable the students for understanding the scope of probability in economics **SO4.5**Critically examine various theories of Consumption and Investment		● **Unit-4.0 Contemporary issues of Indian Economy** 1New theories can be formulated. 2 Demonstrate the origin of economics. 3. Use quantitative reasoning in economic contexts 4.Use problem solving skills 5.Apply economic principles to the analysis of labour market issues 6. Make a critical evaluation of current policy debates in the area	

SW-4 Suggested Sessional Work (SW):

a. Assignments: The Role of Professional Organizations in Setting Accounting Standards

CO02.5 . Understanding the design of the tax structure using the concepts of efficiency and equity

Approximate Hours

Item	Appx Hrs.
Cl	11
LI	00
SW	01
SL	01
Total	13

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO5.1. - Analyse and evaluate classical and Keynesian perspectives of Money, Inflation, and Unemploymen **SO5.2.** - Explore the trade Fluctuations and various Monetary and Fiscal Policies to mitigate the same **SO5.3.** - Evaluation of Post Keynesian Schools of Macroeconomic Though **SO5.4.** Understand multidisciplinary nature, scope and importance of environmental studies and identify the need of public awareness . **SO5.5** Differentiate the relationship between environment and economic developmen		• **Unit-5.0 Contemporary issues of Indian Economy!!** **1** Students understand meaning of economic development. 2.Students know about different models of economic development. 3.Students also get knowledge about different economic problems faced by underdeveloped countries. 4. Students will also come to know about the concept of national income and per capita income of a country. 5. Students will be able to understand economic and social problems of country more effectively 6.Understand the effect of different policies made by government 7. They can analyze the various policies of the government.	

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (C l)	Laboratory Lecture (L I)	Sessional Work (SW)	Self Learning (S l)	Total hour (C l + LI+ SW +S l)
CO.1 Students will learn measures of central tendency, dispersion, correlation and regression to measure and analyze statistical data in order to draw conclusions about various socio economic problems	9	0	1	1	11
CO 2 Students will develop necessary skills for preparing questionnaires, collection and classification of data and presentation in charts and graphs.	8	0	1	1	10
CO3: : Enable students to comprehend various concepts in international economics and analyze various theories of international trade	8	0	1	1	10
CO4 : Students gain a comprehensive understanding of how monetary systems function, including the role of central banks, money creation, and the various forms of money in modern economies.	9	0	1	1	11
CO5 Describe economic development strategies since independence and explain the performance of Indian economy before and after the economic reforms	11	0	1	1	13
Total Hours	**45**	**00**	**05**	**05**	**55**

CO	Unit title		Marks Distribution			Total Marks
		AP	An	Ev	Cr	
CO-1	**Advances in Microeconomic Theory**	02	03	02	03	10
CO-2	**Advances in Microeconomic Theory !!**	04	01	03	02	10
CO-3	**Trade and Development Dynamics**	03	02	02	03	10
CO-4	**Contemporary issues of Indian Economy**	03	03	02	02	10
CO-5	**Contemporary issues of Indian Economy!!**	02	04	02	02	10
	Total	14	13	11	12	**50**

Legend: App: Apply An: Analyze Ev: Evaluate Cr: Create

The end of semester assessment for **Advances in Political 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, Face book,Twitter, Whatsapp, Mobile, Online sources)
8. Brainstorming

Suggested Learning Resources:

S. No.	Title	Author	Publisher	Edition & Year
01	MICRO ECONOMICS	SANDEEP GARG	DHANPAT RAI PUBLICATIONS	2022
02	INDIAN ECONOMIC DEVELOPMENT	T.R. JAIN	VK GLOBAL PUBLICATIONS	2024
03	ECONOMICS	JAY PRAKASH MISHRA	SAHITYA BHAWAN PUBLICATIONS	2021

Curriculum Development Team:

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COs, POs and PSOs MappingCourse Code: - 151MT02

Course Title: - Advances in Economic Theory and Policies

Course Outcomes	Program Outcomes								Program Specific Outcome			
	PO1	**PO2**	**PO3**	**PO4**	**PO 5**	**PO6**	**PO 7**	**PO 8**	**PSO 1**	**PS O2**	**PSO 3**	**PSO 4**
	Communication of present findings and explanation of complex data.	Demonstration of the ability to employ the way of thinking.	Recognizition of the role of ethical values in decision making.	Offer well-structured curricula that facilitate students' academic growth and development.	Establish a well-resourced learning environment conducive to effective economics education	**Leadership Development and Synergy**	**R& D Aptitude**	**Contemporary issues**	**Theoretical knowledge as well as practical knowledge**	**Working various functionalarea**	**Work in various industries**	**To set up business enterprise**
CO-1 Students will learn measures of central tendency, dispersion,	**3**	**3**	**2**	**3**	**2**	**3**	**3**	**2**	**3**	**3**	**3**	**3**

correlation and regression to measure and analyze statistical data in order to draw conclusions about various socio economic problems												
CO2 Students will develop necessary skills for preparing questionnaires, collection and classification of data and presentation in charts and graphs	**3**	**3**	**3**	**3**	**2**	**2**	**2**	**2**	**3**	**2**	**2**	**3**

CO3: : Enable students to comprehend various concepts in international economics and analyze various theories of international trade	**3**	**2**	**2**	**3**	**2**	**2**	**3**	**3**	**3**	**3**	**2**	**3**
CO 4: Students gain a comprehensive understanding of how monetary systems function, including the role of central banks, money creation, and the various forms of money in modern economies.	**3**	**3**	**2**	**2**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**3**
CO5 CO5 Describe economic development strategies since independence and explain the performance of Indian economy before and after the economic reforms	**2**	**3**	**3**	**2**	**3**	**3**	**2**	**2**	**3**	**3**	**3**	**3**

Course Curriculum Map: Advances in Economic Theory and Policies

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO1,2,3,4,5, 6,7,8 PSO 1,2, 3, 4	**CO1: 1** Students will learn measures of central tendency, dispersion, correlation and regression to measure and analyze statistical data in order to draw conclusions about various socio economic problems	**SO1. 2** **SO1. 3** **SO1. 4** **SO1. 5** **SO1. 6**		**Advances in Microeconomic Theory** 1.1, 1.2, 1.3. 1.4, 1.5, 1.6, 1.7, 1.8, 1.9	
PO1,2,3,4,5, 6,7,8 PSO 1,2, 3, 4	**CO2** Students will develop necessary skills for preparing questionnaires, collection and classification of data and presentation in charts and graphs	**SO2. 1** **SO2. 2** **SO2. 3** **SO2. 4** **SO2. 5**		**Advances in Microeconomic Theory !!** 2.1, 2.2, 2.3.2.4, 2.5, 2.6, 2.7, 2.8. .	

PO 1,2,3,4,5,6,7 ,8 PSO 1,2, 3, 4	**CO3** : Enable students to comprehend various concepts in international economics and analyze various theories of international trade	**SO3. 1 SO3. 2 SO3. 3 SO3. 4 SO3. 5**		**Trade and Development Dynamics** .1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8	
PO 1,2,3,4,5,6,7 ,8 PSO 1,2, 3, 4	CO 4 : Students gain a comprehensive understanding of how monetary systems function, including the role of central banks, money creation, and the various forms of money in modern economies.	**SO4. 1 SO4. 2 SO4. 3 SO4. 4 SO4. 5 SO4. 6**		**Contemporary issues of Indian Economy accounting 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 4.9**	As mentioned in page number ……..
PO1,2,3,4,5,6 ,7 ,8 PSO 1,2, 3, 4	CO5 Describe economic development strategies since independence and explain the performance of Indian economy before and after the economic reforms	**SO5. 1 SO5. 2 SO5. 3 SO5. 4 SO5. 5 SO5. 6**		**Contemporary issues of Indian Economy!! 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9,5.10**	As mentioned in page number ……..

Course Code: 126PH03

Course Title: Advances in Educational Technology

Pre-requisite: The research scholar should have knowledge the computer peripherals and its Organization in computer system.

Rationale: The research scholar to understand about the meaning nature scope and significance of E.T. and its important components in terms of hardware and software. To help the research scholar to distinguish between communication and instruction so that they can develop and design sound instructional system. To acquaint research scholar with levels, strategies and models of teaching for improvement. To enable the scholars to understand about the importance of programmed instructions and researches in E.T. To acquaint the scholars with emerging trends in E.T. along with the resources centres of E.T.

Course Outcomes:

Co 1-To enable there search scholar to understand about the meaning, nature, scope and significance of E.T. and its important components in terms of hardware and software.

Co2-Tohelptheresearchscholar to distinguish between communication and instruction so that they can develop and design sound instructional system.

Co3---To acquaint research scholar with levels strategies and models of teaching for improvement.

Co4-To enable the scholars to understand about the importance of programmed instructions and researches in E.T.

Co5—To acquint the scholars with emerging trends in E.T. along with the resources centres of E.T.

Scheme of Studies

Board of Study	Course Code	Course Title	Scheme of studies(Hours/Week)					Total Credits (C)
			CI	LI	SW	SL	Total Study Hours CI+LI+SW+SL	
Program Core (NCTE)	**126PH03**	**Advances in Educational Technology**	3	0	2	1	06	03

Legend:

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

Board of Study	Course Code	Course Title	Scheme of Assessment(Marks)							
			Progressive Assessment(PRA)						End Semester Assessment (ESA)	Total Marks (PRA+ ESA)
			Class Test -1 (A)	Class Test 2 , (B)	Mini Review (c)	Seminar(D)	Mini Project (E)	Total Marks (A+B+ C+ D+ E)		
NCTE	**126 PH03**	**Advances in Educational Technology**	10	10	10	10	10	50	50	100

Course-Curriculum Detailing:

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

CO.1:To enable the research scholar to understand about the meaning ,nature ,scope and significance of E.T. and its important components in terms of hardware and software.

Item	Approximate Hours
CI	**09**
LI	**0**
SW	**01**
SL	**2**
Total	**12**

Sessional Outcomes(SOs)	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self-Learning (SL)
1SO1.Students will gain knowledge about concept of educational technology. **1SO2.**Student will understand the functions of educational technology **1SO3.**Students will understand the components of educational technology. **1SO4**.Students will understand the software components and hardware components **1SO5**. Students will understand the educational technology and instructional technology.		**Unit- I** Concept of Educational Technology: 1.1.Meaning of Educational Technology: , 1.2.Nature of Educational Technology: 1.3. Scope of Educational Technology: 1.4.significance of E.T. 1.5.scope and of Educational Technology: 1.6. Components of E.T.—Software, hardware 1.7. Components of E.T.—Software, 1.8. Components of E.T.—hardware 1.9. Educational technology and Instructional Technology	1. Concept of educational technology 2. educational technology and instructional technology

SW-1 Suggested Sessional Work (SW):

a. Assignments:

Plan and organize a fieldtrip/ excursion to a nearby area of educational important and submit a report

CO.2 To help the research scholar to distinguish between communication and instruction so that they can develop and design sound instructional system.

Item	Approximate Hours
CI	**09**
LI	**0**
SW	**01**
SL	**02**
Total	**12**

Sessional Outcomes(SOs)	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self-Learning (SL)
2SO1. student will understand the Theory of communication 2SO2. Student will understand concept and nature of communication **2SO3**.student will understand the process and components of communication **2SO4.**student will understand the Mass media approach in educational		**Unit-2.0 - communication** 1.- Theory of communication. 2.-Concept and nature of communication. 3.process and components of communication.	1. Mass media approach in educational technology 2. Designing of instructional strategies such

technology. **2SO5**.student will understand the Designing.		4. Types of classroom communication. 5. Mass media approach in educational technology. 6. Designing instructional system. 7. Formulation of instructional objectives. 8. Task analysis. 9. Designing of instructional strategies such as lecture Seminar and tutorials.	as lecture seminar and tutorials.

SW-2 Suggested Sessional Work (SW):

Assignments: A critical survey of co-curricular activities in secondary schools

CO.3: To acquaint research scholar with levels strategies and models of teaching for improvement.

Item	Approximate Hours
CI	09
LI	0
SW	01
SL	02
Total	12

Sessional Outcomes(SOs)	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self-Learning(SL)
3.SO1- student will understand the teaching levels, strategies and models **3. SO2.**- student will understand the Teaching strategies. **3.SO3.** student will understand the Models of teaching **3SO4**.-studentwill understand the psychological		**Unit-3. teaching levels, strategies and models** 1. Memory level of teaching. 2. Understanding level of teaching. 3. Reflective level of teaching. Teaching strategies. 4. Meaning ,and nature of Teaching strategies. 5. Function and types of Teaching strategies.	1. psychological models and modern models of teaching. Modification of teaching behavior 2. micro teaching, flanders interaction analysis, simulation

models and modern models of teaching, modification of teaching behavior **3SO5**.- student will understand the micro teaching, flanders interaction analysis, simulation		Models of teaching. 6. meaning, nature functions and types. 7. Psychological models and modern models of teaching. 8. Modification of teaching behavior. 9. Micro teaching, flanders interaction analysis ,simulation.	

CO4:To enable the scholars to understand about the importance of programmed instructions and researches in E.T.

Item	Approximate Hours
CI	**08**
LI	**0**
SW	**01**
SL	**02**
Total	**11**

Sessional Outcomes(SOs)	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self-Learning (SL)
4SO1.student will understand the origin of programmed instruction model **4SO2.**student will understand the types of programmed instruction model **4SO3.**student will understand the linear instruction model .and branching instruction model. **4SO4.**student will understand the Research in educational technology **4SO5.** student will understand the future priorities in educational technology		**Unit-4.0 programmed instructional model** 1. Origin of programmed instruction model. 2. Types of programmed instruction model. 3. linear instruction model. 4. Branching instruction model. 5. Development of the programmed instructional material. 6. Teaching machines. 7. Research in educational technology. 8. Future priorities in educational technology.	**1.** future priorities in educational technology **2-** linear instruction model. branching instruction model.

CO.5: To acquint the scholars with emerging trends in E.T. along with the resources centres of E.T.

Item	Approximate Hours
CI	**10**
LI	**0**
SW	**01**
SL	**03**
Total	**14**

Sessional Outcomes(SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
5SO1.student will understand the educational technology in formal education. **5SO2.** student will understand the educational technology in informal education. **5SO3**.student will understand the Distance education open learning system. **5SO4.-**student will understand the Emerging trends in educational technology. **5SO5**.student will understand the IGNOU,NIOS their activity for the improvement of teaching learning.		**Unit-5** 1. Educational technology in formal education. 2. Educational technology in non-formal Educational 3. Educational technology in informal education. 4. Distance education. 5. Open learning system- Emerging trends in educational technology 6. Video tape, radio vision, teleconferencing. 7. evaluation and educational technology. 8. CIET, 9- UGC, 10- IGNOU .NIOS .their activity for the improvement of teaching learning.	1- Educational technology in formal education. 2- Educational technology in non-formal Educational 3.Educational technology in informal education.

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Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work(SW)	Self Learning (Sl)	Total hour (Cl+SW+Sl)
CO-1-To enable there search scholar to understand about the meaning nature scope and significance of E.T. and its important components in terms of hardware and software.	9	01	2	13
CO-2-To help the research scholar to distinguish between communication and instruction so that they can develop and design sound instructional system.	9	01	2	13
CO-3---To acquaint research scholar With levels strategies and models of teaching for improvement.	9	01	2	13
CO-4-To enable the scholars to understand about the importance of Programmed instructions and researches in E.T.	8	01	2	13
CO-5—To acquint the scholars with Emerging trends in E.T. along with the resources centres of E.T.	10	01	3	14
Total	45	05	11	61

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution				Total Marks
		Ap	An	E	C	
CO1	**Concept of educational technology.**	2	3	10	5	20
CO2	**Communication.**	2	3	10	5	20
CO3	**Teaching levels, strategies and models.**	2	3	10	5	20
CO4	**Programmed instructional model.**	2	3	10	5	20
CO5	**Resource Centres for educational technology.**	2	3	10	5	20
Total		**10**	**15**	50	25	100

Legend:Ap :Apply, An:Analysis, E:Evaluate, C:Create

The end of semester assessment for **Advances in Educational Technology** will be held with written examination of 50 marks

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

Suggested Instructional/ Implementation Strategies:

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

Suggested Learning Resources:

(a) Books:

S. No.	Title	Author	Publisher	Edition & Year
1	ICT in Education in Global context	Huang, R and Kinshuk, Jon K.Price	Emerging trends report	2014
2	Educational technology &ICT	Dr.sushil kumar gupta	Thakur publication Lakhnow	2020
3	Introduction to Educational technology .	CPSINGH	KITABCHALOTASBOOK	2007
4	Educational Technology	Khan. N	Rajat Publications, New Delhi.	2004
5	Educational Technologies	Gankhar. S.C	N. M. Publications, Panipat	2008

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Cos, Pos and PSOs Mapping
Course Code: 126PH03
Course Title:-Advances in Educational Technology

Course Outcomes	PO1	PO2	PO-3	PO-4	PO-5	PO-6	P07	P08	PO9	PO10	PSO1	PSO2	PSO3	PSO4
	BASICKNOWLEDGE	PROBLAMANALYSIS	DESIGNDEVELOPMENTOFSOLUTION.	SKILLSANDMETHODS	SKILLSANDMETHODS	ENVIRONMENTANDSUSTAINABILITY	ETHICS	INDIVIDUALANDTEAMWORK	COMMUNICATION	LIFELONGLEARNING:	Develop balanced personalities in teacer Impart core competencies for addressing societal changes.	Acquire knowledge and skills in human development and pedagogy.	Address genderinequalitiesineducation. Equip teachers for guidance, counseling,	Prepare teachers for technological and global challenges.
126PH03-1-To Enable the research scholar to understand about the meaning naturescope and significance of E.T. and its important component sinterms ofhardware and software.	3	3	2	3	3	1		3	3	3	2	2	1	1
126PH03-2-To help theresearch scholar to distinguish	2	3	1	2	2	1	2	3	2	2	2	3	1	1

between communication and instruction sothatthey candevelop anddesign sound instructional system.														
126PH03-3--- To acquaint research scholarwith levels strategies andmodels ofteaching for improvement.	2	2	2	2	3	1	2	2	3	2	2	2	2	2
126PH03-4-To enablethe scholarsto understand about the importance of programmed instructions and researches inE.T.	3	2	2	2	2	1	3	3	2	2	3	2	2	2
126PH03-5—To acquintthe scholars with emerging trends in E.T.along with the resources centres of E.T.	2	2	2	2	2	1	2	2	2	2	2	3	2	2

Legend:1-Low,2–Medium, 3-High

Course Curriculum Map: Advances in Educational Technology

Pos & PSOs No.	Cos No.& Titles	SOs No.	Laboratory Instruction(LI)	Classroom Instruction(CI)	Self-Learning (SL)
PO 1,2,3,4,5,6, PSO1,2,3,4,5, 6,7,8	**126PH03-1**-To enable the research scholar to understand about the meaning nature scope and significance of E.T. and its important components in terms of hardware and software.	**SO1.1 SO1.2 SO1.3 SO1.4 SO1.5**		**Unit-1.0 Concept of educational technology.** 1.1,1.2,1.3.1.4, 1.5,1.6	As mentioned in page number ……
PO 1,2,3,4,5,6, PSO1,2,3,4,5, 6,7,8	**126PH03-2-**To help the research scholar to distinguish between communication and instruction so that they can develop and design sound Instructional system.	**SO2.1 SO2.2 SO2.3 SO2.4 SO2.5 SO2.6**		**Unit-2.0 – communication.**2.1, 2.2,2.3.2.4,2.6,	As mentioned in page number ……
PO 1,2,3,4,5,6, PSO1,2,3,4,5, 6,7,8	**126PH03-3---**To acquaint research scholar with levels strategies and models of teaching for improvement.	**SO3.1 SO3.2 SO3.3 SO3.4 SO3.5 SO3.6**		**Unit-3.0 teachinglevels, strategies and models.** 3.1,3.2,3.3,3.4, 3.5,3.6	As mentioned in page number ……
PO 1,2,3,4,5,6, PSO1,2,3,4,5, 6,7,8	**126PH03-4**-To enable the scholars to understand about the importance of programmed instructions and researches in E.T.	**SO4.1 SO4.2 SO4.3 SO4.4 SO4.5 SO4.6**		**Unit-4.0 programmed instructional model.** 4.1,4.2,4.3.4.4, 4.5,4.6	As mentioned in page number ……
PO 1,2,3,4,5,6, PSO1,2,3,4,5, 6,7,8	**126PH03-5—**To acquint the scholars with emerging trends in E.T. along with the resources centres of E.T.	**SO5.1 SO5.2 SO5.3 SO5.4 SO5.5 SO5.6**		**Unit-5.0 Resource centres for educational technology**. 5.1,5.2,5.3.5.4, 5.5,5.6	As mentioned in page number ……

Course Code: **151POS02**

Course Title: **ADVANCES IN POLITICAL SCIENCE**

Pre-requisite: Student should have basic knowledge Educate students about normative political values, concepts and debates centered on these along with political processes, theories, governments in India and other countries and about international relations between those countries.

Rationale: The students n Political Science acquaints students to inculcate various citizenship values like- empathy, cooperation, tolerance, leadership quality, make them responsible in nation- building and develop in them law abidingness.

Course Outcomes:

CO1 Prepare students for a variety of careers or graduate and professional degree programs in fields such as law, bureaucracy, education, politics, policy, civil society and business.

CO2 Offer students the analytical and research skills needed to understand, explain, describe & evaluate society, politics, governments, organized associational life and international relations.

CO3: Political Science offers a strong platform to venture into diverse field like academics, research, teaching, administrative jobs, journalism, work in national and international non-profit organisations (NGOs) and election campaign manager.

CO4 Understanding of government institutions, electoral processes, and policies in a variety of countries around the world and the ability to compare the effectiveness or impact of differing political arrangements across countries

CO5 Along with it the graduation degree in Political Science acquaints students to inculcate various citizenship values like- empathy, cooperation, tolerance, leadership quality, make them responsible in nation- building and develop in them law abidingness

Scheme of studies

Category wise course	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
	POS02	ADVANCES IN POLITICAL SCIENCE	03	00	02	01	06	03

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:

Course Category	Course Code	Course Title	**Scheme of Assessment (Marks)**						
			Progressive Assessment (PRA)					**End Semester Assessment (ESA)**	**Total Marks** (PRA+ ESA)
			Cl / Ho Assignment 5 no. 3 marks each (CA)	Seminar one (SA)	Project	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
	POS02	Advances in Political Science	10	10	10	10	50	50	100

Course Curriculum Detailing:

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

151POS01: Critique, compare and contrast, in the context of relevant literature, key theories involving the political processes, institutions, actors, and ideas in the core scholarly areas of Political Science

Approximate Hours

Item	Appx. Hrs.
Cl	9
LI	0
SW	1
SL	1
Total	11

Session Outcomes (SOs)	(LI)	Class room Instruction (Cl)	(SL)
SO1.1 Explaining nature and scope of Political Science. Discussing different Approaches: (a) Normative approach (b) Behavioral Approach (c) Marxist Approach. **SO1.2.**- Analyzing the concept of Sovereignty of the State. Discussing Monistic Theory, Pluralistic Theory, Doctrine of Popular Sovereignty. **SO1.3.**- Evaluating the theories of the State: Contract theory, Idealist theory, Liberal and Neo-liberal theory, Marxist theory and Gandhian theory. **SO1.5.** - Explaining Schools of Jurisprudence, Theories of Law and sources of Law **SO1.6.**- Methods of Representation, Political Parties and Pressure Group.	.	**Unit-I POLITICAL THEORY – Liberalism, Socialism and Communism** **1.** Liberalism, **2.** Communitarians **3.** Multiculturalism **4.** Green Political theory and Critique of Development **5.** Gender Theories **6.** Femininities **7.** Masculinities **8.** Queer identities	

151POS02:**Offer students the analytical and research skills needed to understand, explain, describe & evaluate society, politics, governments, organized associational life and international relations.**

Approximate Hours

Item	Appx. Hrs.
Cl	8
LI	0
SW	1
SL	1
Total	10

Session Outcomes (SOs)	(LI)	Class room Instruction (CI)	(SL)
SO1.1- Introducing the Indian Constitution with a focus on the role of the Constituent Assembly and examining the essence of the Preamble. **SO2.2** - Examining the Fundamental Rights and Duties of Indian citizens with a study of the significance and status of Directive Principles.	.	**Unit-II: Recent approaches** 1. Comparative state polities in India **2.** Party and electoral politics 3. Regionalism and sub regionalism 4. Comparative politics of southern Countries colonial legacies 5. Pattern of State and Nation buildings **6.** Praty politics-politics of development	
SO2.3. Assessing the nature of Indian Federalism with focus on Union-State Relations. **SO2.4.**- Critically analyzing the important institutions of the Indian Union: the Executive: President; Prime Minister, Council of Ministers; Governor, Chief Minister and Council of Ministers; The legislature: Rajya Sabha, Lok Sabha, Speaker, Committee System, State Legislature, The Judiciary: Supreme Court and the High Courts: composition and functions- Judicial Activism. **SO2.5.** Evaluate how a performance management system affects employee productivity and morale within a give organizational context			

SW-2 Suggested Sessional Work (SW):

a. **Assignments:** Prepare the assignment on HR strategy for a hypothetical organization

151POS02.3: Apply and evaluate research methods and statistical research skills related to the study of political science

Approximate Hours

Item	Appx Hrs.
Cl	8
LI	0
SW	1
SL	1
Total	10

Session Outcomes (SOs)	(LI)	Class room Instruction (Cl)	(SL)
SO3.1. Explaining the nature, scope and evolution of Public Administration; Private and Public Administration; Principles of Socialist Management. **SO3.2**Tracing the Challenges in the discipline of Public Administration like New Public Administration (NPA); Comparative Public Administration (CPA) and Development Administration **SO3.3.**- Analyzing the Administrative Processes: decision making; communication and control; leadership; co-ordination. **SO3.4.** Assessing the relationship between the Citizen and Administration: Lokpal and Lokayukt **SO3.5.** Studying the Organization of the Union Government and State Government		**Unit-3** **1)** Analysing the major Concepts in Public Administration. **2)** Discussing the Ecological approach to Pub. Adm. **3)** Discussing Weberian and Marxian theories of bureaucracy **4)** Understanding the concept of District Administration in India **5)** Examining the Institutions of Financial Administration in India.	

SW-3 Suggested Sessional Work (SW):

a. **Assignments:** Prepare the assignment on Consumer Behaviour and its Impact on Marketing Strategies

151POS2.4: Communicate effectively in written and oral formats relevant to the field of political science

Approximate Hours

Item	Appx Hrs.
Cl	9
LI	0
SW	1
SL	1
Total	11

Session Outcomes (SOs)	(LI)	Class room Instruction (Cl)	(SL)
SO4.1. Explaining scope and subject matter of International Relations as an autonomous academic discipline. **SO4.2** Approaches and methods to study the discipline through Political realism, Pluralism and Worlds system's Model. **SO4.3.** Examining the issues of Underdevelopment, Terrorism, Regionalism and Integration that characterizes the Post second world war order. **SO4.4.** Studying the role of Diplomacy, Propaganda and Military capabilities in the making of foreign policy. **SO4.5** Explaining certain basic concepts like Globalization in contemporary world order.		**Unit-4.0International Politics** **1.** Describing the Cold War phases and understanding the post Cold War era **2.** Discussing the developments in European Ethno-nationalism since 1990's. Tracing the growth of European Union **3.** Examining Indian Foreign Policy: Basic Principles, Evolution and Bilateral Relations. **4.** Analyzing the Foreign Policy of USA and China. -Studying the developments in third world countries in post world war II era like 5.NAM: Relevance, **5.** ASEAN, **6.** SAFTA and SAARC, **7.** OPEC, OAU, **8.** West Asia-Palestine problem after Cold War	

SW-4 Suggested Sessional Work (SW):

a. **Assignments:** The Role of Professional Organizations in Setting Accounting Standards

151POS02.5 Design, create, and defend an original significant contribution to knowledge in the field of politicascience through the use of original and secondary sources of evidence. Develop and practice professional behaviour in research and/or teaching

Approximate Hours

Item	Appx Hrs.
C l	11
LI	00
SW	01
SL	01
Total	13

Session Outcomes (SOs)	**(LI)**	**Class room Instruction (CI)**	**(SL)**
SO5.1.- Outlining the basic values and philosophy of Indian Constitution as expressed in the Preamble. **SO5.2.-** Studying the process of interaction between society and politics in contemporary India- Caste, tribe and religion. **SO5.3.-** Understanding the working of Urban and Rural Self Government in India with special reference to West Bengal **SO5.4.** Creating awareness among students about Nationalism and State building processes in Western Europe and third world.		**Unit-5.0 Indian Politics, Political sociology and welfare state** **1.** Relating Gender and Politics **2.** Examining social stratification through the index of class, caste and elite. **3.** Classifying the different types of Political systems **4.** Establishing State –society interrelationship **5.** Evaluating the concept and types of Political Participation **6.** Assessing Judicial Activism in India with particular reference to Supreme Court	
SO5.5 Discussing the approaches to the study of Political Culture. Evaluating the different agents of Political Socialization and their interrelationships.			

SW-5 Suggested Sessional Work (SW):

a. **Assignments:** Prepare the assignment An International Accounting Standards and Cross-Border Finance

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Laboratory Lecture (LI)	Sectional Work (SW)	Self Learning (Sl)	Total hour (Cl + LI + SW + Sl)
CO-1: Critique, compare and contrast, in the context of relevant literature, key theories involving the political processes, institutions, actors, and ideas in the core scholarly areas of Political Science	9	0	1	1	11
CO2: Investigate and analyze contemporary political issues in the context of underlying theories in political science	8	0	1	1	10
CO3: Apply and evaluate research methods and statistical research skills related to the study of political science	8	0	1	1	10
CO4 Communicate effectively in written and oral formats relevant to the field of political science	9	0	1	1	11
CO5: Design, create, and defend an original significant contribution to knowledge in the field of political science through the use of original and secondary sources of evidence. Develop and practice professional behavior in research and/or teaching	11	0	1	1	13
Total Hours	**45**	**00**	**05**	**05**	**55**

Suggested Specification Table (For ESA)

CO	Unit title	Marks Distribution				Total Marks
		AP	An	E	C	
CO-1	**Political Theory- Liberalism, SOCIALISM and COMMUNISM**	03	02	03	04	12
CO-2	**Recent approaches**	02	03	03	04	12
CO-3	**Public Administration**	01	02	02	03	08
CO-4	**International Politics**	01	01	04	04	10
CO-5	**Indian Politics, Political sociology and Welfare state ,**	02	02	02	02	08
	Total	09	10	14	17	50

Legend: App: Apply An: Analyze Ev: Evaluate Cr: Create

The end of semester assessment for **Advances in Political 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. 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, Online sources)
8. Brainstorming

Suggested Learning Resources:

S. No.	Title	Author	Publisher	Edition& Year
01	Political Theory-	J.C. JOUHARI	Sterling pub. Private	2017
02	Public Administration	C.B. YADAV	Pareek Publication	2021
03	International Politics	Dr. B.L. fadiya	Sanity Publication	2014

CurriculumDevelopmentTeam:

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Cos, POs and PSOs Mapping Course Code:-151MT02

Course Title:- Advances in Political science

Course Outcomes	Program Outcomes								Program Specific Outcome			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
	bureaucracy, education, politics, policy, civil society and business.	politics, governments, organized association al life and internatio nal relations	academics, research, teaching, administrative jobs, journalism, work in national	government institutions, electoral processes, and policies	citizenship values like-empathy cooperation, tolerance	Leadership Development and Synergy	R & D Aptitude	Contemporary issues	Theoretical knowledge as well as practical knowledge	Working variousfunctionalarea	Workinvariousindustries	Tosetupbusinessenterprise
CO-1 Students will be able to identify key concepts and terminology associated with contemporary business practices.	3	3	2	3	2	3	3	2	3	3	3	3
CO2: Explain the cause-and-effect relationships between various trends and their impact on businesses.	3	3	3	3	2	2	2	2	3	2	2	3

CO3: Evaluate the strengths and weaknesses of Businesses in adapting to or leveraging these trends	**3**	**2**	**2**	**3**	**2**	**2**	**3**	**3**	**3**	**3**	**2**	**3**
CO4: Assess the effectiveness of strategies employed by businesses in response to recent trends	**3**	**3**	**2**	**2**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**3**
CO5: Generate innovative solutions or Strategies based on an understanding of recent trends	**2**	**3**	**3**	**2**	**3**	**3**	**2**	**2**	**3**	**3**	**3**	**3**

Course Curriculum Map:
Advances in political science

POs& PSOsNo.	Cos No. & Titles	SOsNo.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO1,2,3,4,5,6,7,8 PSO1,2,3,4	**CO1: Critique, compare and contrast, in the context of relevant literature, key theories involving the political processes, institutions, actors, and ideas in the core scholarly areas of Political Science**	**SO1.1 SO1.2 SO1.3 SO1.4 SO1.5 SO1.6**		**Political Theory.** 1.1,1.2,1.3.1.4,1.5,1.6,1.7,1.8,1.9	
PO1,2,3,4,5,6,7,8 PSO1,2,3,4	**CO2:: Investigate and analyze contemporary political issues in the context of underlying theories in political science**	**SO2.1 SO2.2 SO2.3 SO2.4 SO2.5**		**Recent approaches** 2.1,2.2,2.3.2.4,2.5,2.6,2.7,2.8	
PO1,2,3,4,5,6,7,8 PSO1,2,3,4	**CO3 Apply and evaluate research methods and statistical research skills related to the study of political science**	**SO3.1 SO3.2 SO3.3 SO3.4 SO3.5**		**Public Administration** 3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8	
PO 1,2,3,4,5,6,7,8 PSO1,2,3,4	**CO4. Communicate effectively in written and oral formats relevant to the field of political science**	**SO4.1 SO4.2 SO4.3 SO4.4 SO4.5 SO4.6**		**International Politics** 4.1,4.2,4.3, 4.4, 4.5,4.6,4.7,4.8,4.9	Asmentionedin pagenumber ……..
PO1,2,3,4,5,6,7,8 PSO1,2,3,4	**CO5: Design, create, and defend an original significant contribution to knowledge in the field of political science through**	**SO5.1 SO5.2 SO5.3 SO5.4 SO5.5**		**Indian Politics, Political sociology and Welfare state** 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9,5.10,5.11	Asmentionedin

	the use of original and secondary sources of evidence. Develop an practice professional behavior in research and/or teaching	**SO5.6**			pagenumber ……..

Course Code:	**151PUD02**
Course Title :	**Advances in public Administration and Policy**
Pre-requisite:	The course provides an introduction to the discipline of public administration. The course tries to explain the meaning, nature and scope of public administration along with changes in the context of globalization. It tries to trace the evolution of public administration as a discipline with new trends unfolding in the discipline. This course swells on the new approaches to public administration and helps students comprehend the paradigm shift in the discipline
Rationale:	This course also illustrates the structure and functions of social welfare administration and critically examines the effectiveness of welfare programs in India

Course Outcomes:

CO. 1 Demonstrate broad understanding of public affairs, policy development, policy analysis, economic analysis, management skills, and organization theory and their applications to public service.

CO 2 : Gain knowledge about contribution of major thinkers in the areas of management, motivation, leadership, development .

CO3: : Understand the form and substance of Local Self Governments in Indian scenario..

CO4 : Understand and analyze social policies, their structures in India like health, education

CO5 To develop to communicate effectively, both in writing and oral, using the important terminology, facts, concepts, and theories used in the subject Public Administration

Scheme of studies

Categories of course	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
	PUD02	**Advances in public Administration and Policy**	03	00	02	01	06	03

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

LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or otherlocations 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 toensure outcome of Learning.

Category wise of course	Course Code	Course Title	Scheme of studies (Hours/Week)					Total Credits (C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
	PUD02	Advances in public Administration and Policy	03	00	02	01	06	03

Scheme of Assessment:

Course Category	Course Code	Course Title	Scheme of Assessment (Marks)						
			Progressive Assessment (PRA)					End Semester Assessment (ESA)	Total Marks (PRA + ESA)
			Class/Home Assignment 5 number 3 marks each (CA)	Seminar one (SA)	Project	Class Attendance (AT)	Total Marks (CA+CT+SA+CAT+AT)		
	PUD 02	Advances in public Administration and Policy	10	10	10	10	50	50	100

Course-Curriculum Detailing:

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

PUD02 : Conceptual clarity of Personnel Administration, its issues, career systems and other terms covering various aspects of personnel administration

Approximate Hours

Item	App X Hrs.
C l	9
LI	0
SW	1
SL	1
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self - Learning(SL)
SO1. The course provides an introduction to the discipline of public administration. The course tries to explain the meaning, nature and scope of public administration along with changes in the context of globalization **SO1.2.** - It tries to trace the evolution of public administration as a discipline with new trends unfolding in the discipline **SO1.3.** - This course swells on the new approaches to public administration and helps students comprehend the paradigm shift in the discipline. **SO1.4.** - The course also offers insight on key concepts like development administration, its genesis and changing patterns **SO1.5.** - It also elucidates the objectives and significance of public policy **SO1.6.** - This course also illustrates the structure and functions of social welfare administration and critically examines the effectiveness of welfare programs in India		**Unit-I Concept of Public** Described meaning, nature and scope of Public Administration Differentiate between Public and Private Administration Explain meaning and forms of Organization Describe different Principles of Organisation Identify concepts of Public Administration	

SW-1 Suggested Sessional Work (SW):

a. Assignments: Impact of Technological Changes on Business Environment

PUD02.2 Gaining conceptual and theoretical understanding of development administration including the planning machinery, public enterprises in post-globalization contexts.

Approximate Hours

Item	Appx Hrs.
C l	8
LI	0
SW	1
SL	1
Total	10

Session Outcomes (SOs)	(LI)	Class room Instruction (CI)	(SL)
SO2.1- The objective of the course is to provide superior graduate education to the students aspiring for public service career **SO2.2** - To that end, the course provides an academically rigorous, political science based curriculum relevant to public policy and public Arts **SO2.3.** It promotes understanding of the political, social, legal and economic environment in which public organisations operates. **SO2.4.** - It provides understanding of the nature, scope of administrative process and decision making **SO2.5** This course introduces students to key administrative theories ranging from classical, neo-classical to contemporary theories on administration..		**Unit-II: Study of Public Administration** 1.Current global scenario of Indian Administration 2. Substance of Indian Administration 3. transformative role of Indian Administration 4. : Identify concepts of Public Administration 5. Comprehend functioning of revenue administration 6. Functioning and issues of police administration	

SW-2 Suggested Sessional Work (SW):

a. Assignments: Prepare the assignment on HR strategy for a hypothetical organization

PUD02.3: Awareness about the institutions and mechanism in force for citizen-state interface. In this context the paper seeks to enlighten the students on the current issues and problems of Indian administration

Approximate Hours

Item	Appx Hrs.
C l	8
LI	0
SW	1
SL	1
Total	10

Session Outcomes (SOs)	(LI)	Class room Instruction (Cl)	(SL)
SO3.1. The course also explores some of the recent trends, including feminism and ecological perspective for greater democratisation in restructuring public administration. **SO3.2** Tracing the Challenges in the discipline of Public Administration like New Public Administration (NPA); Comparative Public Administration (CPA) and Development Administration. **SO3.3.** - Analysing the Administrative Processes: decision making; communication and control; leadership; co-ordination **SO3.4.** Assessing the relationship between the Citizen and Administration: Lokpal and Lokayukt **SO3.5**. Studying the Organisation of the Union Government and State Government	.	**Unit-3Administrative Improvement** 1.Analysing the major Concepts in Public Administration. 2.Discussing the Ecological approach to Pub. Adm. 3.Discussing Weberian and Marxian theories of bureaucracy 4.Understanding the concept of District Administration in India 5. Examining the Institutions of Financial Administration in India.	

SW-3 Suggested Sessional Work (SW):

a. Assignments: Prepare the assignment on Consumer Behavior and its Impact on MarketingStrategies

PUD02.4: Connecting the role and relationships of rural and urban local democratic decentralized institutions with other related issues, institutions and their personnel.

Approximate Hours

Item	App X Hrs.
Cl	9
LI	0
SW	1
SL	1
Total	11

Session Outcomes (SOs)	(LI)	Class room Instruction (Cl)	(SL)
SO4.1. The course provides an introduction to the discipline of public administration **SO4.2** The course tries to explain the meaning, nature and scope of public administration along with changes in the context of globalization SO4.3This course also illustrates the structure and functions of social welfare administration and critically examines the effectiveness of welfare programs in India. SO4.4The course also offers insight on key concepts like development administration, its genesis and changing patterns SO4.5 This course swells on the new approaches to public administration	.	**Unit-4.0 Public Policy** 1. Explain concept of Public Policy 2. Internal determinants in the formulation of Public Policy 3. Bureaucracy in the implementation of Public Policy 4. Good Governance, E-Governance and Disaster Management 5. Understanding of the social, political, economic, and cultural factors that influence public administration 6. Urban Development Programmes	

SW-4 Suggested Sessional Work (SW):a. Assignments: The Role of Professional Organizations in Setting Accounting Standards

PUD02.5Understanding of local governmental system, grievance redressal mechanisms and relevance of comparative approach in globalized perspective

Approximate Hours

Item	App X Hrs.
Cl	11
LI	00
SW	01
SL	01
Total	13

Session Outcomes (SOs)	(LI)	Class room Instruction (CI)	(SL)
SO5.1. - To learn develop critical thinking about public policy issues and the ability to conduct professional analysis of social political and economic structures and bureaucratic processes **SO5.2.** - To identify interdisciplinary approach that examines how the confluence of economic, political and social forces informs and shapes public policy. **SO5.3.** - To understand the development of a diverse cohort of faculty and students with a shared value of public service at the local, regional, national and global levels **SO5.4.** To teach where to find, how to research, how to read, and how to apply public policy. **SO5.5** Give an emphasis on experimental learning that gives students opportunities to apply their academic training to practical policy issues	.	**Unit-5.0 Role of Legislature** **5.1**To understand the economic liberalization **5.2** To identify and impact of globalization **5.3**To appreciate the need for downsizing and disinvestment of public sector **5.4** To study the changes in industrial licensing system **5.5** To understand the impact of new economic policy and economic development in India.	

Course Outcomes	Class Lecture(C l)	Laboratory Lecture (L I)	SessionalWork (SW)	Self Learning(S l)	Total hour (C l + LI+ SW +S l)
CO-1: Demonstrate broad understanding of public affairs, policy development, policy analysis, economic analysis, management skills, and organization theory and their applications to public service.	9	0	1	1	11
CO2: : Gain knowledge about contribution of major thinkers in the areas of management, motivation, leadership, development .	8	0	1	1	10
CO3: Understand the form and substance of Local Self Governments in Indian scenario.	8	0	1	1	10
CO4 : Understand and analyze social policies, their structures in India like health, education	9	0	1	1	11
CO5 To develop to communicate effectively, both in writing and oral, using the important terminology, facts, concepts, and theories	11	0	1	1	13

used in the subject Public Administration					
Total Hours	**45**	**00**	**05**	**05**	**55**

SO5.5 Give an emphasis on experimental learning that gives students opportunities to apply their academic training to practical policy issues

Brief of Hours suggested for the Course Outcome

CO	Unit title	Marks Distribution				Total Marks
		Ap	An	E	C	
CO-1	**Concept of Public Administration**	03	02	03	04	12
CO-2	**Study of Public Administration** .	02	03	03	04	12
CO-3	**Administrative Improvement**	01	02	02	03	08
CO-4	**Public Policy**	01	01	04	04	10
CO-5	**Role of Legislature**	02	02	02	02	08
	Total	09	10	14	17	**50**

Legend: Ap: Apply An: Analyze Ev: Evaluate C: Create

The end of semester assessment for **Advances in Political science** will be held with writtenexamination of 50 marks

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

Suggested Instructional/Implementation Strategies:

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

7. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Face book,Twitter, Whatsapp, Mobile, Online sources)
8. Brainstorming

Suggested Learning Resources:

S. No.	Title	Author	Publisher	Edition & Year
01	Public Administration	M.P. SHARMA	KITAAB MAHAL	2024
02	Public Administration in india	Siuli sarkar	PHI Learning	2018
03	Public Administration in America	Michael E. Milakovich	Wadsworth Publishing co Inc	2022

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5. Dr. Udaybhan Singh, Assistant Professor Department of Arts, AKS University

COS, POs and PSOs MappingCourse Code: -
151MT02

Course Title: - Advances in Public Administration and Policy

Course Outcomes	Program Outcomes								Program Specific Outcome			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO 1**	**PSO2**	**PSO 3**	**PSO 4**
	Described meaning, nature and scope of Public Administration	Explain meaning and forms of Organization	To understand the economic liberalization	Internal determinants in the formulation of Public Policy	To study the changes in industrial licensing system	**Leadership Development and Synergy**	**R&D Aptitude**	**Contemporary issues**	**Theoretical knowledge as well as practical knowledge**	**Working various functional area**	**Work in various industries**	**To set up business enterprise**
CO-1 Demonstrate broad understanding of public affairs, policy development, policy analysis, economic analysis, management skills, and organization theory and their applications to public service..	**3**	**3**	**2**	**3**	**2**	**3**	**3**	**2**	**3**	**3**	**3**	**3**
CO2: Gain knowledge about contribution of major thinkers in the areas of management, motivation, leadership,	**3**	**3**	**3**	**3**	**2**	**2**	**2**	**2**	**3**	**2**	**2**	**3**

development												
CO3: Understand the form and substance of Local Self Governments in Indian scenario	**3**	**2**	**2**	**3**	**2**	**2**	**3**	**3**	**3**	**3**	**2**	**3**
CO 4: Understand and analyze social policies, their structures in India like health, education	**3**	**3**	**2**	**2**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**3**
CO5 To develop to communicate effectively, both in writing and oral, using the important terminology, facts, concepts, and theories used in the subject Public Administration	**2**	**3**	**3**	**2**	**3**	**3**	**2**	**2**	**3**	**3**	**3**	**3**

Course Curriculum Map: Advances in Public Administration and Policy

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO1,2,3,4,5,6,7,8 PSO 1,2,3,4	**CO1: -** Demonstrate broad understanding of public affairs, policy development, policy analysis, economic analysis, management skills, and organization theory and their applications to public service..	**SO.1.1** **SO.1.2** **SO.1.3** **SO.1.4** **SO.1.5**		**Concept of Public Administration** 1.1, 1.2, 1.3. 1.4, 1.5, 1.6, 1.7, 1.8, 1.9	
PO1,2,3,4,5,6,7,8 PSO 1,2,3,4	**CO2: :** : Gain knowledge about contribution of major thinkers in the areas of management, motivation, leadership, development	**SO.2.1** **SO.2.2** **SO.2.3** **SO.2.4** **SO.2.5**		**Study of Public Administration** 2.1, 2.2, 2.3.2.4, 2.5, 2.6, 2.7, 2.8 .	
PO 1,2,3,4,5,6,7,8 PSO 1,2,3,4	**CO3** : Understand the form and substance of Local Self Governments in Indian scenario	**SO.3.1** **SO.3.2** **SO.3.3** **SO.3.4** **SO3.5**		**Administrative Improvement** .1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8	
PO 1,2,3,4,5,6,7,8 PSO 1,2,3,4	**CO 4.** Understand and analyze social policies, their structures in India like health, education	**SO4.1** **SO.4.2** **SO.4.3** **SO.4.4** **SO.4.5**		**Public Policy** accounting 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 4.9	As mentioned in page number ……..
PO	**CO5** To develop to communicate effectively, both in writing and	**SO5.1** **SO.5.2** **SO.5.3** **SO.5.4**		**Role of Legislature** 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7, 5.8, 5.9, 5.10,5.11	As mentioned in

1,2,3,4,5,6,7 ,8 PSO 1,2, 3, 4	oral, using the important terminology, facts, concepts, and theories used in the subject Public Administration	**SO.5.5**			page number ……..

Course Code: **151YOG02**

Course Title : **Ph.D. in yoga (Advances of Yoga)**

Pre- requisite: Student should have basic knowledge OF Ph.D. IN YOGA (Advances of yoga) and its concepts.

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

Course Outcomes:

CO 201.1: Students will be able to do research on philosophical areas.
CO 201.2: Students will be able to do research in literary areas.
CO 201.3: Students will be able to do research on the biographies of great yogis and their contribution areas.
CO 201.4: A student will be able to conduct research on health and therapeutic areas.
CO 201.5: Student will be able to research academic areas.

Scheme of Studies:

Code	Course Code	Course Title	Scheme of studies(Hours/Week) 15					Total Credits(C)
			Cl	LI	SW	SL	Total Study Hours (CI+LI+SW+SL)	
Program Core	151YOG 02	Advances of yoga	3	1	2	1	6	3

Legend:
CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial
(T) and others),
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies) along with experienced learning .
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 of Teacher to ensure outcome of Learning.

- Use Complete Blooms Taxonomy at 6 levels in assessment and evaluation.
- Higher level thinking 4,5,6 is expected in Ph.D. Course.
- Give detail & weightage to laboratory instruction.

Theory

Code	Couse Code	Course Title	Scheme of Assessment (Marks)							
			Progressive Assessment (PRA)						**End Semester Assessment (ESA)**	**Total Marks (PRA+ ESA)**
			Class Test 1 (A)	Class Test 2 (B)	Mini Review (C)	Seminar (D)	Mini project (E)	Total Marks (A+B+C+D+E)		
	151YOG02	advances of yoga	10	10	10	10	10	50	50	100

Course-Curriculum Detailing:

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

CO. 1: Students will be able to do research on philosophical areas.

Approximate Hours

Item	AppX Hrs
Cl	09
LI	0
SW	1
SL	1
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO1.1 Student will able to Understand Philosophical Areas SO1.2Student will able to Understand the Brief introduction of Vedas SO1.3 Student will able to Describe Indian Philosophy SO1.4 Student will able to Describe 1.15 Ayurveda and possible areas of their research with examples Sri Madbhagvad Gita SO1.5 Student will able to Describe Puranas	.	Unit-1. - Philosophical Areas 1.1 Brief introduction of Vedas,&Upanishads, 1.2 Indian Philosophy, 1.3 Puranas, 1.4 Smritis, 1.5 Sri Madbhagvad Gita, 1.6 Mahabharata, 1.7 Ramayana, 1.8 Ayurveda and possible areas of their research with examples. 1.9 Ayurveda and possible areas of their research with examples	1. Ayurveda and possible areas of their research with examples 2. Brief introduction of Vedas 3. Indian Philosophy

CO. 2: Students will be able to do research in literary areas.

Approximate Hours

Item	App Hrs
Cl	09
LI	0
SW	1
SL	1
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO2.1 Student will able to Understand Literary Areas **SO2.2**Student will able to Understand the Brief introduction of Patanjal Yoga Sutras, Hathpradipika, Gherand Samhita **SO2.3**Student will able to Understand the Bhakti-Sagar, Shivswarodaya, Vashisth Samhita, Gorakh Samhita **SO2.4**Student will able to Understand the Hathtattva Kaumudi, Hathratnavali **SO2.5**Student will able to Understand the their possible yogic areas of research with examples	.	**Unit-2.** Literary Areas 2.1 Brief introduction of Patanjal 2.2 Yoga Sutras,Hathpradipika, 2.3 Gherand Samhita,,Charandaskrit 2.4 Bhakti-Sagar (Astangyoga), 2.5 Shivswarodaya, Vashisth Samhita 2.6 Gorakh Samhita, 2.7 Hathtattva Kaumudi,Hathratnavali 2.8 their possible yogic areas of research with examples 2.9 Their possible yogic areas of research with examples	1. Patanjal Yoga Sutras, Hathpradipika, Gherand Samhita 2. their possible yogic areas of research with examples

CO. 3: Students will be able to do research on the biographies of great yogis and their contribution areas.

Approximate Hours

Item	Appx Hrs
Cl	09
LI	0
SW	1
SL	1
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO3.1 Student will able to Understand Life Sketches and their contributory Areas **SO3.2**Student will able to Understand the Brief Life-sketches of Saint Kabir Das, Saint Tulsidas SO3.3 Student will able to Describe Swami Charandas, Swami Dayanand, Saraswati SO3.4 Student will able to Describe Swami Vivekanand, Swami Satyanand Saraswati SO3.5 Student will able to Describe their contribution in yogic field with respect to possible research areas	.	**Unit-3.** Life Sketches and their contributory Areas- 3.1 Brief Life-sketches of Saint Kabir Das, 3.2 Saint Tulsidas, Swami Charandas, 3.3 Swami Dayanand Saraswati, 3.4 Sri Aurobindo, Swami Vivekanand, 3.5 Swami Shivanand Saraswati, Swami Satyanand Saraswati 3.6 Swami Satyanand Saraswati 3.7 Swami Kuvalayananda ,Swami Kuvalayananda 3.8 Their contribution in yogic field with respect to possible research areas. 3.9 their contribution in yogic field with respect to possible research areas	1. Life Sketches and their contributory Areas 2. their contribution in yogic field with respect to possible research areas

CO. 4: A student will be able to conduct research on health and therapeutic areas.

Approximate Hours

Item	Appx Hrs
Cl	09
LI	0
SW	1
SL	1
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO4.1 Student will able to Understand Health and Therapeutic Areas- **SO4.2**Student will able to Understand the Basic knowledge of Diet and Health **SO4.3**Student will able to Understand the Alternative therapies and possible areas of its research **SO4.4**Student will able to Understand the Relationship of Yogic therapy with some important Alternative therapies and possible areas of its research	.	**Unit-4.** Health and Therapeutic Areas- 4.1 Basic knowledge of Diet and Health and its norms% 4.2 Health based norms of Swara Yoga , possible areas of research, possible areas of research, 4.3 Yogic Therapy and its concepts, 4.4 scope and principles 4.5 Possible areas of research with examples for therapeutic research on physiological, psychosomatic and psychological disorders. 4.6 Relationship of Yogic therapy with some important Alternative therapies and possible areas of its research with examples 4.7 Relationship of Yogic therapy with some important Alternative therapies and possible areas of its research with examples 4.8 Relationship of Yogic therapy with some important Alternative therapies and possible areas of its research with examples 4.9 Relationship of Yogic therapy with some important Alternative therapies and possible areas of its research with examples	1. Health and Therapeutic Areas- 2- Basic knowledge of Diet and Health 3- Relationship of Yogic therapy with some important Alternative therapies and possible areas of its research

CO. 5: Student will be able to research academic areas

Approximate Hours

Item	AppX Hrs
Cl	09
LI	0
SW	1
SL	1
Total	11

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO5.1 Student will able to Understand Educational Areas SO5.2Student will able to Understand the principles and methodology SO5.3 Student will able to Describe Role of yogic education in social problems SO5.4 Student will able to Describe Games & Sports	.	Unit-5. Educational Areas- 5.1 Form, principles and methodology of yogic education for primary, high/ higher education in schools and colleges; 5.2 principles and methodology of yogic education for primary, high/ higher education in schools and colleges 5.3 their possible areas of research. 5.4 Essential elements for implementation of yogic education in schools /colleges and their implications, their possible areas of research. 5.5 Role of yogic education in social problems, 5.6 Role of yogic education in social problems 5.7 administrative problems, 5.8 physical education, , Games & Sports 5.9 moral education; and , possible areas of research	1. Educational Areas 2. principles and methodology 3. Role of yogic education in social problems 4- Games & Sports

SW-4 Suggested Sessional Work (SW):

a. Assignments:

i. **Ayurveda and possible areas of their research with examples**

ii. Educational Areas principles and methodology

iii. **Health and Therapeutic Areas**

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (Cl)	Sessional Work (SW)	Self Learning (Sl)	Total hour (Cl+SW+Sl)
C0 101.1: Students will be able to do research on philosophical areas.	09	1	2	**12**
C0 101.2: Students will be able to do research in literary areas.	09	1	2	**12**
C0 101.3: Students will be able to do research on the biographies of great yogis and their contribution areas.	09	1	2	12
C0 101.4: A student will be able to conduct research on health and therapeutic areas.	09	1	2	12
CO 101.5: Student will be able to research academic areas.	09	1	2	**12**
Total Hours	45	5	10	**60**

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution				Total Marks
		AP	AN	E	C	
CO-1	Philosophical Areas	03	2	3	2	10
CO-2	Literary Areas	03	3	3	1	10
CO-3	Life Sketches and their contributory Areas	03	2	3	2	10
CO-4	Health and Therapeutic Areas	02	2	3	3	10
CO-5	Educational Areas	02	2	3	3	10
Total		13	11	15	11	50

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

The end of semester assessment for advances in physics 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 -

SN No	Title	Author	Publisher	Edition and year
1	Philosophical Areas	D.R.Jatav	National publishing house	2013
2	Literary Areas	Swmi Niranjnanand Sarsawati	Yog publication trust ,munger bihar	2020
3	Literary Areas	Swmi Satyanand Sarsawati	Yog publication trust ,munger bihar	2015
4	Life Sketches and their contributory Areas	Vishwanath Mukharji	Anurag publication Vanarashi	2019
5	Health and Therapeutic Areas	Dr Vijay Kumar rai	Chaukhambha publication vanarashi	2018
6	Health and Therapeutic Areas	H.David coulter	Motilal banarshidas	1010
7	Health and Therapeutic Areas	Swmi Satyanand Sarsawati	Yog publication trust ,munger bihar	2013
8	Educational Areas	Dr M.L.Gharote	Kaiwalya dham publishing	2001

Curriculum development team –

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Cos, POs and PSOs Mapping

Course Title: Advances of yoga

Course Code : 151YOG02

Course Title: advances of yoga

Course Outcomes	Program Outcome									Program Specific Outcome					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**
	knowledge of yoga, indian philosophy,upnisads ,shastras	human biology, therapeutic yoga, management application of Hatha Yoga and Patanjali	fundamentals of Yoga, Yoga therapy, its principles and Yoga practice, physiological effects of Yoga	alternative therapy, naturopathy, electrotherapy, Ayurved,	yogic food , diet and nutrition alog with applied psychology	Treatment: To create professional therapists	To create yoga therapy experts with in-depth knowledge based on yogic texts	Social health: To establish holistic health	yoga teaching capability, research ability	To prepare good yoga teachers, practitioners and trainers .	To impart legal and scientific knowledge of yoga .	Imparting classical knowledge of yoga and its related Spiritual text.	To provide scientific and medical knowledge of Yoga in the context of modern society And science.	Visit to the best yoga institutes, University, college or center , providing excellent training in yoga Ayurveda panchkarma and alternative Therapy or other related therapies .	To provide the research based education of yoga .
CO1: Students will be able to do research on philosophical areas	**3**	**1**	**3**	**3**	**3**	**1**	**2**	**3**	**3**	**2**	**3**	**3**	**1**	1	3
CO 2: Students will be able to do research in literary areas	**3**	**2**	**1**	**3**	**3**	**1**	**1**	**3**	**1**	**1**	**1**	**3**	**3**	1	3

CO3 : Students will be able to do research on the biographies of great yogis and their contribution areas.	**3**	**2**	**3**	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**1**	1	3
CO 4: A student will be able to conduct research on health and therapeutic areas.	**3**	**2**	**1**	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**2**	**3**	**1**	1	3
CO5: student will be able to research academic areas	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**1**	1	3

Legend: 1 – Low, 2 – Medium, 3 – High

Course Curriculum Map:

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self Learning(SL)
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO-1:1- Students will be able to do research on philosophical areas.	SO1.1 SO1.2 SO1.3 SO1.4		Unit-1.0 Philosophical Areas 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	As mentioned in page number
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO 2 : 2- Students will be able to do research in literary areas.	SO2.1 SO2.2 SO2.3 SO2.4		Unit-2 Literary Areas 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8,2.9,2.10,2.11,2.12,2.13,2.14,2.15,	
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO3 : 3- Students will be able to do research on the biographies of great yogis and their contribution areas.	SO3.1SO3.2 SO3.3 SO3.4		Unit-3 : Life Sketches and their contributory Areas 3.1, 3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9,3.10,3.11,3.12,3.13,3.14,3.15	
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO 4: 4- A student will be able to conduct research on health and therapeutic areas.	SO4.1 SO4.2 SO4.3 SO4.4		Unit-4 : Health and Therapeutic Areas 4.1, 4.2,4.3,4.4,4.5,4.6,4.7,4.8,4.9,4.10,4.11,4.12,4.13,4.14,4.15	
PO 1,2,3,4,5,6 7,8,9 PSO 1,2, 3, 4, 5	CO 4: 5- Student will be able to research academic areas.	SO5.1 SO5.2 SO5.3 SO5.4		Unit-5 : Educational Areas 5.1, 5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9,5.10,5.11,5.12,5.13,5.14,5.15	