



**Faculty of Agricultural Sciences (IAS)  
Siksha 'O' Anusandhan, Deemed to be University**

**M. Sc. (Ag.) in Crop Physiology**

**Programme Outcome:**

- Enriched knowledge on recent developments in soil and crop management with respect to improvement and productivity, water and nutrient management and their interaction with integrated approach and the disease and pest management in integrated manner. The economic indices on package of practices develop and their transfer to farmers makes the students eligible for advanced studies at doctoral level.
- With specialized knowledge in a particular discipline of agricultural sciences, the students are worth to be absorbed in different fields of academics, research and extension under different organizations.
- Agriculture being the applied science, the skills as developed in the fields of crop improvement, crop production, crop protection and social science fields makes the students an asset for taking up the assignments both at organizational and field level.
- The knowledge, skill and expertise gained during the `study of course curriculum provides an opportunity to take up entrepreneurships holistically as a joint venture.

**Programme Specific Objectives:**

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Plant physiology being one of the most important fields as it concerned with life processes of the plants and supplied basic knowledge on various physiological events carried out throughout its life cycle. It aims to increase the yield of the plant economically as it completely depends on plant performance in the field.

**Programme Specific Outcome (PSO):**

1. The predictions and manipulations of its sub applied fields projected to get more yield and productivity under those agro climatic conditions.
2. Plant physiology provides adequate knowledge on plant life cycle, nutrition, development, growth and metabolism.
3. The basic concepts have been incorporated in recent developments on the view of nutritional research, food assimilation, energy metabolism, growth modelling,

hormonal regulations, crop management, plant tissue culture, stress physiology and adaptations.

## MAJOR COURSES SYLLABUS

### **PP- 501      PRINCIPLES OF PLANT PHYSIOLOGY: 4(3+1)**

#### **Objective**

To acquaint the students with the basic concepts of plant physiology and their application in agriculture.

**Outcome:** 1. Basic concepts of plant physiology and their application in agriculture.

2. Various mechanisms and metabolic events at vegetative and reproductive stages of plants, seed physiology and their hormonal regulations.

3. Go through the principle based techniques to know the concepts and quantification of values, is helpful during application and yield prediction.

### **PP-502 PLANT DEVELOPMENTAL BIOLOGY PHYSIOLOGICAL AND MOLECULAR BASIS: 2(2+0)**

#### **Objective**

To explain about basic physiological and molecular processes concerning various facets of growth and development of plants.

**Outcome:** 1. Knowledge on Physiological and molecular basis of plant growth and development of different plants parts, seed germination physiology and seedling growth.

2. Molecular mechanisms of light perception and control on plant development.

3. Molecular basis of embryo formation, regeneration, differentiation and genetic aspects.

### **PP 503 PHYSIOLOGICAL AND MOLECULAR RESPONSES OF PLANTS TO ABIOTIC STRESSES: 3(2+1)**

#### **Objective**

To apprise the students regarding abiotic stress to plant and its molecular basis.

- Outcome:** 1. Knowledge on physiological and molecular responses to various abiotic stresses.
2. Study of different physiological processes and molecular responses to stress.
3. Measurement and screening of stress parameters and behaviour towards tolerance.

**PP-504 HORMONAL REGULATION OF PLANT GROWTH AND DEVELOPMENT:  
3(2+1)**

**Objective**

To apprise the students about structure function of plant growth regulator on growth and development of plant.

**Outcome:**

1. Structure and function of hormones on plant growth and development.
2. Metabolism and applications of hormones on various aspects of plant development.
3. Quantification of hormones-Principles and techniques of bioassays of hormones from plant tissues.

**PP- 505 PHYSIOLOGY OF GROWTH AND YIELD AND MODELING: 2(1+1)**

**Objective**

To impart knowledge regarding crop growth analysis and different yield prediction models.

**Outcome:** 1. Knowledge regarding crop growth analysis and different yield prediction models.

2. Plant sampling to estimate growth and yield parameters.
3. Computer applications in plant physiology, crop productivity and modeling.

**PP- 506 GENOME ORGANIZATION IN HIGHER PLANTS: 3( 2+1)**

**Objective**

To impart basic concept on genome organization in prokaryotic and eukaryotic system.

**Outcome:**

1. To get basic knowledge on gene and genome organization of prokaryotic and eukaryotic systems.
2. Mechanism of gene expression and operon concept involves in transcription, translation and their post modificational controls.
3. To know the techniques of isolation and analysis of genetic materials and their quantification.

**PP -507 MORPHOGENESIS, TISSUE CULTURE AND TRANSFORMATION:**

**3(2+1)**

**Objective**

To impart knowledge about cellular basic of growth and morphogenesis in plants.

**Outcome:** 1. Knowledge on cellular basis of growth and morphogenesis in plants.

2. In vitro culture of different explants such as leaf, stem, shoot apex, cotyledonary nodes.

3. Effect of explant age on propagation potential.

**PP-508 MOLECULAR ASPECTS OF BIOLOGICAL NITROGEN FIXATION: 2(2+0)**

**Objective:**

To impart teaching on physiological, biochemical and molecular aspects of nitrogen fixation.

**Outcome**

1. Knowledge on Nitrogen fixing organisms and biochemistry of nitrogen fixation.

2. Mechanism of Nitrogenase and its regulation during biological nitrogen fixation.

3. Genetics of nif genes and regulation in symbiotic system.

4. Genetic engineering of nif genes and their applications in plant cropping systems.

**PP-509 PHYSIOLOGICAL AND MOLECULAR ASPECTS OF PHOTOSYNTHESIS-CARBONANDNITROGENASSIMILATION: 3( 2+1)**

**Objective**

To impart knowledge about physiological and molecular aspects of carbon reduction cycle and nitrogen assimilation.

**Outcome:** 1. Knowledge about physiological and molecular aspects of carbon reduction cycle and nitrogen assimilation.

2. Physiological and biochemical changes in plants under nutrient sufficiency and deficiency levels.

3. Quantification of pigment levels, enzyme activities.

**PP -510 MINERAL NUTRITION: 3(2+1)**

**Objective:** To impart knowledge about physiological and molecular aspects of carbon reduction cycle and nitrogen assimilation.

**Outcome:**

1. Mechanism of nutrient availability near the root, nutrient uptake by root cells and its transportation.

2. Molecular mechanism of ion uptake functions and regulations.

3. Physiological and molecular mechanisms underlying differential nutrient efficiency in crop genotypes and toxicity.

**PP -511 PHYSIOLOGY OF CROP PLANTS SPECIFIC CASE STUDIES: 2( 2+0)**

**Objective**

To impart knowledge of physiological aspects of different crop plants.

**Outcome**

1. Physiological aspects of different crop plants selection based on local importance

2. Crop specific topics and features.

3. Specific application of physiological concepts to influence yield.

**PP-591 Master's Seminar: 1(1+0)**

**Objective:** To appraise the students about presenting the outcome of the research conducted.

**Outcome:**

1. Understanding of working area and experimental design.
2. Exposure to preparation of power point presentation.
3. Explanation of work plan and ability to answer.

**PP-599 Master's Research: 20(0+20)**

**Objective:** To develop the skills required for conducting research activities in field and laboratory conditions.

**Outcome:** 1. Knowledge on laying out and execution of field experiments.

2. Observation and data collection on field and laboratory studies.

3. Data calculation, tabulation, analysis and interpretation, writing of references cited

## **MINOR COURSES**

**PP-513 SEED PHYSIOLOGY: 3( 2+1)**

**Objective**

To provide an insight into physiological processes governing seed quality and its survival.

**Outcome:**

1. Knowledge on chemical composition of seed, physiology of seed development and maturation.
2. Provide knowledge regarding different seed quality parameters, seed dormancy and seed longevity.
3. Knowledge on Seed ageing and physiology of seed deterioration.

**AGRON 501\* MODERN CONCEPTS IN CROP PRODUCTION: 3(3+0)**

**Objectives:**

To make the students understand the techniques on crop growth analysis, crop modelling, crop response production functions, farming system modules and resource conservation

technologies.

**Outcomes:**

1. Students can perform techniques and interpretate the principles involved in scientific crop production and situation based IFS modules and RCT.
2. Self employment capability through agro-entrepreneurship development by utilizing the by products from different enterprise.
3. Students can apply crop production principles to establish cause and effective relationship with different agronomic traits.

**PBG 511 BIOTECHNOLOGY FOR CROP IMPROVEMENT: 3 (2+1)**

**Objective:**

The objective of this course is to impart knowledge and practical skills to use biotechnological tools in crop improvement.

**Outcome:**

Getting acquainted with various types micro-propagation methods and their application in crop improvement.

Idea on recombinant DNA technology and various methods of gene transfer.

Exposure to the field of of transgenics and their application in crop improvement.

Knowledge on various types of marker systems and their application in in crop improvement.

**SUPPORTING COURSES SYLLABUS**

**Soils -505 PLANT BIOCHEMISTRY: 3(2 + 1)**

**Objective**

Detailed information about biochemical and molecular basis of various plant processes and plant growth regulatory substances.

**Outcome**

- Theoretical experience on biochemical and molecular basis of various plant processes and plant growth regulatory substances.
- Extraction and estimation of carbohydrates and aminoacids, ascorbic acid

- techniques of isolation and purification of enzymes, estimation of DNA and RNA.
- Practical excellence in determining the important biomolecules through different analytical methods.

### **STAT-513 DATA ANALYSIS USING STATISTICAL PACKAGES: 3(2+1)**

#### **Objective**

This course is meant for exposing the students in the usage of various statistical packages for analysis of data. It would provide the students an hands on experience in the analysis of their research data. This course is useful to all disciplines.

#### **Outcome:**

1. Analysis of research data using statistical software.
2. Opting a career as analyst.
3. Development of consultancy firms and project formulation.

### **PGS COURSE**

#### **PGS 501 LIBRARY AND INFORMATION SERVICES : 1(0+1)**

#### **Objective**

To equip the library users with skills to trace information from libraries efficiently, to apprise them of information and knowledge resources, to carry out literature survey, to formulate information search strategies, and to use modern tools (Internet, OPAC, search engines etc.) of information search.

#### **Outcome:**

1. Identify library services and availability of resources in order to develop a realistic overall plan for research to achieve a manageable focus appropriate to the assignment criteria, available resources, and evidence needed to support thesis.
2. Identify keywords, synonyms and related terms in order to flexible search information resources including: Internet, electronic library catalogs and print materials.
3. Identify the range of information source types available (such as peer-reviewed journals), newspaper articles, books, reference sources, etc) their distinguishing characteristics and intended audience, in order to select those appropriate based on the information need.
4. Identify the features and content of different research tools (such as database, catalogs and websites) in order to search those most appropriate to the information need.



## **PGS 502 TECHNICAL WRITING AND COMMUNICATIONS SKILLS: 1(0+1)**

### **Objective**

To equip the students/scholars with skills to write dissertations, research papers, etc.

To equip the students/scholars with skills to communicate and articulate in English (verbal as well as writing). While the emphasis will be on writing, oral communication of scientific and technical information will form an important component of the course, as well.

### **Outcomes**

#### **By the end of this course students will be able to**

- Develop skills that will enable to produce clear and effective scientific and technical documents.
- Use visual items in effectively constructing meaning in communication situations.
- Create clear, concise technical documents that effectively use style and grammar and information structure in ways that create meaning with the reader.
- Collaborate effectively in various writing situations, including planning, creating, and managing, evaluating, editing and revising document production

## **PGS 503 (e-Course) INTELLECTUAL PROPERTY AND ITS MANAGEMENT IN AGRICULTURE 1(1+0)**

### **Objective**

The main objective of this course is to equip students and stakeholders with knowledge of intellectual property rights (IPR) related protection systems, their significance and use of IPR as a tool for wealth and value creation in a knowledge-based economy.

### **Outcome:**

1. Exposure to various types intellectual property rights.
2. Idea on various acts and organization related to IPR.
3. Knowledge on protection of plant varieties under UPOV and PPV & FR Act of India. Plant breeders rights, and Farmers rights.

## **PGS 504 BASIC CONCEPTS IN LABORATORY TECHNIQUES: 1(0+1)**

**Objective** - To acquaint the students about the basics of commonly used techniques in laboratory.

### **Outcome**

- A brief knowledge on the safety protocols to be followed in a laboratory and handling of various equipments present in the laboratory.
- Knowledge on preparations of several standard solutions, agro-chemical doses, buffers, etc for laboratory and field purposes.
- Testing the seed viability, pollen viability and description of flowering plants.

**PGS 505 (e-Course) AGRICULTURAL RESEARCH, RESEARCH ETHICS AND RURAL DEVELOPMENT PROGRAMMES: 1(1+0)**

**Objective**

To enlighten the students about the organization and functioning of agricultural research systems at national and international levels, research ethics, and rural development programmes and policies of Government.

**Outcomes**

- By the end of this course scholars will be sensitized about the basic issues related with agricultural research, ethics in research as well as rural development.
- The scholars will be also educated about principles and philosophy of rural development and various ongoing rural and community development programmes and policies.
- Students will also be motivated towards practising and promoting ethics in research and developmental endeavors.

**PGS 506 DISASTER MANAGEMENT:1(1+0)**

**Objectives**

To introduce learners to the key concepts and practices of natural disaster management; to equip them to conduct thorough assessment of hazards, and risks vulnerability; and capacity building.

**Outcome**

- A brief knowledge on nature and effects of different natural disasters and their management
- Knowledge on different types of man-made disasters and their management
- Appraisal on different organizations involved in disaster management at national and global level

Name of the Course	Course Code	Course Outcomes	PROGRAMME OUTCOMES				PROGRAMME SPECIFIC OUTCOMES		
			PO1	PO2	PO3	PO4	PSO1	PSO2	PSO3
Principles of Plant Physiology	PP-501	CO1	✓	✓			✓	✓	✓
		CO2	✓	✓			✓	✓	✓
		CO3	✓	✓	✓		✓	✓	✓
Plant Developmental Biology, Physiological and Molecular Basis	PP-502	CO1	✓	✓			✓	✓	✓
		CO2	✓	✓	✓		✓	✓	✓
		CO3		✓	✓			✓	✓
Physiological and Molecular Responses of Plants to Abiotic Stress	PP-503	CO1	✓	✓			✓	✓	✓
		CO2	✓	✓			✓	✓	✓
		CO3	✓	✓	✓		✓	✓	✓
Hormonal Regulation of Plant Growth and Development	PP-504	CO1	✓	✓			✓	✓	✓
		CO2	✓	✓			✓	✓	✓
		CO3	✓	✓	✓		✓	✓	✓
Physiology of Growth and Yield Modelling	PP-505	CO1	✓	✓			✓		✓
		CO2	✓	✓	✓		✓		✓
		CO3	✓	✓	✓	✓	✓		✓
Genome Organization in Higher Plants	PP-506	CO1	✓	✓			✓	✓	✓
		CO2	✓	✓			✓	✓	✓
		CO3	✓	✓	✓		✓	✓	✓
Morphogenesis, Tissue Culture and Transformation	PP-507	CO1	✓	✓	✓		✓	✓	✓
		CO2	✓	✓	✓		✓	✓	✓
		CO3	✓				✓	✓	
Molecular Aspects of Biological Nitrogen Fixation	PP-508	CO1	✓	✓			✓	✓	✓
		CO2	✓	✓			✓	✓	✓
		CO3	✓	✓			✓		✓

		CO4	✓	✓	✓		✓		✓
Physiological and Molecular Aspects of Photosynthesis- Carbon and Nitrogen Assimilation	PP-509	CO1	✓	✓			✓	✓	✓
		CO2	✓	✓			✓	✓	✓
		CO3	✓	✓			✓	✓	✓
Mineral Nutrition	PP-510	CO1	✓		✓		✓	✓	✓
		CO2	✓		✓		✓	✓	✓
		CO3	✓		✓		✓	✓	✓
Physiology of Crop Plants Specific Case Studies	PP-511	CO1	✓	✓	✓		✓	✓	✓
		CO2	✓	✓	✓		✓	✓	✓
		CO3	✓	✓	✓		✓	✓	✓
Seed Physiology	PP-513	CO1	✓		✓		✓	✓	✓
		CO2	✓		✓		✓	✓	✓
		CO3	✓		✓		✓	✓	✓
Plant Biochemistry	SOIL-505	CO1	✓	✓	✓		✓	✓	✓
		CO2	✓		✓			✓	✓
		CO3	✓	✓	✓		✓		✓
		CO4	✓	✓	✓		✓		✓
Modern Concepts in Crop Production	AGRON-501	CO1	✓	✓	✓		✓		✓
		CO2				✓			
		CO3	✓		✓		✓		✓
Biotechnology for Crop Improvement	PBG-511	CO1	✓		✓		✓		✓
		CO2	✓	✓	✓		✓		✓
		CO3	✓	✓	✓		✓		✓
		CO4	✓	✓	✓		✓		✓
Data Analysis Using Statistical Packages	STAT-513	CO1		✓	✓		✓		✓
		CO2		✓	✓		✓		✓

		CO3				✓			
Library and Information Services	PGS-501	CO1		✓	✓				
		CO2		✓	✓				
		CO3		✓	✓				✓
		CO4		✓	✓				✓
Technical Writing and Communication Skills	PGS-502	CO1		✓	✓				
		CO2		✓	✓				
		CO3		✓	✓				
		CO4		✓	✓				
Intellectual Property and its Management in Agriculture	PGS-503	CO1		✓	✓				
		CO2		✓	✓				
		CO3		✓	✓				✓
Basic Concepts in Laboratory Techniques	PGS-504	CO1		✓	✓				
		CO2		✓	✓				
		CO3		✓	✓		✓		✓
Agricultural Research, Research Ethics and Rural Development Programmes	PGS-505	CO1		✓	✓				
		CO2		✓	✓				
		CO3		✓	✓				
Disaster Management	PGS-506	CO1		✓	✓				
		CO2		✓	✓				
		CO3		✓	✓				
Master's Seminar	PP-591	CO1	✓	✓	✓		✓		✓
		CO2	✓	✓	✓				✓
		CO3	✓	✓	✓		✓		✓
Master's Research	PP-599	CO1	.	✓	✓	.	✓		
		CO2		✓	✓		✓		✓

		CO3	✓	✓	✓		✓	✓
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<b>Mapping of COs vs. Employability/ Entrepreneurship/ Skill development</b>				
<b>Name of the Course</b>	<b>Course Code</b>	<b>Employability</b>	<b>Entrepreneurship</b>	<b>Skill development</b>
Principles of plant physiology	PP 501	Y		Y
Plant developmental biology physiological and molecular basis	PP 502			Y
Physiological and molecular responses of plants to abiotic stresses	PP 503	Y		Y
Hormonal regulation of plant growth and development	PP 504	Y	Y	Y
Physiology of growth and yield and modeling	PP 505	Y		Y
Genome organization in higher plants	PP 506	Y		Y
Morphogenesis, tissue culture and transformation	PP 507	Y		Y
Molecular aspects of biological nitrogen fixation	PP 508	Y	Y	Y
Physiological and molecular aspects of photosynthesis-carbon and nitrogen assimilation	PP 509	Y		Y
Mineral nutrition	PP 510	Y		Y
Physiology of crop plants – specific case studies	PP 511	Y		Y
Master's seminar	PP 591			Y
Master's research	PP 599			Y
Seed physiology	PP 513	Y	Y	Y
Modern concepts in crop production	AGRN 501	Y	Y	Y
Biotechnology for crop improvement	PBG 511	Y	Y	Y
Plant biochemistry	SOILS 505	Y		Y
Data analysis using statistical packages	STAT 513	Y	Y	Y
Library and information services	PGS 501			Y
Technical writing and communications skills	PGS 502			Y
Intellectual property and its management in agriculture	PGS 503	Y		Y
Basic concepts in laboratory techniques	PGS 504	Y		Y
Agricultural research, research ethics and rural development programmes	PGS 505			Y
Disaster management	PGS 506	Y		Y

