Courses offered at UG:

Sl. No.	Course Number	Title of the course	Credit	UG semester
1	PPH 157	Fundamentals of Crop Physiology	1+1	2nd
2	PPH (H) 151	Fundamentals of Crop Physiology	1+1	2nd (Horticulture)
3	PPH 451	Principles and Practices of Crop Physiology	2+2	7th (As per old syllabus)
4	EC 315	Plant Developmental Biology	2+1	5th (as per New syllabus under 5th Deans' Committee recommendation)

Syllabus of courses at UG level:

Course Title : Fundamentals of Crop Physiology [PPH 157, 1+1]

Theory

Role of water in plant metabolism, diffusion, osmosis, imbibition, water potential and its components, absorption of water, stomata structure and physiology, transpiration

Mineral nutrition of plants: Essentiality, functions and deficiency symptoms of nutrients, nutrient uptake mechanisms

Photosynthesis: Structure and function of chloroplast Light and dark reactions, cyclic and non-cyclic electron transfer, CO_2 fixation: C3, C4 and CAM plants, Photorespiration and its implications

Respiration: Glycolysis, TCA cycle and electron transport chain

Plant growth regulators: Physiological roles and use in agricultural and horticultural crops

Growth analysis, Role of Physiological growth parameters in crop productivity, Physiological aspects of growth and development of major crops

Secondary metabolites: Brief introduction; Major classes of secondary metabolites, examples of each class, roles in plant defense

Practical:

Preparation of solutions and buffers, Study of plant cells, Structure and distribution of stomata, Imbibition, osmosis, plasmolysis, Determination of osmotic potential of tissue, Separation of photosynthetic pigments through paper chromatography, Rate of transpiration, rate of photosynthesis, rate of respiration, effect of respiratory inhibitor, estimation of relative water content, study of deficiency symptoms of mineral nutrients.

Practical:

Course Title: Fundamentals of Crop Physiology [PPH (H) 151, 1+1]

Theory

Role of water in plant metabolism, diffusion, osmosis, imbibition, water potential and its components, absorption of water, stomata structure and physiology, transpiration

Mineral nutrition of plants: Essentiality, functions and deficiency symptoms of nutrients, nutrient uptake mechanisms

Photosynthesis: Structure and function of chloroplast Light and dark reactions, cyclic and non-cyclic electron transfer, CO_2 fixation : C3, C4 and CAM plants, Photorespiration and its implications

Respiration: Glycolysis, TCA cycle and electron transport chain

Plant growth regulators: Physiological roles and use in agricultural and horticultural crops

Growth analysis, Role of Physiological growth parameters in crop productivity, Physiological aspects of growth and development of major crops

Secondary metabolites: Brief introduction; Major classes of secondary metabolites, examples of each class, roles in plant defense

Preparation of solutions and buffers, Study of plant cells, Structure and distribution of stomata, Imbibition, osmosis, plasmolysis, Determination of osmotic potential of tissue, Separation of photosynthetic pigments through paper chromatography, Rate of transpiration, rate of photosynthesis, rate of respiration, effect of respiratory inhibitor, estimation of relative water content, study of deficiency symptoms of mineral nutrients.

Course Title : Principles and Practices of Crop Physiology [PPH 451, 2+2]

Crop growth analysis: Dry matter partitioning, Harvest index, Growth analysis formulae, Determination of LAI, Specific leaf weight, Crop growth rate, Relative growth rate and NAR.

Photosynthesis and Crop productivity**:** Photosynthetic efficiency of crops-C3 and C4 plants, Photorespiration and its significance, CAM pathway and its significance, Physiological determinants of crop yield, Source-sink relation.

Physiological basis of abiotic stress tolerance: General features of drought and salinity stress, Plants' responses to drought and salinity stress, Escape and tolerance mechanism, Physiological and biochemical changes associated with tolerance-brief concept of osmolyte, ROS, antioxidative enzymes, Haber-Weiss reaction, lipid peroxidation.

Growth and metabolic processes associated with tolerance to water logging

Nutriophysiology: Solute transport, Plant nutrients and their functions, Deficiency and toxicity symptoms of nutrients, Detection of deficiency symptoms of different nutrients in crop plants.

Reproductive biology: Alternation of generation, sporogenesis and gametogenesis, double fertilization, Physiological changes associated with seed development, Photoperiodism-definition, classification of plants for photoperiodic responses, Phytochrome-photoreversability, structure, role in plants.

Practical:

Response of plant to abiotic stress (salinity and drought) in relation to seed germination and early seedling growth, determination of photosynthetic pigments in leaf, preparation of standard curve of L-proline, Estimation of proline from plant samples, , Determination of membrane damage, Determination of the activity of antioxidative enzymes (peroxidase and catalase), analysis of different growth parameters in crop, plant hydroponic culture.

Course Title: Fundamentals of Crop Physiology [PPH (H) 151, 1+1]

Theory

Plant growth, development and differentiation **:** Definition: Growth, development and differentiation; Growth pattern, Growth habit, Growth formulae, Embryogenesis and its different stages, meristems in plant development, Homeobox genes, Development of root, shoot and floral primordia, cell differentiation and its control, cell-cell interaction.

Reproductive biology : Alternation of generation, sporogenesis and gametogenesis, pollination and fertilization in flowering plants Introduction of photoperiodism and vernalization, photoperiodic induction, phytochrome structure, multifactorial hypothesis of flowering, molecular basis of floral induction and floral organ development.

Response of plants to adverse abiotic factors**:** Plants' responses to drought, salinity, heat, cold, flood, heavy metals and nutritional deficiency and toxicity.

Tolerance mechanism of plants to various abiotic stresses, introduction to osmolytes, oxidative stress and antioxidative mechanisms, heat shock proteins.

Plant growth regulator and crop production: Physiological roles and mode of action of auxin, gibberellins, cytokinins, ethylene and ABA.

Novel plant growth regulators- physiological roles of salicylic acid, brassinosteroids, jasmonic acid, polyamines.

Applied plant physiology: Factors controlling photosynthetic productivity, partitioninig of photosynthate and its regulation, senescence and fruit ripening, soil-less culture and its application to diagnose nutrient deficiencies.

Practical:

Effect of gibberellic acid on dormancy breaking, seed germination and mobilization of food reserves, Effect of ABA on stomatal opening and closing ,Effect of ethylene on fruit ripening, Bioassay of different phytohormones , Study of pollen sterility, Study of pollen germination and pollen tube growth, Response of plant to abiotic stress in relation to seed germination and early seedling growth, Estimation of proline, Determination of membrane damage, Determination of the activity of antioxidative enzymes (peroxidase and catalase)