

V Semester		
AENT 5311	Principles of Integrated Pest and Disease Management	3 (2+1)
ASOIL 5311	Manures, Fertilizers and Soil Fertility Management	3 (2+1)
AENT 5312	Pests of Crops and Stored Grain and their Management	3 (2+1)
APP 5311	Diseases of Field and Horticultural Crops and their Management -I	3 (2+1)
APB 5311	Crop Improvement-I (<i>Kharif Crops</i>)	2 (1+1)
AEXT 5311	Entrepreneurship Development and Business Communication	2 (1+1)
AENGG 5311	Geoinformatics and Nano-technology and Precision Farming	2 (1+1)
AGRO 5311	Practical Crop Production – I (<i>Kharif crops</i>)	2 (0+2)
APB 5312	Intellectual Property Rights	1 (1+0)
AHFL 5311	Landscaping	3 (2+1)
AMET 5311	Introductory Agro-meteorology & Climate Change	2 (1+1)
Total		26 (15+11)

Theory

Categories of insect pests and diseases, IPM: Introduction, history, importance, concepts, principles and tools of IPM. Economic importance of insect pests, diseases and pest risk analysis. Methods of detection and diagnosis of insect pest and diseases. Calculation and dynamics of economic injury level and importance of Economic threshold level. Methods of control: Host plant resistance, cultural, mechanical, physical, legislative, biological and chemical control. Ecological management of crop environment. Introduction to conventional pesticides for the insect pests and disease management. Survey surveillance and forecasting of Insect pest and diseases. Development and validation of IPM module. Implementation and impact of IPM (IPM module for Insect pest and disease. Safety issues in pesticide uses. Political, social and legal implication of IPM. Case histories of important IPM programmes. Case histories of important IPM programmes.

Practical

Methods of diagnosis and detection of various insect pests, and plant diseases, Methods of insect pests and plant disease measurement, Assessment of crop yield losses, calculations based on economics of IPM, Identification of biocontrol agents, different predators and natural enemies. Mass multiplication of *Trichoderma*, *Pseudomonas*, *Trichogramma*, NPV etc. Identification and nature of damage of important insect pests and diseases and their management. Crop (agro-ecosystem) dynamics of a selected insect pest and diseases. Plan & assess preventive strategies (IPM module) and decision making. crop monitoring attacked by insect, pest and diseases . Awareness campaign at farmers fields.

Theory

- 1 Categories of insect pests and diseases.- 01
- 2 IPM: Introduction, history, importance, concepts, principles and tools of IPM.- 02
- 3 Economic importance of insect pests, diseases and pest risk analysis.- 02
- 4 Methods of detection and diagnosis of insect pest and diseases. - 02
- 5 Calculation and dynamics of economic injury level and importance of Economic threshold level- 02.
- 6 Methods of control: Host plant resistance, cultural, mechanical, physical, legislative, biological and chemical control- 02.
- 7 Ecological management of crop environment. -01
- 8 Introduction to conventional pesticides for the insect pests and disease management.-01
- 9 Survey surveillance and forecasting of Insect pest and diseases. -01
- 10 Development and validation of IPM module- 02.
- 11 Implementation and impact of IPM (IPM module for Insect pest and disease. -01
- 12 Safety issues in pesticide uses. -01
- 13 Political, social and legal implication of IPM. -01
- 14 Case histories of important IPM programmes.-03
- 15 Case histories of important IPM programmes.-02

Practical

- 1 Methods of diagnosis and detection of various insect pests, and plant diseases
- 2 Methods of insect pests and plant disease measurement,
- 3 Assessment of crop yield losses, calculations based on economics of IPM- 02
- 4 Identification of biocontrol agents, different predators and natural enemies- 02.
- 5 Mass multiplication of *Trichoderma*, *Pseudomonas*, *Trichogramma*, NPV etc.

- 6 Identification and nature of damage of important insect pests and diseases and their management.
- 7 Crop (agro-ecosystem) dynamics of a selected insect pest and diseases.
- 8 Plan & assess preventive strategies (IPM module) and decision making.
- 9 Crop monitoring attacked by insect, pest and diseases.
- 10 Awareness campaign at farmers fields.

Theory

Introduction and importance of organic manures, properties and methods of preparation of bulky and concentrated manures. Green/leaf manuring. Fertilizer recommendation approaches. Integrated nutrient management.

Chemical fertilizers: classification, composition and properties of major nitrogenous, phosphatic, potassic fertilizers, secondary & micronutrient fertilizers, Complex fertilizers, nano fertilizers Soil amendments, Fertilizer Storage, Fertilizer Control Order.

History of soil fertility and plant nutrition. criteria of essentiality. role, deficiency and toxicity symptoms of essential plant nutrients, Mechanisms of nutrient transport to plants, factors affecting nutrient availability to plants. Chemistry of soil nitrogen, phosphorus, potassium, calcium, magnesium, sulphur and micronutrients. Soil fertility evaluation, Soil testing. Critical levels of different nutrients in soil. Forms of nutrients in soil, plant analysis, rapid plant tissue tests. Indicator plants. Methods of fertilizer recommendations to crops. Factor influencing nutrient use efficiency (NUE), methods of application under rainfed and irrigated conditions.

Practical

Introduction of analytical instruments and their principles, calibration and applications, Colorimetry and flame photometry. Estimation of soil organic carbon, Estimation of alkaline hydrolysable N in soils. Estimation of soil extractable P in soils. Estimation of exchangeable K; Ca and Mg in soils . Estimation of soil extractable S in soils.. Estimation of DTPA extractable Zn in soils. Estimation of N in plants. Estimation of P in plants. Estimation of K in plants. Estimation of S in plants.

Theory

- 1 Introduction and importance of organic manures, properties and methods of preparation of bulky and concentrated manures-2.
- 2 Green/leaf manuring.
- 3 Fertilizer recommendation approaches.
- 4 Integrated nutrient management.
- 5 Chemical fertilizers: classification, composition and properties of major nitrogenous, phosphatic, potassic fertilizers, secondary & micronutrient fertilizers-3
- 6 Complex fertilizers, nano fertilizers Soil amendments,
- 7 Fertilizer Storage, Fertilizer Control Order.
- 8 History of soil fertility and plant nutrition. criteria of essentiality. role, deficiency and toxicity symptoms of essential plant nutrients-2
- 9 Mechanisms of nutrient transport to plants, factors affecting nutrient availability to plants-2
- 10 Chemistry of soil nitrogen, phosphorus, potassium, calcium, magnesium, sulphur and micronutrients-2
- 11 Soil fertility evaluation,

- 12 Soil testing.
- 13 Critical levels of different nutrients in soil.
- 14 Forms of nutrients in soil, plant analysis, rapid plant tissue tests-2.
- 15 Indicator plants.
- 16 Methods of fertilizer recommendations to crops.
- 17 Factor influencing nutrient use efficiency (NUE), methods of application under rainfed and irrigated conditions.

Practical

- 1 Introduction of analytical instruments and their principles, calibration and applications,
- 2 Colorimetry and flame photometry
- 3 Estimation of soil organic carbon
- 4 Estimation of alkaline hydrolysable N in soils
- 5 Estimation of soil extractable P in soils
- 6 Estimation of exchangeable K; Ca and Mg in soils
- 7 Estimation of soil extractable S in soils
- 8 Estimation of DTPA extractable Zn in soils
- 9 Estimation of N in plants
- 10 Estimation of P in plants
- 11 Estimation of K in plants
- 12 Estimation of S in plants

AENT 5312	Pests of Crops and Stored Grain and their Management	3 (2+1)
------------------	---	----------------

Theory

General account on nature and type of damage by different arthropods pests. Scientific name, order, family, host range, distribution, biology and bionomics, nature of damage, and management of major pests and scientific name, order, family, host range, distribution, nature of damage and control practice other important arthropod pests of various field crop, vegetable crop, fruit crop, plantation crops, ornamental crops, spices and condiments. Factors affecting losses of stored grain and role of physical, biological, mechanical and chemical factors in deterioration of grain. Insect pests, mites, rodents, birds and microorganisms associated with stored grain and their management. Storage structure and methods of grain storage and fundamental principles of grain store management.

Practical

Identification of different types of damage. Identification and study of life cycle and seasonal history of various insect pests attacking crops and their produce: (a) Field Crops; (b) Vegetable Crops; (c) Fruit Crops; (d) Plantation, gardens, Narcotics, spices & condiments. Identification of insect pests and Mites associated with stored grain. Determination of insect infestation by different methods. Assessment of losses due to insects. Calculations on the doses of insecticides application technique. Fumigation of grain store /godown. Identification of rodents and rodent control operations in godowns. Identification of birds and bird control operations in godowns. Determination of moisture content of grain. Methods of grain sampling under storage condition. Visit to Indian Storage Management and Research Institute, Hapur and Quality Laboratory, Department of Food., Delhi. Visit to nearest FCI godowns.

Theory

1. Scientific name, order, family, host range, distribution, identification, nature of damage, biology and management of insect pests of major crops.

Major		Crops		Credit hours
Cereals	:	Rice -	Gall midge, stem borer, leaf and plant hoppers, leaf folder, case worm, army worm, Swarming caterpillar, gundhi bug.	03
		Sorghum & maize	Stem borer, sorghum shoot fly.	
		Wheat	Stem borer, termite	
Pulses	:	Soybean	Girdle beetle, stem fly, tobacco caterpillar, semilooper, whitefly.	03
		Pigeonpea	Pod borer, pod fly, plume moth, spotted pod borer, pod bug.	
		Urid & Mung	Pod borer, red hairy caterpillar.	
		Gram	Pod borer, cutworm.	
		Pea	Pod borer.	
		Lathyrus	Thrips	

Oilseeds	:	Groundnut	Aphid, leaf miner, white grub.	03
		Sesamum	Gall fly, Hawk moth, leaf webber & pod borer.	
		Castor	Castor semilooper, capsule borer, Tussock hairy caterpillar.	
		Linseed	Budfly, linseed caterpillar, thrips.	
		Safflower	Aphid, budfly.	
		Sunflower & Niger	Bihar hairy caterpillar.	
		Mustard	Aphid, Sawfly, painted bug	
Fibre crop	:	Cotton	Boll worms, red cotton bug, whitefly, jassid	05
Cash crops	:	Sugarcane	Top shoot borer, stem borer, leaf hopper, white fly, mealy bug, termite.	
		Potato	Tuber moth, aphid, cutworm.	
Vegetables	:	Okra	Shoot & fruit borer, whitefly, jassid.	05
		Brinjal	Shoot & fruit borer, Red vegetable mite.	
		Chilli	Thrips	
		Sweet potato	Sweet potato weevil.	
		Cruciferous vegetables	Cabbage semilooper, diamond back moth, leaf webber.	
		Tomato	Fruit borer, White fly.	
		Cucurbitous vegetables	Red pumpkin beetle, fruit fly.	
		Ginger & Turmeric	Shoot borer, Rhizome scale insect.	
		Onion & Garlic	Thrips, onion fly.	
		Coriander	Aphid, whitefly.	
Fruits	:	Banana	Rhizome weevil, stem borer.	05
		Gauva	Bark borer, fruit fly.	
		Pomegranate	Anar butter fly, bark borer.	
		Cashew	Tea mosquito bug, cashew stem and root borer.	
		Sapota	Leaf webber, fruit fly.	
		Mango	Inflorescence midge, mango hopper, mealy bug, stone weevil, stem borer.	
		Citrus	Lemon butterfly, citrus psylla, fruit sucking moth, citrus black fly.	
		Papaya	Fruit fly, aphid, whitefly, mite.	
		Ber	Ber butterfly.	
		Litchi	Nut borer, Erionose mite.	
Store grain pests	:	Grain moth, Rice moth, Rice weevil, Khapra beetle, Rust red flour beetle, Lesser grain borer, Pulse beetle- their biology, damage preventive & curative methods of control. Storage structure, Rodents and their management.		05
				24

Practical

S.N.	Lecture	Period
1.	Identification and study of life cycle and seasonal history of various insect pests attacking crops and their produce: (a) Field Crops; (b) Vegetable Crops; (c) Fruit Crops; (d) Plantation crops.	04
2.	Identification of insect pests associated with stored grain.	01
3.	Determination of insect infestation by different methods. Assessment of losses due to insects. Determination of moisture content of grain.	02
4.	Calculations on the doses of insecticides application technique. Fumigation of grain store/godown.	02
5.	Identification of rodents and rodent control operations in godowns.	02
6.	Visit to Indian Storage Management and Research Institute, Hapur and Quality Laboratory, Department of Food., Delhi.	01
7.	Visit to nearest FCI godowns.	12

APP 5311	Diseases of Field and Horticultural Crops and their Management -I	3 (2+1)
----------	---	---------

Theory

Symptoms, etiology, disease cycle and management of major diseases of following crops:
 Field Crops: Rice: blast, brown spot, bacterial blight, sheath blight, false smut, khaira and tungro; Maize: stalk rots, downy mildew, leaf spots; Sorghum: smuts, grain mold and anthracnose, Bajra: downy mildew and ergot; Groundnut: early and late leaf spots, wilt
 Soybean: Rhizoctonia blight, bacterial spot, seed and seedling rot and mosaic; Pigeonpea: Phytophthora blight, wilt and sterility mosaic; Finger millet: Blast and leaf spot; black & green gram: Cercospora leaf spot and anthracnose, web blight and yellow mosaic; Castor: Phytophthora blight; Tobacco: black shank, black root rot and mosaic. Horticultural Crops: Guava: wilt and anthracnose; Banana: Panama wilt, bacterial wilt, Sigatoka and bunchy top; Papaya: foot rot, leaf curl and mosaic, Pomegranate: bacterial blight; Cruciferous vegetables: Alternaria leaf spot and black rot; Brinjal: Phomopsis blight and fruit rot and Sclerotinia blight; Tomato: damping off, wilt, early and late blight, buck eye rot and leaf curl and mosaic; Okra: Yellow Vein Mosaic; Beans: anthracnose and bacterial blight; Ginger: soft rot; Colocasia: Phytophthora blight; Coconut: wilt and bud rot; Tea: blister blight; Coffee: rust

Practical

Identification and histopathological studies of selected diseases of field and horticultural crops covered in theory. Field visit for the diagnosis of field problems. Collection and preservation of plant diseased specimens for Herbarium; Note: Students should submit 50 pressed and well-mounted specimens.

Theory

S.N.	Lecture	Period
1.	Introduction, Symptoms, etiology, disease cycle and management of major diseases of following crops: Field Crops:	3
2.	Rice: blast, brown spot, bacterial blight, sheath blight, false smut, khaira	2
3.	Maize: stalk rots, downy mildew, leaf spots	1
4.	Sorghum: smuts	1
5.	Bajra :downy mildew/green ear and ergot;	1
6.	Groundnut: early and late leaf spots and rust	1
7.	Soybean: Rhizoctonia blight bacterial pustule and mosaic	1
8.	Pigeonpea: Phytophthora blight, wilt and sterility mosaic;	1
9.	Black & green gram: Cercospora leaf spot powdery mildew and yellow mosaic;	2
10.	Horticultural Crops: Guava: wilt	1
11.	Banana: Panama wilt, bacterial wilt, Sigatoka and bunchy top;	1
12.	Papaya: foot rot, leaf curl	1
13.	Cruciferous vegetables: Alternaria leaf spot and black rot;	1

14.	Brinjal: Phomopsis blight, wilt, little leaf and root knot;	2
15.	Tomato: wilts, early and late blight and leaf curl	1
16.	Okra: Yellow Vein Mosaic;	1
17.	Beans: anthracnose and Mosaic;	1
18.	Ginger: rhizome rot;	1
19.	Colocasia: Phytophthora blight; Tea: blister blight; Coffee: rust	1
	Total Period	24

Practical

S.N.	Lecture	Period
1.	Identification and histopathological studies of selected diseases of field and horticultural crops covered in theory	5
2.	Field visit for the diagnosis of field problems	2
3.	Collection and preservation of plant diseased specimens for Herbarium; Note: Students should submit 50 pressed and well-mounted specimens	5
	Total period	12

APB 5311	Crop Improvement-I (<i>Kharif Crops</i>)	2 (1+1)
----------	--	---------

Theory

Centers of origin, distribution of species, wild relatives in different cereals; pulses; oilseeds; fibres; fodders and cash crops; vegetable and horticultural crops; Plant genetic resources, its utilization and conservation, study of genetics of qualitative and quantitative characters; Important concepts of breeding self pollinated, cross pollinated and vegetatively propagated crops; Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for yield, adaptability, stability, abiotic and biotic stress tolerance and quality (physical, chemical, nutritional); Hybrid seed production technology in Maize, Rice, Sorghum, Pearl millet and Pigeonpea, etc. Ideotype concept and climate resilient crop varieties for future.

Practical

Floral biology, emasculation and hybridization techniques in different crop species; viz., Rice, Jute, Maize, Sorghum, Pearl millet, Ragi, Pigeonpea, Urdbean, Mungbean, Soybean, Groundnut, Sesame, Caster, Cotton, Cowpea, Tobacco, Brinjal, Okra and Cucurbitaceous crops. Maintenance breeding of different *kharif* crops. Handling of germplasm and segregating populations by different methods like pedigree, bulk and single seed decent methods; Study of field techniques for seed production and hybrid seeds production in *Kharif* crops; Estimation of heterosis, inbreeding depression and heritability; Layout of field experiments; Study of quality characters, donor parents for different characters; Visit to seed production plots; Visit to AICRP plots of different field crops.

Theory

- 1 Centers of origin, distribution of species, wild relatives in different cereals; pulses; oilseeds; fibres; fodders and cash crops; vegetable and horticultural crops-3
- 2 Plant genetic resources, its utilization and conservation, study of genetics of qualitative and quantitative characters-2
- 3 Important concepts of breeding self pollinated, cross pollinated and vegetatively propagated crops
- 4 Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for yield, adaptability, stability, abiotic and biotic stress tolerance and quality (physical, chemical, nutritional)-3
- 5 Hybrid seed production technology in Maize, Rice, Sorghum, Pearl millet and Pigeonpea, etc-2
- 6 Ideotype concept and climate resilient crop varieties for future.

Practical

- 1 Floral biology, emasculation and hybridization techniques in different crop species; viz., Rice, Jute, Maize, Sorghum, Pearl millet, Ragi, Pigeonpea, Urdbean, Mungbean, Soybean, Groundnut, Sesame, Caster, Cotton, Cowpea, Tobacco, Brinjal, Okra and Cucurbitaceous crops-3
- 2 Maintenance breeding of different *kharif* crops.
- 3 Handling of germplasm and segregating populations by different methods like pedigree, bulk and single seed decent methods-2
- 4 Study of field techniques for seed production and hybrid seeds production in *Kharif* crops
- 5 Estimation of heterosis, inbreeding depression and heritability
- 6 Layout of field experiments
- 7 Study of quality characters, donor parents for different characters;
- 8 Visit to seed production plots
- 9 Visit to AICRP plots of different field crops

AEXT 5311	Entrepreneurship Development and Business Management	2 (1+1)
------------------	---	----------------

Theory

Concept of Entrepreneur, Entrepreneurship Development, Characteristics, types and functions of entrepreneurs. Role of entrepreneurship in economic development & achievement motivation. Barriers of entrepreneurs. SWOT Analysis, contract farming, joint venture, public private partnership, social responsibility of business. Government policy and programs and institutions for entrepreneurship development, Impact of economic reforms on Agribusiness/Agrienterprises. Developing Managerial Skills, Entrepreneurial Development Process; Organizational skill (controlling, supervising, problem solving, monitoring & evaluation), Business Leadership Skills (Communication, direction and motivation Skills), Supply chain management and Total quality management. Project Planning Formulation and report preparation; Opportunities for agri-entrepreneurship and rural enterprise.

Practical

Assessing entrepreneurial traits, problem solving skills, managerial skills and achievement motivation, exercise in creativity, study about planning, monitoring and evaluation process of an enterprise, identification and selection of business idea, preparation of business plan and proposal writing, visit to entrepreneurship development institute and entrepreneurs.

Theory

- 1 Concept of Entrepreneur, Entrepreneurship Development, Characteristics, types and functions of entrepreneurs. 2
- 2 Role of entrepreneurship in economic development & achievement motivation. Barriers of entrepreneurs.
- 3 SWOT Analysis, contract farming, joint venture, public private partnership, social responsibility of business. 2
- 4 Government policy and programs and institutions for entrepreneurship development, Impact of economic reforms on Agribusiness/ Agrienterprises.
- 5 Developing Managerial Skills, Entrepreneurial Development Process; Organizational skill (controlling, supervising, problem solving, monitoring & evaluation) 2
- 6 Business Leadership Skills (Communication, direction and motivation Skills),
- 7 Supply chain management and Total quality management.
- 8 Project Planning Formulation and report preparation; Opportunities for agri-entrepreneurship and rural enterprise. 2

Practical

- 1 Assessing entrepreneurial traits,
- 2 Problem solving skills,
- 3 Managerial skills and achievement motivation,
- 4 Exercise in creativity,
- 5 Study about planning, monitoring and evaluation of an enterprise, -2
- 6 Identification and selection of business idea,-2
- 7 Preparation of business plan and proposal writing,-2
- 8 Visit to entrepreneurship development institute and entrepreneurs.-2

Theory

Precision agriculture: concepts and techniques; their issues and concerns for Indian agriculture; Geo-informatics- definition, concepts, tool and techniques; their use in Precision Agriculture. Crop discrimination and Yield monitoring, soil mapping; fertilizer recommendation using geospatial technologies; Spatial data and their management in GIS; Remote sensing concepts and application in agriculture; Image processing and interpretation; Global positioning system (GPS), components and its functions; Introduction to crop Simulation Models and their uses for optimization of Agricultural Inputs; STCR approach for precision agriculture; Nanotechnology, definition, concepts and techniques, brief introduction about nanoscale effects, nano-particles, nano-pesticides, nano-fertilizers, nano-sensors, Use of nanotechnology in seed, water, fertilizer, plant protection for scaling-up farm productivity.

Practical

Introduction to GIS software, spatial data creation and editing. Introduction to image processing software. Visual and digital interpretation of remote sensing images. Generation of spectral profiles of different objects. Supervised and unsupervised classification and acreage estimation. Multispectral remote sensing for soil mapping. Creation of thematic layers of soil fertility based on GIS. Creation of productivity and management zones. Fertilizers recommendations based of VRT and STCR techniques. Crop stress (biotic/abiotic) monitoring using geospatial technology. Use of GPS for agricultural survey. Formulation, characterization and applications of nanoparticles in agriculture. Projects formulation and execution related to precision farming.

Theory

- 1 Precision agriculture: concepts and techniques; their issues and concerns for Indian agriculture-2
- 2 Geo-informatics- definition, concepts, tool and techniques; their use in Precision Agriculture.
- 3 Crop discrimination and Yield monitoring, soil mapping; fertilizer recommendation using geospatial technologies;
- 4 Spatial data and their management in GIS;
- 5 Remote sensing concepts and application in agriculture;
- 6 Image processing and interpretation; Global positioning system (GPS), components and its functions;
- 7 Introduction to crop Simulation Models and their uses for optimization of Agricultural Inputs;
- 8 STCR approach for precision agriculture;
- 9 Nanotechnology, definition, concepts and techniques, brief introduction about nanoscale effects, nano-particles, nano-pesticides, nano-fertilizers, nano-sensors-2
- 10 Use of nanotechnology in seed, water, fertilizer, plant protection for scaling-up farm productivity.

Practical

- 1 Introduction to GIS software, spatial data creation and editing.
- 2 Introduction to image processing software.
- 3 Visual and digital interpretation of remote sensing images.
- 4 Generation of spectral profiles of different objects.
- 5 Supervised and unsupervised classification and acreage estimation.

- 6 Multispectral remote sensing for soil mapping.
- 7 Creation of thematic layers of soil fertility based on GIS.
- 8 Creation of productivity and management zones.
- 9 Fertilizers recommendations based of VRT and STCR techniques.
- 10 Crop stress (biotic/abiotic) monitoring using geospatial technology.
- 11 Use of GPS for agricultural survey. Formulation, characterization and applications of nanoparticles in agriculture.
- 12 Projects formulation and execution related to precision farming.

AGRO 5311	Practical Crop Production – I (<i>Kharif</i> crops)	2 (0+2)
-----------	--	---------

Practical

Crop planning, raising field crops in multiple cropping systems: Field preparation, seed, treatment, nursery raising, sowing, nutrient, water and weed management and management of insect-pests diseases of crops, harvesting, threshing, drying winnowing, storage and marketing of produce. The emphasis will be given to seed production, mechanization, resource conservation and integrated nutrient, insect-pest and disease management technologies. Preparation of balance sheet including cost of cultivation, net returns per student as well as per team of 8-10 students.

Practical

- 1 Crop planning, raising field crops in multiple cropping systems-3
- 2 Field preparation, seed, treatment, nursery raising, sowing, nutrient-3
- 3 water and weed management and management of insect-pests diseases of crops-3
- 4 harvesting, threshing, drying winnowing, storage and marketing of produce-3
- 5 The emphasis will be given to seed production, mechanization-3
- 6 resource conservation and integrated nutrient-3
- 7 insect-pest and disease management technologies-3
- 8 Preparation of balance sheet including cost of cultivation, net returns per student as well as per team of 8-10 students-3

APB 5312	Intellectual Property Rights	1 (1+0)
----------	------------------------------	---------

Theory

Introduction and meaning of intellectual property, brief introduction to GATT, WTO, TRIPs and WIPO, Treaties for IPR protection: Madrid protocol, Berne Convention, Budapest treaty, etc.

Types of Intellectual Property and legislations covering IPR in India:-Patents, Copyrights, Trademark, Industrial design, Geographical indications, Integrated circuits, Trade secrets. Patents Act 1970 and Patent system in India, patentability, process and product patent, filing of patent, patent specification, patent claims, Patent opposition and revocation, infringement, Compulsory licensing, Patent Cooperation Treaty, Patent search and patent database.

Origin and history including a brief introduction to UPOV for protection of plant varieties, Protection of plant varieties under UPOV and PPV&FR Act of India, Plant breeders rights, Registration of plant varieties under PPV&FR Act 2001, breeders, researcher and farmers rights. Traditional knowledge-meaning and rights of TK holders.

Convention on Biological Diversity, International treaty on plant genetic resources for food and agriculture (ITPGRFA). Indian Biological Diversity Act, 2002 and its salient features, access and benefit sharing.

Theory

- 1 Introduction and meaning of intellectual property, brief introduction to GATT, WTO, TRIPs and WIPO, Treaties for IPR protection: Madrid protocol, Berne Convention, Budapest treaty, etc.
- 2 Types of Intellectual Property and legislations covering IPR in India:-Patents, Copyrights,
- 3 Trademark, Industrial design, Geographical indications,
- 4 Integrated circuits, Trade secrets.
- 5 Patents Act 1970 and Patent system in India, patentability, process and product patent, filing of patent, patent specification, patent claims, Patent opposition and revocation, infringement,
- 6 Compulsory licensing, Patent Cooperation Treaty, Patent search and patent database.
- 7 Origin and history including a brief introduction to UPOV for protection of plant varieties, Protection of plant varieties under UPOV
- 8 PPV&FR Act of India, Plant breeders rights,
- 9 Registration of plant varieties under PPV&FR Act 2001, breeders, researcher and farmers rights.
- 10 Traditional knowledge-meaning and rights of TK holders.
- 11 Convention on Biological Diversity, International treaty on plant genetic resources for food and agriculture (ITPGRFA).
- 12 Indian Biological Diversity Act, 2002 and its salient features, access and benefit sharing.

AHFL 5311	Landscaping	3(2+1)
-----------	-------------	--------

Theory

Importance and scope of landscaping. Principles of landscaping, garden styles and types, terrace gardening, vertical gardening, garden components, adornments, lawn making, rockery, water garden, walk-paths, bridges, other constructed features etc. gardens for special purposes. Trees: selection, propagation, planting schemes, canopy management, shrubs and herbaceous perennials: selection, propagation, planting schemes, architecture. Climber and creepers: importance, selection, propagation, planting, Annuals: selection, propagation, planting scheme, Other garden plants: palms, ferns, grasses and cacti succulents. Pot plants: selection, arrangement, management. Bio-aesthetic planning: definition, need, planning; landscaping of urban and rural areas, Peri-urban landscaping, Landscaping of schools, public places like bus station, railway station, townships, river banks, hospitals, play grounds, airports, industries, institutions. Bonsai: principles and management, lawn: establishment and maintenance. CAD application.

Practical

Identification of trees, shrubs, annuals, pot plants; Propagation of trees, shrubs and annuals, care and maintenance of plants, potting and repotting, identification of tools and implements used in landscape design, training and pruning of plants for special effects, lawn establishment and maintenance, layout of formal gardens, informal gardens, special type of gardens (sunken garden, terrace garden, rock garden) and designing of conservatory and lathe house. Use of computer software, visit to important gardens/ parks/ institutes.

Theory

1. Importance and scope of landscaping. Principles of landscaping, garden styles and types, terrace gardening, vertical gardening, garden components, adornments, lawn making, rockery, water garden, walk-paths, bridges, other constructed features etc. gardens for special purposes -4
2. Trees: selection, propagation, planting schemes, canopy management, shrubs and herbaceous perennials: selection, propagation, planting schemes, architecture. Climber and creepers: importance, selection, propagation, planting -3
3. Annuals: selection, propagation, planting scheme, Other garden plants: palms, ferns, grasses and cacti succulents -3

4. Pot plants: selection, arrangement, management -2
5. Bio-aesthetic planning: definition, need, planning; landscaping of urban and rural areas-3
6. Peri-urban landscaping-2
7. Landscaping of schools, public places like bus station, railway station, townships, river banks, hospitals, play grounds, airports, industries, institutions-3
8. Bonsai: principles and management, lawn: establishment and maintenance-2
9. CAD application-2

Practical

1. Identification of trees, shrubs, annuals, pot plants;
2. Propagation of trees, shrubs and annuals, care and maintenance of plants, potting and repotting-2
3. Identification of tools and implements used in landscape design, training and pruning of plants for special effects - 2
4. Lawn establishment and maintenance -2
5. Layout of formal gardens, informal gardens,
6. Special type of gardens (sunken garden, terrace garden, rock garden) and designing of conservatory and lathe house -2
7. Use of computer software, visit to important gardens/ parks/ institutes -2

AMET 5311	Introductory Agro-meteorology & Climate Change	2(1+1)
-----------	--	--------

Theory

Meaning and scope of agricultural meteorology; Earth atmosphere- its composition, extent and structure; Atmospheric weather variables; Atmospheric pressure, its variation with height; Wind, types of wind, daily and seasonal variation of wind speed, cyclone, anticyclone, land breeze and sea breeze; Nature and properties of solar radiation, solar constant, depletion of solar radiation, short wave, longwave and thermal radiation, net radiation, albedo; Atmospheric temperature, temperature inversion, lapse rate, daily and seasonal variations of temperature, vertical profile of temperature, Energy balance of earth; Atmospheric humidity, concept of saturation, vapor pressure, process of condensation, formation of dew, fog, mist, frost, cloud; Precipitation, process of precipitation, types of precipitation such as rain, snow, sleet, and hail, cloud formation and classification; Artificial rainmaking. Monsoon- mechanism and importance in Indian agriculture, Weather hazards - drought, floods, frost, tropical cyclones and extreme weather conditions such as heat-wave and cold-wave. Agriculture and weather relations; Modifications of crop microclimate, climatic normals for crop and livestock production. Weather forecasting- types of weather forecast and their uses. Climate change, climatic variability, global warming, causes of climate change and its impact on regional and national Agriculture.

Practical

Visit of Agrometeorological Observatory, site selection of observatory, exposure of instruments and weather data recording. Measurement of total, shortwave and longwave radiation, and its estimation using Planck's intensity law. Measurement of albedo and sunshine duration, computation of Radiation Intensity using BSS. Measurement of maximum and minimum air temperatures, its tabulation, trend and variation analysis. Measurement of soil temperature and computation of soil heat flux. Determination of vapor pressure and relative humidity. Determination of dew point temperature. Measurement of atmospheric pressure and analysis of atmospheric conditions. Measurement of wind speed and wind direction, preparation of windrose. Measurement, tabulation and analysis of rain. Measurement of open pan evaporation and evapotranspiration. Computation of PET and AET.

Theory

- 1 Meaning and scope of agricultural meteorology;
- 2 Earth atmosphere- its composition, extent and structure; Atmospheric weather variables; Atmospheric pressure, its variation with height;
- 3 Wind, types of wind, daily and seasonal variation of wind speed, cyclone, anticyclone, land breeze and sea breeze;
- 4 Nature and properties of solar radiation, solar constant, depletion of solar radiation, short wave, longwave and thermal radiation, net radiation, albedo;

- 5 Atmospheric temperature, temperature inversion, lapse rate, daily and seasonal variations of temperature, vertical profile of temperature, Energy balance of earth;
- 6 Atmospheric humidity, concept of saturation, vapor pressure, process of condensation, formation of dew, fog, mist, frost, cloud;
- 7 Precipitation, process of precipitation, types of precipitation such as rain, snow, sleet, and hail, cloud formation and classification;
- 8 Artificial rainmaking. Monsoon- mechanism and importance in Indian agriculture, Weather hazards - drought, floods, frost, tropical cyclones and extreme weather conditions such as heat-wave and cold-wave.
- 9 Agriculture and weather relations; Modifications of crop microclimate, climatic normals for crop and livestock production.
- 10 Weather forecasting- types of weather forecast and their uses.
- 11 Climate change, climatic variability, global warming, causes of climate change and its impact on regional and national Agriculture-2

Practical

- 1 Visit of Agrometeorological Observatory, site selection of observatory, exposure of instruments and weather data recording.
- 2 Measurement of total, shortwave and longwave radiation, and its estimation using Planck's intensity law.
- 3 Measurement of albedo and sunshine duration, computation of Radiation Intensity using BSS.
- 4 Measurement of maximum and minimum air temperatures, its tabulation, trend and variation analysis.
- 5 Measurement of soil temperature and computation of soil heat flux.
- 6 Determination of vapor pressure and relative humidity.
- 7 Determination of dew point temperature.
- 8 Measurement of atmospheric pressure and analysis of atmospheric conditions.
- 9 Measurement of wind speed and wind direction, preparation of windrose.
- 10 Measurement, tabulation and analysis of rain.
- 11 Measurement of open pan evaporation and evapotranspiration.
- 12 Computation of PET and AET.