

AGRICULTURE

w.e.f. Academic Session 2016-17

VI Semester		
AGRO 5321	Rainfed Agriculture & Watershed Management	2 (1+1)
AENGG 5321	Protected Cultivation and Post Harvest Technology	2 (1+1)
APP 5321	Diseases of Field and Horticultural Crops and their Management-II	3 (2+1)
AHFR 5321	Post-harvest Management and Value Addition of Fruits and Vegetables	2 (1+1)
AENT 5321	Management of Beneficial Insects	2 (1+1)
APB 5321	Crop Improvement-II (<i>Rabi crops</i>)	2 (1+1)
AGRO 5322	Practical Crop Production –II (<i>Rabi crops</i>)	2 (0+2)
ASOIL 5321	Principles of Organic Farming	2 (1+1)
AEXT 5321	Communication Skills and Personality Development	2 (1+1)
ACP 5321	Principles of Food Science and Nutrition	2 (2+0)
AHPD 5321	Educational Tours	2 (0+2)
Total		23 (11+12)

AGRO 5321	Rainfed Agriculture & Watershed Management	2 (1+1)
-----------	--	---------

Theory

Rainfed agriculture: Introduction, types, History of rainfed agriculture and watershed in India; Problems and prospects of rainfed agriculture in India ; Soil and climatic conditions prevalent in rainfed areas; Soil and water conservation techniques, Drought: types, effect of water deficit on physio- morphological characteristics of the plants, Crop adaptation and mitigation to drought; Water harvesting: importance, its techniques, Efficient utilization of water through soil and crop management practices, Management of crops in rainfed areas, Contingent crop planning for aberrant weather conditions, Concept, objective, principles and components of watershed management, factors affecting watershed management.

Practical

Studies on climate classification, studies on rainfall pattern in rainfed areas of the country and pattern of onset and withdrawal of monsoons. Studies on cropping pattern of different rainfed areas in the country and demarcation of rainfed area on map of India. Interpretation of meteorological data and scheduling of supplemental irrigation on the basis of evapo-transpiration demand of crops. Critical analysis of rainfall and possible drought period in the country, effective rainfall and its calculation. Studies on cultural practices for mitigating moisture stress. Characterization and delineation of model watershed. Field demonstration on soil & moisture conservation measures. Field demonstration on construction of water harvesting structures. Visit to rainfed research station/watershed.

Theory

- 1 Rainfed agriculture: Introduction, types,
- 2 History of rainfed agriculture and watershed in India;
- 3 Problems and prospects of rainfed agriculture in India ;
- 4 Soil and climatic conditions prevalent in rainfed areas;
- 5 Soil and water conservation techniques,
- 6 Drought: types, effect of water deficit on physio- morphological characteristics of the plants,
- 7 Crop adaptation and mitigation to drought;
- 8 Water harvesting: importance, its techniques,
- 9 Efficient utilization of water through soil and crop management practices,
- 10 Management of crops in rainfed areas,
- 11 Contingent crop planning for aberrant weather conditions,
- 12 Concept, objective, principles and components of watershed management, factors affecting watershed management.

Practical

- 1 Studies on climate classification, studies on rainfall pattern in rainfed areas of the country and pattern of onset and withdrawal of monsoons-2
- 2 Studies on cropping pattern of different rainfed areas in the country and demarcation of rainfed area on map of India-2.
- 3 Interpretation of meteorological data and scheduling of supplemental irrigation on the basis of evapo-transpiration demand of crops.
- 4 Critical analysis of rainfall and possible drought period in the country, effective rainfall and its calculation-2
- 5 Studies on cultural practices for mitigating moisture stress.
- 6 Characterization and delineation of model watershed.
- 7 Field demonstration on soil & moisture conservation measures.
- 8 Field demonstration on construction of water harvesting structures.
- 9 Visit to rainfed research station/watershed.

AENGG 5321	Protected Cultivation and Post Harvest Technology	2 (1+1)
------------	---	---------

Theory

Green house technology: Introduction, Types of Green Houses; Plant response to Green house environment, Planning and design of greenhouses, Design criteria of green house for cooling and heating purposes. Green house equipments, materials of construction for traditional and low cost green houses. Irrigation systems used in greenhouses, typical applications, passive solar green house, hot air green house heating systems, green house drying. Cost estimation and economic analysis.

Important Engineering properties such as physical, thermal and aero & hydrodynamic properties of cereals, pulses and oilseed, their application in PHT equipment design and operation. Drying and dehydration; moisture measurement, EMC, drying theory, various drying method, commercial grain dryer (deep bed dryer, flat bed dryer, tray dryer, fluidized bed dryer, recirculatory dryer and solar dryer). Material handling equipment; conveyer and elevators, their principle, working and selection.

Practical

Study of different type of green houses based on shape. Determine the rate of air exchange in an active summer winter cooling system. Determination of drying rate of agricultural products inside green house. Study of green house equipments. Visit to various Post Harvest Laboratories. Determination of Moisture content of various grains by oven drying & infrared moisture methods. Determination of engineering properties (shape and size, bulk density and porosity of biomaterials). Determination of Moisture content of various grains by moisture meter. Field visit to seed processing plant.

Theory

- 1 Green house technology: Introduction, Types of Green Houses;
- 2 Plant response to Green house environment, Planning and design of greenhouses,
- 3 Design criteria of green house for cooling and heating purposes.
- 4 Green house equipments, materials of construction for traditional and low cost green houses.
- 5 Irrigation systems used in greenhouses, typical applications, passive solar green house, hot air green house heating systems, green house drying.
- 6 Cost estimation and economic analysis.

- 7 Important Engineering properties such as physical, thermal and aero & hydrodynamic properties of cereals, pulses and oilseed, their application in PHT equipment design and operation-2.
- 8 Drying and dehydration; moisture measurement, EMC, drying theory, various drying method, commercial grain dryer (deep bed dryer, flat bed dryer, tray dryer, fluidized bed dryer, recirculatory dryer and solar dryer)-2
- 9 Material handling equipment; conveyer and elevators, their principle, working and selection-2.

Practical

- 1 Study of different type of green houses based on shape-2
- 2 Determine the rate of air exchange in an active summer winter cooling system-2
- 3 Determination of drying rate of agricultural products inside green house-2
- 4 Study of green house equipments. Visit to various Post Harvest Laboratories-2
- 5 Determination of Moisture content of various grains by oven drying & infrared moisture methods. Determination of engineering properties (shape and size, bulk density and porosity of biomaterials)-2
- 6 Determination of Moisture content of various grains by moisture meter. Field visit to seed processing plant-2

APP 5321	Diseases of Field and Horticultural Crops and their Management-II	3 (2+1)
----------	---	---------

Theory

Symptoms, etiology, disease cycle and management of following diseases:

Field Crops:

Wheat: rusts, loose smut, karnal bunt, powdery mildew, alternaria blight, and ear cockle;
Sugarcane: red rot, smut, wilt, grassy shoot, ratoon stunting and Pokkah Boeng;
Sunflower: Sclerotinia stem rot and Alternaria blight; Mustard: Alternaria blight, white rust, downy mildew and Sclerotinia stem rot; Gram: wilt, grey mould and Ascochyta blight;
Lentil: rust and wilt; Cotton: anthracnose, vascular wilt, and black arm; Pea: downy mildew, powdery mildew and rust.

Horticultural Crops:

Mango: anthracnose, malformation, bacterial blight and powdery mildew; Citrus: canker and gummosis; Grape vine: downy mildew, Powdery mildew and anthracnose; Apple: scab, powdery mildew, fire blight and crown gall; Peach: leaf curl. Strawberry: leaf spot Potato: early and late blight, black scurf, leaf roll, and mosaic; Cucurbits: downy mildew, powdery mildew, wilt; Onion and garlic: purple blotch, and Stemphylium blight; Chillies: anthracnose and fruit rot, wilt and leaf curl; Turmeric: leaf spot Coriander: stem gall Marigold: Botrytis blight; Rose: dieback, powdery mildew and black leaf spot.

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

Sl. No.	Chapter	Period
1.	Symptoms, etiology, disease cycle and management of following diseases- <i>Field Crops:</i>	2
2.	Wheat: rusts, loose smut, leaf blight -2	2
3.	Sugarcane: red rot, smut, wilt-2	2
4.	Sunflower: head rot and Alternaria blight;	1
5.	Mustard: Alternaria blight, white rust and downy mildew-2	2
6.	Gram: wilt, collar rot-1	2
7.	Cotton: vascular wilt, and black arm;	1
8.	Pea: powdery mildew and rust.	1

Horticultural Crops:		
1.	Mango: anthracnose, malformation and powdery mildew-2	2
2.	Citrus: canker and gummosis;	1
3.	Grape vine: downy mildew, Powdery mildew	1
4.	Apple: scab, powdery mildew, Peach:leaf curl.;	1
5.	Potato: early and late blight and mosaic;	1
6.	Cucurbits: downy mildew, powdery mildew, wilt;	1
7.	Onion and garlic: purple blotch;	1
8.	Chillies: anthracnose and fruit rot and leaf curl;	1
9.	Turmeric: leaf spot ; Coriander: stem gall;	1
10.	Rose: dieback, powdery mildew and black leaf spot; Aonla: Fruit rot	1
	Total Period	24
Practical		
1.	Identification and histopathological studies of selected diseases of field and horticultural crops covered in theory	6
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.	4
	Total Period	12

AHFR 5321	Post-harvest Management and Value Addition of Fruits and Vegetables	2 (1+1)
-----------	---	---------

Theory:

Importance of post-harvest processing of fruits and vegetables; Extent and possible causes of post harvest losses; Pre-harvest factors affecting postharvest quality, maturity, ripening and changes occurring during ripening; Respiration and factors affecting respiration rate; Harvesting and field handling; Storage (ZECC, cold storage, CA, MA and hypobaric); Value addition concept; Principles and methods of preservation of Jam, Jelly, Marmalade, Preserve, Candy- Concepts and Standards; Fermented and non-fermented beverages. Tomato products- Concepts and Standards; Drying/Dehydration of fruits and vegetables – Concept and methods, osmotic drying. Canning – Concepts and Standards, packaging of products.

Practical:

Application of different types of packaging, containers for shelf life extension. Effect of temperature on shelf life and quality of produce. Demonstration of chilling and freezing injury in vegetables and fruits. Extraction and preservation of pulps and juices. Preparation of jam, jelly, RTS, nectar, squash, osmotically dried products, fruit bar, candy, tomato products and canned products. Quality evaluation of products – physico-chemical and sensory. Visit to processing unit/industry.

Theory:

1. Importance of post-harvest processing of fruits and vegetables.
2. Extent and possible causes of post harvest losses.
3. Pre-harvest factors affecting postharvest quality, maturity, ripening and changes occurring during ripening – 2.
4. Respiration and factors affecting respiration rate.
5. Harvesting and field handling; Storage (ZECC, cold storage, CA, MA and hypobaric).
6. Value addition concept; Principles and methods of preservation.
7. Intermediate moisture food- Jam, jelly, marmalade, preserve, candy – Concepts and Standards.
8. Fermented and non-fermented beverages.
9. Tomato products – Concepts and Standards.
10. Drying/ Dehydration of fruits and vegetables – Concepts and methods, osmotic drying, Canning – Concepts and Standards, packaging of products – 2.

Practical:

1. Application of different types of packaging, containers for shelf life extension – 2.
2. Effect of temperature on shelf life and quality of produce – 2.
3. Demonstration of chilling and freezing injury in vegetables and fruits – 2.
4. Extraction and preservation of pulps and juices – 2.
5. Preparation of jam, jelly, RTS, nectar, squash, osmotically dried products, fruit bar, candy, tomato products and canned products – 2.
6. Quality evaluation of products – physico-chemical and sensory.
7. Visit to processing unit/industry.

AENT 5321	Management of Beneficial Insects	2 (1+1)
-----------	----------------------------------	---------

Theory

Importance of beneficial Insects, Beekeeping and pollinators, bee biology, commercial methods of rearing, equipment used, seasonal management, bee enemies and disease. Bee pasturage, bee foraging and communication. Insect pests and diseases of honey bee. Role of pollinators in cross pollinated plants.

Types of silkworm, voltinism and biology of silkworm. Mulberry cultivation, mulberry varieties and methods of harvesting and preservation of leaves. Rearing, mounting and harvesting of cocoons. Pest and diseases of silkworm, management, rearing appliances of mulberry silkworm and methods of disinfection.

Species of lac insect, morphology, biology, host plant, lac production – seed lac, button lac, shellac, lac- products. Identification of major parasitoids and predators commonly being used in biological control. Insect orders bearing predators and parasitoids used in pest control and their mass multiplication techniques. Important species of pollinator, weed killers and scavengers with their importance.

Practical

Honey bee species, castes of bees. Beekeeping appliances and seasonal management, bee enemies and disease. Bee pasturage, bee foraging and communication. Types of silkworm, voltinism and biology of silkworm. Mulberry cultivation, mulberry varieties and methods of harvesting and preservation of leaves. Species of lac insect, host plant identification. Identification of other important pollinators, weed killers and scavengers. Visit to research and training institutions devoted to beekeeping, sericulture, lac culture and natural enemies. Identification and techniques for mass multiplication of natural enemies.

Theory

S.No.	Chapter	Period
1.	Importance of beneficial insects.	01
2.	Beekeeping, bee biology, commercial methods of rearing, equipments used, seasonal management of honeybee colony, bee pasturage, bee foraging and communication, insect pests & diseases of honey bee. Role of pollinators in cross pollinated plants.	02
3.	Voltinism and biology of silk worm; mulberry cultivation, mulberry varieties and methods of harvesting and preservation of leaves. Rearing appliances of mulberry silkworm and methods of disinfection. Rearing, mounting and harvesting of cocoons. Pests and diseases of silkworm & their management.	03
4.	Species of lac insect, morphology, biology, host plants, lac production, seed lac, button lac, shellac, lac products.	02
5.	Major parasitoids and predators commonly used in biological control and their mass multiplication techniques.	02
6.	Important species of pollinators & weed killers with their importance.	02
		12

Practical

S.No.	Chapter	Period
1.	Honey bee species, castes of bees.	01
2.	Beekeeping appliances and seasonal management.	02
3.	Types of silkworm, voltinism and biology of silkworm. Mulberry cultivation.	02
4.	Species of lac insect, host plant identification	02
5.	Identification of important pollinators and weed killers.	02
6.	Identification and techniques for mass multiplication of natural enemies.	02
7.	Visit to research and training institutions devoted to beekeeping, sericulture, lac culture and natural enemies.	01
		12

APB 5321	Crop Improvement-II (<i>Rabi crops</i>)	2 (1+1)
----------	---	---------

Theory

Centers of origin, distribution of species, wild relatives in different cereals; pulses; oilseeds; fodder crops and cash crops; vegetable and horticultural crops; Plant genetic resources, its utilization and conservation; study of genetics of qualitative and quantitative characters; 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 of *rabi* crops. Ideotype concept and climate resilient crop varieties for future.

Practical

Floral biology, emasculation and hybridization techniques in different crop species namely Wheat, Oat, Barley, Chickpea, Lentil, Field pea, Rajma, Horse gram, Rapeseed Mustard, Sunflower, Safflower, Potato, Berseem. Sugarcane, Tomato, Chilli, Onion; 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 *Rabi* crops; Estimation of heterosis, inbreeding depression and heritability; Layout of field experiments; Study of quality characters, study of 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; fodder crops 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 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
- 4 Hybrid seed production technology of *rabi* crops-2
- 5 Ideotype concept and climate resilient crop varieties for future-2

Practical

- 1 Floral biology, emasculation and hybridization techniques in different crop species namely Wheat, Oat, Barley, Chickpea, Lentil, Field pea, Rajma, Horse gram, Rapeseed Mustard, Sunflower, Safflower, Potato, Berseem. Sugarcane, Tomato, Chilli, Onion-4
- 2 Handling of germplasm and segregating populations by different methods like pedigree, bulk and single seed decent methods-2
- 3 Study of field techniques for seed production and hybrid seeds production in *Rabi* crops;
- 4 Estimation of heterosis, inbreeding depression and heritability-2
- 5 Layout of field experiments; Study of quality characters, study of donor parents for different characters-2
- 6 Visit to seed production plots; Visit to AICRP plots of different field crops

AGRO 5322	Practical Crop Production –II (<i>Rabi</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-2
2. 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-12
3. The emphasis will be given to seed production, mechanization, resource conservation and integrated nutrient, insect-pest and disease management technologies-6
4. Preparation of balance sheet including cost of cultivation, net returns per student as well as per team of 8-10 students-4

ASOIL 5321	Principles of Organic Farming	2 (1+1)
------------	-------------------------------	---------

Theory

Organic farming, principles and its scope in India; Initiatives taken by Government (central/state), NGOs and other organizations for promotion of organic agriculture; Organic ecosystem and their concepts; Organic nutrient resources and its fortification; Restrictions to nutrient use in organic farming; Choice of crops and varieties in organic farming; Fundamentals of insect, pest, disease and weed management under organic mode of production; Operational structure of NPOP; Certification process and standards of organic farming; Processing, leveling, economic considerations and viability, marketing and export potential of organic products.

Practical

Visit of organic farms to study the various components and their utilization; Preparation of enrich compost, vermicompost, bio-fertilizers/bio-inoculants and their quality analysis; Indigenous technology knowledge (ITK) for nutrient, insect, pest disease and weed management; Cost of organic production system; Post harvest management; Quality aspect, grading, packaging and handling.

Theory

- 1 Organic farming, principles and its scope in India-2
- 2 Initiatives taken by Government (central/state), NGOs and other organizations for promotion of organic agriculture
- 3 Organic ecosystem and their concepts
- 4 Organic nutrient resources and its fortification
- 5 Restrictions to nutrient use in organic farming
- 6 Choice of crops and varieties in organic farming
- 7 Fundamentals of insect, pest, disease and weed management under organic mode of production
- 8 Operational structure of NPOP
- 9 Certification process and standards of organic farming
- 10 Processing, leveling, economic considerations and viability
- 11 marketing and export potential of organic products

Practical

- 1 Visit of organic farms to study the various components and their utilization-2
- 2 Preparation of enrich compost, vermicompost, bio-fertilizers/bio-inoculants and their quality analysis-2
- 3 Indigenous technology knowledge (ITK) for nutrient, insect, pest disease and weed management-2
- 4 Cost of organic production system-2
- 5 Post harvest management-2
- 6 Quality aspect, grading, packaging and handling-2.

AEXT 5321	Communication Skills and Personality Development	2(1+1)
-----------	--	--------

Theory

Communication Skills: meaning and process of communication, verbal and nonverbal communication; listening and note taking, writing skills, oral presentation skills; field diary and lab record; indexing, footnote and bibliographic procedures. Reading and comprehension of general and technical articles, precise writing, summarizing, abstracting; individual and group presentations, impromptu presentation, public speaking. Group discussion. Organizing seminars and conferences,

Personality Development: meaning, definition, importance of personality in organizational behaviour, Determinants of personality, personality types and traits.

Practical

Listening and note taking, writing skills, oral presentation skills; field diary and lab record; indexing, footnote and bibliographic procedures. Reading and comprehension of general and technical articles, precise writing, summarizing, abstracting. Individual and group presentations. Identification of personality traits of an individual.

Theory

- 1 Communication Skills: meaning and process of communication, verbal and nonverbal communication, listening and note taking -2
- 2 Writing skills, oral presentation skills
- 3 Field diary and lab record; indexing, footnote and bibliographic procedures-2.
- 4 Reading and comprehension of general and technical articles, precise writing, summarizing, abstracting-2
- 5 Individual and group presentations, impromptu presentation, public speaking; Group discussion-2.
- 6 Organizing seminars and conferences.
- 7 Personality Development: meaning, definition, importance of personality in organizational behaviour
- 8 Determinants of personality, personality types and traits.

Practical

- 1 Listening and note taking
- 2 Writing skills
- 3 Oral presentation skills
- 4 Field diary and lab record
- 5 Indexing, footnote and bibliographic procedures.
- 6 Reading and comprehension of general and technical articles-2
- 7 Precise writing, summarizing, abstracting-2
- 8 Individual and group presentations-2
9. Identification of personality traits of an individual

ACP 5321	Principles of Food Science and Nutrition	2 (2+0)
----------	--	---------

Theory

Concepts of Food Science (definitions, measurements, density, phase change, pH, osmosis, surface tension, colloidal systems etc.); Food composition and chemistry (water, carbohydrates, proteins, fats, vitamins, minerals, flavours, colours, miscellaneous bioactives, important reactions); Food microbiology (bacteria, yeast, moulds, spoilage of fresh & processed foods, Production of fermented foods); Principles and methods of food processing and preservation (use of heat, low temperature, chemicals, radiation, drying etc.); Food and nutrition, Malnutrition (over and under nutrition), nutritional disorders; Energy metabolism (carbohydrate, fat, proteins); Balanced/ modified diets, Menu planning, New trends in food science and nutrition.

Theory

- 1 Concepts of Food Science (definitions, measurements, density, phase change, pH, osmosis, surface tension, colloidal systems etc.); -4
- 2 Food composition and chemistry (water, carbohydrates, proteins, fats, vitamins, minerals, flavours, colours, miscellaneous bioactives, important reactions); -4
- 3 Food microbiology (bacteria, yeast, moulds, spoilage of fresh & processed foods, Production of fermented foods); -3
- 4 Principles and methods of food processing and preservation (use of heat, low temperature, chemicals, radiation, drying etc.); -3
- 5 Food and nutrition, Malnutrition (over and under nutrition), nutritional disorders; -3
- 6 Energy metabolism (carbohydrate, fat, proteins); -3
- 7 Balanced/ modified diets, Menu planning, -2
- 8 New trends in food science and nutrition.-2

AHPD 5321	Educational Tours	2 (0+2)
-----------	-------------------	---------

Students Study & Educational Tours: Student study and educational tours to well-known institutions and organizations and interactions with their faculty help students broaden their knowledge and skills.

