

Integral University, Lucknow
Integral Institute of Agricultural Science and Technology
Evaluation Scheme of Undergraduate program
B. Sc. (Hons.) Agriculture
w.e.f. Session 2019-20

Semester - III

Course Code	Subject	Periods Per h/week/sem			Evaluation Scheme Theory Mid sem			Evaluation Scheme Practical Examination				End sem Theory Exam	Subject total	Credit	Total Credit Points	
		L	T	P	CT	TA	Total	Sessional		End sem exam	Sub Total (sessional + exam)					
								CT	TA	Total						Total
AG215	Crop Production Technology - I (Kharif Crops)	1	0	2	10	10	20	5	5	10	20	50	50	100	1:0:1	2
AG216	Fundamentals of Plant Breeding	2	0	2	10	10	20	5	5	10	20	50	50	100	2:0:1	3
BM271	Agricultural Finance and Cooperation	2	0	2	10	10	20	5	5	10	20	50	50	100	3:0:1	3
AG217	Fundamentals of Plant Pathology	3	0	2	10	10	20	5	5	10	20	50	50	100	3:0:1	4
AE246	Farm Machinery and Power	1	0	2	10	10	20	5	5	10	20	50	50	100	1:0:1	2
HT226	Production Technology for Vegetables and Spices	1	0	2	10	10	20	5	5	10	20	50	50	100	1:0:1	2
ES217	Environmental Studies and Disaster Management	2	0	2	10	10	20	5	5	10	20	50	50	100	2:0:1	3
AG218	Livestock and Poultry Management	3	0	2	10	10	20	5	5	10	20	50	50	100	3:0:1	4
	TOTAL	15		16										800		23

B. Sc. (Hons.) Agriculture
SEMESTER-III
Syllabus: Crop Production Technology – I (*Kharif Crops*)
Paper Code: AG215
w.e.f. Session 2019-20

Theory

2(1+1)

Unit 1.

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of *Kharif* crops. Cereals – rice, maize, sorghum, pearl millet and finger millet

Unit 2.

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of pulses- pigeonpea, mungbean and urdbean; oilseeds- groundnut, and soybean

Unit 3.

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of fibre crops- cotton & jute

Unit 4.

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of forage crops-sorghum, cowpea, cluster bean and napier

Practical

Rice nursery preparation, transplanting of rice, sowing of soybean, pigeonpea and mungbean. maize, groundnut and cotton, effect of seed size on germination and seedling vigour of kharif season crops, effect of sowing depth on germination of kharif crops, identification of weeds in kharif season crops, top dressing and foliar feeding of nutrients, study of yield contributing characters and yield calculation of kharif season crops, study of crop varieties and important agronomic experiments at experimental farm. study of forage experiments, morphological description of kharif season crops, visit to research centres of related crops.

Suggested Readings:

- Reddy SR. *Principles of Agronomy*. Kalyani Publishers.
- Balasubrananiyan P & Palaniappan SP. 2015. *Principles and Practices of Agronomy*. Agrobios
- Reddy Yellamanda T and Shankar Reddy G H. New Edn. *Principles of Agronomy*. Kalyani Publishers Ludhiana.
- Gupta O P. *Scientific Weed Management in the Tropics and Sub- Tropics*. Today and Tomorrow's Printers and Publishers. New Delhi.
- Yawalkar K S and Agarwal J P. *Manures and Fertilizers*. Agricultural Horticultural Publishing House, Nagpur.

Crop Production Technology- I (Kharif Crops)

Course Code: AG 215

Course Objective

1. To know about the origin, distribution, climatic requirements and varieties of *kharif* crops
2. To learn about the method of nursery preparation and transplanting in rice.
3. To familiarize the students with the identification of common weeds in the *kharif* crops
4. To study about the morphological description of *kharif* crops.
5. To learn the yield contributing characters and able to calculate the yield in the crops.

Course Outcome:

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Students learned the origin, distribution, climatic requirements and varieties of <i>kharif</i> crops
CO2	Students learned the method of nursery preparation and transplanting in rice.
CO3	Students can identify the common weeds of the <i>kharif</i> crops
CO4	Learned the morphological description of <i>kharif</i> crops.
CO5	Students know and can calculate the yield in the <i>kharif</i> season crops

CO-PO-PSO mapping

PO	PO												PSO		
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	3	1	1	1	1	2	1	3	1	2	3	3	1
CO2	3	1	3	2	1	1	1	2	1	3	1	3	2	3	2
CO3	3	1	3	1	1	3	1	3	2	3	1	3	2	2	1
CO4	3	1	3	1	1	1	1	1	1	2	1	3	2	2	1
CO5	3	3	3	1	1	1	1	1	1	3	1	3	2	2	1

B. Sc. (Hons.) Agriculture
SEMESTER-III
Syllabus: Fundamentals of Plant Breeding
Paper Code: AG216
w.e.f. Session 2019-20

Theory

3(2+1)

Unit 1.

Historical development, concept, nature and role of plant breeding, major achievements and future prospects; Genetics in relation to plant breeding, modes of reproduction and apomixes, self-incompatibility and male sterility- genetic consequences, cultivar options. Domestication, Acclimatization and Introduction; Centres of origin/ diversity.

Unit 2.

Components of Genetic variation; Heritability and genetic advance; Genetic basis and breeding methods in self- pollinated crops - mass and pure line selection, hybridization techniques and handling of segregating population; Multiline concept. Concepts of population genetics and Hardy-Weinberg Law.

Unit 3.

Genetic basis and methods of breeding cross pollinated crops, modes of selection; Population improvement Schemes-Ear to row method, Modified Ear to Row, recurrent selection schemes; Heterosis and inbreeding depression, development of inbred lines and hybrids, composite and synthetic varieties; Breeding methods in asexually propagated crops, clonal selection and hybridization; Maintenance of breeding records and data collection;

Unit 4.

Wide hybridization and prebreeding; Polyploidy in relation to plant breeding, mutation breeding-methods and uses; Breeding for important biotic and abiotic stresses; Biotechnological tools-DNA markers and marker assisted selection. Participatory plant breeding; Intellectual Property Rights, Patenting, Plant Breeders and & Farmer's Rights.

Practical

Plant Breeder's kit, Study of germplasm of various crops. Study of floral structure of self-pollinated and cross pollinated crops. Emasculation and hybridization techniques in self & cross pollinated crops. Consequences of inbreeding on genetic structure of resulting populations. Study of male sterility system. Handling of segregation populations. Methods of calculating mean, range, variance, standard deviation, heritability. Designs used in plant breeding experiments, analysis of Randomized Block Design. To work out the mode of pollination in a given crop and extent of natural out-crossing. Prediction of performance of double cross hybrids.

Suggested Readings:

- Singh, B.D., 1997. *Plant Breeding: Principles and Methods*. Kalyani Publishers, New Delhi. P. 702.
- Kundan Singh, *Essentials of plant breeding*
- Pundan Singh, 1992. *Genetic*. Kalyani Publishers, New Delhi, P. 509.
- Trivedi PC. 2000. *Plant Biotechnology: Recent Advances*. Panima Publishers
- Chahal GS & Gosal SS. 2002. *Principles and Procedures of Plant Breeding: Biotechnological and Conventional Approaches*. Narosa Publishers.

Fundamentals of Plant Breeding

Course Code: AG 216

Course Objective

1. Basic knowledge of concept, nature , history and role of plant breeding.
2. To learn about Male sterility, Self-incompatibility, modes of reproduction and genetics with relation to plant breeding
3. To study about the biometrical techniques employed in plant breeding
4. To familiarize the students about the genetic basis and breeding methods in self-pollinated, cross-pollinated and asexually propagated crops.
5. To aware the students about the concepts of wide hybridization, polyploidy, mutation breeding and role of biotechnology in the plant breeding

Course Outcome:

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Students learned about the basics, role, history and functions of plant breeding
CO2	Learned the concept of male sterility, self-incompatibility and mode of reproduction and also role of genetics in plant breeding
CO3	Students can employ and practice biometrical analysis in plant breeding
CO4	Knows the genetic basis and various methods in different breeding populations
CO5	Familiarized in the role of biotechnology, polyploidy, wide hybridization and mutation breeding..

CO-PO-PSO mapping

PO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	3	1	1	1		3		3		3	3	3	2
CO2	3	1	3	1	1	1		3		3		3	2	3	2
CO3	3	1	3	2	1	1		3		3		3	3	2	2
CO4	3	1	3	2	1	3		3		3		3	3	2	3
CO5	3	1	3	3	1	3		3		3		3	3	3	2

B. Sc. (Hons.) Agriculture
SEMESTER-III
Syllabus: Agricultural Finance and Co-Operation
Paper Code: BM271
w.e.f. Session 2019-20

Theory

3(2+1)

Unit 1.

Agricultural Finance- meaning, scope and significance, credit needs and its role in Indian agriculture. Agricultural credit: meaning, definition, need, classification. Credit analysis: 4 R's, and 3C's of credits. Sources of agricultural finance: institutional and non-institutional sources, commercial banks, social control and nationalization of commercial banks, Micro financing including KCC. Lead bank scheme, RRBs, Scale of finance and unit cost.

Unit 2.

An introduction to higher financing institutions – RBI, NABARD, ADB, IMF, world bank, Insurance and Credit Guarantee Corporation of India. Cost of credit. Recent development in agricultural credit. Preparation and analysis of financial statements – Balance Sheet and Income Statement. Basic guidelines for preparation of project reports- Bank norms – SWOT analysis.

Unit 3.

Agricultural Cooperation – Meaning, brief history of cooperative development in India, objectives, principles of cooperation, significance of cooperatives in Indian agriculture.

Unit 4.

Agricultural Cooperation in India- credit, marketing, consumer and multi-purpose cooperatives, farmers' service cooperative societies, processing cooperatives, farming cooperatives, cooperative warehousing; role of ICA, NCUI, NCDC, NAFED.

Practicals

Determination of most profitable level of capital use. Optimum allocation of limited amount of capital among different enterprise. Analysis of progress and performance of cooperatives using published data. Analysis of progress and performance of commercial banks and RRBs using published data. Visit to a commercial bank, cooperative bank and cooperative society to acquire firsthand knowledge of their management, schemes and procedures. Estimation of credit requirement of farm business – A case study. Preparation and analysis of balance sheet – A case study. Preparation and analysis of income statement – A case study. Appraisal of a loan proposal A case study. Techno-economic parameters for preparation of projects. Preparation of Bankable projects for various agricultural products and its value added products. Seminar on selected topics.

Suggested Readings:

- Benjamin MC Donald P. 1985, *Investment Projects in Agriculture- Principles and Case studies*. Longman Group Limited. Essex. UK.
- Chole, R. R. *et al.*, 2012, *Entrepreneurship Development and Communication skills*, Scientific publishers, Jodhpur.
- Pandey U. K., *An Introduction to Agricultural Finance*.
- Sagar Mondal and G. L. Ray, *Text Book on Rural Development, Entrepreneurship and Communication Skills*, Kalyani Publications.
- Somani, L. L., *Extension Education and Communication*, Agrotech, Publishing Academy, Udaipur.
- Dr.A.K.Singh,2009. *Entrepreneurship Development and Management*. Lakshmi Publications Ltd.,

Agricultural Finance and Co-Operation

Course Code: BM 271

Course Objective

1. To know about agricultural finance in India.
2. To understand function of various agriculture financial institution.
3. To understand Preparation and analysis of financial statements
4. To know about agricultural cooperation in India

Course Outcome:

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Understand various sources of agricultural finance
CO2	Students are able to understand Preparation and analysis of balance sheet
CO3	Students are able to understand the principles of cooperation, significance of cooperatives in Indian agriculture
CO4	Able to preparation of project reports and SWOT analysis
CO5	Acquired knowledge of Techno-economic parameters for preparation of projects

CO-PO-PSO mapping

PO	PO												PSO		
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	1	1	1	2	3	1	2	2	3	3	3	2
CO2	2	3	1	1	1	1	2	3	1	2	2	3	3	3	3
CO3	2	2	1	1	1	1	1	3	1	1	1	3	3	3	2
CO4	2	3	1	1	1	1	2	3	1	3	2	3	3	2	3
CO5	2	3	1	1	1	1	2	3	1	2	2	3	3	3	3

B. Sc. (Hons.) Agriculture
SEMESTER-III
Syllabus: Fundamentals of Plant Pathology
Paper Code: AG217
w.e.f. Session 2019-20

Theory

4(3+1)

Unit 1.

Introduction: Importance of plant diseases, scope and objectives of Plant Pathology. History of Plant Pathology with special reference to Indian work. Terms and concepts in Plant Pathology. Pathogenesis. Causes / factors affecting disease development: disease triangle and tetrahedron and classification of plant diseases. Important plant pathogenic organisms, different groups: fungi, bacteria, fastidious vesicular bacteria, phytoplasmas, spiroplasmas, viruses, viroids, algae, protozoa, phanerogamic parasites and nematodes with examples of diseases caused by them. Diseases and symptoms due to abiotic causes.

Unit 2.

Fungi: general characters, definition of fungus, somatic structures, types of fungal thalli, fungal tissues, modifications of thallus, reproduction (asexual and sexual). Nomenclature, Binomial system of nomenclature, rules of nomenclature, classification of fungi. Key to divisions, sub-divisions, orders and classes. *Bacteria and mollicutes:* general morphological characters. Basic methods of classification and reproduction. *Viruses:* nature, structure, replication and transmission. Study of phanerogamic plant parasites.

Unit 3.

Nematodes: General morphology and reproduction, classification, symptoms and nature of damage caused by plant nematodes (*Heterodera, Meloidogyne, Anguina, Radopholus* etc.) Growth and reproduction of plant pathogens. Liberation / dispersal and survival of plant pathogens. Types of parasitism and variability in plant pathogens. Pathogenesis. Role of enzymes, toxins and growth regulators in disease development. Defense mechanism in plants.

Unit 4.

Epidemiology: Factors affecting disease development. Principles and methods of plant disease management. Nature, chemical combination, classification, mode of action and formulations of fungicides and antibiotics.

Practical

Acquaintance with various laboratory equipments and microscopy. Collection and preservation of disease specimen. Preparation of media, isolation and Koch's postulates. General study of different structures of fungi. Study of symptoms of various plant diseases. Study of representative fungal genera. Staining and identification of plant pathogenic bacteria. Transmission of plant viruses. Study of phanerogamic plant parasites. Study of morphological features and identification of plant parasitic nematodes. Sampling and extraction of nematodes from soil and plant material, preparation of nematode mounting. Study of fungicides and their formulations. Methods of pesticide application and their safe use. Calculation of fungicide sprays concentrations.

Suggested Readings:

- N.G. Ravichandra, 2013. Fundamentals of Plant Pathology. PHI Hall of India, New Delhi
- Alexopoulos, C.J. Mims, C.W. and Blackwell, M. 1996. Introduction to Mycology Wiley Eastern Ltd., New York.
- Mandahar, C.L. 1987. Introduction to Plant Viruses. Chand and Co. Pvt. Ltd., New Delhi.

Fundamentals of Plant Pathology

Course Code: AG217

Course objective

1. To know about plant diseases, scope and objectives of Plant Pathology
2. Familiar with Causes / factors affecting disease development.
3. Knowledge of Important plant pathogenic organisms.
4. Knowledge of Epidemiology and plant disease management

Course Outcome

After completion of course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Able to know what are the basic criteria regarding plant diseases and Plant Pathology
CO2	Can use the basic knowledge regarding different factors affecting disease development
CO3	Students are able to know about Important plant pathogenic organisms
CO4	Study of Epidemiology and factors affecting it
CO5	By the end of course students will be able to control of different pests by plant disease management.

CO-PO-PSO mapping

PO	PO												PSO		
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	3		3		1	1	3	3	3	3	1
CO2	3	3	3	2	3	3	3				2	3	3	3	1
CO3	3	3	2		3	1	3			1	3	3	3	2	2
CO4	3	3	3	3		2	3		2	1	3	3	3	2	1
CO5	3	3	3	3	1	3	3	1			3	3	3	2	2

B. Sc. (Hons.) Agriculture
SEMESTER-III
Syllabus: Farm Machinery and Power
Paper Code: AE246
w.e.f. Session 2019-20

Theory

2(1+1)

Unit 1.

Status of Farm Power in India, Sources of Farm Power , I.C. engines, working principles of I C engines, comparison of two stroke and four stroke cycle engines ,

Unit 2.

Study of different components of I.C. engine, I.C. engine terminology and solved problems, Familiarization with different systems of I.C. engines: Air cleaning, cooling, lubrication, fuel supply and hydraulic control system of a tractor,

Unit 3.

Familiarization with Power transmission system : clutch, gear box, differential and final drive of a tractor , Tractor types, Cost analysis of tractor power and attached implement, Familiarization with Primary and Secondary Tillage implement, Implement for hill agriculture,

Unit 4.

Implement for intercultural operations, Familiarization with sowing and planting equipment, calibration of a seed drill and solved examples, Familiarization with Plant Protection equipment, Familiarization with harvesting and threshing equipment.

Practicals

Study of different components of I.C. engine. To study air cleaning and cooling system of engine, Familiarization with clutch, transmission, differential and final drive of a tractor, Familiarization with lubrication and fuel supply system of engine, Familiarization with brake, steering, hydraulic control system of engine, Learning of tractor driving, Familiarization with operation of power tiller, Implements for hill agriculture, Familiarization with different types of primary and secondary tillage implements: mould plough, disc plough and disc harrow . Familiarization with seedcum- fertilizer drills their seed metering mechanism and calibration, planters and transplanter Familiarization with different types of sprayers and dusters Familiarization with different intercultivation equipment, Familiarization with harvesting and threshing machinery.

Suggested Readings:

- T. P. Ojha and A.M.Michael. 2005. *Principles of Agricultural Engineering* (Volume - 1), Jain Brothers
- Manoj Kumar Ghoshal and Dharendra Kumar Das. 2008. *Farm Power*, Kalyani publishers.
- Surendra Singh. 2007. *Farm Machinery Principles and Applications*. ICAR Publications
- Roth/Field. 1992. *Introduction to Agricultural Engineering - Problem Solving approaches*, 2nd. Edition. CBS publishers & distributors Pvt. Ltd.
- Surendra Singh & Verma. 2009. *Farm Machinery Maintenance & Management*. ICAR Publication.
- M.M. Pandey & Others. 2012. *Handbook of Agricultural Engineering*. ICAR publication
- Jain S C. 2003. *Farm Machinery-An approach*. Standard Publishers and Distributors, New Delhi

Farm Machinery and Power

Course Code: AE246

Course Objective

1. To introduce the basic knowledge of farm mechanization.
2. To educate the students about working principles, care, repair and maintenance of I C engine and other farm implements.
3. To impart the knowledge of operation, care, repair and maintenance of tractor.
4. To impart the knowledge of tillage, sowing, planting, harvesting, horticultural, hill agriculture, intercultural implements.
5. To provide the knowledge to solve numerical problems based on power, draft, cost of tractor operation with attached implements.

Course Outcome:

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	know the basic knowledge of farm mechanization and can promote the application of farm machinery in agriculture.
CO2	know the working principle of I C engine and they can repair and maintain the I C engine.
CO3	know the tractor operation in the field and students can repair and maintain the tractor.
CO4	have the knowledge about different farm implements like tillage, sowing, planting, and others.
CO5	have the ability to solve the numerical problems based on power, draft, cost of tractor operation with attached implements.

CO-PO-PSO mapping

PO	PO												PSO		
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	3	2	3	3				3		3	3	3	3
CO2	2	3	2	3	3	2				3		3	3	3	2
CO3	3	2	3	3	3	3				2		3	3	2	3
CO4	3	1	2	2	3	3				2		3	3	3	1
CO5	2	3	2	2	2	2				2		3	3	2	1

B. Sc. (Hons.) Agriculture
SEMESTER-III
Syllabus: Production Technology for Vegetable and Spices
Paper Code: HT226
w.e.f. Session 2019-20

Theory

2 (1+1)

Unit 1.

Importance of vegetables & spices in human nutrition and national economy, kitchen gardening

Unit 2.

Brief about origin, area, climate, soil, improved varieties and cultivation practices such as time of sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, harvesting and yield, physiological disorders, of important vegetable and spices (Tomato, Brinjal, Chilli, Capsicum)

Unit 3.

Cucumber, Melons, Gourds, Pumpkin, French bean, Peas. Cole crops such as Cabbage, Cauliflower, Knol-khol

Unit 4.

Bulb crops such as Onion, Garlic; Root crops such as Carrot, Raddish, Beetroot; Tuber crops such as Potato; Leafy vegetables such as Amaranth, Palak. Perennial vegetables).

Practical

Identification of vegetables & spice crops and their seeds. Nursery raising. Direct seed sowing and transplanting. Study of morphological characters of different vegetables & spices. Fertilizers applications. Harvesting & preparation for market. Economics of vegetables and spices cultivation.

Suggested Readings:

- S. Thamburaj, 2014. *Text book of vegetable, tuber crops and Spices*. ICAR, New Delhi
- B.R.Choudhary, 2009. *A Text book on production technology of vegetables*. Kalyani Publishers. Ludhiana.
- T.K.Bose, 2002. *Vegetable Crops*. Nayaprakash. Kolkata
- P.Hazra, 2011. *Modern Technology in Vegetable Production*. New India Publishing Agency. New Delhi.
- T.R.Gopal Krishnan, 2007. *Vegetable Crops*. New India Publishing Agency. New Delhi.
- K.V.Kamath, 2007. *Vegetable Crop Production*. Oxford Book Company. Jaipur
- M.S.Dhaliwal, 2008. *Handbook of Vegetable Crops*. Kalyani Publishers. Ludhiana
- Singh, Umashankar, 2008. *Indian Vegetables*. Anmol Publications. Pvt.Ltd .New Delhi.
- K S Yawalkar, 2008. *Vegetable crops in India*. Agri-Horticultural Pub. House. Nagpur. 2004

Production Technology for Vegetables and Spices

Course Code: HT226

Course objective:

1. To give knowledge about importance and scope of vegetables and spices in human nutrition.
2. To know about origin, geographical distribution, soil and climate requirement of vegetable crops.
3. Familiar with different improved varieties and methods of sowing in different vegetables.
4. Knowledge of various inter cultural operations and their management for vegetable crops.
5. Knowledge of crop protection measure in different crops

Course Outcome

After completion of course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Able to understand about the basic criteria for selection of vegetable crops on the basis of soil and climate requirement.
CO2	Learn the basic knowledge regarding different cultural practices followed for vegetable crops
CO3	Able to know about sowing time of specific varieties for different vegetables according to region and season.
CO4	Study of irrigation and nutrient management and their applications in production vegetables
CO5	By the end of course students will be able to know different physiological disorders and can control different insect pests and diseases.

CO-PO-PSO mapping

PO	PO												PSO		
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	1	2	2	2	3				3	3	3	3
CO2	3	3	3	1	2	2	1	3				3	3	3	2
CO3	3	3	2	1	2	3	2	3				3	3	2	3
CO4	3	3	3	1		2	2	3				3	3	3	2
CO5	3	3		1		2		3				3	3	2	2

B. Sc. (Hons.) Agriculture
SEMESTER-III
Syllabus: Environmental Studies and Disaster Management
Paper Code: ES217
w.e.f. Session 2019-20

Theory

3 (2+1)

Unit 1.

Multidisciplinary nature of environmental studies Definition, scope and importance. Natural Resources: Renewable and non-renewable resources, Natural resources and associated problems. a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. e) Energy resources: Growing energy needs, renewable and nonrenewable energy sources, use of alternate energy sources. Case studies. f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

Unit 2.

Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles. Ecosystems: Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem. Ecological succession, Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystem: a. Forest ecosystem b. Grassland ecosystem c. Desert ecosystem d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit 3.

Biodiversity and its conservation: - Introduction, definition, genetic, species & ecosystem diversity and biogeographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, National and local levels, India as a mega-diversity nation. Hot-spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Unit 4.

Environmental Pollution: definition, cause, effects and control measures of: a. Air pollution b. Water pollution c. Soil pollution d. Marine pollution e. Noise pollution f. Thermal pollution g. Nuclear hazards. Solid Waste Management: causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Social Issues and the Environment: From Unsustainable to Sustainable development, Urban problems related to energy, Water conservation, rain water harvesting, watershed management. Environmental ethics: Issues and possible solutions, climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Wasteland reclamation. Consumerism and waste products. Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Issues involved in enforcement of environmental legislation. Public awareness. Human Population and the Environment: population growth, variation among nations, population explosion, Family Welfare Programme. Environment and human health: Human Rights, Value Education, HIV/AIDS. Women and Child Welfare. Role of Information Technology in Environment and human health.

Unit 5.

Natural Disasters- Meaning and nature of natural disasters, their types and effects. Floods, drought, cyclone, earthquakes, landslides, avalanches, volcanic eruptions, Heat and cold waves, Climatic change: global warming, Sea level rise, ozone depletion. Man Made Disasters- Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire, oil fire, air pollution, water pollution, deforestation, industrial waste water pollution, road accidents, rail accidents, air accidents, sea accidents. Disaster Management- Effect to migrate natural disaster at national and global levels. International strategy for disaster reduction. Concept of disaster management, national disaster management framework; financial arrangements; role of NGOs, community –based organizations and media. Central, state, district and local administration; Armed forces in disaster response; Disaster response; Police and other organizations.

Practical

Pollution case studies. Case Studies- Field work: Visit to a local area to document environmental assets river/ forest/ grassland/ hill/ mountain, visit to a local polluted site-Urban/Rural/Industrial/ Agricultural, study of common plants, insects, birds and study of simple ecosystems-pond, river, hill slopes, etc.

Suggested Readings:

- Nandini, N. Suneetha and Sucharitha Tandon. *Environmental Studies*.
- Aswathanarayana, U. 1999. *Soil resources and the environment*. Oxford and IBH publishing Co., New Delhi. P. 173-195.
- D. D. Misra. *Fundamental Concepts in Environmental Studies*.
- Diwan, P. and P. Diwan. 1998. *Environmental Management Law and Administration*. Variety Books International, New Delhi.
- Krishnamurthy. *An Advanced Textbook on Biodiversity*.
- S. Deshwal A. Deshwal. *A Basic Course in Environmental Science*.
- Erach Bharucha 2005. Textbook of environmental studies for under graduate courses. UGC, University press, Hyderabad.
- Manohara Chary and Jayaram Reddy 2004. Principles of Environmental studies BB Publishers, Hyderabad.

Environmental Studies and Disaster Management

Course Code: ES217

Course Objective

- To gain the knowledge of scope and importance of multidisciplinary nature of environmental studies.
- To learn about the natural resources and its categories; renewable and non-renewable.
- To study about the concept of biodiversity and it's conservation
- To familiarize the students about the definition, causes, effects and control of environmental pollution.
- To aware the students about the meaning and nature of natural disasters.

Course Outcome:

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Students learned about the knowledge of scope and importance of multidisciplinary nature of environmental studies
CO2	Learned about the different types of natural resources.
CO3	Students learned about the concept of biodiversity and it's conservation.
CO4	Students familiarize about the definition, causes, effects and control of environmental pollution.
CO5	Learned about the meaning, types and effects of natural disasters.

CO-PO-PSO mapping

PO	PO												PSO		
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	1	1	1	1	3		3		3	3	3	3
CO2	2	1	2	1	1	1	1	3		3		3	3	2	3
CO3	2	1	1	1	1	1	1	3		2		3	3	2	3
CO4	2	1	1	1	1	1	1	3		3		3	3	3	2
CO5	2	1	1	1	1	1	1	3		2		3	3	2	2

B. Sc. (Hons.) Agriculture
SEMESTER-III
Syllabus: Livestock & Poultry Management
Paper Code: AG218
w.e.f. Session 2019-20

Theory

4 (3+1)

Unit 1.

Role of livestock in the national economy. Reproduction in farm animals and poultry. Housing principles, space requirements for different species of livestock and poultry.

Unit 2.

Management of calves, growing heifers and milch animals. Management of sheep, goat and swine. Incubation, hatching and brooding. Management of growers and layers. Important Indian and exotic breeds of cattle, buffalo, sheep, goat, swine and poultry.

Unit 3.

Improvement of farm animals and poultry. Digestion in livestock and poultry. Classification of feedstuffs. Proximate principles of feed. Nutrients and their functions. Feed ingredients for ration for livestock and poultry. Feed supplements and feed additives. Feeding of livestock and poultry.

Unit 4.

Introduction of livestock and poultry diseases. Prevention (including vaccination schedule) and control of important diseases of livestock and poultry.

Practical

External body parts of cattle, buffalo, sheep, goat, swine and poultry. Handling and restraining of livestock. Identification methods of farm animals and poultry. Visit to IDF and IPF to study breeds of livestock and poultry and daily routine farm operations and farm records. Judging of cattle, buffalo and poultry. Culling of livestock and poultry. Planning and layout of housing for different types of livestock. Computation of rations for livestock. Formulation of concentrate mixtures. Clean milk production, milking methods. Hatchery operations, incubation and hatching equipments. Management of chicks, growers and layers. Debeaking, dusting and vaccination. Economics of cattle, buffalo, sheep, goat, swine and poultry production.

Suggested Readings:

- Banerjee GC. 1989. *Text Book of Animal Husbandry*. Oxford and IBH.
- ICAR. 1962. *Handbook of Animal Husbandry*. ICAR Publication.
- Parsad Jagdish. 2001. *Poultry Production and Management*. Kalyani Publishers.
- Sastry NSR & Thomas CK. 1991. *Dairy Bovine Production*. Kalyani Publishers.
- Singh RA. 1990. *Poultry Production*. Kalyani Publishers.

Livestock & Poultry Management, AG218

Objectives:

- To study External body parts of cattle and buffalo.
- To study Methods of identification marks and dehorning of animal.
- Study of computerized database on dairy farm and Vaccination and control of ecto and endo parasites in cattle and buffalo.
- Preparation of feeding schedule and feeding different categories of cattle and buffalo.
- To study about the method of milking and composition.

Outcome:

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Students gain knowledge regarding livestock in Agriculture.
CO2	They understand the basics of knowledge of breeds of animals.
CO3	They gain knowledge regarding various livestock programs in India.
CO4	They have knowledge about the different livestock programs of Govt of India.
CO5	Able to know about the Role of women Place of livestock in the national economy.

CO-PO-PSO mapping

PO	PO												PSO		
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	2	1	1	3	3	3	1	3	1	3	3	3	3
CO2	3	3	3	1	1	3	3	3	1	3	3	2	2	1	1
CO3	3	2	1	1	1	2	3	3	1	1	2	3	2	2	1
CO4	3	2	2	2	1	3	3	3	1	2	3	3	2	2	2
CO5	3	1	1	1	1	2	3	3	1	2	3	3	3	2	1



Integral University, Lucknow
Integral Institute of Agricultural Science and Technology
Evaluation Scheme of Undergraduate program
w.e.f. Session 2019-20

B. Sc. (Hons.) Agriculture
Semester - IV

Course Code	Course Title	Periods Per h/week/sem			Evaluation Scheme Theory Mid sem			Evaluation Scheme Practical Examination				End sem Theory Exam	Subject total	Credit	Total Credit Points	Attributes								
								Sessional			End sem exam					Sub Total (sessional + exam)	Employability	Entrepreneurship	Skill Development	Gender Equality	Environment &	Human Values	Professional Ethics	
		L	T	P	C T	T A	Total	C T	T A	Total														Total
AG221	Crop Production Technology–II (Rabi Crops)	1	0	2	10	10	20	5	5	10	20	50	50	100	1:0:1	2	√		√					
HT227	Production Technology for Ornamental Crops, MAP and Landscaping	1	0	2	10	10	20	5	5	10	20	50	50	100	1:0:1	2	√		√		√			
AE275	Renewable Energy and Green Technology	1	0	2	10	10	20	5	5	10	20	50	50	100	1:0:1	2	√	√			√			
AG222	Problematic Soils and their Management	2	0	0	10	10	20	-	-	-	-	-	80	100	2:0:0	2	√	√			√			
HT228	Production Technology for Fruit and Plantation Crops	1	0	2	10	10	20	5	5	10	20	50	50	100	1:0:1	2	√	√	√		√			
AG223	Principles of Seed Technology	1	0	4	10	10	20	5	5	10	20	50	50	100	1:0:2	3	√							
MT223	Statistical Methods	1	0	2	10	10	20	5	5	10	20	50	50	100	1:0:	2	√		√					

					0	0									1								
BM272	Agricultural Marketing Trade & Prices	2	0	2	1	1	20	5	5	10	20	50	50	100	2:0:1	3	√						
AG224	Introductory Agro-meteorology & Climate Change	1	0	2	1	1	20	5	5	10	20	50	50	100	1:0:1	2	√					√	
AG235	Agribusiness Management	2	0	2	1	1	20	5	5	10	20	50	50	100	2:0:1	3*	√	√	√				
AG236	Agrochemicals	2	0	2	1	1	20	5	5	10	20	50	50	100	2:0:1	3*	√					√	
AG237	Commercial Plant Breeding	1	0	4	1	1	20	5	5	10	20	50	50	100	1:0:2	3*	√	√	√				
AG238	Weed Management	2	0	2	1	1	20	5	5	10	20	50	50	100	2:0:1	3*	√		√			√	
	Total															20+3*=23							

**Students can opt any one paper from the elective courses.*

B. Sc. (Hons.) Agriculture
SEMESTER-IV
Course Title: Crop Production Technology-II (Rabi crops)
Course Code: AG221
w.e.f. Session 2019-20

Theory

2(1+1)

Unit 1.

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of *Rabi* crops; cereals –wheat and barley,

Unit 2.

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Pulses-chickpea, lentil, peas,

Unit 3.

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of oilseeds-rape seed, mustard and sunflower;

Unit 4.

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of sugar crops-sugarcane; medicinal and aromatic crops-mentha, lemon grass and citronella, Forage crops-berseem, lucerne and oat.

Practical

Sowing methods of wheat and sugarcane, identification of weeds in *rabiseason* crops, study of morphological characteristics of *rabicrops*, study of yield contributing characters of *rabiseason* crops, yield and juice quality analysis of sugarcane, study of important agronomic experiments of *rabicrops* at experimental farms. Study of *rabiforage* experiments, oil extraction of medicinal crops, visit to research stations of related crops.

Suggested Readings:

- Reddy Yellamanda T and Shankar Reddy G H. 1995. Principles of Agronomy. Kalyani Publishers Ludhiana
- Yawalkar K S and Agarwal J P. 1977. Manures and Fertilizers. Agricultural Horticultural Publishing House, Nagpur
- Acquaah G. 2005. *Principles of Crop Production: Theory, Techniques and Technology*. Prentice Hall.
- Balasubrananiyan P & Palaniappan SP. 2010. *Principles and Practices of Agronomy*. Agrobios.

Reddy SR. 2011. *Principles of Agronomy*. Kalyani Publishers

Course Objectives

- Basic concept of origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Rabi crops.
- Knowledge of soil and climatic requirements, varieties, cultural practices and yield of Rabi crops.
- Basic knowledge of origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of oil seed crops and pulses crops.
- Knowledge of oil and climatic requirements, varieties, cultural practices and yield of fodder crops.
- Basic concept of origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of medicinal and aromatic crops.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Students will have basic knowledge of origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Rabi crops
CO2	Knowledge of soil and climatic requirements, varieties, cultural practices and yield of Rabi crops
CO3	Basic knowledge of origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of oil seed crops and pulses crops
CO4	Basic concept of origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of medicinal and aromatic crops
CO5	Knowledge of oil and climatic requirements, varieties, cultural practices and yield of fodder crops and cereal crops

CO-PO-PSO MAPPING:

PO CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	2	3	3	2	3	3	3	3	3	2
CO2	3	2	3	2	2	2	3	2	1	2	3	2	3	3	2
CO3	3	2	3	3	3	2	3	2	2	2	3	2	3	3	1
CO4	2	2	2	2	2	2	2	3	2	2	2	2	3	3	1
CO5	3	3	3	3	3	2	3	3	2	3	3	3	2	2	2

B. Sc. (Hons.) Agriculture
SEMESTER-IV
Course Title: Production Technology for Ornamental Crops, MAPs and Landscaping
Course Code: HT227
w.e.f. Session 2019-20

Theory

2(1+1)

Unit 1.

Importance and scope of ornamental crops, medicinal and aromatic plants and landscaping. Principles of landscaping. Landscape uses of trees, shrubs and climbers.

Unit 2.

Production technology of important cut flowers like rose, gerbera, carnation, liliun and orchids under protected conditions and gladiolus, tuberose, chrysanthemum under open conditions.

Unit 3.

Package of practices for loose flowers like marigold and jasmine under open conditions. Production technology of important medicinal plants like ashwagandha, asparagus, aloe, costus, Cinnamomum, periwinkle, isabgol

Unit 4.

Production technology of important aromatic plants like mint, lemongrass, citronella, palmarosa, ocimum, rose, geranium, vetiver. Processing and value addition in ornamental crops and MAPs produce.

Practical

Identification of Ornamental plants. Identification of Medicinal and Aromatic Plants. Nursery bed preparation and seed sowing. Training and pruning of Ornamental plants. Planning and layout of garden. Bed preparation and planting of MAP. Protected structures – care and maintenance. Intercultural operations in flowers and MAP. Harvesting and post harvest handling of cut and loose flowers. Processing of MAP. Visit to commercial flower/MAP unit.

Suggested Readings:

- Arora JS. 2013. *Introductory Ornamental Horticulture*. Kalyani Publishers.
- Bal JS. 2013. *Fruit Growing*. Kalyani Publishers.
- Chadha KL. 2012. *Handbook of Horticulture*. ICAR
- Dhaliwal MS. 2014. *Handbook of Vegetable Crops*. Kalyani Publishers
- Battacharjee, S. K. and De, L. C. 2005. *Post Harvest Technology of Flowers and Ornamentals Plants*. Ponteer Publisher, Jaipur, India.
- Kitinoja, L. and Kader, A. A. 2003. *Small-Scale Postharvest Handling practice: A Manual for Horticulture crops* (4 ed). US Davis, PHT Research and information Center.

Course Objectives:

- Importance and scope of ornamental crops, medicinal and aromatic plants and landscaping. Principles of landscaping.
- The objective is to provide the training to the trainers in the production and processing of medicinal and aromatic plants
- Access to our production fields, laboratory and interaction with the scientists will provide opportunities to the participants to learn and understand alternative crop production processing and quality aspects
- Understand the post harvest technology of medicinal and aromatic plants Understand cold chain management.
- To make the students aware of post harvest technology and management of medicinal and aromatic plants.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	The course is designed to cover a wide spectrum of the subject matter to provide complete overview of this sector.
CO2	Demonstrate a fundamental understanding of plant identification, selection, use and maintenance of plant material best suited for conventional and sustainable landscapes
CO3	To know importance of Ornamental crops, Medicinal and Aromatic crops.
CO4	Aims at obtaining maximum production at minimum cost.
CO5	To study the different cut flowers like rose, gerbera and carnation under protected conditions

PO CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	3	3		3	2	1	1	3	3	3	1
CO2	3	2	3	2	3	2		3	2	3	1	2	3	3	1
CO3	3	2	3	2	3	2		3	3	2	1	3	3	3	1
CO4	3	2	3	2	3	3		3	2	3	3	3	3	3	1
CO5	3	1	1	2	3	2		3	3	3	2	3	2	2	2

B. Sc. (Hons.) Agriculture
SEMESTER-IV
Course Title: Renewable Energy and Green Technology
Course Code: AE275
w.e.f. Session 2019-20

Theory

2(1+1)

Unit 1.

Classification of energy sources, contribution of these of sources in agricultural sector, Familiarization with biomass utilization for biofuel production and their application,

Unit 2.

Familiarization with types of biogas plants and gasifiers, biogas, bioalcohol, biodiesel and bio-oil production and their utilization as bioenergy resource, introduction of solar energy, collection and their application,

Unit 3.

Familiarization with solar energy gadgets: solar cooker, solar water heater, application of solar energy: solar drying, solar pond, solar distillation, solar photovoltaic system and their application, introduction of wind energy and their application.

Practical

Familiarization with renewable energy gadgets. To study biogas plants, To study gasifier, To study the production process of biodiesel, To study briquetting machine, To study the production process of bio-fuels. Familiarization with different solar energy gadgets. To study solar photovoltaic system: solar light, solar pumping, solar fencing. To study solar cooker, To study solar drying system. To study solar distillation and solar pond.

Suggested Readings:

- Rai, G.D. 2013. Non-Conventional Energy Sources, Khanna Publishers, Delhi.
- Rai, G.D., Solar Energy Utilization, Khanna Publishers, Delhi.
- Khandelwal, K.C. & S. S. Mahdi. 1990. Biogas Technology- A Practical Handbook.
- Rathore N. S., Kurchania A. K., Panwar N. L. 2007. Non Conventional Energy Sources, Himanshu Publications.
- Tiwari, G.N. and Ghoshal, M.K. 2005. Renewable Energy Resources: Basic Principles and Applications. Narosa Pub. House. Delhi.
- Rathore N. S., Kurchania A. K., Panwar N. L. 2007. Renewable Energy, Theory and Practice, Himanshu Publications

Course objective:

1. To provide information to the students about classification of energy resources.
2. To impart knowledge to the student about the role and importance of energy resources in agricultural sector.
3. To make familiarization with types of biogas plants, gasifiers, biodiesel and bio oil production.
4. To make familiarization with solar energy gadgets.
5. To study about the introduction and application of wind and solar energy.

Course Outcome:

After completion of course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Understand the various classifications of energy resources and their contribution in agricultural sector.
CO2	Familiarization with biomass utilization for biofuel production and their application.
CO3	Familiarization with solar energy gadgets, solar cooker solar water pump and solar distillation collection and their application.
CO4	Learn about bio gas and various models of bio gas plant and gasifiers.
CO5	Able to understand bio alcohol, biodiesel and bio-oil production and their utilization as bioenergy resources, introduction of solar energy.

CO-PO- PSO MAPPING:

PO CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	2	2	1	2	3	1	1	1	3	3	3	1
CO2	3	2		1		1	1	3	1	1	1	3	3	3	2
CO3	3	2	1	1	2	2	2		1	1	1	3	3	3	3
CO4	3	2	1	3	3		3		1	1	1	3	3	3	3
CO5	3	2	1	3		2		1	1	1	1	3	2	2	3

B. Sc. (Hons.) Agriculture
SEMESTER-IV
Course Title: Problematic Soils and their Management
Course Code: AG222
w.e.f. Session 2019-20

Theory

2(2+0)

Unit 1.

Soil quality and health, Distribution of Waste land and problem soils in India. Their categorization based on properties.

Unit 2.

Reclamation and management of Saline and sodic soils, Acid soils, Acid Sulphate soils, Eroded and Compacted soils, Flooded soils, Polluted soils. Irrigation water – quality and standards, utilization of saline water in agriculture.

Unit 3.

Remotesensing and GIS in diagnosis and management of problem soils. Multipurpose tree species, bio remediation through MPTs of soils, land capability and classification, land suitability classification. Problematic soils under different Agro-ecosystems

Suggested Readings:

- Soil Analysis Testing: Steps For Getting Your Soil Tested Kindle Edition, By Annie Wilkinson
- *Fundamentals of Soil Science* Indian Society of Soil Science. 1998. IARI, New Delhi
- Hillel D. 1982. *Introduction to Soil Physics*. Academic Press, London
- Brady Nyle C and Ray R Well, 2014. *Nature and properties of soils*. Pearson Education Inc., New Delhi
- Das DK. 2011. *Introductory Soil Science*. Third Revised Edition, Kalyani Publishers.
- Open Access Books - Soil Science | InTechOpen <https://www.intechopen.com/books/subject/soil-science/books/all/1/list>

Course Objective

1. To introduce the concept of problematic soil and its management.
2. To learn about remote sensing and GIS technologies for diagnosis of problematic soil.
3. To study about the reclamation of problematic soil under different Agro systems.
4. To familiarize the students about the concept of Irrigation water quality.
5. To aware the students about the Land capability classification.

Course Outcome:

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Students learned about the different types of problematic soil and its management.
CO2	Learned about the remote sensing and GIS technologies for diagnosis of problematic soil.
CO3	Students learned about the reclamation of problematic soil under different Agro systems.
CO4	Students knew about the concept of Land capability classification
CO5	Familiarized about the Irrigation water quality

CO-PO-PSO mapping

PO CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	2	2	1	1		3		2		3	3	3	1
CO2	3	1	1	2	1	1		3		3		3	3	2	1
CO3	3	1	2	2	1	1		3		2		3	3	2	1
CO4	3	1	2	1	1	1		3		3		3	3	2	1
CO5	3	1	2	2	1	1		3		2		3	2	2	1

B. Sc. (Hons.) Agriculture
SEMESTER-IV
Course Title: Production Technology for Fruit and Plantation Crops
Course Code: HT228
w.e.f. Session 2019-20

Theory

2(1+1)

Unit 1.

Importance and scope of fruit and plantation crop industry in India; Importance of rootstocks

Unit 2.

Production technologies for the cultivation of major fruits-mango, banana, citrus, grape, guava, litchi, papaya, sapota, apple, pear, peach, walnut, almond

Unit 3.

Production technologies for the cultivation of minor fruits- date, ber, pineapple, pomegranate, jackfruit, strawberry, plantation crops-coconut, arecanut, cashew, tea, coffee & rubber

Practical

Seed propagation. Scarification and stratification of seeds. Propagation methods for fruit and plantation crops. Description and identification of fruit. Preparation of plant bio regulators and their uses, Important pests, diseases and physiological disorders of above fruit and plantation crops, Visit to commercial orchards.

Suggested Readings:

- Neeraj Pratap Singh, 2005. Basic concepts of Fruit Science 1st Edn. IBDC Publishers.
- Gardner/Bardford/Hooker, J.R.. Fundamentals of Fruit Production. Mac Graw Hill Book Co., New York.
- Kumar, N., 1990. Introduction to Horticulture. Rajyalakshmi publications, Nagarcoil, Tamil Nadu.
- Chadha, K.L.(ICAR), Handbook of Horticulture. ICAR, New Delhi

Course objective:

1. Importance of fruit and plantation crop industry in India, its classification, soil and climate in relation to fruit production.
2. Knowledge about advanced technologies and rootstocks used to grow intensively high quality fruit crops for enhancing the crop production.
3. Familiar the students about climate, soil and varieties for fruit crops.
4. Knowing the principles and methods of orchard establishment, training, pruning and other horticultural practices needed for fruit production.

Course Outcome

After completion of course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Aware about the major and minor fruits crops and different varieties suitable for different climatic regions. Also about plantation crops.
CO2	Students aware about cultural practices for the cultivation of major and minor fruit crops and plantation crops.
CO3	Students also aware about the flowering physiology and factors involved in fruit-set, unfruitfulness, fruit growth and development.
CO4	Familiar with the important physiological disorders and its management.
CO5	Aware about the different propagation techniques applied in horticultural crops including micro-propagation.

CO-PO-PSO mapping

PO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	3	3		3	2	1	2	3	3	3	3	1
CO2	2	3	1	2	3		2	3	1	3	2	3	3	3	1
CO3	3	2		2	3	1	3	2	1	3	3	3	3	3	1
CO4	3	2	1	3	3	2	2	3	1	2	1	3	3	3	1
CO5	3	3	3	1	3	1	3	2	1	3	3	3	2	3	1

B. Sc. (Hons.) Agriculture
SEMESTER-IV
Course Title: Principles of Seed Technology
Course Code: AG223
w.e.f. Session 2019-20

Theory

3(1+2)

Unit 1.

Seed and seed technology: introduction, definition and importance. Deterioration causes of crop varieties and their control; Maintenance of genetic purity during seed production, seed quality; Definition, Characters of good quality seed, different classes of seed.

Unit 2.

Foundation and certified seed production of important cereals, pulses, oilseeds, fodder and vegetables. Seed certification, phases of certification, procedure for seed certification, field inspection. Seed Act and Seed Act enforcement. Duty and powers of seed inspector, offences and penalties. Seeds Control Order 1983, Varietal Identification through Grow Out Test and Electrophoresis, Molecular and Biochemical test.

Unit 3.

Detection of genetically modified crops, Transgene contamination in non-GM crops, GM crops and organic seed production. Seed drying, processing and their steps, seed testing for quality assessment, seed treatment, its importance, method of application and seed packing. Seed storage; general principles, stages and factors affecting seed longevity during storage. Measures for pest and disease control during storage

Unit 4.

Seed marketing: structure and organization, sales generation activities, promotional media. Factors affecting seed marketing, Role of WTO and OECD in seed marketing. Private and public sectors and their production and marketing strategies.

Practical

Seed production in major cereals: Wheat, Rice, Maize, Sorghum, Bajra and Ragi. Seed production in major pulses: Urd, Mung, Pigeonpea, Lentil, Gram, Field bean, pea. Seed production in major oilseeds: Soybean, Sunflower, Rapeseed, Groundnut and Mustard. Seed production in important vegetable crops. Seed sampling and testing: Physical purity, germination, viability, etc. Seed and seedling vigour test. Genetic purity test: Grow out test and electrophoresis. Seed certification: Procedure, Field inspection, Preparation of field inspection report. Visit to seed production farms, seed testing laboratories and seed processing plant.

Suggested Readings:

- Rattan Lal Agarwal. Seed Technology. 1995. 2ndedn. Oxford & IBH Publishing Pvt Ltd
- Sluisen Groot . 1985. Methods of Artificial Seed Testing. Enkhuizen (Holland) revised form
- International Rules for Seed Testing. ISTA (1985). Seed Science and Technology 13: 299-355.
- Schmidt, L. 2000. Guide to Handling Tropical and Subtropical Forest Seed. Danida

COURSE OBJECTIVES:

- Basic concept of Seed and seed technology: introduction, definition and importance
- Knowledge of Foundation and certified seed production of important crops
- Basic knowledge of Seed certification, phases of certification, procedure for seed certification
- Basic concepts of detection of genetically modified crops, Transgene contamination in non-GM crops
- Seed marketing: structure and organization, sales generation activities

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Students will have basic knowledge of Seed and seed technology: introduction, definition and importance
CO2	Knowledge of Foundation and certified seed production of important crops
CO3	Knowledge of Seed marketing: structure and organization, sales generation activities
CO4	Basic concepts of Seed drying, processing and their steps, seed testing for quality assessment
CO5	Basic concepts of Duty and powers of seed inspector, offences and penalties. Seeds Control Order

CO-PO-PSO mapping

PO CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	3	3	3	2	3	3	2	3	1	3	3	3	1
CO2	2	2	3	2	2	2	3	2	1	2	1	3	3	3	1
CO3	3	2	3	3	3	1	3	2	2	2	1	3	3	2	3
CO4	2	2	1	2	2	2	2	3	1	2	1	3	3	3	2
CO5	2	3	2	2	2	2	2	3	2	2	1	3	2	3	3

B. Sc. (Hons.) Agriculture
SEMESTER-IV
Course Title: Statistical Methods
Course Code: MT223
w.e.f. Session 2019-20

Theory

2(1+1)

Unit 1.

Introduction to Statistics and its Applications in Agriculture, Graphical Representation of Data, Measures of Central Tendency & Dispersion, Definition of Probability, Addition and Multiplication Theorem (without proof). Simple Problems Based on Probability.

Unit 2.

Binomial & Poisson Distributions, Definition of Correlation, Scatter Diagram. Karl Pearson's Coefficient of Correlation. Linear Regression Equations.

Unit 3.

Introduction to Test of Significance, One sample & two sample test t for Means, Chi-Square Test of Independence of Attributes in 2×2 Contingency Table. Introduction to Analysis of Variance, Analysis of One Way Classification.

Unit 4.

Introduction to Sampling Methods, Sampling versus Complete Enumeration, Simple Random Sampling with and without replacement, Use of Random Number Tables for selection of Simple Random Sample.

Practical

Graphical Representation of Data. Measures of Central Tendency (Ungrouped data) with Calculation of Quartiles, Deciles & Percentiles. Measures of Central Tendency (Grouped data) with Calculation of Quartiles, Deciles & Percentiles. Measures of Dispersion (Ungrouped Data). Measures of Dispersion (Grouped Data). Moments, Measures of Skewness & Kurtosis (Ungrouped Data). Moments, Measures of Skewness & Kurtosis (Grouped Data). Correlation & Regression Analysis. Application of One Sample t-test. Application of Two Sample Fisher's t-test. Chi-Square test of Goodness of Fit. Chi-Square test of Independence of Attributes for 2×2 contingency table. Analysis of Variance One Way Classification. Analysis of Variance Two Way Classification. Selection of random sample using Simple Random Sampling.

Suggested Readings:

- Cochran, W.G. and Cox, G.M. Experimental Design. Asia Publishing House.
- Kempthorne, O. (1965): The Design and Analysis of Experiments. John Wiley
- Montgomery, D. C. (2008): Design and Analysis of Experiments, John Wiley.
- Goon, A.M., Gupta, M.K. and Dasgupta, B. (2005): Fundamentals of Statistics. Vol. II, 8thEdn. World Press, Kolkata.
- Casella, G, (2008). Statistical Design. Springer. 6. Gupta, S.C. and Kapoor, V.K. Latest Revised Edition 2015. Fundamentals of Applied Statistics.

Course Objective:

- To understand the basics of statistics
- To understand the application of statistics in agriculture
- To know how to apply various tests and their significance in research work
- To understand the sampling methods

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	To learn the application of statistics
CO2	To impart knowledge in understanding of various tests in agriculture
CO3	To understand the sampling methods in research work
CO4	To learn the various attributes of chi-square test, one sample and two sample test, analysis of variance etc.
CO5	Interpret the results of various tests in agriculture

CO-PO-PSO mapping

PO	PO												PSO		
	CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	3	3	3	3	2	3	3	2	3	1	3	3	2	1
CO2	2	3	3	2	2	2	3	2	1	2	1	3	3	2	1
CO3	3	3	3	3	3	1	3	2	2	2	2	3	3	2	1
CO4	2	3	1	2	2	2	2	3	1	2	1	3	3	2	1
CO5	2	3	2	2	2	2	2	3	2	2	3	3	2	3	1

B. Sc. (Hons.) Agriculture
SEMESTER-IV
Course Title: Agricultural Marketing, Trade and Prices
Course Code: BM272
w.e.f. Session 2019-20

Theory

3(2+1)

Unit 1

Agricultural Marketing: Concepts and definitions of market, marketing, agricultural marketing, market structure, marketing mix and market segmentation, classification and characteristics of agricultural markets. Demand, supply and producer's surplus of agri-commodities: nature and determinants of demand and supply of farm products, producer's surplus – meaning and its types, marketable and marketed surplus, factors affecting marketable surplus of agri-commodities;

Unit 2

Product life cycle (PLC) and competitive strategies: Meaning and stages in PLC; characteristics of PLC; strategies in different stages of PLC; pricing and promotion strategies: pricing considerations and approaches – cost based and competition based pricing; market promotion – advertising, personal selling, sales promotion and publicity – their meaning and merits & demerits; marketing process and functions: Marketing process-concentration, dispersion and equalization; exchange functions – buying and selling; physical functions – storage, transport and processing; facilitating functions – packaging, branding, grading, quality control and labeling (Agmark); Market functionaries and marketing channels: Types and importance of agencies involved in agricultural marketing; meaning and definition of marketing channel; number of channel levels; marketing channels for different farm products; Integration, efficiency, costs and price spread:

Unit 3

Meaning, definition and types of market integration; marketing efficiency; marketing costs, margins and price spread; factors affecting cost of marketing; reasons for higher marketing costs of farm commodities; ways of reducing marketing costs; Role of Govt. in agricultural marketing: Public sector institutions- CWC, SWC, FCI, CACP & DMI – their objectives and functions; cooperative marketing in India;

Unit 4

Risk in marketing: Types of risk in marketing; speculation & hedging; an overview of futures trading; Agricultural prices and policy: Meaning and functions of price; administered prices; need for agricultural price policy; Trade: Concept of International Trade and its need, theories of absolute and comparative advantage. Present status and prospects of international trade in agri-commodities; GATT and WTO; Agreement on Agriculture (AoA) and its implications on Indian agriculture; IPR.

Practical

Plotting and study of demand and supply curves and calculation of elasticities; Study of relationship between market arrivals and prices of some selected commodities; Computation of marketable and marketed surplus of important commodities; Study of price behaviour over time for some selected commodities; Construction of index numbers; Visit to a local market to study various marketing functions performed by different agencies, identification of marketing channels for selected commodity, collection of data regarding marketing costs, margins and price spread and presentation of report in the class; Visit to market institutions – NAFED, SWC, CWC, cooperative marketing society, etc. to study their organization and functioning; Application of principles of comparative advantage of international trade.

Suggested Readings:

- SS Acharya and N L Agarwal. 2005. Agricultural Marketing in India. Oxford and IBH Publishing Co. Pvt. Ltd
- Chandra P. 1984. *Projects: Preparation, Appraisal & Implementation*. McGraw Hill Inc.
- Dewett, K.K. and Chand, A. 1979. *Modern Economic Theory*. S.Chand and Co., New Delhi
- Dewett, K.K. and Varma, J.D. 1986. *Elementary Economics*. S.Chand and Co., New Delhi.
- Gupta RD & Lekhi RK. 1982. *Elementary Economic Theory*. Kalyani Publishers.
- Kotler Philip and Armstrong. *Principles of Marketing*. Prentice-Hall.
- Jhingan, M.L. 2012. *Macro Economic Theory*. Vrinda publishers, New Delhi .

Course Code - BM272**Course Objectives**

1. To imparting knowledge of agriculture marketing.
2. To know the different systems agriculture marketing.
3. To understand the pricing policy in Agriculture.
4. To learn about the Agriculture Cooperation and Agreements in indian agriculture.
5. To understand the finance policy in Agriculture.

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	To Enable students to gain knowledge on agricultural marketing and prospects for improving agricultural marketing system.
CO2	To analyze Marketing Functions, Market Information and Intelligence.
CO3	Imparting knowledge of the marketing efficiency and agricultural prices.
CO4	Student will understand the basics of the marketing trade
CO5	To Provide the platform to the students of Marketing of Agricultural Inputs.

CO-PO-PSO mapping

PO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	3	3	3	3	2	3	3	2	3	1	3	3	2	3
CO2	2	3	3	2	2	2	3	2	1	2	1	3	3	2	3
CO3	3	3	3	3	3	1	3	2	2	2	2	3	3	2	3
CO4	2	3	1	2	2	2	2	3	1	2	1	3	3	2	3
CO5	2	3	2	2	2	2	2	3	2	2	3	3	2	3	3

B. Sc. (Hons.) Agriculture
SEMESTER-IV
Course Title: Introductory Agrometeorology & Climate Change
Course Code: AG224
w.e.f. Session 2019-20

Theory

2(1+1)

Unit 1.

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;

Unit 2.

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;

Unit 3.

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.

Unit 4.

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 wind rose. Measurement, tabulation and analysis of rain. Measurement of open pan evaporation and evapotranspiration. Computation of PET and AET.

Course Objective

- To understand the basics of agricultural meteorology
- To understand the role of solar radiation in agriculture
- To know the process of precipitation and weather hazards
- To understand the agriculture and weather relations

Course Outcome

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Learn the significance of Meteorology
CO2	To understand the process of solar radiation and its significance in agriculture
CO3	To understand the agriculture and weather relations and its significance in agriculture
CO4	To impart knowledge about precipitation process, and importance in Indian agriculture
CO5	To understand the causes of global warming and its effect on agriculture

CO-PO-PSO mapping

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	1	1	1	3	1	2	1	3	3	2	1
CO2	3	3	1	2	1	1	1	3	1	3	1	3	3	2	3
CO3	3	2	2	2	1	1	1	3	1	2	1	3	3	2	1
CO4	3	3	2	1	1	1	1	3	1	3	1	3	3	2	3
CO5	3	3	2	2	1	1	1	3	1	2	2	3	2	3	3

B.Sc. (Hons.) Agriculture
Course Title: Agribusiness Management
Course Code: AG235
w.e.f. Session 2019-20

Theory

3(2+1)

Unit 1.

Transformation of agriculture into agribusiness, various stakeholders and components of agribusiness systems. Importance of agribusiness in the Indian economy and New Agricultural Policy. Distinctive features of Agribusiness Management: Importance and needs of agro-based industries, Classification of industries and types of agro based industries.

Unit 2.

Institutional arrangement, procedures to set up agro based industries. Constraints in establishing agro-based industries. Agri-value chain: Understanding primary and support activities and their linkages. Business environment: PEST & SWOT analysis. Management functions: Roles & activities, Organization culture. Planning, meaning, definition, types of plans. Purpose or mission, goals or objectives, Strategies, policies, procedures, rules, programs and budget. Components of a business plan, Steps in planning and implementation.

Unit 3.

Organization staffing, directing and motivation. Ordering, leading, supervision, communications, control. Capital Management and Financial management of Agribusiness. Financial statements and their importance. Marketing Management: Segmentation, targeting & positioning. Marketing mix and marketing strategies. Consumer behaviour analysis, Product Life Cycle (PLC). Sales & Distribution Management.

Unit 4.

Pricing policy, various pricing methods. Project Management definition, project cycle, identification, formulation, appraisal, implementation, monitoring and evaluation. Project Appraisal and evaluation techniques.

Practical

Study of agri-input markets: Seed, fertilizers, pesticides. Study of output markets: grains, fruits, vegetables, flowers. Study of product markets, retail trade commodity trading, and value added products. Study of financing institutions- Cooperative, Commercial banks, RRBs, Agribusiness Finance Limited, NABARD. Preparations of projects and Feasibility reports for agribusiness entrepreneur. Appraisal/evaluation techniques of identifying viable project- Non-discounting techniques. Case study of agro-based industries. Trend and growth rate of prices of agricultural commodities. Net present worth technique for selection of viable project. Internal rate of return.

Suggested Readings:

- Information and Communication Technologies Management in Turbulent Business Environments by SC Lenny Koh and Stuart Maguire
- Knowledge Management Systems: Information and Communication Technologies for Knowledge Management by Ronald Maier
- Handbook on Foreign Trade Policy and Guide to Export & Import by The Institute of Chartered Accountants of India, New Delhi
- Agricultural and Food Marketing Management by I.M. Crawford

Course Objective:

- To make students aware about the concept of agribusiness.
- To make students aware about the different type of the agro based industries.
- To make students aware of micro and macro environmental forces and their impact on agri-business.
- To make students aware about agricultural marketing.
- To make students familiar with financial management.

Course Outcome:

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Students are well aware about the agribusiness concepts and importance.
CO2	Students are well aware about different type agro-based industries and their importance.
CO3	Students have knowledge about agribusiness environment including suppliers, competitors, customers, political and economic system.
CO4	Students have knowledge about different marketing techniques, PLC, pricing strategies and marketing mix.
CO5	Student can understand financial management concepts applied to the agro-based industries.

CO-PO-PSO mapping

PO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	3	3	1	1	3	1	2	3	3	3	3	2	3
CO2	3	2	3	3	1	1	3	1	3	3	3	3	3	2	3
CO3	3	1	2	3	1	1	3	2	2	2	3	3	3	2	3
CO4	3	1	2	3	1	2	3	2	3	3	3	3	3	2	3
CO5	3	2	3	3	1	2	3	1	2	2	3	3	2	2	3

B.Sc. (Hons.) Agriculture
Course Title: Agrochemicals
Course Code: AG236
w.e.f. Session 2019-20

Theory

3(2+1)

Unit 1.

An introduction to agrochemicals, their type and role in agriculture, effect on environment, soil, human and animal health, merits and demerits of their uses in agriculture, management of agrochemicals for sustainable agriculture.

Unit 2.

Herbicides-Major classes, properties and important herbicides. Fate of herbicides. Fungicides - Classification – Inorganic fungicides - characteristics, preparation and use of sulfur and copper, Mode of action-Bordeaux mixture and copper oxychloride. Organic fungicides- Mode of action- Dithiocarbamates-characteristics, preparation and use of Zineb and maneb. Systemic fungicides- Benomyl, carboxin, oxycarboxin, Metalaxyl, Carbendazim, characteristics and use.

Unit 3.

Introduction and classification of insecticides: inorganic and organic insecticides Organochlorine, Organophosphates, Carbamates, Synthetic pyrethroids Neonicotinoids, Biorationals, Insecticide Act and rules, Insecticides banned, withdrawn and restricted use, Fate of insecticides in soil & plant. IGRs Biopesticides, Reduced risk insecticides, Botanicals, plant and animal systemic insecticides their characteristics and uses.

Unit 4.

Fertilizers and their importance. Nitrogenous fertilizers: Feedstocks and Manufacturing of ammonium sulphate, ammonium nitrate, ammonium chloride, urea. Slow release N-fertilizers. Phosphatic fertilizers: feedstock and manufacturing of single superphosphate. Preparation of bone meal and basic slag. Potassic fertilizers: Natural sources of potash, manufacturing of potassium chloride, potassium sulphate and potassium nitrate. Mixed and complex fertilizers: Sources and compatibility-preparation of major, secondary and micronutrient mixtures. Complex fertilizers: Manufacturing of ammonium phosphates, nitrophosphates and NPK complexes. Fertilizer control order. Fertilizer logistics and marketing. Plant bio-pesticides for ecological agriculture, Bio-insect repellent.

Practical

Sampling of fertilizers and pesticides. Pesticides application technology to study about various pesticides appliances. Quick tests for identification of common fertilizers. Identification of anion and cation in fertilizer. Calculation of doses of insecticides to be used. To study and identify various formulations of insecticide available in market. Estimation of nitrogen in Urea. Estimation of water soluble P_2O_5 and citrate soluble P_2O_5 in single super phosphate. Estimation of potassium in Murrette of Potash/Sulphate of Potash by flame photometer. Determination of copper content in copper oxychloride. Determination of sulphur content in sulphur fungicide. Determination of thiram. Determination of ziram content.

Suggested readings:

- Chemistry and Technology of Agrochemical Formulations by Knowles, Alan (Ed.), Springer
- Pesticides in Agriculture and Environment by Willis B. Wheeler
- Pesticides: Health, Safety and the Environment by Allen Poulter
- Agricultural Pests and their Control by V. B. Awasthi

Course Objectives:

1. Current concept of agrochemicals.
2. To learn about formulation of agrochemicals.
3. To impart the knowledge of the principles and components of fertilizers used in crops.
4. To familiarize the students about the basics methods of used different pesticides etc.
5. To study the basic concept sulphur content in soil.

Course Outcome:

CO1	Students learned about the Introduction, definition, goal and current concepts of different agrochemical.
CO2	Knowledge of sampling of fertilizer and pesticide
CO3	Students familiarize with the different methods of pesticides, herbicides and insecticides
CO4	Gained the knowledge of the various concepts plant bio-pesticides for ecological agriculture
CO5	Studied the basic concept of fertilizer and their importance.

CO-PO-PSO mapping

PO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	2	2	2	1	1	2	1	2	2	2	3	2	2
CO2	3	1	2	2	3	1	1	2	1	3	3	2	3	2	2
CO3	3	1	2	3	3	1	2	2	1	3	3	2	3	2	2
CO4	3	1	2	2	3	1	1	2	1	2	2	1	3	2	2
CO5	3	1	2	3	2	1	1	2	1	3	2	1	2	2	2

B.Sc. (Hons.) Agriculture
Course Title: Commercial Plant Breeding
Course Code: AG237
w.e.f. Session 2019-20

Theory

3(1+2)

Unit 1.

Types of crops and modes of plant reproduction. Line development and maintenance breeding in self and cross pollinated crops (A/B/R and two line system) for development of hybrids and seed production.

Unit 2.

Genetic purity test of commercial hybrids. Advances in hybrid seed production of maize, rice, sorghum, pearl millet, castor, sunflower, cotton pigeon pea, Brassica etc. Quality seed production of vegetable crops under open and protected environment.

Unit 3.

Alternative strategies for the development of the line and cultivars: haploid inducer, tissue culture techniques and biotechnological tools. IPR issues in commercial plant breeding: DUS testing and registration of varieties under PPV & FR Act. Variety testing, release and notification systems in India. Principles and techniques of seed production, types of seeds, quality testing in self and cross pollinated crops.

Practical

Floral biology in self and cross pollinated species, selfing and crossing techniques. Techniques of seed production in self and cross pollinated crops using A/B/R and two line system. Learning techniques in hybrid seed production using male-sterility in field crops. Understanding the difficulties in hybrid seed production, Tools and techniques for optimizing hybrid seed production. Concept of rouging in seed production plot. Concept of line its multiplication and purification in hybrid seed production. Role of pollinators in hybrid seed production. Hybrid seed production techniques in sorghum, pearl millet, maize, rice, rapeseed-mustard, sunflower, castor, pigeon pea, cotton and vegetable crops. Sampling and analytical procedures for purity testing and detection of spurious seed. Seed drying and storage structure in quality seed management. Screening techniques during seed processing viz., grading and packaging. Visit to public private seed production and processing plants.

Suggested Readings:

- Singh, B.D., 1997. *Plant Breeding: Principles and Methods*. Kalyani Publishers, New Delhi. P. 702.
 - Pundan Singh, 1992. *Genetic*. Kalyani Publishers, New Delhi, P. 509.
 - Nagat T, Lorz H & Widholm JM. 2008. *Biotechnology in Agriculture and Forestry*. Springer.
 - Trivedi PC. 2000. *Plant Biotechnology: Recent Advances*. Panima Publishers
 - Spangenberg G. 2001. *Molecular Breeding of Forage Crops*. Kluwer Academic Publishers.
- Chahal GS & Gosal SS. 2002. *Principles and Procedures of Plant Breeding: Biotechnological and Conventional Approaches*. Narosa Publishers

Course Objective

1. Basic knowledge of modes of reproduction
2. To learn about the line development and maintenance breeding
3. To impart the knowledge of genetic purity testing
4. To familiarize the students with haploid inducer mechanism
5. To study the variety testing, release and notification system in India.

Course Outcome:

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	To learn about the types of crops and modes of plant reproduction
CO2	To familiarize the students with development of hybrids and its seed production of different crops
CO3	To gain the knowledge about PPV & FR Act and its implication in breeding
CO4	To understand the tissue culture techniques and biotechnological tools
CO5	To study the quality testing in self and cross-pollinated crops

CO-PO-PSO mapping

PO CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	3	3	1	1	1	1	1	3	1	3	3	2	1
CO2	3	2	3	3	1	1	1	1	1	3	2	3	3	2	1
CO3	3	1	2	3	1	1	1	2	1	2	3	3	3	2	1
CO4	3	1	2	3	1	2	1	2	1	3	2	3	3	2	1
CO5	3	2	3	3	1	2	1	1	1	2	3	3	2	2	1

B.Sc. (Hons.) Agriculture
Course Title: Weed Management
Course Code: AG238
w.e.f. Session 2020-21

Theory

3(2+1)

Unit 1.

Introduction to weeds, characteristics of weeds their harmful and beneficial effects on ecosystem. Classification, reproduction and dissemination of weeds.

Unit 2.

Herbicide classification, concept of adjuvant, surfactant, herbicide formulation and their use. Introduction to mode of action of herbicides and selectivity. Allelopathy and its application for weed management.

Unit 3.

Bio-herbicides and their application in agriculture. Concept of herbicide mixture and utility in agriculture. Herbicide compatibility with agro-chemicals and their application.

Unit 4.

Integration of herbicides with non chemical methods of weed management. Herbicide Resistance and its management.

Practical

Techniques of weed preservation. Weed identification and their losses study. Biology of important weeds. Study of herbicide formulations and mixture of herbicide. Herbicide and agrochemicals study. Shift of weed flora study in long term experiments. Study of methods of herbicide application, spraying equipments. Calculations of herbicide doses and weed control efficiency and weed index.

Suggested Readings:

- Rajagopal, A., Aravindan, R. and Shanmugavelu, K.G., 2015. *Weed management of Horticultural*
- *Crops*. Agrobios (India), Jodhpur. Gupta, O.P. 2015. *Modern Weed Management*. Agro Bios (India), Jodhpur.
- Gupta O P. 1984. *Scientific Weed Management in the Tropics and Sub- Tropics*. Today and Tomorrow's Printers and Publishers. New Delhi.
- Rao V S. 1992. *Principles of Weed Science*. Oxford and IBH Publishing Co. Ltd. New Delhi.
- Reddy Yellamanda T and Shankar Reddy G H. 1995. *Principles of Agronomy*. Kalyani Publishers Ludhiana.

Course Objective

1. Basic knowledge of modes of reproduction
2. To learn about the line development and maintenance breeding
3. To impart the knowledge of genetic purity testing
4. To familiarize the students with haploid inducer mechanism
5. To study the variety testing, release and notification system in India.

Course Outcome:

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	To learn about the types of weeds
CO2	To familiarize with the classification of weeds and herbicides
CO3	To gain the knowledge about Bio-herbicides and their application in agriculture
CO4	To understand the Integration of herbicides management
CO5	To study the Integration of herbicides with non chemical methods

CO-PO-PSO mapping

PO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	3	3	1	1	1	1	1	3	1	3	3	2	1
CO2	3	2	3	3	1	1	1	1	1	3	2	3	3	2	1
CO3	3	1	2	3	1	1	1	2	1	2	3	3	3	2	1
CO4	3	1	2	3	1	2	1	2	1	3	2	3	3	2	1
CO5	3	2	3	3	1	2	1	1	1	2	3	3	2	2	1