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
								Sessional			End sem exam	Sub Total (sessional + exam)				
		L	T	P	CT	TA	Total	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.

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.

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.*
- Dr.A.K.Singh,2009. Entrepreneurship Development and Management. Lakshmi Publications Ltd.,
- S. Anil Kumar, S.C Poornima, M.K. Abhraham and K. Jayashree, 2008; Entrepreneurship Development. New Age International Publishers

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.

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 Dhirendra 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
- JainS C. 2003. *Farm Machinery-Anapproach.* Standard Publishers and Distributors, New Delhi

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.*AText 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

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-sports 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. dies. 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 ourses.UGC, University press, Hyderabad.
- Manohara Chary and Jayaram Reddy 2004.Principles of Environmental studies BB Publishers, Hyderabad.

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.