SEMESTER THIRD

Third Semester								
Sr. No.	**Subject Code**	**Name of the Subject**	**Contact Hours**		**Marks Distribution**			Credits
			Theory	**Practical**	**Internal**	**External**	**Total**	
1.	BAGRS1-351	Crop Production Technology-I (*Kharif* Crops)	1	0	40	60	100	**1**
2.	BAGRS1-352	Environmental Studies and Disaster Management	2	0	40	60	100	**2**
3.	BAGRS1-353	Agricultural Finance and Co-operation	2	0	40	60	100	**2**
4.	BAGRS1-354	Farm Power and Machinery	1	0	40	60	100	**1**
5.	BAGRS1-355	Fundamentals of Plant Breeding	2	0	40	60	100	**2**
6.	BAGRS1-356	Production Technology for Vegetables and Spices	1	0	40	60	100	**1**
7.	BAGRS1-357	Agricultural Informatics	1	0	40	60	100	**1**
8.	BAGRS1-358	Statistical Methods	1	0	40	60	100	**1**
9.	BAGRS1-359	Livestock and Poultry Management	3	0	40	60	100	**3**
10.	BAGRS1-360	Crop Production Technology-I (*Kharif* Crops) Lab	0	2	20	30	50	**1**
11.	BAGRS1-361	Environmental studies and Disaster management Lab	0	2	20	30	50	**1**
12.	BAGRS1-362	Agricultural Finance and Co-operation Lab	0	2	20	30	50	**1**
13.	BAGRS1-363	Farm Power and Machinery Lab	0	2	20	30	50	**1**
14.	BAGRS1-364	Fundamentals of Plant Breeding Lab	0	2	20	30	50	**1**
15.	BAGRS1-365	Production Technology Vegetables and Spices Lab	0	2	20	30	50	**1**
16.	BAGRS1-366	Agricultural Informatics Lab	0	2	20	30	50	**1**
17.	BAGRS1-367	Statistical Methods Lab	0	2	20	30	50	**1**
18.	BAGRS1-368	Livestock Production and Management Lab	0	2	20	30	50	**1**
		Total	**-**	**-**	**540**	**810**	**1350**	**23**

M

SEMESTER III

CROP PRODUCTION TECHNOLOGY-I (KHARIF CROPS)

Subject Code: BAGRS1-351 **LPC- 101** **Duration: 15 Hrs.**

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, Cultural practices and yield of *Kharif c*rops, as per section.

Section-A (3 hours)

Cereals – rice, maize, sorghum, pearl millet and finger millet.

Section-B (4 hours)

Pulses-pigeonpea, mungbean and urdbean.

Section-C (4 hours)

Oilseeds- groundnut, and soybean; fibre crops- cotton & Jute.

Section-D (4 hours)

Forage crops-maize, sorghum, bajra, cowpea, cluster bean and Napier-bajra hybrid.

References: (1) Chhidda Singh, Prem Singh, Rajbir Singh (2018) Modern Techniques for Raising Field Crops.
(2) S.R. Reddy (2008) Agronomy of Field Crops.
(3) R. Prasad (2002) Textbook of Field Crop Production.
(4) M. Joshi (2015) Textbook of Field Crops

ENVIRONMENTAL STUDIES AND DISASTER MANAGEMENT

Subject Code: BAGRS1-352 **LPC-202** **Duration: 30 Hrs.**

Section- A (8 hours)

Environmental studies Definition, scope and importance, Natural Resources, Forest resources, Water resources, Mineral resources, Food resources, Energy resources, Land resources,

Section-B (7 hours)

Ecosystems-Concept of an ecosystem, Structure and function of an ecosystem, Biodiversity and its conservation, Value, Environmental Pollution, Solid Waste Management, Social Issues, Environmental ethics, Wasteland reclamation, Environment Protection Act.

Section-C (7 hours)

Air (Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act.

Section-D (8 hours)

Issues involved in enforcement of environmental legislation. Public awareness, Environment and human health, Women and Child Welfare, Natural Disasters, Climatic change, Man Made Disasters, Disaster Management

M

References: (1) B. K. Paul (2011) Environmental Hazards and Disasters: Contexts, Perspectives and Management.
(2) R. B. Singh (2006) Natural Hazards and Disaster Management: Vulnerability and Mitigation.
(3) M.K. Jha (2010) Natural and Anthropogenic Disasters: Vulnerability, Preparedness and Mitigation
(4) V. Subramanian (2001) A Textbook in Environmental Science

AGRICULTURAL FINANCE AND CO-OPERATION

Subject Code: BAGRS1-353 **LPC: 202** **Duration: 30 Hrs.**

Section-A (8 hours)

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.

Section-B (8 hours)

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.

Section-C (7 hours)

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.

Section-D (7 hours)

Agricultural Cooperation –Meaning, brief history of cooperative development in India, objectives, principles of cooperation, significance of cooperatives in Indian agriculture. Agricultural Cooperation in India- credit, marketing, consumer and multi-purpose cooperatives, farmer's service cooperative societies, processing cooperatives, farming cooperatives, cooperative warehousing: role of ICA, NCUI, NCDC, NAFED.

References: (1) S. Subba Reddyand P. Raghu Ram(1996) Agricultural Finance and Co-operation
(2) R.K. Raut (2018) A Textbook of Agricultural Finance and Cooperation
(3) Sangita Warade & Balak Das Ganvir (2015) Textbook of Agricultural Finance & Cooperation
(4) R. Ahmed (2013) Co-operative and Rural Development in India.

FARM POWER AND MACHINERY

Subject Code: BAGRS1-354 **LPC-101** **Duration: 15 Hrs.**

Section-A (3 hours)

Farm power in India & Sources. IC engine & terminology, Working Principle of 2-stroke &4-Stroke engine & numerical problem.

M

Section-B (4 hours)

Study of different components of 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, Familiarization with power transmission system: clutch, gear box, differential and final drive of a tractor, tractor types, cost analysis of tractor power and attached implements.Different system of tractor, Primary & Secondary implements, Implementation for inter cultural operations, Mulcher.

Section-C (4 hours)

Familiarization with sowing & planting equipment's, Happy Seeder, Seed Drill, Calibration of Seed drill, & paddy transplanter, its mechanism, Direct seedling Rice(DSR) & some numerical problems.

Section-D (4 hours)

Plant protection equipment, Familiarization with Harvesting &Threshing equipment, Cost of operation of tractor & Machinery.

References: (1) M. Muzamil, Asima Jillani (2019) Farm Power and Machinery Agricultural Engineering
(2) Donnell Hunt (2013) Farm Power and Machinery Management
(3) Er. S. Kumar (2018)Farm Power and Machinery
(4) Sharma and Mukesh (2021) Farm Power and Machinery Management

FUNDAMENTALS OF PLANT BREEDING

Subject Code: BAGRS1-355 **LPC- 202** **Duration: 30 Hrs.**

Section-A (8 hours)

Historical development, concept, nature and role of plant breeding, major achievements and future prospects; modes of reproduction and apomixis, self – incompatibility and male sterility- genetic consequences, cultivar options. Domestication, Acclimatization, introduction; Centres of origin/diversity.

Section-B (8 hours)

Genetics in relation to plant breeding, 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, Genetic basis and methods of breeding cross pollinated crops, modes of selection.

Section-C (7 hours)

Heterosis and inbreeding depression, development of inbred lines and hybrids, composite and synthetic varieties; Breeding methods in asexually propagated crops, clonal selection and hybridization; Wide hybridization and pre-breeding.

Section-D (7 hours)

Polyploidy in relation to plant breeding, mutation breeding-methods and uses; Bio technological tools-DNA markers and marker assisted selection. Participatory plant breeding; Intellectual Property Rights, Patenting, Plant Breeders and Farmer's Rights.

References: (1) Phundan Singh (2017) Fundamentals of Plant Breeding

M

(2)**R. W. Allard (2018) Principles of Plant Breeding**
(3) B.D. Singh (2018) A Textbook of Plant Breeding
(4) R.L. Agrawal (2017) Fundamentals of Plant Breeding and Hybrid Seed Production

PRODUCTION TECHNOLOGY FOR VEGETABLE AND SPICES

Subject Code: BAGRS1-356 **LPC- 101** **Duration: 15 Hrs.**

Section-A (3 hours)

Importance of vegetables & spices in human nutrition and national economy, kitchen gardening.brief about origin, area, production, improved varieties and cultivation practices such as time of sowing, sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, harvesting, storage, physiological disorders, disease and pest control and seed production of important vegetable groups: Solanaceous, Cucurbitaceaeous. (Tomato, Brinja;, Chilli, Capsicum, Cucumber, Melons, Gourds, Pumpkin, French bean, Peas).

Section-B (4 hours)

Importance of vegetables & spices in human nutrition and national economy, brief about origin, area, production, improved varieties and cultivation practices such as time of sowing, sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, harvesting, storage, physiological disorders, disease and pest control and seed production of important vegetable groups: Cole(Cabbage, Cauli-flower, Knol- Khol), Root crops(Carrot, Raddish and Beet Root)

Section-C (4 hours)

Importance of vegetables & spices in human nutrition and national economy, brief about origin, area, production, improved varieties and cultivation practices such as time of sowing, sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, harvesting, storage, physiological disorders, disease and pest control and seed production of important vegetable groups: Bulb(Onion, Garlic),Tuber (Potato).

Section-D (4 hours)

Importance of vegetables & spices in human nutrition and national economy, brief about origin, area, production, improved varieties and cultivation practices such as time of sowing, sowing ,transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, harvesting, storage, physiological disorders, disease and pest control and seed production of important vegetable groups: Leafy (Amaranth, Spinach). Perennial vegetables and salad crops and Spices.

References: (1) S. and N.S. Thamburaj (2014) Textbook of Vegetables, Tubercrops and Spices
(2)N.P. Singh (2017) Modern Technology on Vegetable Production
(3) Pradeep Kumar Singh (2016) Applied Production Technology of Vegetables
(4) R.S. Agrawal and Ankur Tiwari (2004) Production Technology of Spices

AGRICULTURAL INFORMATICS

Subject Code: BAGRS1-357 **LPC: 101** **Duration: 15 Hrs.**

Section-A (4 hours)

Computer Programming, General Concepts, Documentation and Program Maintenance, Debugging programs, Errors. Introduction to Visual Basic, Java, Fortran, C/ C++, etc, concepts and standard input/output operations, Variables and Constants, Operators and Expressions, Flow of control, Inbuilt and User defined functions, programming techniques for agriculture/forestry.

M

Section-B (4 hours)

E-Agriculture, concepts, design and development. Application of innovative ways to use information and communication technologies (IT) in agriculture/forestry. ICT for Data Collection, formation of development programmes, monitoring and evaluation of Programmes.

Section-C (4 hours)

Computer Models in agriculture/forestry: statistical, weather analysis and crop simulation models, concepts, structure, inputs-outputs files, limitation, advantages and application of models for understanding plant processes, sensitivity, verification, calibration and validation. IT application for computation of water and nutrient requirement of crops, Computer-controlled devices (automated systems) for Agri-input management, Smartphone mobile apps in Agriculture for farm advises, market price, postharvest management etc; Geospatial technology, concepts, techniques, components and uses for generating valuable agri-information.

Section-D (3 hours)

Decision support systems, taxonomy, components, framework, classification and applications in agriculture/forestry, DSS, Agriculture Information/ Expert System, Soil Information Systems etc for supporting Farm decisions. Preparation of contingent crop-planning and crop calendars using IT tools.

References: (1) R. Chakravarthy(2006) Agri Informatics: An Introduction

(2) G. Vanitha (2011) Agro-Informatics

(3) Jayashankar Pradhan Subrat K Mahapatra ,Subrata K Mohanty, Jwel Bhuiya (2019) Introductory Agri-Informatics

STATISTICAL METHODS

Subject Code: BAGRS1-358 **LPC: 101** **Duration: 15 Hrs.**

Section-A (3 hours)

Introduction to Statistics and its Applications in Agriculture, Graphical Representation of Data, Measures of Central Tendency, and Dispersion.

Section-B (4 hours)

Definition of Probability, Addition and Multiplication Theorem (without proof). Simple problem based on Probability. Binomial and Poisson Distributions, Definition of Correlation, Scatter Diagram. Karl Pearson's Coefficient of Correlation. Linear Regression Equations.

Section-C (4 hours)

Introduction to Test of Significance, One sample & two sample test t for Means, Chi-Square Test Of Independence of Attributes in 2 x2 Contingency Table.

Section-D (4 hours)

Introduction to Analysis of Variance, Analysis of One Way Classification. 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.

References: (1) S.P. Gupta (2000) Statistical Methods
(2) S.C. Gupta and V.K. Kapoor (2014) Fundamentals of Statistical Methods
(3) N.G. Das (2008) Statistical Methods

M

LIVESTOCK AND POULTRY MANAGEMENT

Subject Code: BAGRS1-359 **LPC: 303** **Duration: 45 Hrs.**

Section A (12 hours)

Role of livestock in the national economy. Housing principles, space requirements for different species of livestock and poultry. Management of calves, growing heifers and milch animals. Management of sheep, goat and swine. Incubation, hatching and brooding. Management of growers and layers.

Section-B (10 hours)

Important Indian and exotic breeds of cattle, buffalo, sheep, goat, swine and poultry. Improvement of farm animals and poultry.

Section-C (13 hours)

Reproduction in 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.

Section-D (10 hours)

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

References: (1) C.K. Thomas, N.S.R. Sastry, and R.A. Singh (2005) Livestock Production Management

(2) Shraddha Shrivastava and V. N. Gautam (2017) A Textbook of Livestock Production and Management

(3) Sunil Kumar and B.K. Mishra (2013) Livestock Production and Management: Recent Trends and Future Prospects

CROP PRODUCTION TECHNOLOGY-I (KHARIF CROPS) LAB

Subject Code: BAGRS1-360 **LPC: 021** **Duration: 30 Hrs.**

Rice nursery preparation, transplanting of rice, sowing of soybean, pigeon-pea and mungbeanmaize, 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.

ENVIRONMENTAL STUDIES AND DISASTER MANAGEMENT LAB

Subject Code: BAGRS1-361 **LPC: 021** **Duration: 30 Hrs.**

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.

M

AGRICULTURAL FINANCE AND CO-OPERATION LAB

Subject Code: BAGRS1-362 **LPC: 021** **Duration: 30 Hrs.**

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 first-hand 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.

FARM MACHINERY AND POWER LAB

Subject Code: BAGRS1-363 **LPC: 021** **Duration: 30 Hrs.**

Study of different Components of IC 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 and disc plough. Study of Mould Board plough, different parts, measurement, Plough size, and Horizontal & Vertical Suction. Study of Reversible Mould Board Plough, disc plough & disc harrow. Familiarization with seed cum fertilizer drill, Furrow openers, Seed metering mechanism& calibration. Familiarization with different types of sprayers & dusters. Familiarization with Harvesting and Threshing machinery. Familiarization with planter, transplanter. Familiarization with different Intercultural equipment.

FUNDAMENTALS OF PLANT BREEDING LAB

Subject Code: BAGRS1-364 **LPC: 021** **Duration: 30 Hrs.**

Plant Breeder's kit, Study of germ-plasm 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. Handing of segregation populations. Methods of calculating mean, range, variance, standard deviation, heritability. Designs used in plant breeding experiment, 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

PRODUCTION TECHNOLOGY FOR VEGETABLE AND SPICES LAB

Subject Code: BAGRS1-365 **LPC: 021** **Duration: 30 Hrs.**

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

M

AGRICULTURAL INFORMATICS LAB

Subject Code: BAGRS1-366 **LPC: 021** **Duration: 30 Hrs.**

Study of Computer Components, accessories, practice of important DOS Commands. Introduction of different operating systems such as windows, UNIX, Linux, Creating, Files & Folders, File Management. Use of MS-WORD and MS Power point for creating, editing and presenting a scientific Document, Handling of Tabular data, animation, video tools, art tool, graphics, template & designs. MS-EXCEL - Creating a spreadsheet, use of statistical tools, writing expressions, creating graphs, analysis of scientific data, handling macros. MS-ACCESS: Creating Database, preparing queries and reports, demonstration of Agri-information system. Introduction to World Wide Web (WWW) and its components, creation of scientific website, presentation and management agricultural information through web. Introduction of various programming languages such as Visual Basic, Java, Fortran, C, C++, and their components Hands on practice on writing small programmes. Hands on practice on Crop Simulation Models (CSM), DSSAT/Crop-Info/CropSyst/ Wofost. Preparation of Inputs file for CSM and study of model outputs, computation of water and nutrient requirements of crop using CSM and IT tools. Use of smart phones and other devices in agro-advisory and dissemination of market information. Introduction of Geospatial Technology, demonstration of generating information important for Agriculture. Hands on practice on preparation of Decision Support System.

STATISTICAL METHODS LAB

Subject Code: BAGRS1-367 **LPC: 021** **Duration: 30 Hrs.**

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, 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 x2 contingency table. Analysis of Variance One Way Classification. Analysis of one way. Selection of random sample using Simple Random Sampling.

LIVESTOCK & POULTRY MANAGEMENT LAB

Subject Code: BAGRS1-368 **LPC: 021** **Duration: 30 Hrs.**

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 equipment's. Management of chicks, growers and layers. Debeaking, dusting and vaccination. Economics of cattle, buffalo, sheep, goat, swine and poultry production.

M