

**MRSPTU B.SC. (HONS.) AGRICULTURE SYLLABUS 2019 BATCH ONWARDS**

<b>Fourth Semester</b>								
Sr. No.	Subject Code	Name of the Subject	Contact Hours		Marks Distribution			Credits
			Theory	Practical	External	Internal	Total	
1.	BAGRS1-451	Crop Production Technology-II (Rabi Crops)	1	0	40	60	100	1
2.	BAGRS1-452	Problematic Soils and their management	2	0	40	60	100	2
3.	BAGRS1-453	Production technology for Fruits and Plantation crops	1	0	40	60	100	1
4.	BAGRS1-454	Farming system and Sustainable Agriculture	1	0	40	60	100	1
5.	BAGRS1-455	Agro-meteorology and Climate Change	1	0	40	60	100	1
6.	BAGRS1-456	Agricultural Marketing, Trade and Prices	2	0	40	60	100	2
7.	BAGRS1-457	Renewable Energy and Green Technology	1	0	40	60	100	1
8.	BAGRS1-458	Principles of Seed Technology	1	0	40	60	100	1
9.	BAGRS1-459	Production Technology for Ornamental Crops, MAP and Landscaping	1	0	40	60	100	1
10.	BAGRS1-460	Fundamentals of Plant Biotechnology	2	0	40	60	100	2
11.	BAGRS1-461	Crop Production Technology-II (Rabi Crops) Lab	0	2	20	30	50	1
12.	BAGRS1-462	Problematic Soils and their management Lab	0	2	20	30	50	1
13.	BAGRS1-463	Agro-meteorology and Climate Change Lab	0	2	20	30	50	1
14.	BAGRS1-464	Agricultural Marketing, Trade and Prices Lab	0	2	20	30	50	1
15.	BAGRS1-465	Renewable Energy and Green Technology Lab	0	2	20	30	50	1
16.	BAGRS1-466	Principles of Seed Technology Lab	0	2	20	30	50	1
17.	BAGRS1-467	Production Technology for Ornamental Crops, MAP and Landscaping Lab	0	2	20	30	50	1
18.	BAGRS1-468	Fundamentals of Plant Biotechnology Lab	0	2	20	30	50	1

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<b>19.</b>	XXXXX	<b>Elective</b> Agrochemicals/Commercial Plant Breeding/Bio-pesticides and Bio-fertilizers/ Weed Management	2	0	40	60	100	<b>2</b>
<b>20.</b>	XXXXX	<b>Elective (Lab)</b> Agrochemicals/Commercial Plant Breeding/Bio-pesticides and Bio-fertilizers/Weed Management	0	2	20	30	50	<b>1</b>
		<b>Total</b>	-	-	620	930	1550	24

**Electives:**

1. Agrochemicals: **BAGRD1-471**
2. Commercial Plant Breeding: **BAGRD1-472**
3. Bio-pesticides and Bio-fertilizers: **BAGRD1-473**
4. Weed Management: **BAGRD1-474**

**Electives Lab:**

1. Agrochemicals Lab: **BAGRD1-475**
2. Commercial Plant Breeding Lab: **BAGRD1-476**
3. Bio-pesticides and Bio-fertilizers Lab: **BAGRD1-477**
4. Weed Management Lab: **BAGRD1-478**

## SEMESTER IV

### CROP PRODUCTION TECHNOLOGY-II (RABI CROPS)

**Subject Code: BAGRS1-451**

**L P C  
1 0 1**

**Duration: 15 Hours**

#### Section-A (4 Hours)

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, Cultural practices and yield of rabi crops as per section: Cereals –wheat and barley, pulses-chickpea, lentil, peas.

#### Section-B (4 Hours)

Oilseeds-rapeseed, mustard and sunflower

#### Section-C (4 Hours)

Sugar crops-sugarcane; medicinal and aromatic crops-mentha, lemon grass and citronella

#### Section-D (3 Hours)

Forage crops-berseem, lucerne and oat.

### PROBLEMATIC SOILS AND THEIR MANAGEMENT

**Subject Code: BAGRS1-452**

**L P C  
2 0 2**

**Duration: 30 Hours**

#### Section-A (8 Hours)

Soil quality and health, Distribution of Waste land and problem soils in India, their Categorization based on properties. Problematic soils under different Agro-ecosystems.

#### Section-B (8 Hours)

Reclamation and management of Saline and sodic soils, Acid soils, Acid Sulphate soils, Eroded and Compacted soils, Flooded soils, Polluted soils. Multipurpose tree species, bio remediation through MPTs of soils.

#### Section-C (7 Hours)

Remote sensing and GIS in diagnosis and management of problem soils. land capability and classification, land suitability classification.

#### Section-D (7 Hours)

Irrigation water – quality and standards, utilization of saline water in agriculture.

### PRODUCTION TECHNOLOGY OF FRUIT AND PLANTATION CROPS

**Subject Code: BAGRS1-453**

**L P C  
1 0 1**

**Duration: 15 Hours**

#### Section-A (4 Hours)

Importance and scope of fruit and plantation crop industry in India, Importance of rootstocks.

#### Section-B (4 Hours)

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

**Section-C (4 Hours)**

Minor fruits- date, ber, pineapple, pomegranate, jackfruit, strawberry

**Section-D (3 Hours)**

Plantation crops-coconut, arecanut, cashew, tea, coffee & rubber.

**FARMING SYSTEM AND SUSTAINABLE AGRICULTURE**

**Subject Code: BAGRS1-454**

**L P C  
1 0 1**

**Duration: 15 Hours**

**Section-A (4 Hours)**

Farming System-scope, importance, and concept, Types and systems of farming system and factors affecting types of farming, Farming system components and their maintenance

**Section-B (4 Hours)**

Cropping system and pattern, multiple cropping system, Efficient cropping system and their evaluation, Allied enterprises and their importance, Tools for determining production and efficiencies in cropping and farming system

**Section-C (4 Hours)**

Sustainable agriculture-problems and its impact on agriculture, indicators of sustainability, adaptation and mitigation, conservation agriculture strategies in agriculture, HEIA, LEIA and LEISA and its techniques for sustainability.

**Section-D (3 Hours)**

Integrated farming system-historical background, objectives and characteristics, components of IFS and its advantages, Site specific development of IFS model for different agro-climatic zones, resource use efficiency and optimization techniques, Resource cycling and flow of energy in different farming system, farming system and environment, Visit of IFS

**INTRODUCTORY AGRO-METEOROLOGY & CLIMATE CHANGE**

**Subject Code: BAGRS1-455**

**L P C  
1 0 1**

**Duration: 15 Hours**

**Section-A (4 Hours)**

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

**Section-B (4 Hours)**

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, vapour pressure, process of condensation, formation of dew, fog, mist, frost, cloud; Precipitation, process of precipitation, types of precipitation such as rain, snow, sleet, and hail.

**Section-C (4 Hours)**

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.

**Section-D (3 Hours)**

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.

**AGRICULTURAL MARKETING, TRADE AND PRICES**

**Subject Code: BAGRS1-456**

**L P C  
2 0 2**

**Duration: 30 Hours**

**Section-A (8 Hours)**

Agricultural Marketing: Concepts and definitions of market, marketing, agricultural marketing, market structure, 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.

**Section-B (8 Hours)**

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.

**Section-C (7 Hours)**

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: 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.

**Section-D (7 Hours)**

Role of Govt. in agricultural marketing: Public sector institutions- CWC, SWC, FCI, CACP &DMI – their objectives and functions cooperative marketing in India; 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. GATT and WTO; Agreement on Agriculture (AoA) and its implications on Indian agriculture; IPR.

**RENEWABLE ENERGY & GREEN TECHNOLOGY**

**Subject Code: BAGRS1-457**

**L P C  
1 0 1**

**Duration: 15 Hours**

**Section-A (4 Hours)**

Classification of energy sources and their contribution in Agricultural sector. Briquettes and uses of briquettes.

**Section-B (4 Hours)**

Biomass utilization for bio-fuel production and their application, Biogas, Bio-alcohol, Biodiesel and bio-oil production and their utilization as bio-energy resources.

**Section-C (4 Hours)**

Introduction to solar energy, Collection and their applications, Solar energy Gadgets, Solar cooker, solar water heater.

**Section-D (3 Hours)**

Application of Solar Energy; Solar drying, Solar pond, Solar pump, Solar distillation, Solarphoto-voltaic system and their application. Introduction to wind energy, types and their application.

**PRINCIPLES OF SEED TECHNOLOGY**

**Subject Code: BAGRS1-458**

**L P C  
1 0 1**

**Duration: 15 Hours**

**Section- A (4 Hours)**

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. Foundation and certified seed production of important cereals, pulses, oilseeds, fodder and vegetables.

**Section-B (4 Hours)**

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. Detection of genetically modified crops, Transgene contamination in non-GM crops, GM crops and organic seed production.

**Section-C (4 Hours)**

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.

**Section-D (3 Hours)**

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.

**PRODUCTION TECHNOLOGY FOR ORNAMENTAL CROPS, MAPS AND LANDSCAPING**

**Subject Code: BAGRS1-459**

**L P C**

**Duration: 15 Hours**

**1 0 1**

**Section-A (4 Hours)**

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

**Section-B (4 Hours)**

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

**Section-C (4 Hours)**

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

**Section-D (3 Hours)**

Aromatic plants like mint, lemongrass, citronella, palmarosa, ocimum, rosegeranium, vetiver. Processing and value addition in ornamental crops and MAPs produce.

**FUNDAMENTALS OF PLANT BIOTECHNOLOGY**

**Subject Code: BAGRS1-460**

**L P C**

**Duration: 30 Hours**

**2 0 2**

**SECTION-A (8 Hours)**

Concepts and applications of plant biotechnology Scope: embryo culture, anther culture, pollen culture, organ culture, cell suspension culture, callus culture, ovule culture and their applications. Michaelis & Menten and Line Weaver Burk equation & plots; Introduction to allosteric enzymes. Nucleic acids: Importance and classification; Structure of Nucleotides, A, B & Z DNA; RNA: Types and Secondary & Tertiary structure. Metabolism of carbohydrates: Glycolysis, TCA cycle, Glyoxylate cycle, Electron transport chain. Metabolism of lipids: Beta oxidation, Biosynthesis of fatty acids.

**SECTION-B (8 Hours)**

Micro-propagation methods; organogenesis and embryogenesis, Synthetic seeds and their significance; somatic hybridization and cybrids, Embryo rescue and its significance, Somaclonal variation and its use in crop improvement, cryo-preservation.

**SECTION-C (7 Hours)**

Introduction to recombinant DNA methods: physical (Gene gun method), chemical (PEGmediated) and *Agrobacterium* mediated gene transfer methods; Transgenics and its importance in crop improvement.

**SECTION-D (7 Hours)**

PCR techniques and its applications; RFLP, RAPD, SSR; Marker Assisted Breeding in crop improvement; Biotechnology regulations.

**CROP PRODUCTION TECHNOLOGY-II (RABI CROPS) LAB**

**Subject Code: BAGRS1-461**

**L P C  
0 2 1**

**Duration: 30 Hours**

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

**INTRODUCTORY AGRO-METEOROLOGY & CLIMATE CHANGE LAB**

**Subject Code: BAGRS1-463**

**L P C  
0 2 1**

**Duration: 30 Hours**

**Practical:**

Visit of Agro-meteorological 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.

**AGRICULTURAL MARKETING, TRADE AND PRICES LAB**

**Subject Code: BAGRS1-464**

**L P C  
0 2 1**

**Duration: 30 Hours**

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; 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.

**RENEWABLE ENERGY & GREEN TECHNOLOGY LAB**

**Subject Code: BAGRS1-465**

**L P C  
0 2 1**

**Duration: 30 Hours**

- To study biogas plants.
- To study Gasifiers.
- To study the production process of bio diesel.
- To study briquetting machine.
- To study the production process of bio-fuels.
- To study soar cooker.
- To study solar drying system.
- To study solar distillation.
- To study the performance of wind mill.



**PRINCIPLES OF SEED TECHNOLOGY LAB**

**Subject Code: BAGRS1-466**

**L P C  
0 2 1**

**Duration: 30 Hours**

Seed production in major cereals: Wheat, Rice, Maize, Sorghum, and Bajra. 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: Solanaceous, Cruciferous, Malvaceous, Amaryllidaceous and Cucurbitaceous Seed sampling and testing: Physical purity, germination, viability, etc. Seed and seed vigour test. Genetic purity test: Grow out test. Seed certification: Procedure, Field inspection and preparation of field inspection report.

**PRODUCTION TECHNOLOGY FOR ORNAMENTAL CROPS, MAPS AND LANDSCAPING LAB**

**Subject Code: BAGRS1-467**

**L P C  
0 2 1**

**Duration: 30 Hours**

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.

**PROBLAMATIC SOILS AND THEIR MANAGEMENT LAB**

**Subject Code: BAGRS1-462**

**L P C  
0 2 1**

**Duration: 30 Hours**

- Characterization of acid, acid sulfate, salt-affected and calcareous soils.
- Determination of cations ( $\text{Na}^+$ ,  $\text{K}^+$ ,  $\text{Ca}^{++}$  and  $\text{Mg}^{++}$ ) in irrigation water and soil samples.
- Determination of anions ( $\text{Cl}^-$ ,  $\text{SO}_4^{--}$ ,  $\text{CO}_3^{--}$  and  $\text{HCO}_3^-$ ) in irrigation waters and soil samples.
- Determination of  $\text{CaCO}_3$  in calcareous soils.
- Lime requirements of acid soil and gypsum requirements of sodic soil.

Computation of SAR and RSC of irrigation water

**FUNDAMENTALS OF PLANT BIOTECHNOLOGY LAB**

**Subject Code: BAGRS1-468**

**L P C  
0 2 1**

**Duration: 30 Hours**

Sterilization techniques. Composition of various tissue culture media and preparation of stock solutions for MS nutrient medium. Callus induction from various explants. Micropropagation, hardening and acclimatization. Demonstration of isolation and quantification of nucleic acids. Demonstration of gel electrophoresis techniques and DNA finger printing. Demonstration of gene transfer techniques.

## **Elective**

### **AGROCHEMICALS**

**Subject Code: BAGRD1-471**

**L P C  
2 0 2**

**Duration: 30 Hours**

#### **SECTION-A (8 Hours)**

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. Herbicides-Major classes, properties and important herbicides. Fate of herbicides

#### **SECTION-B (8 Hours)**

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.

#### **SECTION-C (7 Hours)**

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.

#### **SECTION-D (7 Hours)**

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 potassiumchloride, 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.

### **COMMERCIAL PLANT BREEDING**

**Subject Code: BAGRD1-472**

**L P C  
2 0 2**

**Duration: 30 Hours**

#### **SECTION-A (8 Hours)**

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

#### **SECTION-B (8 Hours)**

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.

#### **SECTION-C (7 Hours)**

Alternative strategies for the development of the line and cultivars: haploid inducer, tissue culture techniques and biotechnological tools.

**SECTION-D (7 Hours)**

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.

**BIOPESTICIDES AND BIOFERTILIZERS**

**Subject Code: BAGRD1-473**

**L P C  
2 0 2**

**Duration: 30 Hours**

**SECTION-A (8 Hours)**

History and concept of biopesticides. Importance, scope and potential of biopesticide. Definitions, concepts and classification of biopesticides viz. pathogen, botanical pesticides, and biorationales.

**SECTION-B (8 Hours)**

Botanicals and their uses. Mass production technology of bio-pesticides. Virulence, pathogenicity and symptoms of entomopathogenic pathogens and nematodes. Methods of application of biopesticides. Methods of quality control and Techniques of biopesticides. Impediments and limitation in production and use of biopesticide.

**SECTION-C (7 Hours)**

Biofertilizers - Introduction, status and scope. Structure and characteristic features of bacterial biofertilizers- *Azospirillum*, *Azotobacter*, *Bacillus*, *Pseudomonas*, *Rhizobium* and *Frankia*; Cynobacterialbiofertilizers- *Anabaena*, *Nostoc*, *Hapalosiphon* and fungal biofertilizers- AM mycorrhiza and ectomycorrhiza. Nitrogen fixation -Free living and symbiotic nitrogen fixation. Mechanism of phosphate solubilization and phosphate mobilization, K solubilization.

**SECTION-D (7 Hours)**

Production technology: Strain selection, sterilization, growth and fermentation, mass production of carrier based and liquid biofertilizers. FCO specifications and quality control of biofertilizers. Application technology for seeds, seedlings, tubers, sets etc. Biofertilizers -Storage, shelf life, quality control and marketing. Factors influencing the efficacy of biofertilizers.

**WEED MANAGEMENT**

**Subject Code: BAGRD1-474**

**L P C  
2 0 2**

**Duration: 30 Hours**

**Section-A (8 Hours)**

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

**Section-B (8 Hours)**

Herbicide classification, concept of adjuvant, surfactant, herbicide formulation and their use. Introduction to mode of action of herbicides and selectivity.

**Section-C (7 Hours)**

Allelopathy and its application for weed management. Bio-herbicides and their application in agriculture. Concept of herbicide mixture and utility in agriculture. Herbicide compatibility with agro-chemicals and their application.

**Section-D (7 Hours)**

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

**AGROCHEMICALS LAB**

**Subject Code: BAGRD1-475**

**L P C  
0 2 1**

**Duration: 30 Hours**

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<sub>2</sub>O<sub>5</sub> and citrate soluble P<sub>2</sub>O<sub>5</sub> in single super phosphate. Estimation of potassium in Muriate 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.

**COMMERCIAL PLANT BREEDING LAB**

**Subject Code: BAGRD1-476**

**L P C  
0 2 1**

**Duration: 30 Hours**

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.

**BIOPESTICIDES AND BIOFERTILIZERS LAB**

**Subject Code: BAGRD1-477**

**L P C  
0 2 1**

**Duration: 30 Hours**

Isolation and purification of important biopesticides: *Trichoderma*, *Pseudomonas*, *Bacillus*, *Metarhizium* etc. and its production. Identification of important botanicals. Visit to biopesticide laboratory in nearby area. Field visit to explore naturally infected cadavers. Identification of entomopathogenic entities in field condition. Quality control of biopesticides. Isolation and purification of *Azospirillum*, *Azotobacter*, *Rhizobium*, P-solubilizers and cyanobacteria. Mass multiplication and inoculum production of biofertilizers. Isolation of AM fungi -Wet sieving method and sucrose gradient method. Mass production of AM inoculants.

**WEED MANAGEMENT LAB**

**Subject Code: BAGRD1-478**

**L P C  
0 2 1**

**Duration: 30 Hours**

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.