

B.Sc.(Hons.)Ag. Semester –V NEP Syllabus

S. No	Course code	Course title	Credit hours	Mark Distribution				
				T	I	P	Total	
1.	AG-501	Rainfed and dryland Agriculture	2(1+1)	50	20	30	100	
2.	AG-502	Crop Improvement-1(<i>Kharif</i> crops)	2(1+1)	50	20	30	100	
3.	AG-503	Pests of Crops and Stored Grain and their Management	3(2+1)	50	20	30	100	
4.	AG-504	Agricultural Marketing Trade & Prices	3(2+1)	50	20	30	100	
5.	AG-505	Protected Cultivation and Secondary Agriculture	3(2+1)	50	20	30	100	
6.	AG-506	Diseases of Field and Horticultural Crops and their Management-I	3(2+1)	50	20	30	100	
7.	AG-507	Production Technology for Fruit and Plantation Crops	2(1+1)	50	20	30	100	
8.	AG-508	Communication Skills and Personality Development	2(1+1)	50	20	30	100	
9.	AG-509	Intellectual Property Rights	1(1+0)	80	20	--	100	
10	AG-510	Principles of Food Science & Nutrition	3(2+1)	50	20	30	100	
11	AG-511	Geo-informatics and Nano technology	2(1+1)	50	20	30	100	
12	Elective (Optional Choice any One Paper)	AGE-51	Agri-business Management	3(2+1)	50	20	30	100
		AGE-52	Agrochemicals	3(2+1)	50	20	30	100
		AGE-53	Commercial Plant Breeding	3(1+2)	50	20	30	100
		AGE-54	Landscaping	3(2+1)	50	20	30	100
		AGE-55	Food Safety and Standards	3(2+1)	50	20	30	100
		AGE-56	Bio pesticides & Bio fertilizers	3(2+1)	50	20	30	100
Total			29 Credit					

Theory	Internal	Practical
50	20	30

Rainfed and Dryland Agriculture:

2(1+1) AG-501

Theory

Rainfed and dryland agriculture-Introduction. types and history. Problems & prospects of rainfed agriculture in India. Soil and climatic conditions prevalent in rainfed areas. Drought: types, effect of water deficit on physico-morphological characteristics of the plants. Mechanism of crop adoption under moisture deficit conditions. Efficient utilization of water through soil and crop management practices, management of crops in rainfed areas. Contingent crop planning for aberrant weather conditions. Precision agriculture; concepts and techniques: their issues and concerns for Indian agriculture.

Practical

Studies on climatic classifications, studies on rainfall pattern in rainfed areas of the country. Studies on cropping pattern of different dry land areas in the country and demarcation of dryland area on map of India. Interpretation of meteorological data and scheduling of supplemental irrigations on the basis of evapo-transpiration demand of crops effective rainfall and its calculations. Visit to rainfed research stations/watersheds.

Theory	Internal	Practical
50	20	30

Crop Improvement-I (Kharif Crops)

2(1+1) AG-

502

Theory

Centers of origin. Distribution of species. Wild relatives in different cereals (Rice, Maize, Sorghum and Pearl millet); pulses (Pigeon pea, Urdbean and Mungbean); oilseeds (Groundnut); fibre (Cotton). Important concepts of breeding self-pollinated and cross pollinated. Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for yield, adaptability, stability, abiotic and biotic stress and quality (physical, chemical, nutritional); Hybrid seed production technology in Maize, Rice, Sorghum, Pearl millet and Pigeonpea.

Practical

Floral biology, emasculation and hybridization techniques in different crop species; viz., Rice, Maize, Sorghum, Pearl millet, Pigeonpea, Urdbean, Mung bean, Groundnut, Cotton crops. Maintenance breeding of different kharif crops. Handling of germ plasm and segregating populations by different methods like pedigree, bulk and single seed descent methods; Study of field techniques for seed production and hybrid seeds production in Kharif crops; Estimation of heterosis, inbreeding depression and heritability; Layout of field experiments; Study of quality characters, donor parents for different characters; Visit to seed production plots; Visit to AICRP plots of different field crops.

Theory	Internal	Practical
50	20	30

PESTS OF FIELD CROPS, STORED GRAINS AND THEIR MANAGEMENT 3(2+1)AG-503

Theory

General account on nature and type of damage by following insect pests arthropods pests. Scientific name, order, family, host range, distribution, biology and bionomics. nature of damage, and management of major pests and scientific name, order, family, host range, distribution, nature of damage and control practice other important arthropod pests(mites) of various field crops. Factors affecting losses of stored grain and role of physical, biological, mechanical and chemical factors in deterioration of grain. Insect pests, mites, rodents, birds and microorganisms associated with stored grain and their management. Storage structure and methods of grain storage and fundamental principles of grain store management.

Paddy: *Leptocorisavaricroms*, *HieroglyphusSpp.*, *Nilaparvatalugens*, *Nephotetix,spp.*, *Mythimnaseparata*.

JowarMaize: *Chilopartellus*. *Atherigonavariasoccata*, *Scirpophagaexcerpatalis*. *Chiloinfuscatelles*

Sugarcane: *Topborer*, *Pyrilla*, *EarlyShootborer* and *whitefly*

Cotton: *Pectinaphoragossypiella*. *EariasSpp*, *Syleptaderogata*, *DysdercusSpp*, *Bemisiatabacz*. *Amrascabzgutulla*

Oilseeds: *Lipaphiserysimi*, *Athaliaproxima* *Ragrada Cruciferarun*, *Dasyneura*

Pulses: *Helicoverpaarmigera* *AgrotisSpp.*, *Etiellazinckenella*

Pests of Stored Grains: *Sitophilus oryzae*, *Trogoderma granarium*, *Sitotroga cerealella*, *Callosobruchuschinensis*.

Polyphagouspests: *Odontotermesobesus*, *Holotrichiaconsanguinea*, *Spilosomaobliqua*, *Spodopteralitura*, *AmsactaSpp*

Practical

Identification of different types of damage. Identification and study of life cycle and seasonal history of various insect pests attacking field crops and their produce. Identification of insect pests and Mites associated with stored grain. Determination of insect infestation by different methods. Assessment of losses due to insects. Calculations on the doses of insecticides application technique. Fumigation of grain store in godown. Identification of rodents and rodent control operations in godowns. Identification of birds and bird control operations in godowns. Determination of moisture content of grain. Methods of grain sampling under storage condition. Visit to Indian Storage Management and Research Institute, Hapur and Quality Laboratory. Department of Food., Delhi. Visit to nearest FCI godowns.

Theory	Internal	Practical
50	20	30

AG-504: Agricultural Marketing, Trade and Prices

3(2+1)

Theory

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; 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: 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; Risk in marketing: Types of risk in marketing; speculation & hedging; an overview of future 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; IPRGST.

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. SYNC,-CWC, cooperative marketing society, etc. to study their organization and functioning; Application of principles of comparative advantage of international trade.

Theory	Internal	Practical
50	20	30

Protected Cultivation and Secondary Agriculture

3(2+1) AG-505

Theory

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

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

bed dryer, recirculatory dryer and solar dryer). Material handling equipment: conveyer and elevators, their principle, working and selection.

Practical

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

Theory	Internal	Practical
50	20	30

Diseases of Field and Horticultural Crops & their Management-I 3(2+1) AG-506

Theory

Symptoms, etiology, disease cycle and management of major diseases of following crops: Field Crops: Rice: Blast, Brown spot, Bacterial Blight. Sheath blight, false smut, Khaira and tungro; Maize: stalkrots, downymildew.; Sorghum: smuts; Bajra: downy mildew and ergot; Groundnut: early and leafspots; Pigeonpea: Phytophthora blight, wilt and sterility mosaic; Greengram: Cercospora leaf spot, web blight and yellow mosaic;

Tobacco: Mosaic. Horticultural Crops: Guava: wilt and anthracnose; Banana: Panama wilt, sigatoka and bunchytop; Papaya: foot rot and leafcurl.

Cruciferous vegetable: Alternaria leaf spot and black rot; Brinjal: phomopsis blight, sclerotiniaand little leaf; Tomato: early and late blight, leaf curl and mosaic; Okra: Yellow Vein Mosaic; Beans: Anthracnose and bacterial blight: ginger: softrot; Colocasia: Phytophthora blight.

Practical

Identification and histopathological studies of selected diseases of field and horticultural cropscovered in theory. Field visit for the diagnosis of field problems. Collection and preservation of plant diseased specimens for herbarium Note: Students should submit 10 pressed and well-mounted specimens.

Theory	Internal	Practical
50	20	30

Production Technology for Fruit and Plantation Crops **2(1+1) AG-507**

Theory

Importance and scope of fruit and plantation crop industry in India; High density planting; Use of root stocks; Production technologies for the cultivation of major fruits- mango, banana, citrus, grape, guava, Litchi, papaya, apple, pear, peach and; minor fruits- pineapple, pomegranate, jackfruit, strawberry. nut crops; plantation crops- coconut, reanut, cashew, tea, coffee & rubber.

Practical

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

Theory	Internal	Practical
50	20	30

Communication Skills and Personality Development**2(1+1) AG-508****Theory**

Communication: meaning and definition: Principles and process of communication. Models and barriers to communication; Verbal and nonverbal communication. Communication Skills: Listening and note taking, writing skills, oral presentation skills; field diary and lab record; indexing, footnote and bibliographic procedures. Reading and comprehension of general and technical articles, precise writing, summarizing, abstracting; individual and group presentations, impromptu presentation, public speaking; Group discussion. Organizing seminars and conferences. Diffusion and adoption of innovation: concept and meaning, process and stages of adoption, adopter categories.

Theory	Internal	Practical
80	20	---

Intellectual Property Rights

1(1+0) AG-509

Theory

Introduction and meaning of intellectual property, brief introduction to GATT, WTO. TRIPS and WIPO, Treaties for IPR protection; Types of Intellectual Property and legislations covering IPR in India:-Patents, Copyrights, Trademark, Industrial design, Geographical indications, Integrated circuits, Trade secrets. Patents Act 1970 and Patent system in India, patent ability. process and product patent, filing of patent, patent specification, patent claims, Patent opposition and revocation, infringement, Compulsory licensing. Patent Cooperation Treaty, Patent search and patent database. Origin and history including a brief introduction to UPOV for protection of plant varieties, Protection of plant varieties under UPOV and PPV&FR Act of India, Plant breeder's rights, Registration of plant varieties under PPV&FR Act 2001, breeders, researcher and farmers rights. International treaty on plant genetic resources for food and agriculture (ITPGRFA). Indian Biological Diversity Act, 2002 and its salient features, access and benefit sharing.

Theory	Internal	Practical
50	20	30

AG-510 Principles of Food Science and Nutrition

3(2+1)

Theory:

Definition of food and food science. Composition of food, Foods of animal origin, Digestive system of Ruminants. Definition, Chemistry and Function of Carbohydrate, Fat, Proteins and Water. Requirement. Availability. Functions and Nutritional deficiency disease of minerals and vitamins. Flavours and colours used in food. Food microbiology with special reference to milk, Physio Chemical properties of milk.

Composition and processing of egg, meat and chicken, feed additives, antibiotics, enzymes and hormones.

Practical

1. Sampling of milk.
2. Specific gravity of milk by lactometer.
3. Water quality test.
4. Study of Nutritional deficient conditions.
5. Study of Nutritional disorders.
6. Quality parameters for egg, meat and chicken.
7. Fatness by Gerber's method.
8. T.S. & S.N.F. percentage by Richmond's scale and formula.

Theory	Internal	Practical
50	20	30

Geo-informatics and Nano-technology

2(1+1) AG-511

Theory

Geo-informatics- definition concepts, tool and techniques; their use in Precision Agriculture. Crop discrimination and yield monitoring, soil mapping; fertilizer recommendation using geospatial technologies: Spatial data and their management in GIS; Remote sensing concepts and application in agriculture; Image processing and interpretation; Global positioning system (GPS), components and its functions; Nanotechnology, definition, concepts and techniques, brief introduction about nano scale effects, nano-particles, nano-pesticides, nano-fertilizers, nano-sensors. Use of nanotechnology in seed, water, fertilizer, plant protection for scaling-up farm productivity.

Practical

Introduction to GIS software, Introduction to image processing software. Visual interpretation of remote sensing images. Generation of spectral profiles of different objects. Supervised and unsupervised classification and acreage estimation.. Multispectral remote sensing for soil mapping. Creation of thematic layers of soil fertility based on GIS. Creation of productivity and management zones. Fertilizer recommendations based on VRT and STCR techniques. Crop stress (biotic/abiotic) monitoring using geospatial technology. Use of GPS for agricultural survey. Formulation, characterization and applications of nanoparticles in agriculture. Projects formulation and execution related to precision farming.

ELECTIVE COURSES (Chose any One Paper)

Theory	Internal	Practical
50	20	30

Agri-business Management 3(2+1)

AGE-51

Theory

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. Institutional arrangement. procedures to setup 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. 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 behavior analysis, Product Life Cycle (PLC). Sales & Distribution Management. 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. retails 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.

Theory	Internal	Practical
50	20	30

Agrochemicals

3(2+1)AGE-52

Theory

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 agro chemicals for sustainable agriculture. Herbicides- Major classes, properties and important herbicides. Fate of herbicides. Fungicides- Classification- In organic 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. Introduction and classification of insecticides: inorganic and organic insecticides Organochlorine, Organophosphates, Carbamates, Synthetic pyrethroids Neonicotinoids. Hiorationals. 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. Fertilizers and their importance. Nitrogenous fertilizers: Feed stocks and Manufacturing of ammonium sulphate, ammonium nitrate, ammonium chloride, urea. Slowrelease 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, nitro phosphates 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 P₂O₅ and citrate soluble P₂O₅ in single super phosphate. Estimation of potassium in- Murexite 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.

Theory	Internal	Practical
50	20	30

Commercial Plant Breeding

3(1+2) AGE-53

Theory

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. 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. 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.

Theory	Internal	Practical
50	20	30

Landscaping

3(2+1)AGE-54

Theory

Importance and scope of landscaping. Principles of landscaping, garden styles and types. Terrace gardening, vertical gardening. garden components, adornments, lawn making. rockery. water garden. walk-paths, bridges, other constructed features etc. gardens for special purposes. Trees: selection. propagation. planting schemes, canopy management, shrubs and herbaceous perennials: selection. propagation, planting schemes, architecture. Climber and creepers: importance, selection, propagation, planting, Annuals: selection, propagation, planting scheme. Other garden plants: palms, ferns, grasses and cacti succulents. Pot plants: selection. arrangement, management. Bio-aesthetic planning: definition. need, planning: landscaping of urban and rural areas, Peri-urban landscaping, Landscaping of schools, public places like bus station, railway station, townships, riverbanks, hospitals, playgrounds, airports. industries, institutions. Bonsai: principles and management, lawn: establishment and maintenance. CAD application.

Practical

Identification of trees, shrubs, annuals, pot plants; Propagation of trees, shrubs and annuals, care and maintenance of plants. potting and repotting, identification of tools and implements used in landscape design, training and pruning of plants for special effects, lawn establishment and maintenance, layout of formal gardens, informal gardens, special type of gardens (sunken garden, terrace garden, rock garden) and designing of conservatory and lathe house. Use of computer software, visit to important gardens/ parks/ Institutes.

Theory	Internal	Practical
50	20	30

Food Safety and Standards

3(2+1) AGE-55

Theory

Food Safety - Definition. Importance, Scope and Factors affecting Food Safety. Hazards and Risks, Types of hazards - Biological, Chemical, Physical hazards. Management of hazards - Need. Control of parameters. Temperature control. Food storage. Product design. Hygiene and Sanitation in Food Service Establishments- Introduction. Sources of contamination and their control. Waste Disposal. Pest and Rodent Control. Personnel Hygiene. Food Safety Measures. Food Safety Management Tools- Basic concepts. PRPs, OMPs, SSOPs etc. HACCP. ISO series. TQM - concept and need for quality components of TOM. Kaizen. Risk Analysis. Accreditation and Auditing. Water Analysis, Surface Sanitation and Personal Hygiene. Food laws and Standards- Indian Food Regulatory Regime, FSSAI. Global Scenario CAC. Other laws and standards related to food. Recent concerns- New and Emerging Pathogens. Packaging, Product labeling and Nutritional labeling. Genetically modified foods\ transgenics. Organic foods. Newer approaches to food safety. Recent Outbreaks. Indian and International Standards for food products.

Practical

Water quality analysis physico-chemical and microbiological. Preparation of different types of media. Microbiological Examination of different food samples. Assessment of surface sanitation by swab/rinse method. Assessment of personal hygiene. Biochemical tests for identification of bacteria. Scheme for the detection of food borne pathogens. Preparation of plans for implementation of FSMS -HACCP, ISO: 22000.

Theory	Internal	Practical
50	20	30

Course title: Bio pesticides & Bio fertilizers 3(2+1)

AGE-56

Theory

History and concept of biopesticides. Importance. Scope and potential of biopesticide. Definitions, concepts and classification of biopesticides viz. pathogen, botanical pesticides, and bio rationales. 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. Biofertilizers - Introduction. status and scope. Structure and characteristic features of bacterial biofertilizers- Azospirillum, Azotobacter, Pseudomonas. Rhizobium and Frankia; Cyanobacterial biofertilizers- 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, P-solubilization. Production technology: Strain selection, sterilization, growth and fermentation, mass production of carrier based and liquid biofertilizers. FCC) 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.

Practical

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 in oculums production of biofertilizers. Isolation of AM fungi –Wet sieving method and sucrose gradient method. Mass production of AM inoculants.