

Syllabus M.Sc. Agri Biotechnology

Syllabus for M.Sc. (Agri.) Biotechnology

1. **Agricultural Biochemistry** - Isomerism, hydrogen bond and hydrophobic interaction in biomolecules; chemistry of biomolecules-carbohydrates, amino acids, proteins, lipids and nucleic. Metabolism of carbohydrates, fatty acids and protein. Genetic code, replication, transcription and translation. Enzymes and their kinetics, factors affecting enzyme activity. Competitive- and non-competitive inhibitions. Coenzymes and cofactors. Plant pigments.

2. **Animal Husbandry and Veterinary Science**- Importance of livestock in agriculture; relationship between plant and animal husbandry; mixed farming; animal breeding; breeds of indigenous and exotic cattle, buffaloes, goats, sheep, pigs and poultries and their potential for milk, egg, meat and wool production; classification of feed and fodder; major contagious diseases affecting cattle and drought animals, poultries and pigs; reproduction biology of cattle; artificial insemination, fertility and sterility; principles of immunization and vaccination; description, symptoms, diagnosis and treatment of major contagious diseases; drugs used for killing, tranquillizing and doping farm and wild animals; study of milk composition; physical properties and food value of milk; quality control of milk, tests and legal standards; dairy equipments and their cleaning; organization of dairy, milk processing and distribution; microorganism found in dairy and milk products; pregnancy and distochea.

3. **Cell Biology** - Modern tools and techniques in the study of cytology; prokaryotic and eukaryotic cells-structural and ultrastructural details; functions of organelles including membrane; cell cycle, mitosis and meiosis; numerical structural variation in chromosomes and their significance.

4. **Protection** - Diseases of field, vegetable, orchard and plantation crops of India and their control; causes and classification of plant diseases; principles of plant disease control biological control of diseases; Seed health testing, Integrated pest management-concepts and components; host plant resistance-biological control of insect pests; genetic

5. manipulation of insects for their control; pesticides, their formulation, classification and safe use; behavioural methods; use of computer modeling in pest and disease outbreak; use of semiochemicals in IPM; insect growth regulators; biotechnological

approaches in IPM; IPM in major crops, Principles of nematode management-integrated nematode management in major crops-silkworm types; mulberry silkworm, culturing methods; pests and diseases of mulberry and mulberry silkworm and their management.

6. Cropping Systems and Crop Management - Impact of the high yielding and short duration varieties on shifts in cropping patterns; concepts of multiple cropping, relay cropping and inter-cropping and their importance in relation to food **production crop** production practices for important cereals, pulses, oilseeds, fibre, sugar and cash crops; crop weed, their characteristics, cultural biological and chemical weed control; remote sensing and agriculture.

7. Ecology and Environment - Ecology and its relevance to man; natural resources their management and conservation- Climatic elements as factors of crop growth- impact of changing environment on cropping pattern- change in environment due to agriculture-environmental pollution and associated hazards to crops, animals and humans-liquid and solid waste disposal- Pollution prevention and remediation.

8. Principles of Food Science and Processing - Food production and consumption trends in India; food Science objective food composition; nutritive value of foods; importance and scope of food processing; Indian scenario; Effect of processing on different food groups; Food spoilage; Principles and methods of preservation; Quality Standards, Ventra Centicals.

9. Genetics and Plant Breeding -Earlier concepts of heredity; Mendel's work and laws of heredity; Chromosomal theory of inheritance; Gene interactions; Multiple alleles; Multiple factor hypothesis; Linkage and crossing over; Linkage analysis; Construction of genetic map; Sex determination; Sex linked; sex influenced and sex limited traits; Spontaneous and induced mutations; Centre of origin; Domestication of crop plants; Conservations and utilization of genetic resources; Reproductive and pollination mechanisms in plants; Methods and principles in plant breeding; Methods of breeding selfpollinated crops; Methods of breeding cross- pollinated crops; Methods of breeding asexually propagated crops; self incompatibility and male sterility in crop breeding; mutation breeding in crop improvement; Ploidy breeding in crop improvement; Innovative breeding methods in crop improvement.

10. Horticulture and Forestry - Climatic requirements and cultivation of major fruits, flowers and vegetable crops spice in plantation crops, the package of practices and

the scientific basis for the same; handling and marketing of fruit and vegetables; preservation of fruits and vegetables; fruit and vegetable in human nutrition; landscaping and floriculture; ornamental plants and design and lay out of lawns and gardens; tissue culture and micropropagation of important fruit, vegetable and ornamental plants including major spices and plantation crops, important features, scope and propagation of various types of forestry plantations, such as, extension/social forestry, agroforestry and the management of natural forests.

11. Agricultural Microbiology - Spontaneous generation theory-Germ theory-Discovery of antibiotics-Types of Microscopes Principles and equipment of different kinds of sterilisation-staining Techniques-Nutritional types of bacteria-Growth curve-Factors influencing bacterial growth-Fermentation: Principle and Application-Classification of Bacteria-Gene transfer methods in microorganisms Antigen and antibody reaction. Contributions of Beijerinck and Winogradsky-Role of microbes in carbon and nitrogen cycles-Influence of Rhizosphere on soil microorganism-Various types of nitrogen fixing microorganism-Production of bacterial biofertilizers: Rhizobium, Azospirillum, Phosphobacteria etc.- Fungal biofertilizers; Ecto- and Endomycorrhizae- Azolla and BGA- Method of application for different biofertilizers.

12. Plant Physiology - Plant physiology and its significance in agriculture; physical properties and chemical constitution of protoplasm; plant cell water relation - imbibition, surface tension, diffusion, osmosis; absorption and translocation of water and nutrients; transpiration, guttation, mineral deficiencies and their symptoms; physiological disorders, correction hydroponics, foliar nutrition aerobic and anaerobic respiration; Photorespiration Factors affecting respiration and Photorespiration. Photosynthesis- modern concept and the factors affecting photosynthesis, nitrogen fixation growth development and differentiation; growth hormones, growth retardants, growth inhibitors and their use in agriculture; tropism in plants photoperiodism and vernalization; seed dormancy and germination; fruit ripening process and its control.

13. Seed Technology - Seed technology and its importance; production processing and testing of seeds of crop plants; seed storage, seed certification; role of NSC in production; New seed policy and seed control order, Terminator Technology.

14. Soil Science and Agricultural Chemistry - Soil as a medium of plant growth and its composition; mineral and organic constituents of soil and their role in crop

production; chemical physical and microbiological properties of soil; essential plant nutrients, their functions occurrence and recycling; micro-secondary and micro nutrient sources and their management; integrated nutrient management, soil water relationship, principles of soil fertility and its evaluation for judicious use of fertilizers; organic manure and biofertilizers; soil conservation planning on water shed basis; erosion and run -off management in hilly, foot hills and valley lands; processes and factors affecting soil erosion; dryland agriculture and its problems; rainfed agriculture.

15. Biostatistics - Compilation, classification, tabulation and diagrammatic representation of data; measures of central tendency, correlation and regression involving two variables; concept of random sampling; tests of significance testing of hypothesis; statistical tests two kinds of error; chi-square test; principles of sampling; sampling and sampling errors; analysis of variance transformations to stabilize variance; principles of experimental design, randomized block design; latin square design; factorial experiments; missing plot techniques. Introduction to computer-Electronic data processing, operating system-common software available-Internet applications-Databases and bioinformatics.

16. Agricultural Biotechnology - Concepts and scope of biotechnology. Tissue culture and its application, Micropropagation. Meristem culture and production of virus-free plants. Anther and microspore culture. Embryo and ovary culture. Protoplast isolation. Protoplast fusion-somatic hybrids, cybrids. Somaclones. Synthetic seeds. In vitro germplasm conservation. Cryopreservation. Organelle DNA, Satellite-and repetitive DNAs. DNA repair. Regulation of gene expression. Recombinant DNA technology-cloning vectors, restriction enzymes, gene cloning. Methods of gene transfer in plants. Achievements and recent developments of genetic engineering in agriculture. Development of transgenies for biotic & abiotic stress tolerance, Ribozyme Technology microarray, bioethics, terminator technology, nanotechnology, DNA finger printing, gene silencing.

Syllabus for M.V.Sc.

ANIMAL BIOTECHNOLOGY

Structure of prokaryotic and eukaryotic cells, cell wall, membranes, cell organelles, organization and functions, chromosome structure and functions, cell growth division and differentiation. Sub unit structure of macromolecules and supermolecular systems. Self assembly of sub units, viruses, bacteriophage, ribosomes and membrane systems.

Scope and importance of biochemistry in animal sciences, cell structure and functions. Chemistry and biological significance of carbohydrates, lipids, proteins, nucleic acids, vitamins and hormones. Enzymes— chemistry, kinetics and mechanism of action and regulation. Metabolic inhibitors with special reference to antibiotics and insecticides.

Biological oxidation, energy metabolism of carbohydrates, lipids, amino acids and nucleic acids. Colorimetry, spectrophotometry, chromatography and electrophoresis methods.

Chemistry of antigens and antibodies and molecular basis of immune reaction, radio-immune assay and other assays. Chemistry of respiration and gas transport, water and electrolyte metabolism. Deficiency diseases, metabolic disorders and clinical biochemistry. Endocrine glands, biosynthesis of hormones and their mechanism of action. History of molecular biology, biosynthesis of proteins and nucleic acids, genome organization, regulation of gene expression, polymerase chain reaction, basic principles of biotechnology applicable to veterinary science gene sequence, immunodiagnosics, animal cell culture, in vitro fertilization. Sub-unit vaccines: Principles of fermentation technology.

VETERINARY SCIENCE

Anatomy Physiology. Structure of cells, cell organelles, chromosome structure and functions, cell growth, division and differentiation and functions. Histology and physiology of mammalian organs and systems, major sense organs and receptors; Exocrine and endocrine glands, hormones and their functions, blood composition and function. Homeostasis, osmoregulation and blood clotting.

Veterinary Microbiology (Bacteriology, Virology, Immunology), Veterinary Pathology Veterinary Parasitology. Classification and growth characteristics of bacteria, important bacterial diseases of livestock and poultry, general characters, classification of important fungi. Nature of viruses, morphology, and characteristics, viral immunity, important viral diseases of livestock and poultry. Viral vaccines. Antigen and antibody, antibody formation, immunity, allergy, anaphylaxis hypersensitivity, immunoglobulins, complement system. Etiology of diseases and concept, extrinsic and intrinsic factors, inflammation degeneration, necrosis, calcification, gangrene, death, atrophy, hypertrophy, benign and malignant tumours in domestic animals. General classification, morphology, life cycle of important parasites, important parasitic diseases (Helminths, Protozoa and Arthropods) of veterinary importance with respect to epidemiology, symptoms pathogenesis diagnosis, immunity and control.

Veterinary Medicine, Epidemiology veterinary surgery and Veterinary Obstetrics and Gynaecology including reproduction. Clinical examination and diagnosis, Etiology, epidemiology, symptoms, diagnosis, prognosis, treatment and control of diseases affecting different body systems of various species of domestic animals, epidemiology— aims, objectives, ecological concepts and applications. General surgical principles and management of surgical cases. Types, administration and effects of anaesthesia. Principles and use of radiological techniques in the diagnosis of animal diseases. Estrus and estrus cycle in domestic animals, Synchronization of estrus, fertilization, pregnancy diagnosis, parturition, management of postpartum complications dystokias and its management, fertility, infertility and its management, artificial insemination.

Veterinary Public Health, Veterinary Pharmacology & Toxicology. Zoonotic diseases through milk and meat, Zoo animal health. Source and nature of drugs, pharmacokinetics, Chemotherapy-sulpha drugs, antibiotics, mechanism and problem of drug resistance. Drug allergy, important poisonous plants, toxicity of important agro-chemicals and their detoxification, drugs action on different body systems.

ANIMAL SCIENCES

Animal Genetics and Breeding. Inheritance of acquired characters, cell structure and functional organization, mitosis, meiosis, Mendel's laws, gene interaction, sex determination, sex linkages, cytoplasmic, heredity, quantitative inheritance, linkages and combination, different types of chromosomes, gene structure and functions, mutation, speciation and evolution, inbreeding and crossbreeding, general and specific combining ability, heterosis, sire evolution, breeds of various important livestock species, breeding programmes, population statistics of livestock species.

Animal Nutrition, Feed Technology, Animal Physiology. General nutrition, carbohydrates, proteins and fats their digestion and metabolism protein value of the feed measure of protein quality and its application, requirement of energy, protein, minerals (macro and micro), vitamins and additives for pigs and poultry, protein-energy interrelationship, comparative design of nutrients in various species. Feed and animal body composition, function of water in body, rumen digestion and metabolism, nonprotein nitrogen metabolism in rumen, feeds and fodders, role of antibiotics, hormones and biostimulators. Digestion - control and motility and secretion of alimentary tract, gastric hormones, digestion and absorption in ruminants and monogastic animals, avian digestion. Mechanism, neural and chemical control of respiration, gaseous transport and exchange, high altitude living, physiology of work and exercise. Control of male sexual behaviour, ovarian function, estrus, ovulation, mechanism of sperm capacitating, sperm and ovum transport,

female genital tract, fertilization, implantation, maintenance of pregnancy and physiology of placenta.

Artificial insemination collection, preservation, transport of semen, semen diluters, artificial insemination, embryo transfer-collection, preservation, transport and transplantation of zygotes, oocytes culture and in vitro fertilization. Animal Husbandry, Dairy Science, Livestock Production and Management, Animal Product Technology & Meat Science and Poultry Science. General concepts of livestock production and management in Indian agro-climatic and socioeconomic conditions, impact of livestock farming in Indian agriculture; concept of livestock housing, production and reproduction management of livestock species, lactation management, concept of machine milking. Poultry industry in India, random sample test, breeding programmes for broilers and layers. Composition of milk, meat, fish, poultry and eggs, technology or processing and preservation of livestock products, methods of processing and storage of meat. Meat products, eggs, poultry meat, food preservation, refrigeration, freezing, freeze drying, dehydration canning, radio pasteurization, chemical additives, curing, smoking.

Veterinary Extension. Definition and concept of sociology, differences between rural, tribal and urban communities, social change, factors of change. Principles and steps of extension education, community development—aims, objectives, organizational set up and concept evolution of extension in India, extension teaching method. Role of livestock in economy, health and socio-psychology of rural, semi-urban and urban society. Identifying social taboos, social differences, obstacles in the way of organizing programmes. Concept of marketing, principles of co-operative societies, animal husbandry development planning and programme, key village scheme, ICDD, Gosadan, Goshala, Role of Gram Panchayat in Livestock production of rural economy. Data analysis, basics of statistics and computational techniques.