

## Syllabus for M.Sc. (Agri.) Biotechnology

1. Agricultural Biochemistry - Hydrogen and hydrophobic interaction in biomolecules. Metabolism of carbohydrates, fatty acids and protein. Genetic code, replication, transcription and translation. Enzymes and kinetics, factors affecting enzymes. Enzyme inhibition. Coenzymes and cofactors.
2. Animal Husbandry and Veterinary Science- Importance of livestock in agriculture; principles of immunization and vaccination; description, symptoms, diagnosis and treatment of major contagious diseases; dairy; organization of dairy, milk processing; microorganism found in dairy and milk products.
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. Integrated pest management-concepts and components; host plant resistance-biological control of insect pests; genetic manipulation of insects for their control; pesticides, their formulation; biotechnological approaches in IPM; Principles of nematode management-integrated nematode management in major crops.
5. Cropping Systems and Crop Management - Impact of the high yielding and short duration varieties on cropping patterns; concepts of multiple cropping, relay cropping and inter-cropping and their importance.
6. 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; Pollution prevention and remediation.
7. Principles of Food Science and Processing - Food production and consumption trends in India;; 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.
8. 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 self-pollinated 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.
9. Horticulture and Forestry - Climatic requirements and cultivation of major fruits, flowers and vegetable crops; tissue culture and micropropagation of important fruit, vegetable and ornamental plants, important features, scope and propagation of various types of forestry plantations, such as, extension/social forestry, agroforestry and the management.
10. 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-Variety 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.
11. 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 Photo- respiration. 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.
12. 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.
13. 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.

14. 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. Internet applications-Databases and bioinformatics.
15. 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.