

## **JNU CBEE 2012 Syllabus for MSc Agri./ Biotechnology Programs**

**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.

**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 poultry and their potential for milk, egg, meat and wool production; classification of feed and fodder; major contagious diseases affecting cattle and drought animals, poultry 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 dystocia.

**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.

**Crop 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 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.

**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.

**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.

**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.

**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.

**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.

**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-Variou types of nitrogen fixing microorganism-Production of bacterial biofertilizers: Rhizobium, Azospirillum, Phosphobacteria etc. - Fungal biofertilizers; Ecto- and Endomychorizae- Azolla and BGA- Method of application for different biofertilizers.

**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 nutritions aerobic and anaerobic respiration; Photo respiration 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.

**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.

**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.

**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.

**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.