Course outcome Semester wise

Course: BSc

Subject: Biochemistry

I Semester

- Cellular basis and chemical foundations of life.
- Unique properties of water & concentration units,
- Biophysical chemistry - Photochemistry, radioactivity, its units and measurement & buffers
- Bio organic chemistry – Classification, structure and importance of Alkaloids, Terpenes & pytochemicals
- Stereochemistry – Types, nomenclature with examples
- Reaction mechanism – Concept of reaction intermediates and mechanism with examples
- Biomolecules – Classification, structure and biological functions of Carbohydrates, amino acids , proteins and nucleic acids

II Semester

- The classification, structure & biological importance of lipids.
- The classification, characteristic properties and importance in different fields of enzymes.

III Semester

- Physiology of muscular system, Nervous system, Cardiovascular system, Excretory system & Gastrointestinal, Endocrine system & hepatic system

IV Semester

- Metabolism of Carbohydrates, amino acids, lipids & nucleic acids
- Oxidative phosphorylation & Phtophosphorylation.

V Semester

(Elective paper 1)

- Knowledge of Nutrition and Assessment of nutritious status
- Dietary sources, requirement, Biological functions & deficiency disorders of macro & micro nutrients.
- Energy requirement for BMR & different physical activities and their determination
- Nutraceuticals

(Elective paper2)

- Nutritional disorders such as Kwashiorkor and Marasmus, Scurvy, beri beri, pellagra, Xerophthalmia and Night blindness with relation to biochemical basis for symptoms.
- Metabolic and Lifestyle disorders such as Obesity, diabetes Miletus & cardiovascular disorders
- Mulifactorial disorders & cancer
- Inborn errors of Metabolism & Diseases due to misfolded proteins

(Compulsory Paper-1)

- Biochemical techniques such as Chromatographic, Electrophoresis, Spectroscopy & centrifugation techniques

(Compulsory Paper-2)

- Protein isolation, purification & characterization techniques

VI Semester

(Elective paper1)

- Structure of prokaryotic & eukaryotic genes Replication of DNA,Transcription
- translation & mutation under Molecular biology
- Different types of immunity
- Structure & characteristics of Antibodies & Antigens
- Antigen antibody interaction
- Hypersensitivity reactions
- Vaccination

(Elective paper2)

- Plant cell structure.
- Photosynthesis and Carbon assimilation.
- Nitrogen metabolism.
- Regulation of plant growth and Plant tissue culture.

(Compulsory Paper-1)

- Analysis of Urine & blood for various constituents & their clinical significance.
- Disorders of Carbohydrate metabolism.
- Gastric function, Pancreatic Function, Kidney function & Liver function tests
- Serum enzymes in liver disease
- Cardiac injury profile

(Compulsory Paper-2)

- Basics in Biostatistics
- Bioinformatics - Biological databases and data retrieval &- Sequence alignment

Subject: Microbiology

I Semester

Introduction to Microbiology and Bacteriology

- Adoption of concepts of Microbiology for healthy, hygienic and better living.
- Student gains better knowledge in handling Microscopy, Staining techniques, Sterilization techniques, Preparation of Culture media, Culture techniques.
- Student understands the structure of bacterial cell and its nutritional requirements and nutritional types

II Semester

Microbial Diversity and Environmental Microbiology

- Student understands the Diversity in microbial life and its role in environment
- Student learns the method to classify and naming of microbes.
- Student understands the role of microbes in biogeochemical cycles for sustainment of plant, animal and human life.

III Semester

Virology, Microbial Physiology, Microbial Genetics and Dairy Microbiology

- Student understands the concepts of virology, bacterial growth and bacterial photosynthesis.
- Student learns role of microbes in understanding genetics.
- Student understands the role of microbes in preparation of fermented dairy products and Preservation of dairy products.

IV Semester

Microbial Metabolism, Genetic Engineering and Food Microbiology

- Student understands the concepts of Microbial metabolism.
- Student learns role of microbes in development of the field Genetic Engineering.
- Student understands the role of microbes in food spoilage, food borne diseases, preparation of fermented food products.

V Semester

Agricultural Microbiology, Industrial Microbiology and Microbial Biotechnology (Elective paper1)

- Student understands the eco-friendly role of biofertilizers and biopesticides in agriculture.
- Student learns role of microbes in fermentation process for Industrial production.
- Student understands the role of microbes in prevention of pollution of environment by secondary treatment of sewage.
- Student understands the role of microbes in cost effective immobilization process and eco-friendly bioremediation.

Plant Pathology (Elective Paper2)

- Student understands role of plant pathogen in stages of disease development.
- To study the different plant diseases with its causative agents.

- Student learns epidemiology and control of disease.

Food Fermentation Techniques

Compulsory paper1

- Student understands the role of starter culture in preparation of fermented food products.
- Student learns the preparation of different types of fermented foods its health benefits.

Biofertilizers and Biopesticides

Compulsory paper2

- Student understands the role of biofertilizers and biopesticides.
- Student learns the preparation of different types of biofertilizers and biopesticides.

VI Semester

Immunology, Medical Microbiology and Phytopathology

Elective paper3

- Student understands concepts of immune system.
- Student learns immunoprophylaxis, immunotherapy, immunopathology and diagnosis.
- Student study the different types of human diseases and its treatment.
- To study the different types of plant diseases and its treatment.

Microbes in Sustainable Agriculture and Development

Elective paper4

- Student understands the role of microbes in soil formation, soil microflora and mineralization.
- Student learns the preparation of different types of biofertilizers and biopesticides.

Microbial Diagnosis in Health Clinics

Compulsory paper3

- Student learns the collection of different types of lab specimen for disease diagnosis.
- Student learns the different methods used in disease diagnosis.

Management of Human Microbial Diseases

Compulsory paper4

- 1. Student learns about emerging human microbial diseases.
- 2. Student learns prevention of microbial diseases of human.

Subject: Biotechnology

I Semester

DSC 1

- Biomolecules : Students learn to identify chemical elements. Compare and contrast the structure and function of the carbohydrates, proteins, nucleic acids, lipids. Identify their chemical elements and functional groups .Recognize the structure of sugars & amino acid and the peptide bond that connects di-, tri, and polypeptides.
- Cell Biology: Students will understand the structures and purposes of basic components of prokaryotic and eukaryotic cells, especially macromolecules, membranes, and organelles, how these cellular components are used to generate and utilize energy in cells and understand the cellular components underlying mitotic cell division.
- Genetics : Genetics introduces the principles of evolutionary and quantitative characters to students. They will understand relationships between molecule/cell level phenomena ("modern" genetics) and organism-level patterns of heredity ("classical" genetics) and will test and deepen their mastery of genetics by applying this knowledge in a variety of problem-solving situations such as Laws of segregation and independent assortment.

DSC 2

- Microbiology : Students learn classification of micro organisms, isolation, culture , staining, identification, pure culture techniques, maintenance and preservation of cultures etc.
- Enzymology: Students will study enzyme structure, cofactor and coenzymes chemical structure , factors that affect enzyme activity, such as , pH , concentration.
- Cellular Metabolism: Students learn the metabolic pathways - the energy-yielding and energy-requiring reactions in life and understand the diversity of metabolic regulation.

DSC 3

- Bio-Analytical Techniques: Students learn the basic principle and applications of gel electrophoresis, chromatographic separations and centrifugation techniques.
- Molecular Biology: Students learn the molecular mechanism of DNA replication, transcription and Translation; Compare the structure of eukaryotic genes with the structure of simpler prokaryotic genes.
- Genetic Engineering: They study on enzymes used in genetic engineering, polymerase chain reaction (PCR), gene transfer techniques, genetic engineering applications, production of transgenic animals and plants and their products.

DSC4

- Immunology and Immuno technology: Students learn the basic mechanisms of innate and adaptive immunity, the cellular/molecular pathways of humoral/cell-mediated adaptive responses, regulation of immune responses and immune tolerance, cytokine biology.
- Medical Biotechnology: This study includes study on recent advances in biotechnology in the field of medicine like vaccine therapy, hormone therapy, enzyme therapy, cytokine therapy, MCA therapy, gene therapy, antisense technology, nucleic acids in treatment and diagnosis of diseases.

DSE 1

- Plant Cell and Tissue Culture: Students study the vast application of plant tissue culture which includes Anther culture, pollen culture, germplasm conservation, somaclonal variation, synthetic seeds, somatic embryogenesis, protoplast technology, micropropagation, ovary/ovule/embryo culture etc.
- Animal Tissue Culture: Students learn the theory and practice of animal tissue culture with their role and applications in biotechnology and biochemical research. The topics covered in this course include media preparation, sterile techniques, aseptic handling, initiation and routine maintenance of cells in culture, common contaminants of animal cell culture, and understanding of some of the applications of cell culture technology e.g. somatic cell fusion and hybridoma technology.
- Reproductive Technology: Students will learn the principle and applications of artificial methods of conception – test tube baby, ZIFT, IUD, Contraception etc.

DSE 2

- Environmental Biotechnology: Students will learn the biotechnological methods in pollution abatement, biodegradation of xenobiotic compounds, biohydro metallurgy and bio-mining, treatment of industrial wastes: pulp, dye, leather and solid waste management and eco friendly bio-products.
- Agricultural Biotechnology : Students will learn the applications of research areas of Agricultural Biotechnology that include: gene cloning, construction of novel pest and disease resistance genes, development of new immunological and nucleic acid types of diagnostic probes for plant and animal disease, genetic engineering of microorganisms for the production of important pharmaceutical agents, and development of new bioengineered strains of microorganisms for fermentation and food production services.
- Food Biotechnology : The course discusses food processing and enzymes involved in food processing , fruit ripening and its manipulation, role of ACC syntheses, genetically modified foods- Golden rice, transgenic potato, transgenic fish, biotechnology in dairy industry.