M.Sc. Microbiology

Programme Specific Outcomes

At the time of post graduation, the students will be able to-

PSO1: Understand basics of Microbiology and various aspects involved in it

PSO2: Understand various fermentation processes and enzymes involved in the production of specific products

PSO3: Acquire knowledge in isolation of microorganisms, their nutritional requirement and their culturing under specific conditions

PSO4: Understand evolution of viruses and various schemes of classification and nomenclature of viruses

PSO5: Gain knowledge related to Photosynthesis, Bacterial photosynthesis: scope, electron carriers and cyclic flow of electrons

PSO6: Understand concept of gene expression in microorganisms and eukaryotes

PSO7: Acquire knowledge of fermentation techniques and its design

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Course Outcomes

F.Y. M.Sc. Semester I

Th I – Biostatistics Computer applications and Research Methodology

At the end of the course, the students will be able to-

CO1: Discuss methods of data collection, sampling and interpretation of data

CO2: Explain steps involved in data representation by histogram, polygon, ogive curves and pie diagram

CO3: Solve statistical data by measures of central tendency viz. Mean, median and mode

CO4: Describe ideal method to write technical report, project report, project proposal, review paper and research paper

Th II – Bioenergetics and Enzymology

At the end of the course, the students will be able to-

CO1: Describe various pathways of carbohydrate metabolism role of enzymes

CO2: Describe various fermentation processes as well as microorganism and enzymes involved in the production of specific products

CO3: Explain endogenous metabolism of reserve food materials like PHB and Glycogen- their production and its futuristic applications

CO4: Discuss Microbial degradation of aliphatic and aromatic hydrocarbons with respect to microorganisms and enzymes involved

CO5: Describe properties of Enzymes like catalytic power, activation energy, substrate specificity, active site, theories of its mechanisms and its classification

Th III – Bioinstrumentation techniques and Applications

At the end of the course, the students will be able to-

CO1: Validate digital balance, pH meter, micropipette, spectrophotometer

CO2: Analyze qualitatively and quantitatively various bio-molecules

CO3: State and explain principle and generalized operational procedure of sophisticated instruments like HPLC, FTIR, GC-MS, LC-MS, Electron Microscopes

CO4: Analyze various bio-molecules on colorimeter and double beam UV-Visible spectrophotometer

CO5: Separate nucleic acids and proteins by using gel electrophoresis, chromatography and preparative spectroscopy

Th IV – Industrial Food and Dairy Microbiology

At the end of the course, the students will be able to-

CO1: Comprehend role of microorganisms in food fermentations as well as in food spoilage

CO2: Describe mechanism of food fermentation

CO3: Discuss role of food regulatory authorities and its impact on quality food preparation

CO4: Describe role and importance of Biosensors in food industry is understood

CO5: Discuss applications of microorganisms producing colors

CO6: Comprehend methods of food preservation

CO7: Discuss microbial production of surfactants, polysaccharide

Semester II

Th V – Recent Trends in Virology

At the end of the course, the students will be able to-

CO1: Describe evolution of viruses and various schemes of classification and nomenclature of viruses

CO2: Give various methods used for cultivation of viruses in In Vitro or In Vivo conditions

CO3: Perform purification of viruses from biological samples and their assays using various chemical and physical methods

CO4: Describe genetic makeup and its role in infectivity of various bacterial, plant and animal viruses

CO5: Explain pattern of infection, life cycle and pathogenesis of various enveloped / non enveloped animal, plant and bacterial viruses

CO6: Explain various ways to control the viral disease in animals and plants based on use of antiviral agents

Th VI – Molecular Immunology

At the end of the course, the students will be able to-

CO1: Explain Immune biology, immune systems and types

CO2: Define antibodies and discuss structure, function and their classes

CO3: Give type of immunities and responding cells like B cells, T cells

CO4: Discuss Antigen and antibodies interaction viz. agglutinations, precipitation

CO5: Describe types of pathways for stimulations of antibodies production

CO6: Discuss various techniques used to identify presence of antigens ELISA, RIA etc

Th VII – Microbial Physiology

At the end of the course, the students will be able to-

CO1: Describe process of Photosynthesis, Bacterial photosynthesis: scope, electron carriers, cyclic flow of electrons

O2: Discuss bacterial Respiration: Aerobic and Anaerobic Respiration, Energy generation in all groups of chemolithotrophs, Biochemistry: methanogenesis and ammonia oxidation

CO3: Describe Structure and organization of membrane: Solute Transport in microorganisms and their mechanisms

CO4: Explain concept of Bacterial Sporulation and spores, Heat resistance and sporulation, describe Stages of sporulation

CO5: State and explain concept bacterial Chemolithotrophy and Nitrogen Metabolism, discuss physiological groups of chemolithotrophs

CO6: Discuss biochemistry of biological nitrogen fixation and ammonia assimilation

Th VIII – Microbial Diversity and Extremophiles

At the end of the course, the students will be able to-

CO1: Describe microbial diversity and their habitate

CO2: Define extremophiles and give their applications

CO3: Give mechanism of survival of microbes under extreme conditions

CO4: Comprehend community ecology and marine ecosystem

CO5: Describe role of mycorrhiza, xtremozymes; give its significance

CO6: Discuss general characteristics of various group of microorganisms

S.Y. M.Sc. Semester III

Th IX – Enzyme Technology

At the end of the course, the students will be able to-

CO1: Extract and Purify Microbial Enzymes, describe enzyme purification, methods like salts and Solvents, liquid – liquid extraction, chromatographic processes

CO2: Produce enzyme (lab scale) and determine efficiency of enzyme, perform purification by measuring specific activity at various stages viz. salt precipitation, Dialysis

CO3: Describe Enzyme Inhibition and Kinetics, Irreversible and reversible enzyme inhibitions

CO4: Discuss regulation of enzyme activity- Allosteric regulation, feedback regulation and cascade System (Genetic regulation), covalent modification

CO5: Explain Immobilization, methods and practical application, Analytical, therapeutic, environmental and industrial applications of immobilized enzymes

CO6: Describe enzyme therapy – Treatment of genetic deficiency diseases, Enzymes in cancer therapy

Th X – Bioprocess Engineering and Technology

At the end of the course, the students will be able to-

CO1: Discuss various types of fermenter and its design

CO2: Describe immobilization cell/enzyme reactors

CO3: Elaborate commercialization of microbial fermentation

CO4: Discuss role and significance of computers in fermentation industry

CO5: Give importance of mass transfer; explain in detail mechanism of mass transfer

Th XI – Molecular Microbial Genetics

At the end of the course, the students will be able to-

CO1: Describe gene expression in microorganisms and eukaryotes and their differences

CO2: Give applications of various genes like structural genes, functional genes, etc

CO3: Discuss importance and applications of various enzymes in the processes like replication, transcription and translations

CO4: Give various types of RNA and discuss their role during translation, tRNA activations

CO5: What is mutation? Giveits types and effects CO6: Define Recombinations-transduction, conjugation; give their types

CO7: Discuss various types of operons and their positive and negative regulations

Th XII – Environmental Microbial Technology

At the end of the course, the students will be able to-

CO1: Describe ecosystem with its biotic and abiotic components and their interactions

CO2: Define food chain, food web, biosphere, communities and habitat

CO3: Identify various water pollutants, their role in water pollution and direct or indirect effect on ecosystem

CO4: Explain eutrophication, discuss influencing factors and its impact on quality of water in natural resources

CO5: Give mechanism effluent treatment schemes including multistep processes; give its significance

CO6: Identify xenobiotics, enlight their bad side and influence on global environmental issues

S.Y. M.Sc. Semester IV

T XIII – Recombinant DNA Technology

At the end of the course, the students will be able to-

CO1: Explain gene expression in prokaryotes and eukaryotes, differentiate them in detail

CO2: Give applications of different modifying enzymes used in gene manipulations

CO3: Discuss various vectors in plants, animals and for micro-organisms viz. plasmids, cosmids phagemids, PAC, BAC, YAC; give their applications

CO4: Discuss operations of PCR machines, gel electrophoresis of nucleic acids and their documentation

CO5: Describe various technologies developed in genetic engineering to make recombinant DNA and get their expressions in desired cells

CO6: Discuss Gene studies based on PCR as well as independent of PCR viz. RFLP, AFLP, RAPD etc

Th XIV – Fermentation Technology

At the end of the course, the students will be able to-

CO1: Explain enzyme, antibiotic and polysaccharide fermentation

CO2: Discuss IPR with reference to protection of novel design, process in a legal framework

CO3: Discuss mushroom cultivation and single cell protein production

CO4: Comprehend bioterrorism, microorganisms involved and ways to tackle with the problem

CO5: Give types and steps involved in production of biofuel from microbial source

CO6: Describe plant tissue culturing

Th XV – Bioinformatics, Microbial genomics & Proteomics

At the end of the course, the students will be able to-

CO1: Discuss nucleotide databases- like EMBL, Gene Bank, DDBJ and protein databases like SWISSPROT, PROSITE, PDB etc

CO3: Discuss handling of various public domain databases for nucleic acid and protein sequences with different software

CO4: Explain proteomics with respect to their structure, functions and analysis

CO5: Describe 2D and 3D structures of sequence identified proteins with their active sites and functionalities

CO6: Discuss DNA Microarray preparations and tools required for analysis of same by SAGE, SOFT finder etc

CO7: Analysis of different protein spots by various sophisticated techniques viz. Mass Spectroscopy, Electro spray ionization Peptide Mass fingerprinting and XRD with NMR for Structural analysis

Th XVI – Pharmaceutical Microbiology

At the end of the course, the students will be able to-

CO1: Explain concept of antimicrobial assays, therapeutic index, LD50, and cellular transport system of various drug molecules

CO2: Define and classify antimicrobial agents with respect to their mechanism of action, antimicrobial spectrum, and SAR (Structural activity and relationship)

CO3: Give mechanism of action of chemical disinfectants, antiseptics, preservatives

CO4: Describe targeted drug delivery system, gene therapy and drug delivery systems used in it

CO5: Give importance of in-process controlling measures to maintain sterility in production plants

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