M Sc biotechnology course of study

Course Title: Microbiology
Course No.: BT 514
Credits: 3

General objective

- The course is intended to acquaint the students about different forms /fields of microorganisms with their applications

Specific objective

After the completion of the course, the students should be able to:

- describe the morphology and classification of different groups of microorganisms
- explain the factors influencing growth of microorganisms
- apply methods of microbial growth in laboratory conditions
- Identify microbial diseases of human/animals/plants
- identify the unknown microorganisms using conventional and advanced diagnostic techniques
- elucidate microbial mechanism of pathogenicity
- Utilize molecular and immunological tools in disease diagnosis

Course Structure

Bacterial Classification **3hrs**

Basis of classification. Bergey's classification of Bacteria.

Cell structure of Bacteria **3 hrs**

The cell wall structure of Gram positive and Gram negative bacteria, Lipopolysaccharide walls and its significance. Function and importance of capsule, spore and flagella.

Bacterial Nutrition and Growth **5 hrs**

Nutritional requirements, Chemical, physical and energy requirements for growth.Toxic forms of oxygen. Transport mechanism of nutrients

Bacterial growth curve. reproduction, measurement of microbial cell growth in terms of number, volume and biomass, Effect of environmental factors in cell growth. Microbial growth at extreme of environment. Bacteriological media,

Cultivation of Bacteria **2 hrs**

The isolation and cultivation of pure culture. Methods of maintenance and preservation of culture, Major culture collection centre

Microbial Control **4 hrs**

Physical Methods of Microbial Control, Chemical Methods of Microbial Control

Antimicrobics

Methods for Evaluating Disinfectants and Antiseptics, Route of administration, Mechanisms of Antimicrobial Action, Alteration of cell walls, Cytoplasmic membranes

Interference with protein, Nnucleic acid structure, Inhibition of general metabolic pathway

Antibiotic Susceptibility Testing,

Disc diffusion, Minimum Inhibitory Concentration (MIC) and Minimum bactericidal concentration (MBC)Test, Combination therapy

Microbial mechanism of pathogenicity **5 hrs**

Portals of entry of pathogens to the host, penetration of host defense by pathogens penetration into host cell cytoplasm (cytoskeleton), damage of host cell by pathogen.Viral mechanism to invade host defense and cytopathic effects.Molecular mechanisms for origin of new pathogens. Host-pathogen interaction. Evolution of pathogenesis and regulation of virulence, Mechanisms for origin of new pathogens. The development of resistant organisms in populations

Diagnostic microbiology **5 hrs**

Cultivation and identification of microorganism:

Sites of sample collection Culture identification: microscopic examination, Conventional system technique: blood culture, urine culture, sputum, throat swab, stool culture, BACTec technique, cultivation for obligate pathogen, phage typing, antimicrobial susceptibility testing, immunological techniques: antibody based identification, detection of microbial antigen, western blot RIA, ELISA, immunofluorescence, immunolocalization, flow cytometry, PCR based molecular diagnosis PCR, DNA chips (microarray), ribotyping, southern blotting, nucleic acid hybridization, DNA fingerprinting, fatty acid profile, protein profiling

Bacterial disease of human **8hrs**

Disease of skin and eyes, disease of nervous system, disease of cardiovascular and lymphatic system, microbial diseases of the respiratory system (upper and lower), disease of digestive system, disease of urinary and reproductive system,

Microbial Genetics **4 hrs**

Genetic recombination in bacteria, Conjugation, Transformation, Transduction

Fungi, Structure and Physiology **3 hrs**

Morphology, classification, reproduction and cultivation of fungi, medical importance of fungi, Fungal mycotoxins.

General Virology **3 hrs**

Nature of viruses, Isolation and identification of Viruses. Classification of viruses. Mode of replicationcultivation ofviruses, and bacteriophages,

General parasitology **3 hrs**

Classification, cultivation, identification, life cycle of protozoa and helminthes