

## MMB202: MICROBIOLOGY AND INDUSTRIAL APPLICATIONS

<b>Teaching Scheme</b> Lectures: 4 hrs/Week  Credits: 4	<b>Examination Scheme</b> Class Test - 12Marks Teachers Assessment - 6Marks Attendance - 12 Marks End Semester Exam - 70 marks
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Prerequisite: - Biochemistry, Molecular Biology, Genetic Engineering.

**Course Objectives:** The objectives of this course are to introduce the students to the field of microbiology with special emphasis on microbial diversity, morphology, physiology and nutrition; methods for control of microbes and host-microbe interactions.

### Detailed syllabus

#### Unit I

**Microbial Diversity & Systematics** Classical and modern methods and concepts; Domain and Kingdom concepts in classification of microorganisms; Criteria for classification; Classification of Bacteria according to Bergey's manual; Molecular methods such as Denaturing Gradient Gel Electrophoresis (DGGE), Temperature Gradient Gel Electrophoresis (TGGE), Amplified rDNA Restriction Analysis and Terminal Restriction Fragment Length Polymorphism (T-RFLP) in assessing microbial diversity; 16S rDNA sequencing and Ribosomal Database Project.

#### Unit II

**Microbial Growth & Physiology** Ultrastructure of Archaea (*Methanococcus*); Eubacteria (*E.coli*); Unicellular Eukaryotes (Yeast) and viruses (Bacterial, Plant, Animal and Tumor viruses); Microbial growth: Batch, fed-batch, continuous kinetics, synchronous growth, yield constants, methods of growth estimation, stringent response, death of a bacterial cell. Microbial physiology: Physiological adaptation and life style of Prokaryotes; Unicellular Eukaryotes and the Extremophiles (with example from each group)

#### Unit III

**Microbial Interactions and Infection** Host-Pathogen interactions; Microbes infecting humans, veterinary animals and plants; Pathogenicity islands and their role in bacterial virulence

#### Unit IV

**Microbes and Environment** Role of microorganisms in natural system and artificial system; Influence of Microbes on the Earth's Environment and Inhabitants; Ecological impacts of microbes; Symbiosis (Nitrogen fixation and ruminant symbiosis); Microbes and Nutrient cycles; Microbial communication system; Quorum sensing; Microbial fuel cells; Prebiotics and Probiotics; Vaccines

#### Unit V

**Industrial Applications** Basic principles in bioprocess technology; Media Formulation; Sterilization; Thermal death kinetics; Batch and continuous sterilization systems; Primary and secondary metabolites; Extracellular enzymes; Biotechnologically important intracellular products; exopolymers; Bioprocess control and monitoring variables such as temperature, agitation, pressure, pH Microbial processes-production, optimization, screening, strain improvement, factors affecting down stream processing and recovery; Representative examples of ethanol, organic acids, antibiotics etc. Enzyme Technology-production, recovery, stability and formulation of bacterial and fungal enzymes-amylase, protease, penicillin acylase, glucose isomerase; Immobilised Enzyme and Cell based biotransformationssteroids, antibiotics, alkaloids, enzyme/cell electrodes.