

Course	Discipline Specific Core
Semester	III
Paper Number	MBTCR3062T & MBTCR3062P
Paper Title	GENERAL MICROBIOLOGY
No. of Credits	6
Theory/Composite	Composite
No. of periods assigned	4 Theory + 4 Practical
Course description/objective	<ol style="list-style-type: none"> 1. In this paper, students will be introduced to microbes that form many of the basic models for research in Biotechnology, Molecular Biology and Medicine. 2. Light will be thrown on the fundamental concepts in Microbiology and Microbial Taxonomy. 3. The cultivation and nutritional requirements of microbes, their growth and reproductive strategies including sporulation, how to control microbial growth, and the importance of water and food as their natural niches and vehicles of disease transmission will be explained to the students. 4. Students will also be given a brief introduction to Virology here. Uniqueness of viruses with respect to their obligate parasitism, structural & genomic organisation, replication cycle and classification will be explained. 5. This Virology module will serve as a prelude to the Recombinant DNA Technology module (in Sem V) that includes viral vectors. 6. In the practical module, students will be introduced to methods for staining microorganisms, for cultivation of microorganisms and isolation of bacteria from natural sources.
Syllabus	<p>Theory Module A: (38 marks)</p> <p>UNIT I: Basic Introduction to Microbiology: Fundamentals, History and Evolution of Microbiology; Classification of microorganisms: Microbial taxonomy, criteria used including molecular approaches, Microbial phylogeny and current classification of bacteria; Morphology and cell structure of major groups of microorganisms: e.g. bacteria, algae, fungi and protozoa.</p> <p>UNIT II: Nutrition and cultivation of microorganisms: Nutritional categories of microorganisms; nutrients for bacteria; microbial culture: concept of pure culture, methods of isolation of pure culture (purification) and preservation.</p> <p>UNIT III: Growth and sporulation of microorganisms: Microbial growth: Growth curve, Generation time, synchronous, batch, fed-batch and continuous cultures; factors affecting growth of bacteria; measurement of bacterial growth; Endospores and sporulation in bacteria.</p> <p>UNIT IV: Controlling microbial growth in the environment and in the body: Control of microorganisms by physical, chemical and chemotherapeutic agents.</p> <p>UNIT V: Water and Food Microbiology:</p> <ol style="list-style-type: none"> 1. <i>Water Microbiology:</i> Bacterial pollutants of water; coliforms and non-coliforms; sewage composition and its disposal.

	<p>2. <i>Food microbiology</i>: Important microorganisms in food microbiology: molds, yeasts and bacteria; major food-borne infections and intoxications; preservation of various types of foods; fermented foods.</p> <p>No. of Classes: 3 Classes per week</p> <p>Module B: (12 marks)</p> <p>UNIT VI: Virology Nature and Properties of Viruses <i>General Introduction</i> – definition, general properties, Ellis and Delbruck’s experiment, virus assays, cultivation of viruses, detection <i>Structure of viruses</i> – filamentous and isometric viruses, enveloped viruses, viruses with head-tail morphology <i>Classification of viruses</i> – Baltimore’s classification, satellites, viroids and prions (just mention) Bacteriophages <i>Process of Infection</i> - Attachment and entry of viral genomes (bacteriophage λ, M13) Replication of viral genome – rolling circle (bacteriophage λ), looped rolling circle (M13), terminal redundancy and circular permutation – T-even bacteriophages <i>Gene expression of viral genomes</i> – Bacteriophage λ - lytic and lysogenic cycles.</p> <p>No. of Classes: 1 Class per week</p> <p>Practical</p> <ol style="list-style-type: none"> 1. Preparation of media & sterilization methods. 2. Cultivation of microorganisms in pure culture in broth and agar (slant, stab). 3. Methods of isolation of bacteria from natural sources (soil/food) by spread-plate and streak-plate methods. 4. Staining methods: simple staining, Gram staining, endospore staining, negative staining, fungus staining. 5. Enumeration of microorganisms - total & viable count.
Readings	<p>Theory</p> <p>Module A</p> <ol style="list-style-type: none"> 1. Alexopoulos CJ, Mims CW, and Blackwell M. (1996). <i>Introductory Mycology</i>. 4th edition. John and Sons, Inc. 2. Bauman RW. (2011). <i>Microbiology: With Diseases by Taxonomy</i>. 3rd edition. Pearson / Benjamin Cummings. 3. Jay JM, Loessner MJ and Golden DA. (2005). <i>Modern Food Microbiology</i>. 7th edition, CBS Publishers and Distributors, Delhi, India. 4. Kumar HD. (1990). <i>Introductory Phycology</i>. 2nd edition. Affiliated East Western Press. 5. Madigan MT, Martinko JM and Parker J. (2009). <i>Brock Biology of Microorganisms</i>. 12th edition. Pearson / Benjamin Cummings. 6. Pelczar MJ, Chan ECS and Krieg NR. (1993). <i>Microbiology</i>. 5th

	<p>edition. McGraw Hill Book Company.</p> <p>7. Stanier RY, Ingraham JL, Wheelis ML, and Painter PR. (2005). General Microbiology. 5th edition. McMillan.</p> <p>8. Tortora GJ, Funke BR, and Case CL. (2008). Microbiology: An Introduction. 9th edition. Pearson Education.</p> <p>9. Willey JM, Sherwood LM, and Woolverton CJ. (2008). Prescott, Harley and Klein's Microbiology. 7th edition. McGraw Hill Higher Education.</p> <p>Module B</p> <ol style="list-style-type: none"> 1. Basic Virology - Wagner & Hewlett (2nd ed.) (Reference) 2. Biochemistry - Voet and Voet (3rd ed.) 3. Introduction to Modern Virology - Dimmock, Easton and Leppard (6th ed.) 4. Principles of Virology - Flint, Enquist, Racaniello & Skalka (3rd ed.). (Reference). <p>Practical</p> <ol style="list-style-type: none"> 1. Experiments in Microbiology, Plant Pathology and Biotechnology – K. R. Aneja. 2. Microbiology: A Laboratory Manual - Cappuccino and Sherman. 3. Practical Microbiology – R. C. Dubey.
Evaluation	<p>Theory: Continuous Internal Assessment: 10 marks End-Semester Theory Examination: 50 marks</p> <p>Practical: Continuous Internal Assessment: 32 marks End-Semester Examination: 8 marks</p>
Paper Structure for End Sem Theory	<p>Module A (38 marks) Answer Q.1 (Compulsory) and any four from the rest (Q.2 – Q.7) Q.1 Compulsory (10 marks) Q.2 – Q.7: Any four out of six questions (7 marks each) i.e. 7 marks x 4 questions = 28 marks.</p> <p>Module B (12 marks) Any one from Q.8.and Q.9. – 12 marks No subpart will be less than 1 and more than 5.</p>