

Subject Code: SC202000102	Subject Title: Principles of Microbiology
COURSE TYPE: CORE COURSE	

Course Objective:

Microbiology being a study of organisms of microscopic size, students who opt for this course will get knowledge regarding different microscopic techniques, isolation & preservation of bacteria, bacteriological media, growth of prokaryotes, the biosynthesis of various compounds in Bacteria. It will also provide an insight in the energy production processes in microbes. Microbial diseases of human and plant will provide basic understanding microbial pathogenesis.

Teaching scheme (hours) per week		Credit			Theory Marks		Practical Marks		Total
Theory	Practical	Theory	Practical	Total	Uni. Assessment	Cont. Assessment	Uni. Assessment	Cont. Assessment	
4		4		4	60	40			100

Unit	Content	Lectures	Weightage
1	Unit :1 Methods of Studying Microorganisms: Principles of Microscopy: Concept of Numerical Aperture, Resolving Power & Magnification; Bright Field, Dark Field, Phase Contrast, Fluorescence Microscopy; Advanced Microscopic Techniques: Preparation of Specimen for Microscopy, SEM, TEM, Differential Interference Contrast Microscopy, Atomic Force Microscopy, Confocal Scanning Laser Microscopy; Applications of Different Microscopic Techniques. Methods used for the Isolation of Microorganisms: Types of Different Bacteriological Media and their Applications; Methods for the isolation of bacteria in pure form: Streak Plate Method, Spread Plate Method, Serial Dilution Technique, Pour Plate Method, Single Cell Isolation Technique using Stage Micromanipulator; Methods for the Cultivation of Anaerobic Bacteria; Microorganisms that can not be cultivated in the laboratory; Methods for the preservation of Microorganisms.	15	25%
2	Unit 2: Microbial Growth and biosynthesis Microbial Growth: Definition of Growth, Bacterial growth curve, Measurement of growth, Efficiency of growth, Synchronous growth Continuous growth (chemostat and turbidostat). Biosynthesis: Biosynthesis of Cell wall (peptidoglycan), Biosynthesis of Polysaccharides, Biosynthesis of Purines and pyrimidine, Biosynthesis of fatty acids.	15	25%
3	Unit 3: Energy production Energy production: Substrate level Phosphorylation, Membrane bioenergetics and the proton potential, Electron transport chain and its components. (ETC in Prokaryotes and Eukaryotes) Photosynthesis: The phototrophic microbes: Introduction to Oxygenic and anoxygenic photosynthesis. Cyclic and Non cyclic photosynthesis.	12	20%

	The purple photosynthetic bacteria, The green bacteria, Cyanobacteria, and chloroplast Carbon dioxide fixations systems.		
4	Microbes and Diseases A) Human pathology Introduction Human disease of Virus: Influenza, SARS, Polio Human Disease of Bacteria: Cholera, Tetanus, Tuberculosis Human Disease of Fungi and Protozoa: Mycoses, Amoebiasis, Malaria B) Plant Pathology Concept of plant disease. Symptoms associated with microbial plant diseases, types of plant pathogens, economic losses, and social impact of plant diseases. Important diseases caused by fungi Early blight of potato - <i>Alternaria solani</i> Late blight of potato - <i>Phytophthora infestans</i> Powdery mildew of wheat - <i>Erysiphe graminis</i> Black stem rust of wheat - <i>Puccinia graminis tritici</i> Loose smut of wheat - <i>Ustilago nuda</i> Important diseases caused by phytopathogenic bacteria: Angular leaf spot of cotton, bacterial leaf blight of rice, crown galls, bacterial cankers of citrus.	18	30%

Learning Outcome:

This course will educate the students to acquire knowledge of basic microbiological techniques such as Microscopy, Isolation, Cultivation and Preservation of bacteria. The Students will also learn the fundamental aspect of bacterial growth, energy generation processes and their disease-causing abilities.

Reference Books:

1. Microbial Physiology by Albert G. Moat and John W. Foster. Third edition, John Wiley and Sons; 2002
2. General Microbiology by Roger Stanier, fifth edition Mac Milan Press Ltd.
3. The Prokaryotes. A handbook on the biology of bacteria: ecophysiology, isolation, identification, applications. Volumes I-IV by Balows, A., Truper, H. G., Dworkin, M., Harder, W., Schleifer, K. H. Springer-Verlag, New York; 1992
4. Principles of Microbiology by R.M. Atlas, Mosby publishers, St. Louis; 1995
5. Brock Biology of Microorganisms (12th edition) by Madigan and John M. Martinko, Paul V. Dunlap, David P. Clark Benjamin Cummings; 2008.
6. Microbiology: An Introduction by Gerard J Tortora, Berdell R Funke, Christine L Case Benjamin-Cummings Publishing Company ; 2008.