

Semester	1
Course	Major
Paper Code	CIMB230111T
Paper Title	Microbial Diversity, Systematics & Bacteriology
No. of Credits	4
Theory / Practical / Composite	THEORY
Minimum No. of preparatory hours per week a student has to devote	4 hours/week
Number of Modules	No modules
Syllabus	<p><u>General characteristics of Algae and fungi</u></p> <ul style="list-style-type: none"> • Algae --General characteristics of algae including occurrence, thallus organization, algal cell ultra-structure, pigments, flagella, eyespot, food reserves and reproduction-vegetative, asexual and sexual. Different types of life cycles in algae with suitable examples: Haplontic, Haplontic, Diplontic, Diplobiontic and Diplohaplontic life cycles. Applications of algae in agriculture, industry, environment and food. • Fungi-- General characteristics of fungi including habitat, distribution, nutritional requirements, fungal cell ultra- structure, thallus organization and aggregation, fungal wall structure and synthesis, asexual reproduction, sexual reproduction, heterokaryosis, heterothallism and parasexual mechanism. Economic importance of fungi with examples in agriculture, environment, Industry, medicine, food, biodeterioration and mycotoxins. • Protozoa --General characteristics with special reference to Amoeba, Paramecium, Plasmodium, Leishmania and Giardia <p><u>Diversity of Microbial World</u></p> <p>Difference between prokaryotic and eukaryotic microorganisms.</p> <p>Development of Classification systems - Aim and principles of classification, systematics and taxonomy. Early approaches to classification. Phenetic classification system - Whittaker's five kingdom-General characteristics of different groups. Numerical Taxonomy. Binomial Nomenclature- Rules and scientific sources of naming. Bergey's Manual of Systematic Bacteriology [First Edition]</p> <p>Acellular microorganisms like Viruses, Viroids, Prions with emphasis on distribution, occurrence, morphology, mode of reproduction and economic importance.</p> <p><u>Bacterial Systematics</u></p> <p>Molecular and modern approaches to phylogenetic classification systems - evolutionary chronometers, rRNA oligonucleotide sequencing, signature sequences, T_m value, G+C content and protein sequences. Carl Woese's classification systems and their utility. Bergey's Manual of Systematic Bacteriology [Second Edition]. Differences between eubacteria and archaeobacteria.</p> <p><u>Bacterial Cell Organization</u></p> <p>Morphology: Cell size, shape and arrangement</p> <p>Cell wall: Structure and function of Gram positive and Gram negative cell wall; Archaeobacterial cell wall.</p> <p>Cell membrane: Structure and function of bacterial and archaeal cell membranes.</p> <p>Cytoplasm: Nucleoid, plasmid, ribosomes, mesosomes, inclusion</p>

	<p>bodies. Structures external to cell wall: Glycocalyx, capsules, flagella, endoflagella, pili and fimbriae. Special structure: Endospores</p> <p><u>Bacterial Staining</u> Stains: Definition, chemistry and classification of stains. Staining techniques: Principles and mechanisms of Simple (Positive and Negative) Staining, Differential (Gram and Acid Fast) Staining, Special (Endospore, Capsule, Flagella).</p> <p><u>Bacterial Nutrition and Growth</u> Nutrition: Nutritional requirements in bacteria and nutritional categories Culture Media: Components of media, natural and synthetic media, complex media, selective and differential media, enriched and enrichment media, transport and anaerobic media Growth: Definition, Measurement of growth, batch culture (phases of growth, generation time and growth rate), continuous culture, Synchronous growth, diauxic growth.</p> <p><u>Control of Bacterial Growth</u> Physical methods of microbial control: Heat, low temperature, high pressure, filtration, desiccation, osmotic pressure, radiation Chemical methods of microbial control: types and mode of action of disinfectants</p> <p><u>Reproduction in Bacteria</u> General methods of reproduction in bacteria. Binary fission: overview.</p>	
Learning Outcomes	<ul style="list-style-type: none"> • To know about the microbial diversity and systematics • To study the bacterial reproduction, growth and nutrition • To study the bacterial cell organization 	
Reading/Reference Lists	<ol style="list-style-type: none"> 1. Tortora GJ, Funke BR and Case CL. (2008). Microbiology: An Introduction. 9th edition. Pearson Education 2. Madigan MT, Martinko JM, Dunlap PV and Clark DP. (2014). Brock Biology of Microorganisms. 14th edition. Pearson International Edition 3. Cappucino J and Sherman N. (2010). Microbiology: A Laboratory Manual. 9th edition. Pearson Education Limited 4. Wiley JM, Sherwood LM and Woolverton CJ. (2013) Prescott's Microbiology. 9th Edition. McGraw Hill International. 5. Atlas RM. (1997). Principles of Microbiology. 2nd edition. W.M.T.Brown Publishers. 6. Pelczar MJ, Chan ECS and Krieg NR. (1993). Microbiology. 5th edition. McGraw Hill Book Company. 7. Stanier RY, Ingraham JL, Wheelis ML, and Painter PR. (2005). General Microbiology. 5th edition. McMillan 8. Advanced Microbiology online MOOC course by Dr Arup Kumar Mitra- https://onlinecourses.swayam2.ac.in/cec22_bt20/preview 	
Evaluation	<p>Theory CIA: 30 Semester Exam:70</p>	<p>Practical (if applicable) CA: Semester Exam:</p>
Paper Structure for Theory Semester Exam	<p>Full marks 70 Short questions: 10 (each 2 marks) from 12 (10x2=20) Long questions: 5 (each 10 marks) from 7 (5x10=50)</p>	

