

Subject Code: 2SC1020201	Subject Title: Microbiology
Course Type: Core Course	

Course Objective:

Microbiology is a study of organisms of microscopic size. Students will learn the historical perspectives associated with the subject of microbiology. Students will learn the fundamental aspects of Staining, Microscopy, Isolation, Pure Culture & Preservation Techniques. This course will make the student familiar with basic microbiological techniques and processes that will help them understand the prokaryotic processes in a much better way.

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	2	6	70	30	30	20	150

A. Microbiology Theory:

PAPER: 1SC1020201 Basics of Microbiology

Unit	Content	Lectures	Weightage (%)
1	Introduction to Bacterial Taxonomy and Nomenclature - Basic principles of Bacterial Taxonomy & Nomenclature: concept of species, taxa, type strain. - Introduction to different systems of Bacterial classification & Nomenclature - Methods for the Classification of Microorganisms: Intuitive Method, Numerical Taxonomy, Genetic Methods for the Classification of Microorganisms (DNA Homology Experiment & 16S rRNA Oligonucleotide Cataloguing Method) - Introduction to Bergey's Manual of Systematic Bacteriology The Past, Present & Future Status of Bacterial Classification & Nomenclature	15	25%
2	Introduction to Bacterial Nutrition & Growth: - Nutritional diversities in bacteria - Nutritional Classification of Bacteria: Autotrophs, Heterotrophs, Phototrophs, Chemotrophs - Nutritional requirements of bacteria - Composition and nutritional value of ingredients of growth media - Cultivation methods of bacteria, characteristics of growth, modes of cell division	15	25%
3	Principles of Microbial Control -1 - General principles: Control by killing, inhibition and removal - Definition of Terms: Bactericidal, Bacteriostatic, MIC, MLD, LD50, Chemotherapy, Antibiotic, Growth Factor Analogue - Characteristics of an Ideal Antimicrobial Agent. Antibiotics: - Antibiotics that Inhibit Cell wall synthesis: β-Lactam Group of Antibiotics (Penicillin, Cephalosporin) - Antibiotics that Inhibit Protein synthesis: (Streptomycin, Tetracyclines,	15	25%

	Chloramphenicol) - Antibiotics that Effect cell membrane - Antibiotics that interferes with Nucleic acid - Growth Factor Analogues: Mode of Action of Sulfa Drugs		
4	Principles of Microbial Control - 2 - Definition of Terms: Sterilization, Disinfection, Antisepsis. - Principles and methods of sterilization Physical: Hot Air Oven, Pressure Cooker, Autoclave, Laminar Air Flow - Chemical: Alcohol, Aldehyde, Phenol, Halogen, Hypochlorite, Fumigants, Surfactants, Dyes, Heavy Metals & Gaseous Sterilizing Agents. - Phenol coefficient Method - Radiation methods: UV rays, gamma rays, ultrasonic methods - Physical agents of microbial control : Osmotic Pressure, Filtration(HEPA filters)	15	25%
	TOTAL HOURS	60	

Learning Outcome:

By offering this course, students will learn to formulate bacteriological media for cultivation of different kind of microorganisms. Students will acquire knowledge on how to control microorganisms and their growth by using a variety of physical, chemical and gaseous sterilizing agents.

Reference books:

1. Tortora GJ, Funke BR and Case CL. (2008). Microbiology: An Introduction. 9th edition. Pearson Education
2. Stanier, RY, Ingram "General Microbiology"
3. Madigan MT, Martinko JM, Dunlap PV and Clark DP. (2014). Brock Biology of Microorganisms. 14th edition. Pearson International Edition
4. Prescott, M. J., Harley, J.P. and D.A. Klein (2002). "Microbiology", 5th Edition, WCB Mc GrawHill, New York.
5. Atlas, R.M. (1997). Principles of Microbiology. 2nd edition. W.M.T.Brown Publishers.
6. Pelczar, M.J., Chan, E.C.S. and N.R. Kreig (1993). "Microbiology" 5th Edition, Tata Mc Graw Hill Publishing co. Ltd., New Delhi.
7. Dubey, R. C. and D. K. Maheshwari (2000). "General Microbiology". S. Chand Publications, New Delhi.
8. J.G. Black. (2005). "Microbiology: Principles and Explorations" John Willey, USA.
9. Schlegel, H.G. (2010) General Microbiology, Willey Publications.
10. Patel, R. J. "Experimental Microbiology Volume-1 & 2" Aditya publication, Gujarat (2016)

Microbiology Practicals:

(PRACTICALS FOR PAPER: 1SC1020201 : FUNDAMENTALS OF BACTERIOLOGY)

1. Techniques for Cultivation of Microorganisms
2. Study of pigmented bacteria: *S. aureus*, *S. epidermidis*, *M. luteus*, *S. marcescens*, *P. aeruginosa*
3. Study of bacterial structure by structural staining: Spore, Capsule, Cell Wall
4. Special staining: Spirochete by Fontana's method
5. Growth Curve of *E. coli*
6. Effect of temperature and pH on growth of bacteria

7. Study of effect (Bacteriostatic & Bactericidal) of chemicals on bacterial growth: heavy metals, phenol, mercuric chloride, crystal violet, antibiotics by different methods: paper disc method, agar ditch method, agar cup method.
8. Morphological and biochemical characteristics of selected bacterial genera: *Escherichia*, *Bacillus*, *Pseudomonas*, etc.

Scheme of Practical Examination:

Exam Time: 4 Hrs.

Total Marks: 50

Skeleton for Practical Examination:

Ex-1: Techniques for Cultivation of Microorganisms, Effect of Temperature, pH , Antibiotics & Heavy Metals on Microbial Growth	(15)
Ex-2: Special Staining Techniques (Cell Wall/Capsule/Spore/Spirochete Staining Methods)	(10)
Ex-3: Spotting (Spots 1-10)	(10)
Ex-4: Viva-Voce	(10)
Ex-5: Journals, Slides & Routine Performance	(05)
	<u>Total Marks:</u> (50)

➤ **General Instructions for Candidates:**

1. Students must bring with themselves their duly signed & certified journals, slidebox, apron, slides, colour pencils, Nichrome Wire Loop & Matchbox.
2. Students must bring with themselves their Exam. Receipt & College ID Card while appearing in practical examinations
2. 80% Attendance is compulsory to qualify for taking practical examination of the candidate.
3. Malpractices in any form will be strictly dealt with during the conduct of practical examination.