FACULTY OF SCIENCE AND HUMANITIES
B.Sc. (Microbiology) Semester-1
In Effect from Academic Year 2021-22

Subject Code: 2SC1020101	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:

Unit	Content	Lectures	Weightage(%)
1	**Unit 1: History of Microbiology:** • Introduction to Microbiology and applied fields of Microbiology • Development of microbiology as a discipline, Spontaneous generation vs. biogenesis. Contributions of Anton von Leeuwenhoek, Louis Pasteur, Robert Koch, Joseph Lister • Role of microorganisms in fermentation (Germ Theory of Fermentation) , Germ theory of disease, • Development of various microbiological techniques. • Development of the field of soil microbiology: Contributions of Alexander Fleming, Martinus W. Beijerinck, Sergei N. Winogradsky, Selman A.Waksman • Establishment of fields of medical microbiology and immunology through the work of Paul Ehrlich, Elie Metchnikoff, Edward Jenner	15	25%
2	**Unit 2: Prokaryotic Cell Organization** • Shape, size, and arrangement of bacterial cell **Structure of bacterial cell** • Surface appendages of bacteria: General nature, arrangement, structure and role of flagella, General nature, and significance of pili, prosthecae and stalks • Surface layers of bacteria: General nature and significance of capsule and slime layer, cell wall, cell membrane and Mesosomes • Bacterial cytoplasm and cell organelles: Cytoplasm, cytoplasmic inclusions, nuclear material • Bacterial endospore : Spore structure, sporulation and spore germination	15	25%
3	**Unit 3: Isolation, Pure Culture and Preservation Techniques for Microorganisms** **Isolation of Bacteria:** • Definitions of Terms: Isolation, Pure Culture, Axenic Culture, Colony,	15	25%

	Clone • Methods for the Isolation of Bacteria: Streak Plate Method (Direct Method, Sector Method, Four Flame Method), Spread Plate Method, Serial Dilution Technique, Pour Plate Method, Enrichment culture, Single Cell Isolation by Micromanipulator • Methods for the Cultivation of Anaerobic Bacteria **Preservation of Microorganisms:** • Periodic transfer to fresh media, storage by subculturing microorganisms under oil, Sand cultures, Storage at Low temperatures: Lyophilization & Liquid Nitrogen. • Concept & Importance of Culture Collection Centers for Microorganisms.		
4	**Unit :4 Principles of Staining Techniques & Microscopy** **Types of Stains & Staining techniques:** • Dyes & Stains, • Role of Primary Stains, Counter Stains, Mordants, Decolorizers, Accentuators with suitable examples. • Simple, Differential (Grams' Staining & Acid-Fast Staining), Negative, Structural staining techniques (Spore, Capsule, Flagella, Cell Wall, Metachromatic Granules, etc.) **Principles of Microscopy:** simple & compound, Bright field, Dark field, Phase contrast & Fluorescence Microscopy, **Electron Microscopy:** • Scanning Electron Microscopy & Transmission Electron Microscopy: Principles, Specimen Processing Techniques involved & their merits and demerits	**15**	**25%**
	TOTAL HOURS	**60**	

Learning Outcome:
Students will learn to identify the microorganisms based on their morphological features. They will be able to isolate different microorganisms by learning the isolation and cultivation techniques as laid out in this course. Students will be able to stain and observe different microbiological specimens by learning the staining and microscopic techniques. Moreover, students will be better able to comprehend the fundamental aspects of microbiology by understanding the historical perspectives of the subject.

Reference books:
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. Presscott, M. J., Harley, J.P. and D.A. Klein (2002). "Microbiology", 5th Edition, WCB Mc GrawHill, New York.
4. Atlas, R.M. (1997). Principles of Microbiology. 2nd edition. WM.T.Brown Publishers.
5. Pelczar, M.J., Chan, E.C.S. and N.R. Kreig (1993). "Microbiology" 5th Edition, Tata Mc Graw Hill Publishing co. Ltd., New Delhi.
6. Dubey, R. C. and D. K. Maheshwari (2000). "General Microbiology". S. Chand Publications, New Delhi.
7. Frobisher, H., Hinsdil, R.D., Crabtree, K. T. and D. R. Goodhert (2005). " Fundamentals of Microbiology", Saunder & Co., London.
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: **1SC1020101**: FUNDAMENTALS OF MICROBIOLOGY)

1. Safety precautions to work in Microbiology Laboratory
2. Preparation of Culture Media: Solid & Liquid
3. Isolation of Bacteria by Streak Plate Method (using Direct & Sector Streaking Methods)
4. Pour Plate Technique for Quantitative Bacteriological Analysis of Given Samples
5. Microscopic observation of bacteria for Morphological characters by Simple (Monochrome & Negative) Staining
6. Differential Staining Technique: Grams' Staining
7. Preservation of Bacterial Cultures

Scheme of Practical Examination:

Exam Time: 4 Hrs. *Total Marks: 50*

Skeleton for Practical Examination:

Ex-1: Isolation of Bacteria by Streak (Direct/Sector Method) & Pour Plate Method	(15)
Ex-2: Simple & Differential Staining Techniques (Monochrome/Negative/Grams' Staining)	(10)
Ex-3: Spotting (Spots 1-10)	(10)
Ex-4: Viva-Voce	(10)
Ex-5: Journals, Slides & Routine Performance	(05)
Total Marks:	(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.