



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3131302

Semester – III

Subject Name: Environmental Microbiology and Bioremediation

Type of course: Engineering Science

Prerequisite: None

Rationale: Microorganisms not play a very important role in treatment and disposal of wastes but also are responsible for spreading many diseases. Hence a working knowledge of microbiology forms a base for other core subjects of environmental engg.

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs
1	Introduction to microbiology: Scope of microbiology, Structure and classification of microbes, Role of microbes in human life and environment, Prokaryotic cell, Cytoplasm of Eukaryotes	04
2	Basic methods in microbiology: Microscopic methods, Techniques of sterilization, Media preparation, Isolation and inoculation, direct observation and staining techniques, Maintenance and preservation of cultures	06
3	Microscope and Microscopy: Optical Microscopes and electron microscope	04
4	Prokaryotes and Viruses: Brief description about Bacteria and Viruses and their role and importance in Environment	04
5	Eukaryotes: Brief description about protozoa, algae and fungi and their role and importance in Environment.	06
6	Microorganisms and Human diseases: Diseases caused by bacteria, fungi and protozoa	06
7	Role of Microorganisms in Environment, Industry and Food: Soil microorganisms, microorganisms in aquatic habitats, microorganisms and pollution,	06



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	Microorganisms in sewage, Fermentation processes, products of industrial fermentation	
8	Control of microbes: Principles of control of microbes, Uses of physical agents and chemical agents.	02
9	Bioremediation: Introduction, Fundamental principles, In-situ bioremediation of soil and Groundwater, Ex-situ bioremediation of soil, Wastewater bioremediation, Innovative treatment technologies, Case studies.	04

Suggested Specification table with Marks (Theory): (For BE only)

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	20	30	0	0	0

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. Microbiology by Pelczar and Ried
2. Environmental Microbiology by Ralph Mitchell
3. Wastewater Engineering- Treatment and Reuse, Metcalf and Eddy, Inc., Revised by Tchobanoglous, Burton and Stensel
4. Introduction to Microbiology by A.S. Rao
5. Environmental Microbiology by Manish L. Shrivastva
6. Handbook of Bioremediation Edited by Norris et al, Robert S. Kerr; Environmental Research Laboratory.
7. Bioremediation Principles: Ewies, Ergas, Chang and Schroeder

Course Outcomes:

Sr. No.	CO statement	Marks % Weightage
CO-1	Identify techniques to enumerate microbes	15
CO-2	Describe the structure of microbes & relate their role in environment	40



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CO-3	Compare the physical & chemical agents for control of microbes	15
CO-4	Discuss the principles of bioremediation for treatment of soil, wastewater & ground water.	30

List of Experiments:

1. To prove that microbes are ubiquities.
2. To determine MPN of given water sample.

Major Equipment:

1. Autoclave
2. Biological Incubator
3. Monopan Balance