

GUJARAT TECHNOLOGICAL UNIVERSITY

ENVIRONMENT ENGINEERING

ENVIRONMENTAL MICROBIOLOGY & BIOREMEDIATION

SUBJECT CODE: 2131302

B.E. 3RD SEMESTER

Type of course: Applied Sciences

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	Examination Marks						Total Marks
L	T	P		Theory Marks			Practical Marks			
			ESE (E)	PA (M)		PA (V)		PA (I)		
PA	ALA	ESE		OEP						
4	2	0	6	70	20	10	30	0	20	150

Content:

Sr. No.	Contents	Total Hrs	% Weightage
1	Introduction to microbiology	04	8
	Scope of microbiology, Structure and classification of microbes, Role of microbes in human life and environment, Prokaryotic cell, Cytoplasm of Eukaryotes		
2	Basic methods in microbiology	06	10
	Microscopic methods, Techniques of sterilization, Media preparation, Isolation and inoculation, direct observation and staining techniques, Maintenance and preservation of cultures		
3	Microscope and Microscopy	04	8
	Optical Microscopes and electron microscope		
4	Prokaryotes and Viruses	04	8
	Brief description about Bacteria and Viruses and their role and importance in Environment		
5	Eukaryotes	06	10
	Brief description about protozoa, algae and fungi and their role and importance in Environment.		
6	Microorganisms and Human diseases	08	14
	Diseases caused by bacteria, fungi and protozoa		
7	Microorganisms in Environment, Industry and Food	08	14
	Soil microorganisms, microorganisms in aquatic habitats, microorganisms and pollution, Microorganisms in sewage, Fermentation processes, products of industrial fermentation		
8	Control of microbes	08	14

	Principles of control of microbes, Uses of physical agents and chemical agents.		
9	Bioremediation	08	14
	Introduction, Fundamental principles, In-situ bioremediation of soil and Groundwater, Ex-situ bioremediation of soil, Wastewater bioremediation, Innovative treatment technologies, Case studies.		

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 Outcome:

After learning the course the students should be able to:

1. Use the working knowledge of microbiology to appreciate the role of microbes in environmental engineering.
2. Perform basic experiments related to microbiological examination of water.
3. Relate the role of micro organisms in spread of human diseases.
4. Select the type of physical and chemical agents for microbial control applying the principles of microbial control.
5. Justify the role of microbes in bioremediation.

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.