GUJARAT TECHNOLOGICAL UNIVERSITY

ENVIRONMENTAL SCIENCE AND TECHNOLOGY (35)

ENVIRONMENTAL BIOSCIENCE

SUBJECT CODE: 2143503

B.E. 4th SEMESTER

Type of course: Environmental Science & Technology

Prerequisite: A good fundamental backup of basics of microbiology and biotechnology for environmental science and technology

Rationale: The main objective of this subject is to make students aware about the basics of microbiology and biotechnology as how these can be applied in Environment for reducing pollutants and also how biotechnology applications are used.

Teaching and Examination Scheme:

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

Content:

Sr. No.	Topic	Teaching Hours	Module Weightage (%)
1.	Introduction of microbiology, characteristics and classification of microbes, role of microbes in environment(Bacteria, algae, fungi, protozoa, virus)	8	10
2.	Microbiology of soil, air, water, Basic principal of microbial transformation of organic matter, biodegradation, acclimatization.	8	10
3.	Culture media, , isolation and identification of microbes, culture technique, Pure & mixed culture, Aerobic and anaerobic metabolism, microbial growth	8	25
4.	Structure and function of Macromolecule (Carbohydrates, Lipids, Proteins, amino Acids), Structure and function of cell constituent, Classification and role of enzymes.	12	20
5.	Introduction to Biotechnology , applications of biotechnology in industries and environmental engineering	5	10
6.	Role of microorganism in water and waste water engineering, Microbiology applied to air/water pollution control(Bioremediation, Bioscrubbers and biofilter) Biogas technology- production	12	25

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks				
R Level	U Level	A Level	N Level	E Level
17	28	27	14	9

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate 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:

- Microbiology by Pelczar 5th Edition.
- Biochemistry by U. Satyanarayana
- Biotechnology by B.D. Singh
- Fundamentals of Genetics by B.D. Singh
- Gene cloning and DNA analysis by T.A. Brown.
- Microbiology by Pawar and Dagniwala(Himalaya publishing House)
- General microbiology by Stainer (Mac Millan Publication)

Course Outcome: After learning the course the students should be able:

1. To know the names of micro-organisms present in soil, air and identify them.
2. Should know the applications of biotechnology in their particular field.
3. Should know the basics part so that they know how they need to apply in industries in the near future.

List of Experiments and Open Ended Projects:

Minimum **5** practicals to be performed and remaining time should be allotted to open-ended projects/study reports/latest outcomes in technology study**:-**

1. In the beginning of the academic term, faculties will have to allot their students atleast one Open-ended Project / Study Report /Latest outcome in technology.
2. Literature survey including patents and research papers of fundamental process

- Design based small project **or**
- Study report based on latest scientific development **or**
- Technology study report/modeling/ simulation/collection report **or**
- Computer based simulation / web based application/ analysis presentations of basic concept field which may help them in chemical engineering.

3. These can be done in a group containing maximum **three** students in each.
4. Faculties should cultivate problem based project to enhance the basic mental and technical level of students.
5. Evaluation should be done on **approach of the student on his/her efforts** (not on 4. Faculties should cultivate problem based project to enhance the basic mental and technical level of students.
5. Evaluation should be done on **approach of the student on his/her efforts** (not on completion) to study the design module of given task.
6. In the semester student should perform **minimum** 5 set of experiments and complete **one small open ended dedicated project** based on engineering applications.This project along with any performed experiment should be **EVALUATED BY EXTERNAL EXAMINER.**

PRACTICALS (ANYFIVE):

1.	Introduction of instruments used in Microbiology/Biotechnology along with principles.
2.	Demo practical as how aseptic condition is kept in lab and how culture is grown in lab.
3	Growing of culture and showing them the staining techniques.
4.	Simple staining.
5.	Gram Staining.
6.	DNA isolation

Major Equipment:
Laminar air flow, Rotary shaker, Refrigerator, Pure cultures, Bacteriological incubator, Centrifuge.

Open Ended Project fields:-
Students are free to select any area of science and technology based on chemical technology applications to define Projects.

Some suggested projects are listed below:

- Projects related to biogas and bioremediation.
- Project related to treatment of wastewater.

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 is 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 be sent to achievements@gtu.edu.in.