SEMESTER-VI

ENVIRONMENTAL MICROBIOLOGY

THEORY

Program: B.Sc. **Max. Hours: 45**
Course Code: U20/MIC/DSE/602 **Hours per week: 3**
Course Type: DSE **Max. Marks: 100**
No. of Credits: 3

Course Objectives:

- To understand the contribution of microorganisms in Water and different types of sewage treatment.
- To learn the role of microorganisms in plant growth promotion and understand the role of microorganisms in plant diseases and their control.

Course Outcomes:

CO1: Understand the role of microbes in water and of sewage treatment process.
CO2: Evaluate the role of microorganisms in biogeochemical cycle.
CO3: Analyse the importance of plant growth promoting microorganisms and understand the role of biofertilizers and its applications in crop fields.
CO4: Apply the principles of plant disease control and Biopesticides to prevent diseases inplants.

MODULE I - INTRODUCTION TO AIR AND WATER MICROFLORA (12Hrs)

Air microflora**,** air sampling techniques .Treatment and safety of drinking (potable) water, Criteria for potability of water, Purification of water.
Sewage treatment- composition of sewage, objectives of sewage treatment.
Microbiology of polluted water, sewage treatment (Primary treatment, Secondary treatment- Trickling Filters, Activated sludge, oxidation ponds, Advanced Treatment methods, Anaerobic treatment, Composting.

MODULE II - BIOGEOCHEMICAL CYCLES & MICROBIAL INTERACTIONS (10 Hrs)

Role of micro-organisms in Carbon cycle,
Nitrogen cycle, Phosphorus cycle,
Microbial interactions-mutualism, competition, commensalism, antagonism, parasitism, predation.

MODULE III - SOIL MICROFLORA AND PGPR (12 Hrs)

Rhizomicrobiomeand Phyllomicrobiome, Plant growth promoting microorganisms.
(Mycorrhiza, Rhizobium, Azospirillum, Azotobacter, Cyanobacteria, Frankia and PSM)
Biofertilizer- Preparation of Rhizobial inoculants.
Cyanobacterial Biofertilisers.

MODULE IV - PLANT DISEASES (11 Hrs)

Disease triangle, Symptoms of plant diseases caused by fungi, symptoms of disease caused by bacteria and viruses.
Principles of plant disease control-
Prophylactic measures, Therapeutic measures, Immunization measures
Biological control of plant diseases. Biopesticides–Bacillus thuringiensis, Nuclear polyhedrosis virus (NPV).

Text Books :

1. S. Ram Reddy, M.A SingaraCharya,A Text Book of Microbiology (Applied Microbiology), Volume IV. Himalaya publishing house.
2. Dubey, Maheshwari,(1999),Text book of Microbiology, 1st Edition,S.Chand Publishers.
3. R.C.Dubey, (1993), Textbook of Biotechnology, 1st Edition, S.Chand publishers.

Reference Books :

1. Alexander Martin, Text Book of Soil Microbiology, Krieger Publications.
2. Arun K Sharma Biofertilizers for sustainable Agriculture, Agrobios publishers.
3. K. Vijaya Ramesh by Environmental Microbiology by (MJP Publishers)
4. Madigan et al by Brock Biology of Micro organisms
5. Bitton, G. Waste water microbiology, 3rd Edition,Wiley Blackwell Publishers.
6. Henze, M. Waste water treatment – Biological and chemical process by Henze, M.Springer-Verlag Berlin Heidelberg.
7. Martin Alexander Biodegradation and Bioremediation second(2001),Academic Press.
8. F. Mason (1996). Biology of freshwater pollution. Third edition. Longman Group 356p
9. Gopal Reddy et al,(2008), Laboratory experiments in Microbiology,3rd edition, Himalaya publishers.
10. Prescott, Harley and Klein Wim. Laboratory Exercises in Microbiology Mc.Graw Hill Publishers.
11. R.C Dubey, D.K Maheshwari,(2012), Practical Microbiology ,S Chand and Company, New Delhi.
12. Cappuccino, Sherman, Microbiology Laboratory Manual, Pearson Education.

ENVIRONMENTAL MICROBIOLOGY

MODEL QUESTION PAPER

THEORY

Course Code: U20/MIC/DSE/ 602 **Max Marks: 60**
Credits : 3 **Time : 2Hrs**

SECTION – A

I. Answer the following **4 x 10 = 40 M**

1. Describe various methods of primary and secondary sewage treatment.

OR

2. Write notes on treatment, safety of drinking water and criteria for potability of water.

3. Describe briefly the role of microorganisms in Nitrogen cycle.

OR

4. Write notes on types of microbial interactions.

5. Write notes on preparation of Rhizobial inoculants.

OR

6. Explain about different plant growth promoting microorganisms

7. Describe the principles of plant disease control in detail.

OR

8. Write notes on biopesticides.

SECTION – B

II. Answer any <u>FOUR</u> **4 x 5 = 20 M**

9. Air sampling techniques
10. Composting
11. Carbon cycle
12. Rhizomicrobiome
13. Disease triangle
14. Symptoms of plant diseases caused by viruses.

ENVIRONMENTAL MICROBIOLOGY

PRACTICAL

Course Code: U20/MIC/DSE/602/P **Max. Hours: 45**
Course Type: DSE **Hours per week: 3**
No. of Credits: 1 **Max. Marks: 50**

Course Objectives:

- To demonstrate and analyse basic laboratory skills and techniques related to the cultivation isolation, staining and identification of microorganisms.
- To learn Standard Coliform Test and Biological oxygen demand of water samples

Course Outcomes:

CO1 : Isolate and identify Rhizosphere , Phyllosphere and Rhizobia from plants.
CO2 : Perform Standard Coliform Test and Biological oxygen demand of water samples.
CO3 : Isolate and identify Antagonist, Azospirillum and Azotobacter from soil samples.
CO4 : Isolate microorganisms from environment.

PRACTICAL SESSIONS

1. Isolation of Rhizosphere microflora.
2. Isolation of Phyllosphere microflora.
3. Isolation of Rhizobia from root nodules.
4. Standard Coliform Test.
5. Biological oxygen demand.
6. Isolation of microorganisms from air by petriplate exposure method.
7. Isolation of antagonistic microorganisms by crowded plate technique.
8. Isolation of Azospirillum.
9. Isolation of Azotobacter.
10. Isolation of microorganisms from soil by dilution plate technique.

MODEL QUESTION PAPER

PRACTICAL

Course Code: U20/MIC/DSE/ 602/P **Max Marks: 50**
Credits : 1 **Time : 2Hrs**

Answer the following

I. MAJOR: **1 x 20 = 20 M**

1. Perform Biological oxygen demand on the given water sample, report the D2 Value and calculate BOD. D1 value of the sample provided.

II. MINOR **1 x 10 = 10 M**

2. Isolation of Rhizosphere microflora has been performed and plates provided. Identify and report the organisms by staining techniques.

OR

3. Isolation of microorganisms from air by Petri plate exposure method has been performed and plates provided. Identify and report the organisms by staining techniques.

III. Identify the spots A- E and write few significant points. **5 x 2 = 10 M**

IV. Record **5 M**

V. Viva **5M**