Swami Ramanand Teerth Marathwada University, Nanded.

Revised Curriculum of
B. Sc. Second Year
Environmental Science

W.e.f. : June, 2009.

Course Structure of Under - graduate Degree Course

(B. Sc. II Year) Environmental Science

Class : B. Sc. II Year				
Sr. No.	***Course Code***	***Title of the Paper***	***No. of Periods***	***Maximum marks***
04	Env. 201	Environmental Microbiology	80	100
05	Env. 202	Air pollution : Prevention and Control	80	100
06	Env. 203	Laboratory Course	60	100
07	Env. 204	Laboratory Course	60	100

Env. 201 : Environmental Microbiology

Unit I : Introduction and Types of Microorganisms :

History of microorganisms; Microbiology in 21st century. **Types of Microorganisms : 01. Protista :** Concept of Protista, Eukaryotic and Prokaryotic cells; **Viruses :** Occurrence, Nature, Size, Structure, Life cycle, Economic importance, Tmv, Bacteriophages; **Bacteria :** Shape, The Bacterial cell, Characteristics of bacterial cell : cell membrane, Cell wall, Mesosomes, slim layer and capsule, flagella, Nucleus, vacuoles, mitochondria, Ribosome, endospores; Growth and measurement of bacterial cell; Classification based on carbon, oxygen, temperature, and energy sources, Optimum factors for the growth of bacteria (Temperature, pH, Radiation, Salinity) (15)

Unit II : Methods in Microbial study :

Culture media: Common ingredients of culture media: Water, Peptones, Meat extract, Yeast extract, Gelatin, Agar, Sodium chloride, Inorganic requirements, Fermentable compounds, Vitamins, Nitrogen sources, pH, Buffers; Types of Culture media : Synthetic media, Non synthetic media; **Methods of staining:** Monochrome, Differential, Negative, Acid fast; **Culture methods:** Pour plate, Spread plate, Streak plate. (15)

Unit III : Microbial Control :

Definitions: Sterilization, Disinfection, Antiseptic, Sanitizer, Germicide, Antimicrobial agent, Preservatives; **Factors influencing anti microbial activity:** Concentration, Time, Temperature, The number of organisms, Kind of organisms, Nature of the environment; **Mechanism of the cell injury:** Damage to the cell wall, Damage to the cytoplasmic membrane, Denaturation and coagulation of protein, Inhibition of metabolic reactions; **Sterilization methods :** Physical sterilization, Chemical sterilization, Gases sterilization. (10)

Unit IV : Microbial diseases :

Amoebiosis and its control, **Bacterial diseases and its control:** Shigellosis, Pneumonia, Typhoid fever, Cholera; **Viral diseases and its control:** Influenza, Polio, Aids; **Fungal diseases:** Air borne allergenic diseases, Aspergellosis. (15)

Unit V : Soil microbiology :

Microorganisms in soil: Bacteria, Fungi, Protozoa, Algae, Viruses; Functions of microorganisms in soil; Humus; Functions of Humus; Role of microbes in carbon cycle; Role of microbes in Nitrogen cycle: Ammonification, Nitrification, Nitrate reduction, Denitrification, Nitrogen fixation, Symbiotic nitrogen fixation, Non symbiotic nitrogen fixation,; Role of microbes in Sulphur cycle; (15)

Unit VI : Food Microbiology :

Initial contamination of fresh food, Microbial spoilage of foods, Preservation of foods, Microbiological examination of foods, Fermented foods, Food poisoning. (10)

****

References

01. General microbiology Volume I & II : C. B. *Powar & H. F. Daginawala (Himalaya publishing House, Mumbai), 2002*
02. Fundamental principles of Bacteriology : *A. J. Salle, (Tata McGraw-Hill Publishing Company, New Delhi), 1974*
03. Microbiology : *P. D. Sharma (Rastogi publication Meerut)*
04. Microbiology : *Pelizer, Reid & Chan (Tata McGraw-Hill Publishing Company Limited, New Delhi),*
05. Hand book of Microbiology : *Yu. S. Krivashein (Mir Publishers Mascow)*
06. Microbiology for Environmental Engineering : *M. C. Kinnery (Tata McGraw-Hill Publishing Company New Delhi),*
07. Introduction to Virology : *S. B. Biswas*
08. General microbiology : *Stainer*
09. Applied Microbiology : *imta Kale & Kishore Bhusari (Himalaya Publishing House, Mumbai)*
10. Medical Microbiology : *Day & Day, and Anant Narayan*

Env. 202 : Air Pollution : Prevention & Control

Unit I : Atmosphere & Meteorology :

Atmosphere, Wind circulations, Temperature distribution in the atmosphere, Factors affecting Temperature, Atmospheric circulations, Wind direction and Wind speed, Atmospheric stability and Pollution movement, Inversion, Plume behavior. (10)

Unit II : Types of Air Pollutants and Their Sources :

Natural contaminants: Aerosols, Dust, Smoke, Mist, Fog, Fumes, Particulate matter (PM), Suspended particulate matter (SPM), Respirable suspended particulate matter (RSPM), Fly ash, Photochemical smog; Gaseous air pollutants: Sulphur dioxide, hydrogen sulphide, Hydrogen fluorides, Chlorine, Oxides of nitrogen, Carbon monoxide, Aldehydes, Organic vapors, Tetra ethyl lead, Radio active gases. Natural sources: Volcano, Accidental fires in forests, Dust storms, Oceans, Plants; Combustion; Stationary sources: Fertilizer complex, Cement industries, Thermal power stations, Sulphuric acid industry, Fluoride industry, Acid manufacturing, Soap and detergent industry, Petroleum and Coal industry, Iron and steel industry, Stone and Clay products; Mobile sources: Automobiles. (20)

Unit III : Ambient Air Pollutants Sampling, Analysis and Measurement :

Particulate matter sampling and analysis: Dust fall measurement, SPM and RSPM using High volume air sampler; Gaseous pollutants sampling and analysis: Carbon monoxide, Ozone, Hydrogen sulphide, Nitrogen dioxide, Sulphur dioxide, Hydrogen cyanide, Ammonia, Aldehydes. (10)

Unit IV : Air Pollution Effects:

Effects of air pollution on human health, Vegetation, Animals, Material and structure; Long term effects on the planet : Green house effects, Ozone layer depletion, Acid rain (15)

Unit V : Air Pollution Control:

Particulate emission control: Gravity settlers, Cyclone separators, Fabric filters, Electrostatic precipitators, Wet scrubbers; Gaseous emission control: Principles of absorption and adsorption; Packed towers, Plate towers, Spray towers; Odour control: Combustion: Removal methods: removal of Sulfur dioxide, Nitrogen oxides, Hydrocarbons. (15)

Unit VI : Noise Pollution :

Introduction, Mechanism of hearing, Physiological response to noise, Sources of Noise, Effects of Noise Pollution : Auditory effects & Non auditory effects, Noise level measurement, Noise pollution Control devices. (10)

****

References

01. **Air Pollution and its control :** *Sumit malhotra (Pointer publishers, Jaipur)*
02. **Air Pollution :** *M. N. Rao (Tata McGraw – Hill publishing company, New Delhi)*
03. **Air Pollution :** *B. K. sharma, H. Kaur (Krishna prakashan media, Meerut)*
04. **Pollution of our Atmosphere :** *B. Henderson, (Sellers Adam Hilger Limited, Bristol)*
05. **Fundamentals of Air Pollution :** *Richard W. Bowbel, Donald L. Fox, D. Bruce Tunner, and Arthur C. Stern (Academic Press, California)*
06. **Air Pollution control Engineering :** *Noel De Nevers (Mc Graw – Hill international, New York)*
07. **Air Pollution :** *S. K. Agarawal (A. P. H. Publishing corporation, New Delhi)*
08. **Air Pollution :** *V. P. Kudesia (Pragati Prakashan, Meerut)*
09. **General climatology :** *Critichfield H. J.*
10. **Climatology : Fundamentals and Applications :** *Mater J. R.*
11. **Climatology : Selected Applications :** *Henry D. Foth*
12. **Introduction to weather and climate :** *Trewartha*
13. **The Atmosphere : An Introduction to Meterology :** *Fedrik K. Lutgen, E. J. Tarbuck*
14. **Air Pollution (Volume I to X) :** *A. C. Stern (Academic Press)*
15. **General Meteorology :** *H. R. Byers (Tata Mc Grew – Hill Publications, New Delhi)*

Env. 203 : Laboratory Course

01. Study of Microscope.
02. Study of sterilization equipments (Hot air oven, Autoclave).
03. Study of Laboratory equipments (Incubator, Inoculating chamber, Centrifuge).
04. Preparation and sterilization of culture media.
05. Study of Bacteria (Types).
06. Isolation of bacteria from Soil.
07. Isolation of Fungi from Soil.
08. Observation of motility of organisms by hanging drop technique.
09. Monochrome staining.
10. Differential (Gram's) staining.
11. Negative staining.
12. Isolation of bacteria by Streak plate, Pour plate, Spread plate method.
13. Total Viable Count of Water.
14. Determination of Total Coliforms from water.
15. Determination of Fecal Coliforms from water.
16. Differentiation between Fecal and non fecal Coliforms by IMViC test.
17. Determination of Quality of Milk by Methylene Blue Reductase test.
18. Isolation of Azatobacter species from Soil.
19. Qualitative test for protein by biuret test.
20. Qualitative test for carbohydrate by Benedict's test.

****

Env. 204 : Laboratory Course

01. Study of High Volume Air Sampler.
02. Study of Rotorod Air Sampler and Tilak Air Sampler.
03. Dust Fall measurement by tiles exposure method.
04. Determination of Carbon Di Oxide (CO_2) by Zincondroff Technique.
05. Determination of Carbon monoxide (CO_2) by Co detector.
06. Detection of SO_2 from ambient air.
07. Detection of H_2S from ambient air.
08. Detection of Ammonia from ambient air.
09. Interpretation of wind rose diagram.
10. Determination of wind velocity.
11. Determination of Air pollution index.
12. Determination of Suspended Particulate Matter by HVAS.
13. Determination of Respirable Suspended Particulate Matter by HVAS.
14. Estimation of SO_X from air by High Volume Air Sampler and Spectrophotometer.
15. Estimation of NO_X from air by High Volume Air Sampler and Spectrophotometer.
16. Estimation of Ammonia from air by High Volume Air Sampler and Spectrophotometer.
17. To Study the effects of SO_2 on plant.
18. To Study the effects of H_2S on plant.
19. To Study the effects of Ammonia on plant.
20. Determination of Noise Level by dB meter.

****

Swami Ramanand Teerth Marathwada University, Nanded.

Model Question Paper (Theory)

Class : B. Sc. Second Year

Subject : Environmental Science

Paper : Env. 201 : Introduction to Environmental Microbiology

Paper : Env. 202 : Air pollution Prevention and control

Time : Three Hours **Maximum Marks : 100**

Q. 1: Essay Type Question 20 marks

OR

a) Short Question 10 marks

b) Short Question 10 marks

Q. 2: Essay Type Question 20 marks

OR

a) Short Question 10 marks

b) Short Question 10 marks

Q. 3: Essay Type Question 20 marks

OR

Essay Type Question 20 marks

Q. 4: Essay Type Question 20 marks

OR

Essay Type Question 20 marks

Q. 5: Short Notes (Any Four) 20 marks

i)

ii)

iii)

iV)

V)

Vi)

Swami Ramanand Teerth Marathwada University, Nanded.

Model Question Paper (Practical)
Class : B. Sc. Second Year
Subject : Environmental Science
Paper : Env. 203 : Laboratory Course

Time : Three Hours **Maximum Marks : 100**

Q. 1: Stain the bacterial culture by Monochrome / Gram's / Negative staining Technique. 20

Q. 2: Determine number of Total Coliforms / Fecal Coliforms from provided sample. 20

OR

Differentiate between Fecal Coliforms and Non fecal Coliforms by IMViC test

OR

Determine Total Viable Count of Bacteria from provided water sample

Q. 3: Determine the quality of milk by Methylene blue Reductase test. 15

OR

Isolate Azatobacter species from provided soil sample.

OR

Observe the motility of the microorganisms by hanging drop technique.

OR

Isolate bacteria / Fungi from provided soil sample.

Q. 4: Isolate Bacteria from provided sample by Streak / Pour / Spread plate method. 15

OR

Test protein Qualitatively by biuret test.

OR

Test carbohydrates Qualitatively by Benedict's test.

Q. 5: a) Record Book submission 10
b) Viva Voce 10
c) Excursion Report 10

Swami Ramanand Teerth Marathwada University, Nanded.

Model Question Paper (Practical)

Class : B. Sc. Second Year

Subject : Environmental Science

Paper : Env. 204 : Laboratory Course

Time : Three Hours **Maximum Marks : 100**

Q. 1: Determine Suspended Particulate Matter / Respirable Suspended Particulate Matter by High Volume Air Sampler. 20

OR

Estimate SO_X / NO_X from air by High Volume Air Sampler and Spectrophotometer

Q. 2: Determine Dust Fall rate by tiles exposure method. 20

OR

Determine Carbon Di Oxide (Co_2) from air by Zincondroff Technique.

Q. 3: Detect of So_2 / H_2S / Ammonia from ambient air by Qualitative tests. 15

OR

Interpret wind rose diagram. / Determine wind velocity.

OR

Determine Co by Co detector from Ambient air.

Q. 4: Determine Noise Level of the ambient air by dB meter. 15

OR

Determine Air pollution index.

OR

Study the Effects of So_2 / H_2S / Ammonia on plant material.

Q. 5: a) Record Book submission 10

b) Viva Voce 10

c) Excursion Report 10
