



**Swami Ramanand Teerth
Marathwada University, Nanded.**

*Revised Curriculum
B. Sc. Second year (Semester III)
Environmental Science*

w.e.f. : June, 2010

**Semester program for
B. Sc. II Year Environmental Science**

Semester Third				Semester Fourth				Annual Practical		Total marks of the Year
Paper Code	Total Marks for Theory Papers	External Theory Examination	Internal Assessment	Paper Code	Total Marks for Theory Papers	External Theory Examination	Internal Assessment	Paper Code	Total Marks	
Env. 201	50	40	10	Env. 203	50	40	10	Env. 205	50	300
Env. 202	50	40	10	Env. 204	50	40	10	Env. 206	50	

- External 40 marks are splitted in to 15 marks Multiple choice questions and 25 marks Subjective questions for each paper
- Internal 10 marks are splitted in to 05 marks for home assignment and 05 marks for the mid term examination
- Work load for theory papers Env. 201, Env. 202, Env. 203, & Env. 204 is 03 periods per week.
- Paper Env. 205 & Env. 206 (Laboratory courses) are annual and having work load 03 periods per week.

Course Structure & Marking System

B. Sc. II year (Semester III) Environmental Science

Sr. No.	Course Code	Title of the Paper	No. Of Periods Per Week	Total No. of Periods In the Semester	Internal Assessment		External Examination	Total marks
					Home Assignment	Mid Term Exam		
01	Env. 201	Basic concepts in Microbiology	03	45	05	05	40	50

02	Env. 202	Air Pollution and Meteorology	03	45	05	05	40	50
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Env. 201 : Basic concepts in 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. (15)

References

01. **General microbiology Volume I & II** : C. B. Powar & H. F. Dagainawala (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 Moscow)
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 & meteorology

Unit I : Atmosphere & Meteorology :

Structure of Atmosphere, Temperature distribution in the atmosphere, Factors affecting Temperature, Temperature inversion, Wind direction and Wind speed, Atmospheric stability and Pollution movement, 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; Bio pollutants : Pollen bio pollutants, Algal bio pollutants, Fungal bio pollutants, Combustion; Stationary sources: Fertilizer complex, Cement industries, Thermal power stations, Sulphuric acid industry, Fluoride industry, Nitric acid plants, Soap and detergent industry, Petroleum and Coal industry, Iron and steel industry, Stone and Clay products, Kraft pulp manufacturing, Incineration of refuse and solid wastes; Mobile sources: Automobiles, Aero planes. (20)

Unit III : Air Pollution Effects:

Effects of air pollution on human health: Mechanism of action of air pollutants, Human health effects, Specific air pollutants and their health effects, Major Disasters showing health effects: Meuse Valley (Belgium disaster, Donora (USA) disaster, London disaster, Los Angeles disaster,

Effects of air pollution on Animals: Effects of Fluorine, Arsenic, Lead, Pests, Ionizing radiation.

Effects of Air pollution on Plants: Structure of normal leaf, Air pollutants affecting plants, Forms of damages to leaves, Kinds of injuries to plants, Effects of specific pollutants on plants: HF, Ozone, Chlorine, Hydrogen chloride, Nitric oxides, Ammonia, Hydrogen cyanide, Herbicides.

Economic effects of Air Pollution: Mechanism of deterioration in polluted atmosphere, Factors influencing atmospheric deterioration, Material damage : Effects on Building materials, Paints, Textiles, Rubber, Leather, Paper, Glass and ceramics, Effects on art treasure,

Long term effects on the planet : Green house effects, Ozone layer depletion, Acid rain (15)

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 :** *Critchfield 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 Meteorology : *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)*



Swami Ramanand Teerth Marathwada University, Nanded.

Class : B. Sc. Second Year (Semester III)

Subject : Environmental Science

Time : Two Hours Fifteen minutes

Maximum Marks : 050

Paper : Env. 201 : Basic Concepts in Microbiology

- Q. 1: Compulsory Questions on basic concepts 05 marks
- a)
 - b)
 - c)
 - d)
 - e)
- Q. 2: Short answer Questions 10 marks
- a)
 - b)
- OR
- c)
 - d)
- Q. 3: Essay Type Question 10 marks
- OR
- Essay Type Question
-

Paper : Env. 202 : Air Pollution & Meteorology

- Q. 1: Compulsory Questions on basic concepts 05 marks
- a)
 - b)
 - c)
 - d)
 - e)
- Q. 2: Short answer Questions 10 marks
- a)
 - b)
- OR
- c)

d)

Q. 3: Essay Type Question
OR
Essay Type Question

10 marks



**Swami Ramanand Teerth
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*Revised Curriculum
B. Sc. Second year (Semester IV)
Environmental Science*

w.e.f. : June, 2010

Course Structure & Marking System
B. Sc. II year (Semester IV) Environmental Science

Sr. No.	Course Code	Title of the Paper	No. Of Periods Per Week	Total No. of Periods In the Semester / Year	Internal Assessment		External Examination	Total marks
					Home Assignment	Mid Term Exam		
01	Env. 203	Environmental Microbiology	03	45	05	05	40	50
02	Env. 204	Air & Noise Pollution Control	03	45	05	05	40	50
03	Env. 205	Laboratory Course	03	60	---	---	50	50
04	Env. 206	Laboratory Course	03	60	---	---	50	50

Env. 203 : Environmental Microbiology

Unit IV : Microbial diseases :

Amoebiasis 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.
Microbiology of milk : Sources of microorganisms in milk, Types of microorganisms in milk, Microbial examination of milk, Pasteurization of milk (15)

References

01. **General microbiology Volume I & II** : C. B. Powar & H. F. Dagainawala (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. 204 : Air & Noise Pollution Control

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

Sampling of air pollutants : Sampling without concentration, Sampling with concentration,

Sampling methods : Sedimentation, Filtration, Impingement method, Electrostatic precipitation, Thermal precipitation, Centrifugal method,

Particulate matter sampling and analysis: Dust fall measurement, SPM and RSPM sampling using High volume air sampler;

Gaseous pollutants sampling and analysis: Carbon monoxide, Ozone, Hydrogen sulphide, Nitrogen dioxide, Sulphur dioxide, Hydrogen cyanide, Ammonia, Aldehydes. (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 :**

Speech interference, Physiological effects, Behavioral effects, Annoyance, Effects on efficiency, Fatigue, Mental health effects, Hearing loss, Biological effects, Noise level measurement, **Noise and vibration Control:** Barrier and enclosures,

Silencers, Vibration dumping, Vibration isolation. (15)

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. **Introduction to weather and climate :** Trewartha
10. **Air Pollution (Volume I to X) :** A. C. Stern (Academic Press)

Env. 205 : 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. 206 : 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 (CO₂) by Zincondroff Technique.
05. Determination of Carbon monoxide (CO) by Co detector.
06. Detection of SO₂ from ambient air.
07. Detection of H₂S 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 SO₂ on plant.
18. To Study the effects of H₂S on plant.
19. To Study the effects of Ammonia on plant.
20. Determination of Noise Level by dB meter.



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Class : B. Sc. Second Year (Semester IV)

Subject : Environmental Science

Time : Two Hours Fifteen minutes

Maximum Marks : 050

Paper : Env. 203 : Environmental Microbiology

- Q. 1: Compulsory Questions on basic concepts 05 marks
- a)
 - b)
 - c)
 - d)
 - e)
- Q. 2: Short answer Questions 10 marks
- a)
 - b)
- OR
- c)
 - d)
- Q. 3: Essay Type Question 10 marks
- OR
- Essay Type Question
-

Paper : Env. 204 : Air & Noise pollution control

- Q. 1: Compulsory Questions on basic concepts 05 marks
- a)
 - b)
 - c)
 - d)
 - e)
- Q. 2: Short answer Questions 10 marks
- a)
 - b)
- OR
- c)

d)

Q. 3: Essay Type Question
OR
Essay Type Question

10 marks



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Model Question Paper (Practical)

Class : B. Sc. Second Year

Subject : Environmental Science

Paper : Env. 205 : Laboratory Course

Time : Three Hours

Maximum Marks : 050

Q. 1: Stain the bacterial culture by Monochrome / Gram's / Negative staining Technique. 10

Q. 2: Determine number of Total Coliforms / Fecal Coliforms from provided sample. 10

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. 10

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. 10

OR

Test protein Qualitatively by biuret test.

OR

Test carbohydrates Qualitatively by Benedict's test.

Q. 5: a) Record Book submission 05
b) Viva Voce 05



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Model Question Paper (Practical)

Class : B. Sc. Second Year

Subject : Environmental Science

Paper : Env. 206 : Laboratory Course

Time : Three Hours

Maximum Marks : 050

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- Q. 1: Determine Suspended Particulate Matter / Respirable Suspended Particulate Matter by High Volume Air Sampler. 10
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. 10
OR
Determine Carbon Di Oxide (Co₂) from air by Zincondroff Technique.
- Q. 3: Detect of SO₂ / H₂S / Ammonia from ambient air by Qualitative tests. 10
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. 10
OR
Determine Air pollution index.
OR
Study the Effects of SO₂ / H₂S / Ammonia on plant material.
- Q. 5: a) Record Book submission 05
b) Excursion Report 05
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