

SARVAJANIK UNIVERSITY

Faculty of Science

M.Sc Environmental Science



SARVAJANIK
UNIVERSITY

INCLUSIVE | INTEGRATED | INNOVATIVE

Faculty of Science

M.Sc. Environment Science

Semester - I

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M.Sc Environmental Science

Faculty: Science	Department: Environmental Science
Program: M. Sc. Environmental Science	Type of Subject: Theory + Practical
Subject: Earth Science and Geology	
Semester- I	

Student Learning Outcomes (SLOs):

- The course is designed to provide the basic understanding of various earth science and geological processes.
- The various developments in earth sciences provide an understanding of changing environments, the natural distribution of energy resources, and provide various methodologies for mitigating and predicting the effects of geological disasters.

References and Textbooks: (With Author, Edition, Publishers, ISBN)

1. Keller E.A (2012): Introduction to Environmental Geology, Pearson Publication, USA.
2. Sagar Rajendra (2014): Geochemistry and Environmental Geology, Anmol Publications Pvt. Ltd., New Delhi.
3. Holden J. (2012): Physical Geography and the Environment, Pearson Publishers.
4. Kailash R. (2014): General Geology, Anmol Publications Pvt. Ltd.
5. Selley R.C (1998): Elements of Petroleum Geology, Academic Press.

UNIT 1: The Earth and Systems

07 Hours

- 1.1 Fundamental concept of environmental geosciences; Geological Time Scale, History of Earth
- 1.2 Earth Interior: Physical, Chemical characteristics and types of crust, mantle and core
- 1.3 earth systems and its interaction –lithosphere, atmosphere, hydrosphere and biosphere
- 1.4 Geographical classification and zones of Environment. Energy budget of the earth

UNIT 2: Rocks and Mineral

07 Hours

- 2.1 Concepts of major, trace and REE. Classification of trace elements, mobility of trace elements
- 2.2 Types of rocks, characteristics, types and classification
- 2.3 Interconversion of rocks, Rock cycle
- 2.4 Principles of stratigraphy and sedimentary layer formation

UNIT 3: Weathering and Soil formation

07 Hours

- 3.1 Physical, Chemical and Biological weathering processes, Soil development, Soil profile
- 3.2 Soil Complex: Components and properties
- 3.3 Soil Classification and types
- 3.4 Factors affecting soil formation

UNIT 4: Ecohydrology and Ground water geology

07 Hours

- 4.1 Distribution of water in earth, major basins and groundwater provinces of India

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- 4.2 Darcy's law and its validity
- 4.3 Ghyben-Herzberg relation between fresh-saline water
- 4.4 Origin and composition of seawater, Types of water resources
- 4.5 Rainwater harvesting techniques and groundwater recharging methods.

UNIT 5: Plate Tectonics **08 Hours**

- 5.1 Types of plate boundaries and concept of plate tectonics, Rate of plate movement
- 5.2 Sea-floor spreading and continental drift
- 5.3 Marine sediments and their classification, Marine resources and coral reefs
- 5.4 Wilson Cycle, Gaia Hypothesis

UNIT 6: Energy Resources and mineral economics **08 Hours**

- 6.1 Origin, occurrence, distribution and uses of coal and petroleum
- 6.2 Renewable, nonrenewable and sustainable energy resources
- 6.3 Strategic, essential, atomic and critical minerals
- 6.4 Conservation of mineral resources, mineral resource in India

UNIT 7: Biogeochemical Cycles **08 Hours**

- 7.1 Hydrological Cycle: Systems concept of hydrological cycle; Precipitation; Evaporation and transpiration
- 7.2 Mineral Cycles: Carbon Cycle, Nitrogen Cycle, Oxygen cycle, Phosphorus Cycle and Sulfur Cycle
- 7.3 Uniformity and system concept in mineral cycles
- 7.4 Energy flow models

UNIT 8: Earth Surface Processes and Ecological Disturbance **08 Hours**

- 8.1 Earthquake: Magnitude, Intensity and Process
- 8.2 Oceanic Processes: El Nino, La Nina, ENSO, Walker circulation
- 8.3 External Influences: Ecological Disturbance, Volcanic Disturbance and Intermediate disturbance hypothesis
- 8.4 Effect of ecological disturbance on biological diversity

Practicals:

1. Study of contour patterns on topographic map.
2. Study of earthquake and volcanic belts of India.
3. Study of Igneous (Granite, Basalt), Metamorphic (Slate, Marble) and Sedimentary (Limestone, Sandstone) rocks.
4. Estimation of respiration rate by Light Dark Bottle method.
5. Quantitative analysis of planktons from water sample.
6. Determination trophic status index of given water bod.

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Faculty: Science	Department: Environmental Science
Program: M. Sc. Environmental Science	Type of Subject: Theory + Practical
Subject: Environmental Microbiology and Epidemiology	
Semester- I	

Student Learning Outcomes (SLOs):

- Expanding basic knowledge of environmental microbiology in terms of applied aspects.
- Knowledge of basic concepts and techniques of microbial source tracking and microbial risk assessment.
- Understanding of biodeterioration and biofouling along with techniques of studying them and their management.

References and Textbooks: (With Author, Edition, Publishers, ISBN)

1. Pepper IL, Gerba CP, Gentry TJ, Maier RM, editors. Environmental microbiology. Academic press; 2011 Oct 13. 978-0123705198.
2. Yates MV. Manual of environmental microbiology. John Wiley & Sons; 2020 Aug 11. 978-1555816025.
3. Allsopp D, Seal KJ, Gaylarde CC. Introduction to biodeterioration. Cambridge University Press; 2004 Jun 28. 978-0521528870.

UNIT-1 Methods in Water Microbiology

07 Hours

- 1.1 Current and developing methods of detecting indicator organisms
- 1.2 Assessing efficiency of wastewater treatment
- 1.3 Epidemiology of waterborne infections
- 1.4 Drinking water microbiology

UNIT-2 Methods in Air Microbiology

07 Hours

- 2.1 Introduction to aeromicrobiology
- 2.2 Analysis of bioaerosol samples
- 2.3 Transport of microorganisms in air
- 2.4 Aerobiology of agricultural pathogens

UNIT-3 Sampling for environmental microbiology studies

07 Hours

- 3.1 Water sampling and processing
- 3.2 Surface sampling
- 3.3 Soil sampling for microbial analyses
- 3.4 Sampling of wastewater and biosolids

UNIT-4 Physiological methods for the detection of microorganisms

07 Hours

- 4.1 Measuring microbial activity in pure cultures

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- 4.2 Measuring carbon respiration
- 4.3 Use of radiolabelled tracers
- 4.4 Enzyme assays

UNIT-5 Microbial Source Tracking and Risk Assessment **08 Hours**

- 5.1 Evolution of microbial source tracking
- 5.2 Human fecal pollution tracking
- 5.3 Risk assessment framework
- 5.4 Exposure assessment

UNIT-6 QA/QC in Environmental Microbiology **08 Hours**

- 6.1 Introduction to principles of QA
- 6.2 General quality control
- 6.3 Quality control for bacteriological analyses
- 6.4 Quality control for virological analyses

UNIT-7 Microbiology of extreme environments **08 Hours**

- 7.1 Low temperature environments
- 7.2 High temperature environments
- 7.3 Desiccation and UV stress
- 7.4 Deep-sea hydrothermal vents
- 7.5 Acidic environments

UNIT-8 Biodeterioration and Biofouling **08 Hours**

- 8.1 Introduction to biodeterioration
- 8.2 Fungal, algal and cyanobacterial growth affecting structures
- 8.3 Investigative biodeterioration
- 8.4 Control of biodeterioration

Practicals:

1. Detection of fecal streptococci by membrane filtration method
2. Study of microorganisms from bioaerosols
3. Use of dehydrogenase enzyme activity to study microbial activity
4. Detection of microbial respiration in soil

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Faculty: Science	Department: Environmental Science
Program: M. Sc. Environmental Science	Type of Subject: Theory + Practical
Subject: Emerging Environmental Problems and Technology for Pollution Control	
Semester- I	

Student Learning Outcomes (SLOs):

- The paper intends to deal with various pollution sources, its effects, control, measures and treatment options for various pollutants using technological upgradation.
- The paper will help students understand how their decisions and actions affect the environment, builds knowledge and skills necessary to address complex environmental issues, as well as ways to take action to keep our environment healthy and sustainable for the future.

References and Textbooks: (With Author, Edition, Publishers, ISBN)

1. Rao M.N (2012): Air Pollution, Tata McGraw Hill Education Pvt. Ltd., New Delhi.
2. Birdie G.S and Birdie L.S (2015): Water Supply and Sanitary Engineering, Dhanpat Rai Publishing Company, New-Delhi.
3. Sharma B.K (2016): Environmental Chemistry, Krishna Prakashan, U.P.
4. Khan I.H and Ahsan Naved (2017): Textbook of Solid Waste Management, CBS Publishers, New Delhi.
5. Metcalf and Eddy (2015): Wastewater Engineering Treatment and Reuse, McGraw Hill Education (India) Pvt. Ltd.
6. Datta A.K. and Rao M.N (2014): Wastewater Treatment, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
7. Phifer Russell and Mctigue William (1988): Handbook of Hazardous Waste Management, Lewis Publishers, USA.

UNIT 1: Environment and Pollution

07 Hours

- 1.1 Biogeochemical Cycles
- 1.2 Greenhouse Effect
- 1.3 Global Warming
- 1.4 Acid Rain

UNIT 2: Industrial Pollution

07 Hours

- 2.1 Introduction
- 2.2 Causes of Industrial Pollution
- 2.3 Environmental Problems of Industries
- 2.4 Clean Technology

UNIT 3: Air Pollution

07 Hours

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- 3.1 Classification of Air Pollutants
- 3.2 Primary and Secondary Pollutants
- 3.3 Stationary and Mobile Source
- 3.4 Control of Air Pollution by modern Equipments.

UNIT 4: Vehicular Pollution **07 Hours**

- 4.1 Automobile Emissions
- 4.2 Alternative Fuels
- 4.3 Biofuels
- 4.4 Ecofriendly Vehicles

UNIT 5: Industrial Effluent Treatment **08 Hours**

- 5.1 Characteristics of Industrial Effluent
- 5.2 Physical Methods- Screening, Skimming, Equalization, Sedimentation, Flootation
- 5.3 Chemical Methods- Neutralization, Precipitation, Electrolysis, Ion Exchange
- 5.4 Biological Methods- Activated Sludge Process, UASB, Trickling Filter, SBR

UNIT 6: Common Effluent Treatment Plant **08 Hours**

- 6.1 Introduction
- 6.2 Principles of CETP
- 6.3 Common Quality Parameters
- 6.4 Treatment Units at CETP

UNIT 7: Hazardous Waste **08 Hours**

- 7.1 Characteristics of Hazardous Waste
- 7.2 Secured Landfilling
- 7.3 Detection and Classification of Radioactive Waste
- 7.4 Disposal of Radioactive Waste

UNIT 8: Environment Friendly Technologies **08 Hours**

- 8.1 Eco-Technology
- 8.2 Ecological Farming System
- 8.3 Organic Farming
- 8.4 Watershed Management

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Practicals:

1. Principle and Working of Stack Monitoring Kit.
2. Determination of Total Dissolved Solids in industrial sample.
3. Determination of Chromium in industrial sample.
4. Determination of Aluminum in industrial sample.