

SARVAJANIK UNIVERSITY

Faculty of Science

B. Sc. Environment Science



SARVAJANIK
UNIVERSITY

INCLUSIVE | INTEGRATED | INNOVATIVE

Faculty of Science

B. Sc. Environment Science

Semester - 3

Faculty: Science	Department: Environmental Science
Program: B. Sc. Environmental Science	Type of Subject: Theory + Practical
Subject: Pollution and Control	
Semester- 3	

Student Learning Outcomes (SLOs):

- The paper intends to deal with various pollution sources, its effects, control, measures, sampling and analysis of some pollutants.
- The course will emphasize understanding mechanisms of pollutants impacting human health by developing an understanding of different types of contaminants, their sources and mitigation measures.

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

1. Dhameja S.K (2005) Environmental Engineering and Management, Kataria Publication, New-Delhi.
2. Purohit and Agrawal (2012) Environmental Pollution-Causes, Effects and Control, Agrobios, Jodhpur.
3. Sharma B.K (2016) Environmental Chemistry, Krishna Prakashan, U.P.
4. Ramchandra T.V (2018) Management of Municipal Solid Waste, TERI press, New Delhi.
5. Rao M.N (2012) Air Pollution, Tata McGraw Hill Education Pvt. Ltd., New Delhi.
6. Metcalf and Eddy (2015): Wastewater Engineering Treatment and Reuse, McGraw Hill Education (India) Pvt. Ltd.
7. Birdie G.S and Birdie J.S (2017): Water Supply and Sanitary Engineering, Dhanpatrai Publishing Company.

UNIT 1: Environmental Pollution

- 1.1 Pollutants
- 1.2 Sources of Pollution
- 1.3 Effects of Pollution on Environment
- 1.4 Types of Environmental Pollution

UNIT 2: Air Pollution

- 2.1 Terminology
- 2.2 Classification of Air Pollutants
- 2.3 Effects of Air Pollution
- 2.4 Standards and Control of Air Pollution

UNIT 3: Water Pollution

- 3.1 Introduction
- 3.2 Characteristics of Water
- 3.3 Causes and Effects of Water Pollution
- 3.4 Standards and Control of Water Pollution

UNIT 4: Marine Pollution

- 4.1 Causes of Marine Pollution
- 4.2 Effects of Marine Pollution

4.3 Control of Marine Pollution

4.4 Coastal Zone Management

UNIT 5: Noise Pollution

5.1 Sources of Noise Pollution

5.2 Effects of Noise Pollution

5.3 Standards and Control of Noise Pollution

5.4 Measurement of Sound

UNIT 6: Thermal Pollution

6.1 Introduction

6.2 Sources of Thermal Pollution

6.3 Effects of Thermal Pollution

6.4 Control of Thermal Pollution

UNIT 7: Solid Waste Management

7.1 Sources of Solid Waste

7.2 Classification of Solid Waste

7.3 Causes and Effects of Solid Waste Pollution

7.4 Control of Solid Waste Pollution

UNIT 8: Soil Pollution

8.1 Soil Pollution by Industrial Waste

8.2 Soil Pollution by Urban Waste

8.3 Soil Pollution by Mining Waste

8.4 Effects of Modern Agro Technology

Practicals:

1. Determination of SPM and RSPM from ambient air.
2. Determination of SO_x and NO_x from ambient air.
3. Determination of Acidity from water sample.
4. Determination of Carbon from solid waste.

Faculty: Science	Department: Environmental Science
Program: B. Sc. Environmental Science	Type of Subject: Theory + Practical
Subject: Remote Sensing, GIS and GPS	
Semester- 3	

Student Learning Outcomes (SLOs):

- This paper deals with identification and explanation of principles, concepts, methods and techniques relevant for geoinformation processing and earth observation.
- It explores the temporal and social context of geo-information science and technology and be able to integrate these insights in the environmental management and sustainable development.

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

1. William Emery and Adriano Camps. Introduction to Satellite Remote Sensing. Elsevier Publication. ISBN: 9780128092545
2. Norman Kerle, Lucas L. F. Janssen, Gerrit C. Huurneman. Principles of Remote Sensing. ITC educational Textbook Series.
3. Basudeb Bhatta, (Oxford Publications, New Delhi). Remote Sensing and GIS. ISBN: 9780195692396.
4. Thomas Lillesand, Ralph W. Kiefer, Jonathan Chipman (Wiley). Remote Sensing and Image Interpretation, 7th Edition. ISBN: 9781118919477

UNIT 1: Fundamentals of Remote sensing

- 1.1 Remote Sensing – history & development, definition, concept and principles
- 1.2 Electromagnetic radiation and their interactions
- 1.3 Stages of remote sensing process
- 1.4 Types of satellite orbits - Geostationary, sun synchronous, shuttle orbit. Semi synchronous orbit (Molniya orbit) and Quasi-zenith satellite orbit

UNIT 2: Sensors, platforms and Image analysis

- 2.1 Types of Sensors: Whiskbroom scanners, Push-broom scanners, Side Looking scanner, Imaging and non-imaging sensors, Active and passive sensor
- 2.2 Platforms: Ground, Airborne and Space borne Platform
- 2.3 Photogrammetry – basic principles, types, steps and elements of image interpretation
- 2.4 Image: Preprocessing, Types and Classification

UNIT 3: Indian Remote Sensing Programme and Applications

- 3.1 Indian remote sensing programme, Earth Observation Satellites
- 3.2 Satellite launch vehicles: SLV, PSLV and GSLV
- 3.3 Applications of Remote Sensing in natural resource management, agriculture, forestry and Ecology
- 3.4 Application of remote sensing in disaster monitoring, mitigation and preparedness

UNIT 4: Geographical Information System (GIS)

- 4.1 Introduction to Geographic Information Systems (GIS)
- 4.2 Objective, components and elements of GIS

4.3 Data models – Vector and Raster data, Spatial and Non-spatial data

4.4 GIS software: ILWIS, QGIS and MapWindow GIS

UNIT 5: GPS and GNSS

5.1 System segments and GPS satellite signals

5.2 Error Sources and Positioning Types of GPS, Elements of GPS

5.3 Introduction to GNSS

5.4 Mobile Mapping and GPS Applications

UNIT 6: Advanced geoinformatics processes: Thermal and Microwave Remote Sensing

6.1 Thermal Remote Sensing: Basic Principle, Interaction of Thermal Radiation with Terrain Elements

6.2 Thermal Data Processing: Thermal Energy Detectors, Thermal Radiometers, Thermal Scanners and characteristics

6.3 Microwave Remote Sensing: Basic Principles, Radar Operation, Polarization

6.4 Side Looking Radar System (SLAR), Synthetic Aperture Radar (SAR)

UNIT 7: Advanced geoinformatics processes: Hyperspectral Remote Sensing

7.1 Hyperspectral Remote Sensing: Basic principles and Advantages,

7.2 Hyperspectral sensors and platforms, Sensor specifications

7.3 LIDAR: Basic Principles and advantages, Laser and Scanning System

7.4 Applications in Vegetation, Urban and Coastal mapping

UNIT 8: Geoinformatics in environmental science & management

8.1 Air quality monitoring and forecast system of IIRS-ISRO

8.2 Indian Geo-Platform of ISRO: BHUVAN

8.3 Biodiversity assessment with geoinformatics

8.4 Satellite telemetry for wildlife studies

Practicals:

1. Study of topographical features using different topographic maps.
2. Fundamental exercise on generation of a basic thematic map layer using any GIS open-source software.
3. Satellite Image Annotation
4. Visual interpretation of aerial, digital, thermal and satellite images.
5. Demonstration of ILWIS Software.

Faculty: Science	Department: Environmental Science
Program: B. Sc. Environmental Science	Type of Subject: Theory + Practical
Name of Paper: Environmental Microbiology	
Semester- 3	

Student Learning Outcomes (SLOs):

- Basic understanding of microbiology of air, water and soil
- Knowing microbial hazards of environmental origin
- Knowing treatment of drinking water
- Having basic concept of indicator microorganisms
- Learning sampling and cultural methods for the detection of microorganisms in environmental samples

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

- Pepper IL, Gerba CP, Gentry TJ, Maier RM, editors. Environmental microbiology. Academic press; 2011 Oct 13. 978-0123705198

Unit-1 Soil Microbiology

- 1.1 Historical perspective and modern environmental microbiology
- 1.2 Soil as a microbial environment
- 1.3 Microorganisms in surface soils
- 1.4 Distribution of microorganisms in soil
- 1.5 Microorganisms in subsurface environment

Unit-2 Aeromicrobiology

- 2.1 Important airborne pathogens and toxins
- 2.2 Aerosols and their nature
- 2.3 Bioaerosol control
- 2.4 Biosafety in laboratory

Unit-3 Aquatic Microbiology

- 3.1 Introduction to aquatic microbiology
- 3.2 Microbial habitats in the Aquatic Environments
- 3.3 Aquatic Environments
- 3.4 Aquatic microbes as future foods

Unit-4 Environmentally Transmitted Pathogens

- 4.1 Environmentally transmitted bacteria
- 4.2 Parasitology
- 4.3 Environmentally transmitted viruses
- 4.4 Transport of pathogens in environment

Unit-5 Indicator Microorganisms

- 5.1 Coliforms
- 5.2 Fecal Streptococci
- 5.3 Other potential indicator organisms
- 5.4 Standards and criteria for indicators

Unit-6 Drinking Water Treatment

- 6.1 Water treatment processes
- 6.2 Water treatment requirements
- 6.3 Water distribution systems
- 6.4 Microbial growth in distribution systems

Unit-7 Environmental Sample Collection and Processing

- 7.1 Sampling of soils and sediments
- 7.2 Sampling strategies and methods for water
- 7.3 Devices for collection of air samples
- 7.4 Detection of microorganisms on fomites

Unit-8 Cultural Methods for Detection of Microorganisms

- 8.1 Cultural methods for bacteria
- 8.2 Culture media for bacteria
- 8.3 Cultural methods for fungi
- 8.4 Cultural methods for algae and cyanobacteria

Practicals:

1. Heterotrophic plate count of soils
2. Study of microorganisms present in ambient air by settling plate method
3. Enumeration of coliforms by MPN method

Faculty: Science	Department: Environmental Science
Program: B. Sc. Environmental Science	Type of Subject: Theory + Practical
Semester: 3	
Subject: Agriculture and Forestry	

Student Learning Outcomes (SLOs):

- This course will develop student's exploring capacity in field of agriculture and forest.
- The course will increase knowledge of agricultural practices and agricultural economic values in students.
- The course will develop exploring capacity of students in wild life and its protection movements.

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

1. Balasubramaniyan, P and Palaniappan, S.P. 2001. Principles and Practices of Agronomy. AgroBios(India)Ltd., Jodhpur.
2. Brady, N.C. and Well, R.R. 2002. The Nature and Properties of Soils (13th ed.). Pearson Education, Delhi.
3. De, G.C.1989. Fundamentals of Agronomy. Oxford & IBH Publishing Co., New Delhi.
4. Havlin, J. L., Beaton, J. D., Tisdale, S.L., and Nelson, W.L. 2006. Soil Fertility and Fertilizers: An Introduction to Nutrient Management (7thed.). Pearson Education, Delhi.
5. ICAR.2006. Hand book of Agriculture, ICAR, New Delhi.
6. Aldrich, R.J. and Kramer, R.J. 1997. Principles in Weed Management. Panama Publications, New Delhi.
7. Rao, V.S. 2000. Principles of Weed science (2nd ed.). Oxford & IBH Publishing Co. New Delhi.
8. Reddy, S.R. 1999. Principles of Agronomy. Kalyani Publishers, Ludhiana
9. Ashton,M.S., Tyrrell,M.L., Spalding D., Gentry, B. (Eds.)(2012) Managing Forest Carbon in a changing climate. Springer Dordrecht Heidelberg London New York.

Unit-1: Introduction to Agriculture (7 Lecture)

- 1.1 Origin, history and world agricultural system
- 1.2 Factors affecting to crop production
- 1.3 Environmental pollution and associate hazards on Agriculture
- 1.4 Ecological and socioeconomic dimension of Agriculture.

UNIT-2: Principles of agronomy (7 Lecture)

- 2.1 Meaning, definition and scope of agronomy
- 2.2 Agronomic classification of crops
- 2.3 Tillage: types, implementation and characteristics of crop
- 2.4 Crop nutrition and Integrated Nutrient Management

UNIT-3 Weed Management (7 Lecture)

- 3.1 Introduction and classification of weed
- 3.2 Methods of weed control
- 3.3 Integrated weed management(IWM)

3.4 Herbicides: classification and methods of application

UNIT-4 Organic farming and soil health (7 Lecture)

4.1 Concept, practice and management of organic farming

4.2 Manures and compost: types and enrichment methods

4.3 Integrated Nutrient Management (INM) and Integrated Plant Nutrient supply system (IPNS)

4.4 Soil health concepts and assessment

UNIT-5 Agroforestry (7 Lecture)

5.1 Introduction and Classification of agroforestry system

5.2 Tree architecture and canopy management

5.3 agroforestry design and diagnosis in different climatic zones

5.4 Social forestry: components and achievements

UNIT-6 Introduction to Forestry (7 Lecture)

6.1 History of forestry and classification of forest

6.2 Indian and World scenario in forest

6.3 Biogeographic classifications of India and wild life in India

6.4 Forest economics: basic concept, national income and types of inflation.

Unit-7 Wildlife Management (7 Lecture)

7.1 Introduction and biological basis of wildlife management

7.2 Agencies involved in wildlife conservation.

7.3 Captive wildlife

7.4 Wildlife conflict and wildlife census

Unit-8 Carbon forestry and global climate change (7 Lecture)

8.1 Forests and global carbon cycle: flow, flux, sink, offset, fertilization, footprint and CCS

8.2 Forest soil as carbon reservoirs

8.3 Global climate change, politics and the earth reservoirs

8.4 Global climate change mechanism: CDM & REDD+

Practicals:

1. Bulk density, porosity and infiltration rate of agricultural soil
2. Determination of soil moisture by thermo-gravimetric method and volumetric methods.
3. Techniques of weed collection and preservation.
4. Survey of weeds in crop fields and other habitats- Identification and preparation of herbarium of weeds.
5. Estimation of carbon content (Organic/inorganic) in wood, soil, litter or forest based products.