SARVAJANIK UNIVERSITY
INCLUSIVE | INTEGRATED | INNOVATIVE

Faculty of Science

M.Sc. Environment Science (Environmental Management)

Semester - II

SARVAJANIK UNIVERSITY
Faculty of Science
M.Sc Environmental Management

Faculty: Science	**Department:** Environmental Science
Program: M. Sc. Environmental Science (Environmental Management)	**Type of Subject:** Theory + Practical
Subject: Environmental Waste & Its Management	
Semester- II	

Student Learning Outcomes (SLOs):

- The paper intends to deal with various techniques needed for sampling, analysis and control of various environmental pollutants.
- The paper will also provide knowledge regarding basic concepts of ecosystems and the ways to manage environment.

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

1. Sharma B.K (2016): Environmental Chemistry, Krishna Prakashan, U.P
2. Purohit and Agrawal (2012): Environmental Pollution-Causes, Effects and control, Agrobios, Jodhpur.
3. Rao M.N (2012): Air Pollution, Tata McGraw Hill Education Pvt. Ltd., New Delhi.
4. Bhargava S.K (2015): Practical Methods for Water and Air Pollution Monitoring, New Age International Publishers, New-Delhi.
5. Maiti S.K (2003): Hand Book of Methods in Environmental Studies-I, ABD Publishers, Jaipur.
6. Maiti S.K (2003): Hand Book of Methods in Environmental Studies-II, ABD Publishers, Jaipur.
7. Kulkarni Vijay and Ramchandra T.V (2015): Environmental Management, TERI press, New Delhi.
8. Ramchandra T.V (2018): Management of Municipal Solid Waste, TERI press, New Delhi.

UNIT 1: Environmental Management **07 Hours**

1.1 Definitions and Scope
1.2 Goals and Tools for Environment Management
1.3 Implications of Population Growth
1.4 Need for Sustainable Development

UNIT 2: Ecosystem Concepts **07 Hours**

2.1 Structure of an Ecosystem
2.2 Biomass, Energy and Energy Flow
2.3 Food Chains, Food Webs and Trophic Levels
2.4 Effect of Imbalance on the Ecosystem

UNIT 3: Environmental Audit **07 Hours**

3.1 Practice in developed Countries
3.2 Audit Objectives
3.3 Audit Methodology
3.4 Environment Audit Report

UNIT 4: Environment Impact Assessment **07 Hours**

4.1 Purpose and Goal
4.2 Methodology of EIA
4.3 EIA of Hazardous Waste
4.4 Limitations of EIA

UNIT 5: Life Cycle Assessment **08 Hours**

5.1 Origin of LCA
5.2 LCA Code of Conduct
5.3 Methodology for LCA
5.4 Applications of LCA

UNIT 6: Sampling Site Selection **08 Hours**

6.1 Criteria for Site Selection
6.2 Sampling Types
6.3 Dissolved Oxygen Sampler
6.4 Preserving Water Samples

UNIT 7: Analytical Techniques **08 Hours**

7.1 Spectroscopy
7.2 Flame-Photometer
7.3 Chromatography
7.4 Polarography

UNIT 8: Analytical Methods **08 Hours**

8.1 BOD and COD
8.2 Stack Monitoring
8.3 Ambient Monitoring
8.4 Humidity

Practicals:

1. Determination of chromium in water sample
2. Determination of humidity.
3. Determination of Sodium by Flame Photometer.
4. Determination of Potassium by Flame Photometer.

SARVAJANIK UNIVERSITY
Faculty of Science
M.Sc Environmental Management

Faculty: Science	**Department:** Environmental Science
Program: M. Sc. Environmental Science (Environmental Management)	**Type of Subject:** Theory + Practical
Subject: Natural Resources & Disaster Management	
Semester- II	

Student Learning Outcomes (SLOs):

- To provide knowledge about the nature of Earth's resources, their generation, Extraction and impact of human activities on earth's environment.
- The students are expected to understand effective management strategies. It aims to provide an idea of effective management strategies and a critical insight of the major sustainability issues.

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

4. Francois Ramade 1984. Ecology of Natural Resources. John Wiley & Sons Ltd, ISBN-13: 978-0471906254.
5. Odum, E.P. 1971. Fundamentals of Ecology. W.B. Saunders Co. USA.
6. Tiwari, G.N. & Ghosal. M. K. 2005. Renewable Energy Resources: Basic Principles and Application. Narosa Publishing House.
7. Handbook of Disaster Risk Reduction & Management, Christian N Madu and Chu-Hua Kuei, 1st Edition, 2017, World Scientific.
8. World Famous Disasters, Narendra Malhotra, 1st Edition, 2004, Jain Book Depot.

Natural Disasters, R.K. Sharma and Gagandeep Sharma, 1st Edition, 2005, Jain Book Depot.

UNIT-1: Introduction to Natural Resources **07 Hours**

1.1 Classification of natural resources; renewable and non-renewable resources

1.2 Resource degradation & resource conservation; resource availability and factors influencing its availability

1.3 Types of resources: Land resources; Water resources; Fisheries and other marine resources; Energy resources; Mineral resources

1.4 Impact on natural resources: Human impact; ecological, social and economic dimension of resource management

UNIT-2: Natural Resources and Conservation **07 Hours**

2.1 Forest resources: economic and ecological importance of forests, forest management strategies, sustainable forestry.

2.2 Water resources: supply, renewal, and use of water resources, freshwater shortages, strategies of water conservation.

2.3 Soil resources: Importance of soil, soil conservation strategies.

2.4 Food resources: world food problem, techniques to increase world food production, green revolution.

UNIT-3 Non-Renewable Energy Resources **07 Hours**

3.1 Oil: formation, exploration, extraction and processing, oil shale, tar sands
3.2 Natural gas: exploration, liquefied petroleum gas, liquefied natural gas
3.3 coal: reserves, classification, formation, extraction, processing, coal gasification; environmental impacts of non-renewable energy consumption
3.4 impact of energy consumption on global economy; application of green technology; future energy options and challenges

UNIT-4 Renewable Energy Resources **07 Hours**

4.1 Energy efficiency; life cycle cost; cogeneration; solar energy: technology, advantages, passive and active solar heating system, solar thermal systems, solar cells, JNN solar mission
4.2 Hydropower: technology, potential, operational costs, benefits of hydropower development
4.3 Nuclear power: nuclear fission, fusion, reactors, pros and cons of nuclear power, storage of radioactive waste, radioactive contamination
4.4 Tidal energy; wave energy; ocean thermal energy conversion (OTEC); geothermal energy; energy from biomass; bio-diesel.

UNIT-5 Natural Disasters **08 Hours**

5.1 Types of natural disasters
5.2 Natural disasters and medicine
5.3 Natural disaster: awareness and education
5.4 Natural disaster reduction: global concern

UNIT-6 Hazards in the Environment **08 Hours**

6.1 Hazards, risk and disasters
6.2 Current views: the complexity paradigm
6.3 Phases of disaster
6.4 Explaining, measuring and managing disaster

UNIT-7 Risk Assessment and Management **08 Hours**

7.1 Nature of risk and assessment
7.2 Risk perception and its' communication and practice.
7.3 Risk management
7.4 Role of information technology in risk assessment and

management

UNIT-8 Disaster Management in India **08 Hours**

8.1 Lessons from the past considering the examples of Bhuj earthquake, tsunami disaster, and Bhopal tragedy

8.2 National Disaster Management Framework, national response mechanism, role of government bodies such as NDMC and IMD

8.3 Role of armed forces and media in disaster management; role of space technology in disaster management

8.4 Case study of efficient disaster management during cyclone 'Phailin' in 2013.

Practicals:

1. Study of physical properties of minerals.
2. Calculation of map distance using a ratio scale.
3. Calculation of earthquake travel times.
4. Creation of topographic map.

SARVAJANIK UNIVERSITY
Faculty of Science
M.Sc Environmental Management

Faculty: Science	**Department:** Environmental Science
Program: M. Sc. Environmental Science (Environmental Management)	**Type of Subject:** Theory
Subject: Instrumentation and Analytical Techniques	
Semester- II	

Student Learning Outcomes (SLOs):

- This Course Paper proposes to teach about Principle, Instrumentation and Applications of various spectroscopy and chromatographic techniques, advanced instrumentation techniques, chemical sensors and biosensors.
- This papers deals with the history, origin, laws, principles, theories, instrumental set up, its working mechanism, various components and it working pattern, procedure of analysis and applications in the various field of analysis.

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

1. Engineering Chemistry, P.C. Jain & Monica Jain, 17th Edition, Reprint 2011, Dhanpatrai Publishing Company (P) Ltd.
2. Handbook of Analytical Instrument, R.S. Khandpur,2nd Edition, Reprint 2009, Tata McGraw Hill Publishers.
3. Instrumental Methods of Chemical Analysis(Analytical Chemistry) , H. Kaur, 8th Edition, 2012, Pragati Prakashan.
4. Basic Concepts of Analytical Chemistry, S.M. Khopkar, 3rd Edition, Reprint 2009, New Age International (P) Limited, Publishers.
5. Analytical Instrumentation Handbook, Ewing's , Edited by Jack Cazes, 3rd Edition, 2005, Marcel Dekker Publisher.
6. Instrumental Methods of Analysis, H.H.Willard, L.L.Meritt, J.A. Dean and F.A. Settle, 7th Edition,1986, CBS Publishers.
7. Instrumental methods of analysis, B.K. Sharma, 24th Edition, 2005, Goel Publishing House.
8. Instrumental Analysis, D.A. Skoog, D.M. West, F.J. Holler and S.R. Crouch, 11th Edition, Reprint 2012, Cengage Learning.
9. BIOS-Instant Notes-Analytical Chemistry, D. Kealey, P.J. Haines, 2002, Viva Books (P) Ltd.
10. Analytical Instrumentation, Bela G. Liptak, 1st Edition,1994, 1st Indian Reprint, 2012, Chilton Book Company.

UNIT 1: Visible Spectroscopy **07 Hours**

1.1 Characteristics of electromagnetic spectrum
1.2 Origin of spectra and electronics transitions
1.3 Laws of absorption of radiation - Lambert & Beer's law and its deviation

1.4 The architecture of a spectrophotometer
1.5 Calibration curve and standard addition method - multi component analysis
1.6 Applications of UV-visible spectroscopy

UNIT 2: Atomic Absorption Spectrometry **08 Hours**

2.1 The history & principle of atomic absorption spectroscopy
2.2 AAS – Instrumentation
2.2.1 Radiation sources: line & continuum
2.2.2 Atomization techniques: FAAS & GFAAS
2.2.3 Wavelength selector: monochromator
2.2.4 Detectors: PMT
2.2.5 Single & double beam AAS
2.3 Applications of atomic absorption spectrometry

UNIT 3: Optical Emission Spectrometry **08 Hours**

3.1 Introduction and principle
3.2 Atomic spectroscopic sources
3.3 Inductively coupled plasma - the discharge
3.4 ICP-OES Instrumentation
3.4.1 Nebulizers
3.4.2 Spray Chambers
3.4.3 Sample introduction systems
3.4.4 Optics and the spectrometer
3.4.5 Emission detectors
3.5 Applications of ICP-OES

UNIT 4: Advanced Instrumentation Techniques **07 Hours**

4.1 Principle, Instrumental set up & Applications of Non dispersive IR (gas analyzer)
4.2 Modern elemental analyzer
4.3 Total organic carbon analyzer
4.4 Mossbauer Spectroscopy
4.5 Turbidimetry
4.6 Naphelometry

UNIT 5: Gas Chromatography **07 Hours**

5.1 Introduction of chromatography and principle of separation
5.2 Classification -GSC and GLC & its applications

5.3 Components of instruments: carrier gas, sample injection system, stationary and mobile phase
5.4 Columns - packed column and capillary column - WCOT, SCOT, PLOT
5.5 Detectors - FID, TCD, ECD, ASD
5.6 Principle and applications of GC-HS, GC-MS

UNIT 6: High Performance Liquid Chromatography **08 Hours**

6.1 Introduction, principle and types of HPLC
6.2 Components of instruments: pumps high pressure, pneumatic, syringe, reciprocating, hydraulic
6.3 Sample injection system
6.4 Column
6.5 Detector: ultra violet light absorption, refractive index, evaporative light scattering
6.6 Selective applications in separation and estimations
6.7 Principle and applications of LC-MS

UNIT 7: Ion Exchange and Ion Exclusion Chromatography **07 Hours**

7.1 Ion exchangers – types, characteristics and properties
7.2 Ion exchange equilibrium and factors affecting it
7.3 Instrumental set up of IEC- columns and detector
7.4 Principle, procedure and applications of IEC
7.5 Principle, working procedure and applications of Ion Exclusion Chromatography:
7.5.1 Gel Permeation Chromatography
7.5.2 Ion Exclusion Technique
7.5.3 Inorganic Molecular Sieves

UNIT 8: Chemical Sensors and Biosensors **08 Hours**

8.1 Definition and classification of sensors, Signal and noise
8.2 Efficiency of sensors, sensitivity and limit of detection
8.3 Principle and applications of
8.3.1 Electrochemical sensors
8.3.1.1 Coulometry & Potentiometry
8.3.1.2 Conductimetry & Amperometry
8.3.1.3 Polarography & Voltammetry
8.3.2 Solid state electrode & Mass sensitive sensors
8.3.3 Optical sensors & Thermal sensors
8.3.4 Biosensors & Biocatalytic biosensors