



॥ तमसो मा ज्योतिर्गमय ॥

VISION

To provide equal opportunities for value based global education for creating an Enlightened Society

MISSION

To establish and facilitate educational institutions in the region for providing affordable value based global education to all who aspire to study and to create opportunities to educators, social workers and philanthropists to serve society



SARVAJANIK
UNIVERSITY

INCLUSIVE | INTEGRATED | INNOVATIVE

creating an enlightened society...

UNIVERSITY OFFICE

Dr. R. K. Desai Marg, Athwalines,
Surat-395001, Gujarat, India.

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CURRICULUM FOR

“MASTER OF SCIENCE (ENVIRONMENTAL SCIENCE)”

M.Sc. (Environmental
Science)

SEM – 1

SEM – 2

w.e.f. Academic Year 2026-27

Constituent Institute:
Shree Ramkrishna Institute of
Computer Education and Applied
Sciences (SRKI)



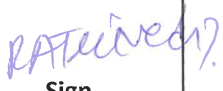
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SARVAJANIK UNIVERSITY
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Course Curriculum **MASTER OF SCIENCE (ENVIRONMENTAL SCIENCE) Sem-1 and 2**

The Course Curriculum of Master of Science (Environmental Science) was proposed and drafted by **Academic and Curriculum Committee of Environmental Science** under the Faculty of Science in the meeting held on **02-07-2026** and recommended to '**BOARD OF STUDIES**' for approval.

Dr. Ratna Trivedi Chairman, Academic & Curriculum Committee Science	Place of the meeting <u>Sarvajani University Office</u>	 Sign
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The proposed Course Curriculum was approved by **Board of Studies; Science** under the Faculty of Science in the meeting held on **21-08-2026** and was recommended to the '**FACULTY**' for approval.

Dr. Jay Bergi Chairman, Board of Studies- Science	Place of the meeting <u>Sarvajani University Office</u>	 Sign
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The Course Curriculum approved by the **Faculty of Science** in the meeting held on **21-08-2026** and was recommended to '**ACADEMIC COUNCIL**' for approval.

Dr. Jay Bergi Chairman & Dean, Faculty of Science	Place of the meeting <u>Sarvajani University Office</u>	 Sign
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The Course Curriculum approved by the '**Academic Council of Sarvajani University**' in the meeting held on **16-09-2026**.

Mr. Ashish Desai Member Secretary, Academic Council & I/c. Registrar, <u>Sarvajani University</u>	Place of the meeting <u>Sarvajani University Office</u>	 Sign
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- *The approved curriculum of Master of Science (Environmental Science) is with effect from the Academic year **2026-27***



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Environmental Science) Sem-I and II



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Faculty of Science

M. Sc. (Environmental Science)

DETAILED CURRICULUM
(W.E.F. 2026-27)



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Environmental Science) Sem-I and II

Credit Framework for 2 Years Postgraduate Program (As per KCG SOP) wef 2026-27
Faculty of Science, Sarvajani University

Semester	DSC						DSE		Skill Enhancement		Total Credits
	DSC No. of Papers	Theory		Lab		Total DSC Credits					
		Theory Hours	Theory Credits	Lab Hrs	Lab Credits		No. of Papers	Credits	No. of Papers	Credits	
1	4	3+3+3+3	3+3+3+3	2+2+2+2	1+1+1+1	16	1	4	1	2	22
2	4	3+3+3+3	3+3+3+3	2+2+2+2	1+1+1+1	16	1	4	1	2	22
3	4	3+3+3+3	3+3+3+3	2+2+2+2	1+1+1+1	16	1	4	1	2	22
4	Dissrt.			48	16	16	1	4	1	2	22
Total after 2yrs	12 + 1					64	4	16	4	8	88



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Environmental Science) Sem-I and II

Teaching Scheme for M.Sc. (Organic Chemistry) Semester – I to II						
Semester	Course Category	Credits	Theory (Hrs/Week)	Theory (Total)	Laboratory (Hrs/Week)	Laboratory (Total)
I	Discipline Specific Core-1	4	3	45	2	30
	Discipline Specific Core-2	4	3	45	2	30
	Discipline Specific Core-3	4	3	45	2	30
	Discipline Specific Core-4	4	3	45	2	30
	Discipline Specific Elective-1	4	3	45	2	30
	Skill Enhancement Courses-1	2	2	30	-	-
	Total	22	17	255	10	150
II	Discipline Specific Core-5	4	3	45	2	30
	Discipline Specific Core-6	4	3	45	2	30
	Discipline Specific Core-7	4	3	45	2	30
	Discipline Specific Core-8	4	3	45	2	30
	Discipline Specific Elective-2	4	3	45	2	30
	Skill Enhancement Courses-2	2	2	30	-	-
	Total	22	17	255	10	150



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Environmental Science) Sem-I and II

Evaluation Scheme for M.Sc. (Organic Chemistry) Semester – I to II							
Semester	Course Category	Continuous and Comprehensive Evaluation (CCE)			Total CCE	Semester End Examination (SEE)	Grand Total
		CCE	Assignment	Attendance			
I	Discipline Specific Core-1	30	10	10	50	50	100
	Discipline Specific Core-2	30	10	10	50	50	100
	Discipline Specific Core-3	30	10	10	50	50	100
	Discipline Specific Core-4	30	10	10	50	50	100
	Discipline Specific Elective-1	30	10	10	50	50	100
	Skill Enhancement Courses-1	15	5	5	25	25	50
II	Discipline Specific Core-5	30	10	10	50	50	100
	Discipline Specific Core-6	30	10	10	50	50	100
	Discipline Specific Core-7	30	10	10	50	50	100
	Discipline Specific Core-8	30	10	10	50	50	100
	Discipline Specific Elective-2	30	10	10	50	50	100
	Skill Enhancement Courses-2	15	5	5	25	25	50



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Environmental Science) Sem-I and II



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Faculty of Science

M. Sc. (Environmental Science)

SEM - 7

DETAILED CURRICULUM
(W.E.F. 2026-27)



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Environmental Science) Sem-I and II

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	M. Sc. Environmental Science		
Course Type	DSC		Version	1.0		
Semester	0		Effective From	June, 2026		
Course Code	MSES21101	Course Name	Environmental Hazards, Ecotoxicology and Disaster Management(TH)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CA)	Term end examinations (TEE)	Total
3	3 hrs	0	0	40	35	75

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	M. Sc. Environmental Science		
Course Type	DSC		Version	1.0		
Semester	0		Effective From	June, 2026		
Course Code	MSES21102	Course Name	Environmental Hazards, Ecotoxicology and Disaster Management (PR)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CA)	Term end examinations (TEE)	Total
1	0	0	2 hrs	10	15	25

Program: M. Sc.	Department: Environmental Science
	Type of Subject: Theory



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Environmental Science) Sem-I and II

Subject: Environmental Hazards, Ecotoxicology and Disaster Management

Student Learning Outcomes (SLOs):

To understand the causes, impacts, and management of environmental hazards, the principles of ecotoxicology, and disaster risk reduction strategies.

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

1. Environmental Hazards: Assessing risk and reducing disaster, Keith Smith, 6th Edition, 2013, Routledge, Taylor and Francis group.
2. Environmental Health, Assessing Risk and Reduction Disaster, Smith, K. 3rd Edition, 2001, Routledge.
3. Natural Disasters, R.K. Sharma and Gagandeep Sharma, 1st Edition, 2005, Jain Book Depot.
4. Environmental Pollution and Control in Chemical Process Industries, S.C. Bhatia, 2nd Edition, 3rd Reprint, 2014, Khanna Publishers.
5. Industrial Wastewater Treatment, A.D. Patwardhan, 1st Edition, 2nd Reprint, 2009, PHI Learning Private Limited.

Unit-1: Introduction hazards and Disaster (7 Lecture)

- 1.1 Hazards, risk and disasters
- 1.2 Current views: the complexity paradigm
- 1.3 Phases of disaster
- 1.4 Explaining, measuring and managing disaster

UNIT-2: Natural disasters (8 Lecture)

- 2.1 Types of natural disasters
- 2.2 Natural disasters and medicine
- 2.3 Natural disaster: awareness and education
- 2.4 Natural disaster reduction: global concern

UNIT-3 Ecotoxicology-1 (7 Lecture)

- 3.1 Ecotoxicology: introduction and importance
- 3.2 Drug dosage- ED50 and LD50
- 3.3 Drug metabolism and role of cytochrome p450 enzymes
- 3.4 Carcinogens and carcinogenicity
- 3.5 Bioaccumulation and biomagnification

UNIT-4 Ecotoxicology-2 (8 Lecture)

- 4.1 Toxic chemicals in the environment: classification
- 4.2 Biochemical effects and toxicology of heavy metals (Cadmium, Lead, Arsenic, Mercury)
- 4.3 Toxicology of Hazardous Chemicals [Ozone, PAN, Cyanide, Methyl Iso Cyanate (MIC), Pesticides]
- 4.4 Bioaccumulation and Biomagnification

UNIT-5 Risk Assessment and Management (7 Lecture)

- 5.1 Nature of risk and assessment
- 5.2 Risk perception and its' communication and practice
- 5.3 Risk management



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Environmental Science) Sem-I and II

5.4 Role of information technology in risk assessment and management

UNIT-6 Reducing the Impact of Disaster (8 Lecture)

- 6.1 Protection: hazard resistance
- 6.2 Mitigation: disaster aid and insurance
- 6.3 Adaptation: preparedness, predictions, forecasts and warnings
- 6.4 Adaptation: land use planning

Practical's:

1. Determination of Cadmium and Lead by titration method.
2. Determination of Copper & Manganese in water sample by Spectrophotometer.
3. Study of heavy metal biosorption by using fungal biomass.
4. Calculation of earthquake travel times.
5. Screening of hydrocarbon degrading bacteria.



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Environmental Science) Sem-I and II

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	M. Sc. Environmental Science		
Course Type	DSC		Version	1.0		
Semester	01		Effective From	June, 2026		
Course Code	MSES21103	Course Name	Environmental Pollution Control and Management (TH)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CA)	Term end examinations (TEE)	Total
3	3 hrs	0	0	40	35	75

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	M. Sc. Environmental Science		
Course Type	DSC		Version	1.0		
Semester	01		Effective From	June, 2026		
Course Code	MSES21104	Course Name	Environmental Pollution Control and Management (PR)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CA)	Term end examinations (TEE)	Total
1	0	0	2 hrs	10	15	25



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Environmental Science) Sem-I and II

Program: M.Sc.	Department: Environmental Science
	Type of Subject: Theory
Subject: Environmental Pollution Control and Management	
Semester-1	

Student Learning Outcomes (SLOs):

To provide a comprehensive understanding of various types of pollution, their control technologies, and management strategies.

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

1. Integrated solid waste management : Engineering principles and issues - George Tchobanoglous, Hilary Theisen, Samuel A. Vigil, 2nd Edition , 2014, McGraw Hill Education
2. Handbook of solid waste management - Frank Kreith, 1st Edition , 1994, McGraw Hill Inc
3. Management of municipal solid waste - T. V. Ramchandra, 5th Reprint, 2014, TERI Press
4. Environmental Pollution and Control in Chemical Process Industries, S.C. Bhatia, 2nd Edition, 3rd Reprint, 2014, Khanna Publishers.
5. Industrial Wastewater Treatment, A.D. Patwardhan, 1st Edition, 2nd Reprint, 2009, PHI Learning Private Limited.

Unit-1: Air Pollution: Source and Effects (7 Lecture)

- 1.1 Sources of air pollution: primary, secondary pollutants and particulate matter, natural and man-made sources
- 1.2 Factors affecting air pollution: wind direction, temperature inversion, mixing height, precipitation, humidity, solar radiation
- 1.3 Effects of air pollution on biological system: animals, plants, humans
- 1.4 Effects of air pollution on non-biological systems: materials

UNIT-2: Air Pollution Control (8 Lecture)

- 2.1 Particulate control at source: Raw material change, Process modification, Equipment modification
- 2.2 Particulate Control equipments: Settling chambers, Cyclones, Electrostatic precipitators, Scrubbers
- 2.3 Control of gaseous pollutants: Adsorption, Absorption, Combustion, Condensation
- 2.4 Control measures of Global warming, Acid rain, Ozone depletion and Smog

UNIT-3 Water Pollution (7 Lecture)

- 3.1 Sources of ground water pollution and its effect
- 3.2 Sources of surface water pollution and its effect
- 3.3 Source of agricultural and Pesticide pollution in water
- 3.4 Characteristics & Types of industrial waste water



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Environmental Science) Sem-I and II

UNIT-4 Waste Water Treatment (8 Lecture)

- 4.1 Principles of industrial waste treatment
- 4.2 Protection of surface water from pollution with industrial sewage
- 4.3 Treatment and disposal of industrial sewage
- 4.4 Treatment of wastes or effluents with organic impurities
- 4.5 Treatment of wastes or effluents with Inorganic impurities

UNIT-5 Solid Waste Management (7 Lecture)

- 5.1 Source, classification and Causes-effects of Solid waste
- 5.2 Control measures: Collection, Disposal, Recycling, recovery and reuse of solid waste, Waste utilization and applications
- 5.3 Municipal Solid Waste: source, Composition and types
- 5.4 Characteristics/properties of MSW: physical, chemical and biological
- 5.5 Transformation of MSW: physical, chemical and biological

UNIT-6 Hazard Waste (8 Lecture)

- 6.1 Nature, sources, Identification and listed hazardous waste Characteristics, classification and effects
- 6.2 Hazardous waste management: generation, storage and collection, transfer and transport, processing, disposal
- 6.3 Biomedical and E-waste: Source, generation, classification and segregations
- 6.3 Hazardous waste treatment: physical, chemical, thermal and biological
- 6.4 Pollution prevention and waste minimization

Practical's:

- 1. Determination of SO_x and NO_x of ambient air.
- 2. To determine RSPM and SPM of ambient air.
- 3. Determination of Turbidity and Conductivity of given water sample
- 4. To determine the temporary and permanent hardness of water.
- 5. Analysis of DO, BOD and COD in Waste Water Sample.
- 6. Analysis of Fluoride in Ground Water and Potable Water.
- 7. To determine Carbon, Nitrogen, Phosphors and Potassium content of solid waste.



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Environmental Science) Sem-I and II

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	M. Sc. Environmental Science		
Course Type	DSC		Version	1.0		
Semester	01		Effective From	June, 2026		
Course Code	MSES21105	Course Name	Environment and Human Health (TH)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CA)	Term end examinations (TEE)	Total
3	3 hrs	0	0	40	35	75

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	M. Sc. Environmental Science		
Course Type	DSC		Version	1.0		
Semester	01		Effective From	June, 2026		
Course Code	MSES21106	Course Name	Environment and Human Health (PR)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CA)	Term end examinations (TEE)	Total
1	0	0	2 hrs	10	15	25

Department: Environmental Science



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Environmental Science) Sem-I and II

Program: M. Sc.	Type of Subject: Theory
Subject: Environment and Human Health	
Semester-1	

Student Learning Outcomes (SLOs):

To examine the interrelationships between environmental quality and human health, including disease transmission and the impact of pollution.

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

1. Environmental Health Vol. 1 – H. Koren and M. Bisesi, 4th Edition, 2003, Lewis Publishers.
2. Environmental Health Vol. – H. Koren and M. Bisesi, 4th Edition, 2003, Lewis Publishers.
3. M. H. Fulekar (I.K. International Publishing House Pvt. Ltd., New Delhi), Industrial Hygiene and Chemical Safety. ISBN: 81-88237-92-2.

Unit-1: Environmental Problem and Human Health (7 Lecture)

- 1.1 Human Systems
- 1.2 Toxicological Principles
- 1.3 Principles of communicable disease
- 1.4 Epidemiological principles

UNIT-2: Concept of Industrial Hygiene (8 Lectures)

- 2.1 Introduction
- 2.2 Industrial hygiene and Industrial hygienist
- 2.3 Recognition, Evaluation, Monitoring and Control of Industrial Hygiene
- 2.4 Physical and Chemical Classification of Airborne Contaminants

UNIT-3 Occupational Diseases and health Legislation (7 Lecture)

- 3.1 Pneumoconiosis
- 3.2 Silicosis, Asbestosis
- 3.3 Lead and its Compounds
- 3.4 Mercury, Chromium and its Compounds
- 3.5 OHSAS18001, ILO Conventions, The Factories Act, 1948, Water (Prevention & control of pollution) Act, 1974, Air (Prevention & control of pollution) Act, 1981 and Rules. Environment protection Act 1986 (Amended)

UNIT-4 Urbanization and health (8 Lecture)

- 4.1 Pollution and health
- 4.2 Urbanization & Industrialization
- 4.3 Disaster and health
- 4.4 Natural disaster and Manmade disaster



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Environmental Science) Sem-I and II

UNIT-5 Indoor Environment and Health (7 Lecture)

- 5.1 Source and Problems of Indoor Air Pollution
- 5.2 Health and Housing Problems
- 5.3 Biological Contaminants, Accidents and Injuries
- 5.4 Indoor Air contaminants control

UNIT-6 Toxicology and Health Risk (8 Lecture)

- 6.1 Toxic chemicals in the environment
- 6.2 Biochemical effects and toxicology of heavy metals and hazardous chemicals
- 6.3 Preventive measures to protect environment
- 6.4 Industrial ecosystem

Practical's:

- 1. Determination Physical Properties of Water.
- 2. Determination of pollutants in ambient air using HVS.
- 3. Detection of coliforms by MPN.
- 4. Assessment of air flora of different places by gravity settling technique.
- 5. To determine chlorine dose for water supply



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Environmental Science) Sem-I and II

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	B.Sc. (Hons.) / (Hons. with Research) Environmental Science		
Course Type	Major		Version	1.0		
Semester	07		Effective From	June, 2026		
Course Code	BSES11707	Course Name	Geospatial Technologies for Environmental Management (TH)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CA)	Term end examinations (TEE)	Total
3	3 hrs	0	0	40	35	75

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	M. Sc. Environmental Science		
Course Type	DSC		Version	1.0		
Semester	01		Effective From	June, 2026		
Course Code	MSES21108	Course Name	Geospatial Technologies for Environmental Management (PR)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CA)	Term end examinations (TEE)	Total
1	0	0	2 hrs	10	15	25



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Environmental Science) Sem-I and II

	Department: Environmental Science
Program: M.Sc.	Type of Subject: Theory
Subject: Geospatial Technologies for Environmental Management	
Semester-1	

Student Learning Outcomes (SLOs):

To introduce the principles and applications of Geographic Information Systems (GIS) and Remote Sensing (RS) in environmental monitoring and management.

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

1. Remote Sensing and GIS, 2nd Edition, Basudeb Bhatt, Oxford University press.
2. Basics of Remote Sensing and GIS, 1st Edition, 2014, S. Kumar, University Science Press.
3. Bioinformatics: A Biologist's guide to Biocomputing and Internet - M. S. Brown, 1st Edition, 2000, Eaton Publishing, Natick, USA.

Ecoinformatics: Tools and Techniques - R. A. Reddy, 1st Edition, 2009, SBS Publishers, New Delhi.

Unit-1: Introduction to GIS and Remote Sensing (7 Lecture)

- 1.1 Introduction and history of GIS and remote sensing
- 1.2 Types of remote sensing and characteristics of images: photographic, digital, and microwave
- 1.3 Ground truth data and Global Positioning System
- 1.4 Geospatial analysis

UNIT-2: Spatial Data and Geospatial Analysis (8 Lectures)

- 2.1 Spatial and non-spatial data
- 2.2 Visual presentation of spatial data
- 2.3 Digital Elevation Models (DEMs)
- 2.4 Spatial modeling

UNIT-3 Ecological Databases (7 Lecture)

- 3.1 Introduction to Cloud-Based Geospatial Analysis
- 3.2 Remote Sensing Fundamentals and Data Access
- 3.3 Environmental Applications with Spectral Indices
- 3.4 Land Use / Land Cover (LULC) Classification

UNIT-4 Ecological Knowledge Systems and Modeling (8 Lecture)

- 4.1 Introduction to concept mapper: SEEK, VEGBANK
- 4.2 SEEK software
- 4.3 Analysis and modelling

UNIT-5 Ecosystem visualization and taxonomic hierarchies (7 Lecture)

- 5.1 Introduction to Spire, ELVIS
- 5.2 ELVIS tools
- 5.3 Species list constructor
- 5.4 Food Web constructor
- 5.5 Evidence Provider



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Environmental Science) Sem-I and II

5.6 Ontology Tool (SPOTTER)

UNIT-6 Application and Case Studies (8 Lecture)

- 6.1 Application of Remote Sensing and GIS in environmental Assessment and management
- 6.2 Use of remote sensing for land use, forestry and water resources
- 6.3 GIS for ecological management
- 6.4 Environmental Monitoring using GIS and Remote sensing

Practical's:

1. Calculation of map distance using a ratio scale.
2. Plant data retrieval from appropriate database.
3. Algae data retrieval from Algal Base database.
4. IUCN data retrieval from IUCN red list database.
5. IUCN data retrieval from image database WDPA dataset.
6. Identification of coal fields - Economic aspects, availability of coal or Usage of topographic maps
- to study about land forms
7. Study of biological hotspots of south Gujarat.



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Environmental Science) Sem-I and II

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	M. Sc. Environmental Science		
Course Type	DSE		Version	1.0		
Semester	02		Effective From	June, 2026		
Course Code	MSES22101	Course Name	Environment and Energy (TH)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CA)	Term end examinations (TEE)	Total
3	3 hrs	0	0	40	35	75

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	M. Sc. Environmental Science		
Course Type	DSE		Version	1.0		
Semester	02		Effective From	June, 2026		
Course Code	MSES22102	Course Name	Environment and Energy (PR)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CA)	Term end examinations (TEE)	Total
1	0	0	2 hrs	10	15	25

Name of faculty: Science

Department: Environmental Science



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Environmental Science) Sem-I and II

Program: M.Sc. 1	Type: Theory + Practical
Subject: DSE- Energy and Environment	Semester: 1
Course description: The students are expected to understand the importance of energy conservation and become capable to identify the technologies for effective utilization of renewable energy sources.	
Student learning outcome: After learning the subject, students will be able to understand, • Importance of renewable energy sources. • Application of different renewable energy sources. • Impact of energy on ecology, society and environment. • Energy Policy of India and our energy future. • The need, importance and scope of non-conventional and alternative energy.	

Unit-1: Introduction:

- 1.1 Definition of Energy and Units of energy
- 1.2 Law of conservation of energy
- 1.3 Scenario of renewable and non-renewable energy sources,
- 1.4 Needs of renewable energy, advantages and limitations of renewable energy
- 1.5 present energy scenario of conventional and RE sources.

Unit-2: Solar Energy:

- 2.1 Sun as source of energy: solar energy potential in India, National solar mission,
- 2.2 Solar radiation and its spectral characteristics, solar radiation outside the Earth's atmosphere and at the Earth's surface,
- 2.3 Flat plate and concentrating collectors, solar thermal power generation
- 2.4 fundamentals of solar photo voltaic conversion.

Unit-3: Wind Energy and Ocean thermal Energy:

- 3.1 Wind power and its sources, modern wind energy-modern wind turbines
- 3.2 wind energy estimation, types of wind energy systems, site selection
- 3.3 Details of wind turbine generator.
- 3.4 Definition and Conversion principal Ocean thermal energy
- 3.5 Energy from tides, tidal power plants, single and double basin plants
- 3.6 site requirements, advantages and limitations

Unit-4: Bio Energy:

- 4.1 Types of biogas plants, biogas generation,
- 4.2 factors affecting biogas generation
- 4.3 Advantages and disadvantages of biomass energy,
- 4.4 Biomass gasification, types of gasification.

Unit-5: Energy, environment and society:

- 5.1 Impact of energy use on the environment, fossil fuel burning and related issues of air pollution, 5.2 global warming, greenhouse effect, nuclear energy and related issues of radioactive waste,
- 5.3 social inequalities related to energy production, distribution and use.
- 5.4 Energy -production, transformation and utilization, associated environmental impacts
- 5.5 Nuclear accidents, Nuclear pollution



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FACULTY OF SCIENCE
Master of Science (Environmental Science) Sem-I and II

5.6 Over consumption of energy and its impact on the environment, economy and global change.

Unit-6: Energy policy and our energy future:

- 6.1 Energy statistics in India and world,
- 6.2 Importance of energy conservation,
- 6.3 India's Energy Strategy(National Energy Policy),
- 6.4 Energy audit definition and types of energy audit energy management system
- 6.5 Fuel and energy substitution in future.

References:

- 1.Solar Energy: Principles of Thermal collection and storage, S.P.Sukhatme and J.K.Nayak, McGraw-Hill Education.
- 2. Elliott, D. 1997. Sustainable Technology, Energy, Society and Environment. New York, Routledge Press.
- 3. Sathyajith Mathew.2006.Wind energy: fundamental, resources analysis and economics. Springer Berlin Heidelberg, The Netherland ISBN: 139783540309055.
- 4.M.V.R. Koteswara. Rao, "Energy Resources: Conventional & Non-conventional" BSP Publications,2006.
- 5.Craig. J.R.,Vaughan, D.J.,Skinner.B.J.1996. Resources of the Earth: Origin, use and environmental impact.(2ndedition). Prentice hall, New Jersey.
- 6. Godfrey Boyle, "Renewable Energy Power for A Sustainable Future," Oxford University Press.

Practicals:

- 1. Determination of carbon foot print of home, institute and any one industry.
- 2. Demonstration practical for fermentation for Biogas production.
- 3. Visit to power plant (any).
- 4. Detection of CV from various agriculture waste.
- 5. Proximate analysis of Coal.
- 6. Ash analysis from agriculture waste ash/coal ash etc.



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Environmental Science) Sem-I and II

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	M.Sc. All		
Course Type	SEC-1		Version	1.0		
Semester	01		Effective From	June, 2026		
Course Code	MSES23101	Course Name	Research Methodology - 1			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CA)	Term end examinations (TEE)	Total
2	2 hrs	0	0 hrs	25	25	50



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Environmental Science) Sem-I and II

Faculty: Science	Department: Env. Sc. and Biotech.
Program: M.Sc.	Type: SEC
Subject: Research Methodology - 1	Credits: 2
Semester: I	

References:

1. Ghosh, B. N. (1982). *Scientific method and social research*. Sterling Publishers.
2. Kothari, C. R. (2004). *Research methodology: Methods and techniques*. New Age International.

Unit 1: Conceptual Foundation

(06 hours)

- 1.1 Constituents and theoretical perspectives
- 1.2 Approaches to inquiry
- 1.3 Strategies and process
- 1.4 Hypothesis: its types and sources
- 1.5 Nature, sources and types of data
- 1.6 Measurement scales of variables

Unit 2: Philosophy of Scientific research

(08 hours)

- 2.1 Positivist philosophy of science and its criticism
- 2.2 Karl Popper and Thomas Kunh's philosophy of science
- 2.3 Definition, need and purpose of research
- 2.4 Conceptual framework of research
- 2.5 Basic and applied research
- 2.6 General characteristics of modern research
- 2.7 Criteria for selecting a topic and Scientific method

Unit 3: Planning of research

(08 hours)

- 3.1 Criteria of scientific research
- 3.2 Purpose and development of theory
- 3.3 Scope of research in biology
- 3.4 Stages and process of research
- 3.5 Sources of data
- 3.6 Sample design
- 3.7 Survey research
- 3.8 Experimental research



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Environmental Science) Sem-I and II

Unit 4: Methods of research

(08 hours)

- 4.1 Planning and process of observation
- 4.2 Types of observation
- 4.3 Questionnaire method
- 4.4 Pre-testing and distribution of questionnaires
- 4.5 Interviewing method
- 4.6 Parts and planning of experimental research
- 4.7 Laboratory vs Field experiment
- 4.8 Experiment design



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FACULTY OF SCIENCE
Master of Science (Environmental Science) Sem-I and II



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FACULTY OF SCIENCE
Master of Science (Environmental Science) Sem-I and II

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	B.Sc. (Hons.) / (Hons. with Research) Environmental Science		
Course Type	Major		Version	1.0		
Semester	08		Effective From	June, 2026		
Course Code	BSES11805	Course Name	Lifestyle for Environment (LiFE) and Sustainable Living(TH)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CA)	Term end examinations (TEE)	Total
3	3 hrs	0	0	40	35	75

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	B.Sc. (Hons.) / (Hons. with Research) Environmental Science		
Course Type	Major		Version	1.0		
Semester	08		Effective From	June, 2026		
Course Code	BSES11806	Course Name	Lifestyle for Environment (LiFE) and Sustainable Living (PR)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CA)	Term end examinations (TEE)	Total
1	0	0	2 hrs	10	15	25

	Department: Environmental Science
Program: B. Sc.	Type of Subject: Theory
Subject: Lifestyle for Environment (LiFE) and Sustainable Living	
Semester-8	

Student Learning Outcomes (SLOs):



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Environmental Science) Sem-I and II

To promote an understanding of sustainable lifestyles and the role of individual and community actions in environmental conservation.

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

1. Ecology, Environment and Resource Conservation. Singh, J.S., Singh, S.P. and Gupta, S.R., 1st Edition, 2015, S. Chand Publishing.
2. Environmental Biotechnology: Basic concepts and applications - I. S. Thakur, 1st Edition, 2006, IK International Publications, New Delhi
3. Environmental Biotechnology - M. H. Fulekar, 1st Edition, 2010, Science Publishers, CRC press, Taylor & Francis, USA

Unit-1: Introduction to Sustainable Living (8 Lecture)

- 1.1 Concept of LiFE (Lifestyle for Environment)
- 1.2 Principles of sustainable development
- 1.3 Mindful and deliberate utilization vs. mindless consumption
- 1.4 The 4Rs (Reduce, Reuse, Recycle, Refuse).

UNIT-2: Sustainable Consumption and Food Systems (7 Lectures)

- 2.1 Eco-friendly habits in daily life (Conserving water and Energy)
- 2.2 Reducing food wastage
- 2.3 Sustainable food choices: Millets, indigenous herbs, and medicinal plants
- 2.4 Community gardens and Kitchen Gardens

UNIT-3 Waste Management and Circular Economy (7 Lecture)

- 3.1 Composting food waste at home
- 3.2 Creating products from waste
- 3.3 Importance of clothes recycling
- 3.4 Urban farming and hydroponics
- 3.5 Plastic and E-waste management

UNIT-4 Energy and Water conservation (8 Lecture)

- 4.1 Energy conservation in agriculture and industrial sectors
- 4.2 Renewable energy sources (Solar, Wind, hydropower, bioenergy, tidal, geothermal)
- 4.3 Rainwater harvesting and water conservation
- 4.4 Sustainable water management practices

UNIT-5 Community and youth Engagement (7 Lecture)

- 5.1 Community strengthening activities
- 5.2 Planning and Preparation for green practices
- 5.3 Role of Individuals
- 5.4 Case Studies of Community (Under the LiFE mission)

UNIT-6 Ecotourism and Sustainable Business (8 Lecture)

- 6.1 Introduction of Ecotourism
- 6.2 Sustainability's Components: Economic Footprint



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FACULTY OF SCIENCE
Master of Science (Environmental Science) Sem-I and II

- 6.3 Key strategies for development of ecotourism
- 6.4 Recent and future Trends in Tourism
- 6.5 Economic benefits and impacts of tourism

Practical's:

1. Preparation of Herbarium for ecological important plants.
2. Cultivation of microbes on waste material and observation of decomposition rate and biomass generation
3. Preparation of field report based on the survey of local flora.
4. To determine wind velocity by cup type Anemometer
5. Demonstration of Weather Monitoring Station.



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Environmental Science) Sem-I and II

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	B.Sc. (Hons.) / (Hons. with Research) Environmental Science		
Course Type	Major		Version	1.0		
Semester	08		Effective From	June, 2026		
Course Code	BSES11807	Course Name	Climate Change Adaptation and Resilience(TH)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CA)	Term end examinations (TEE)	Total
3	3 hrs	0	0	40	35	75

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	B.Sc. (Hons.) / (Hons. with Research) Environmental Science		
Course Type	Major		Version	1.0		
Semester	08		Effective From	June, 2026		
Course Code	BSES11808	Course Name	Climate Change Adaptation and Resilience (PR)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CA)	Term end examinations (TEE)	Total
1	0	0	2 hrs	10	15	25

Subject code:	Department: Environmental Science
Program: B. Sc.	Type of Subject: Theory



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Master of Science (Environmental Science) Sem-I and II

Subject: Climate Change Adaptation and Resilience
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Semester-8

Student Learning Outcomes (SLOs):

To understand the science of climate change, its impacts, and the strategies for adaptation and building resilience.

Unit-1: Fundamentals of Climate Science (8 Lecture)

Earth's climate system
Green House Effect and Global warming
Ozone Layer Depletion
Smog (Sulphurous and Photochemical)
Acid Rain

UNIT-2: Climate Change Impacts (7 Lectures)

2.1 Impacts on human communities and Agriculture
2.2 Drought, rising temperature, natural disasters, loss of habitats and agricultural land
2.3 Impacts on biodiversity and speciation
2.4 El Nino and La Nina

UNIT-3 Vulnerability and Risk Assessment (7 Lecture)

3.1 Key concepts: Impacts, Hazard, exposure, Vulnerability and Risk
3.2 Vulnerability to various disasters (floods, heat waves, desertification)
3.3 Risk assessment frameworks
3.4 Land Use / Land Cover (LULC) Classification

UNIT-4 Climate Change Adaptation (8 Lecture)

4.1 Concept of adaptation, mitigation, and resilience; Strategies, policy objectives, and implementation of action plans
4.2 Adaptation in agriculture, water resources, and urban planning.

UNIT-5 Building Resilience (7 Lecture)

5.5 Strategies for increasing resilience
5.6 Community-based adaptation
5.7 Ecosystem-based adaptation
5.8 Infrastructure resilience; Disaster risk reduction (DRR)



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Environmental Science) Sem-I and II

UNIT-6 Policy and International Frameworks (8 Lecture)

- 6.1 Application of Remote Sensing and GIS in environmental Assessment and management
- 6.2 National policies on climate change (NAPCC)
- 6.3 Role of mitigation (reducing emissions) and adaptation
- 6.4 Net zero pathways and climate resilience

Practical's:

- 1. Draw and explain earth's radiation budget and energy balance of the earth's surface.
- 2. Determination of intensity of the solar radiation by Albedometer.
- 3. Determination of relative humidity of ambient air by Psychrometer.
- 4. To determine wind velocity by cup type Anemometer
- 5. Demonstration of Weather Monitoring Station.



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Environmental Science) Sem-I and II

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	B.Sc. (Hons.) / (Hons. with Research) Environmental Science		
Course Type	Major		Version	1.0		
Semester	08		Effective From	June, 2026		
Course Code	BSES11801	Course Name	Environmental Law (TH)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CA)	Term end examinations (TEE)	Total
3	3 hrs	0	0	40	35	75

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	B.Sc. (Hons.) / (Hons. with Research) Environmental Science		
Course Type	Major		Version	1.0		
Semester	08		Effective From	June, 2026		
Course Code	BSES11802	Course Name	Environmental Law (PR)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CA)	Term end examinations (TEE)	Total
1	0	0	2 hrs	10	15	25



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Environmental Science) Sem-I and II

Subject code:	Department: Environmental Science
Program: B. Sc.	Type of Subject: Theory
Subject: Environmental Law	
Semester-8	

Student Learning Outcomes (SLOs):

To understand the science of climate change, its impacts, and the strategies for adaptation and building resilience.

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

1. Handbook of Environmental Laws – P. B. Sahasranaman, 2nd Edition, 2012, Oxford University Press.
2. Environmental Law Case Book – P. Leelakrishnan, 2nd Edition, 2006, Lexis Nexis.
3. Environmental Protection and the Law – A. Gadekar and N. Solanki, 1st Edition, 2015, A.P.H. Publishing Corporation.
4. Environmental Regulation, Law, Science and Policy – R. V. Percival, 1st Edition, 1992, Little Brown & Comp.

Unit-1: Fundamentals of Environmental Law (8 Lecture)

- 1.1 Nature, scope and evolution of Environmental Law
- 1.2 Environmental ethics and environmental justice
- 1.3 Principles of Environmental Law:
 - 1.3.1 Precautionary Principle
 - 1.3.2 Polluter Pays Principle
 - 1.3.3 Public Trust Doctrine
 - 1.3.4 Sustainable Development Principle
- 1.4 Environmental governance and environmental rights

UNIT-2: Constitutional and Institutional Framework (7 Lectures)

- 2.1 Environmental Protection in Directive Principles and Fundamental Duties
- 2.2 Environmental regulatory institutions (MoEFCC, CPCB, SPCBs)
- 2.3 National Green Tribunal (NGT): Structure, Powers and Functions

UNIT-3 Environmental Legislations in India (7 Lecture)

- 3.1 Environment protection act, 1986
- 3.2 The Water (Prevention and Control of Pollution) Act, 1974
- 3.3 The Air (Prevention and Control of Pollution) Act, 1981
- 3.4 Factories act, 1948
- 3.5 National Environmental Policy, 2006
- 3.6 Noise Pollution (Regulation and Control) Rules, 2000
- 3.7 Environmental Impact Assessment Notification, 2006

UNIT-4 Biodiversity and Natural Resource Laws (8 Lecture)

- 3.1 Wildlife (Protection) Act, 1972
- 3.2 Forest (Conservation) Act, 1980



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Environmental Science) Sem-I and II

- 3.3 Biological Diversity Act, 2002
- 3.4 Forest Rights Act, 2006
- 3.5 Wetland Conservation Rules
- 3.6 Community participation in biodiversity conservation

UNIT-5 International Environmental Law and Treaties (7 Lecture)

- 5.1 Evolution of International Environmental Law
- 5.2 Stockholm Conference (1972)
- 5.3 Rio Earth Summit (1992)
- 5.4 Convention on Biological Diversity (CBD)
- 5.5 UNFCCC, Kyoto Protocol and Paris Agreement
- 5.6 Montreal Protocol, Ramsar Convention and Basel Convention

UNIT-6 Environmental Litigation and Contemporary Issues (8 Lecture)

- 6.1 Public Interest Litigation (PIL) in environmental protection
- 6.2 Landmark environmental case laws in India
- 6.3 Environmental crimes and liabilities
- 6.4 Environmental compliance and corporate responsibility
- 6.5 Climate justice and environmental rights
- 6.6 Emerging issues:
 - Plastic pollution
 - E-waste management
 - ESG and environmental governance

Practical's:

- 1. Case study analysis of landmark judgments of the Supreme Court, High Courts, and NGT..
- 2. Visit to Gujarat Pollution Control Board (GPCB) / Environmental Regulatory Authority and report preparation.
- 3. Preparation of Environmental Compliance Report for an industry or institution.



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Environmental Science) Sem-I and II

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	B.Sc. (Hons.) / (Hons. with Research) Environmental Science		
Course Type	Major		Version	1.0		
Semester	08		Effective From	June, 2026		
Course Code	BSES11803__	Course Name	Environmental Monitoring & Audit(TH)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CA)	Term end examinations (TEE)	Total
3	3 hrs	0	0	40	35	75

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	B.Sc. (Hons.) / (Hons. with Research) Environmental Science		
Course Type	Major		Version	1.0		
Semester	08		Effective From	June, 2026		
Course Code	BSES11804__	Course Name	Environmental Monitoring & Audit (PR)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CA)	Term end examinations (TEE)	Total
1	0	0	2 hrs	10	15	25



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Environmental Science) Sem-I and II

Subject code:	Department: Environmental Science
Program: B. Sc.	Type of Subject: Theory
Subject: Environmental Monitoring and Audit	
Semester-8	

Student Learning Outcomes (SLOs): Explain the concepts, principles, and objectives of environmental monitoring and auditing. Apply sampling and monitoring techniques for air, water, soil, and noise pollution assessment.

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

1. **P.K. Goel** – *Environmental Monitoring: A Laboratory Manual*.
2. **S.K. Maity** – *Handbook of Methods in Environmental Studies (Vol. I & II)*.
3. **APHA** – *Standard Methods for the Examination of Water and Wastewater*.
4. **CPCB** Guidelines on Environmental Monitoring and Auditing.

Unit-1: Fundamentals of Environmental Monitoring (8 Lecture)

- 1.1 Concept, scope and significance of environmental monitoring
- 1.2 Environmental quality indicators and standards
- 1.3 Monitoring objectives and monitoring networks
- 1.4 Sampling strategies and sample preservation
- 1.5 Quality Assurance (QA) and Quality Control (QC)
- 1.6 Environmental monitoring programmes

UNIT-2: Air and Noise Monitoring (7 Lectures)

- 2.1 Ambient air quality monitoring
- 2.2 Monitoring of PM_{2.5}, PM₁₀, SO_x, NO_x, CO and ozone
- 2.3 National Ambient Air Quality Standards (NAAQS), AQI and Interpretation
- 2.4 Noise Monitoring Techniques

UNIT-3 Water and Soil Quality Monitoring (7 Lecture)

- 3.1 Water quality monitoring and sampling
- 3.2 Physical, chemical and biological parameters
- 3.3 Drinking water quality standards
- 3.4 Wastewater characterization and monitoring
- 3.5 Soil quality indicators and assessment
- 3.6 Heavy metal monitoring in soil and water

UNIT-4 Environmental Audit and Environmental Management Systems (8 Lecture)

- 4.1 Environmental audit: concepts and objectives
- 4.2 Types of environmental audits
 - 4.2.1. Compliance audit
 - 4.2.2. Management audit
 - 4.2.3. Energy audit
 - 4.2.4. Green audit
- 4.3 Environmental Management System (EMS)
- 4.4 ISO 14001 standards and certification
- 4.5 Life Cycle Assessment (LCA)
- 4.6 Environmental performance indicators



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FACULTY OF SCIENCE
Master of Science (Environmental Science) Sem-I and II

UNIT-5 Environmental Compliance and Sustainability Assessment (7 Lecture)

- 5.1 Environmental Legislation and compliance requirement
- 5.2 Environmental clearance and consent mechanisms
- 5.3 ESG (Environment, Social and Governance) Framework
- 5.4 Sustainability indicators and reporting
- 5.5 Carbon footprint assessment
- 5.6 Environmental Reporting and disclosure system

UNIT-6 Advanced Monitoring Technologies and Applications (8 Lecture)

- 6.1 Remote sensing and GIS in environmental monitoring
- 6.2 Real-time monitoring systems
- 6.3 Drone-based environmental monitoring
- 6.4 Internet of Things (IoT) in environmental assessment
- 6.5 Environmental data management and interpretation
- 6.6 Case studies on industrial and institutional environmental audits

Practical's:

- 1. Analysis of physico-chemical parameters of drinking water and wastewater samples
- 2. Monitoring and assessment of ambient air quality parameters and calculation of Air Quality Index (AQI).
- 3. Soil quality assessment including pH, electrical conductivity, organic carbon and nutrient analysis.
- 4. Noise level monitoring using sound level meter and preparation of noise mapping report.
- 5. Preparation of Environmental Audit Report for an educational institution, industry, or local body.
- 6. Environmental Management System (EMS) documentation and ISO 14001 compliance assessment.



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Environmental Science) Sem-I and II

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	M. Sc. Environmental Science		
Course Type	DSE		Version	1.0		
Semester	02		Effective From	June, 2026		
Course Code	MSES22201	Course Name	Community based Environmental Management and Sustainable Livelihoods (TH)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CA)	Term end examinations (TEE)	Total
3	3 hrs	0	0	40	35	75

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	M. Sc. Environmental Science		
Course Type	DSE		Version	1.0		
Semester	02		Effective From	June, 2026		
Course Code	MSES22202	Course Name	Community based Environmental Management and Sustainable Livelihoods (PR)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CA)	Term end examinations (TEE)	Total
1	0	0	2 hrs	10	15	25



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Environmental Science) Sem-I and II

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	M.Sc. All		
Course Type	SEC-2		Version	1.0		
Semester	02		Effective From	June, 2026		
Course Code	MSES23201	Course Name	Research Methodology - 2			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CA)	Term end examinations (TEE)	Total
2	2 hrs	0	0 hrs	25	25	50



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Environmental Science) Sem-I and II

Faculty: Science	Department: Env. Sc. and Biotech.
Program: M.Sc.	Type: SEC
Subject: Research Methodology-2	Credits: 2
Semester: 2	

References:

1. Ghosh, B. N. (1982). *Scientific method and social research*. Sterling Publishers.
2. Kothari, C. R. (2004). *Research methodology: Methods and techniques*. New Age International.

Unit 1: Conceptual Foundation

(06 hours)

- 1.1 Constituents and theoretical perspectives
- 1.2 Approaches to inquiry
- 1.3 Strategies and process
- 1.4 Hypothesis: its types and sources
- 1.5 Nature, sources and types of data
- 1.6 Measurement scales of variables

Unit 2: Philosophy of Scientific research

(08 hours)

- 2.1 Positivist philosophy of science and its criticism
- 2.2 Karl Popper and Thomas Kunh's philosophy of science
- 2.3 Definition, need and purpose of research
- 2.4 Conceptual framework of research
- 2.5 Basic and applied research
- 2.6 General characteristics of modern research
- 2.7 Criteria for selecting a topic and Scientific method



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
Master of Science (Environmental Science) Sem-I and II

Unit 3: Planning of research

(08 hours)

- 3.1 Criteria of scientific research
- 3.2 Purpose and development of theory
- 3.3 Scope of research in biology
- 3.4 Stages and process of research
- 3.5 Sources of data
- 3.6 Sample design
- 3.7 Survey research
- 3.8 Experimental research

Unit 4: Methods of research

(08 hours)

- 4.1 Planning and process of observation
- 4.2 Types of observation
- 4.3 Questionnaire method
- 4.4 Pre-testing and distribution of questionnaires
- 4.5 Interviewing method
- 4.6 Parts and planning of experimental research
- 4.7 Laboratory vs Field experiment
- 4.8 Experiment design

