



॥ 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.

Website: www.sarvajanikuniversity.ac.in

Email: admin@sarvajanikuniversity.ac.in

Email: info@sarvajanikuniversity.ac.in

Mo.: +919979102021 / +9197129 30321

Contact No .+912612660266



CURRICULUM FOR

**“BACHELOR OF
SCIENCE (HONS)” /
“BACHELOR OF
SCIENCE (HONS
WITH RESEARCH)”**

B.Sc. (Hons)

(Environmental Science)

B.Sc. (Hons with Research)

(Environmental Science)

SEM – 7

SEM – 8

w.e.f. Academic Year 2026-27

Constituent Institute:

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



Course Curriculum

BACHELOR OF SCIENCE (Hons) / BACHELOR OF SCIENCE (Hons with Research) (ENVIRONMENTAL SCIENCE) Sem-7 and 8

The Course Curriculum of Bachelor 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

Sarvajani University Office

Ratna Trivedi
Sign

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

Sarvajani University Office

Jay Bergi
Sign

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

Sarvajani University Office

Jay Bergi
Sign

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,

Sarvajani University

Place of the meeting

Sarvajani University Office

Ashish Desai
Sign

- The approved curriculum of Bachelor of Science (Hons) / Bachelor of Science (Hons with Research) (Environmental Science) Sem-7 and 8 is with effect from the Academic year 2026-27



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII



**SARVAJANIK
UNIVERSITY**

INCLUSIVE | INTEGRATED | INNOVATIVE

Faculty of Science
B. Sc. (Honours) Environmental Science
B.Sc. (Honours with Research)
Environmental Science

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



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
 B.Sc. (Honours) (Environmental Science) /
 B.Sc. (Honours with Research) (Environmental Science)
 Sem-VII and VIII

Credit Framework for Four Years Undergraduate Program (As per KCG SOP)
 Faculty of Science, Sarvajani University

Semester	Major						Minor		Skill Enhancement		Ability Enhancement		Multidiscipline		Value Added		Total Credits
	Major No. of Papers	Theory		Lab		Total Major Credits	No. of Papers	Credits	No. of Papers	Credits	No. of Papers	Credits	No. of Papers	Credits	No. of Papers	Credits	
		Theory Hours	Theory Credits	Lab Hrs	Lab Credits												
1	2	3+3	3+3	2+2	1+1	8	1	4	1	2	1	2	1	4	1	2	22
2	2	3+3	3+3	2+2	1+1	8	1	4	1	2	1	2	1	4	1	2	22
3	3	3+3+3	3+3+3	2+2+2	1+1+1	12	0	0	1	2	1	2	1	4	1	2	22
4	3	3+3+3	3+3+3	2+2+2	1+1+1	12	1	4	1	2	1	2	1	4	1	2	22
5	3	3+3+3	3+3+3	2+2+2	1+1+1	12	2	8	1	2	1	2	1	4	1	2	22
6	3	3+3+3	3+3+3	2+2+2	1+1+1	12	1	4	Internship	4	1	2	1	4	1	2	22
Total after 3y	16					64	6	24	5+1	10+4	5	10	3	12	4	8	132
7 (Honors)	4	3+3+3+3	3+3+3+3	2+2+2+2	1+1+1+1	16	1	4	1	2							22
8 (Honors)	4	3+3+3+3	3+3+3+3	2+2+2+2	1+1+1+1	16	1	4	1	2							22
7 (Research)	3	3+3+3	3+3+3	2+2+2	1+1+1	12	1	4	RP	6							22
8 (Research)	3	3+3+3	3+3+3	2+2+2	1+1+1	12	1	4	RP	6							22
Total after 4y	24/22					96/88	8	32	7+1	18/26	5	10	3	12	4	8	176



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

Teaching Scheme for B.Sc. (Hons) / B.Sc. (Hons with Research) Semester – I to VIII						
Semester	Course Category	Credits	Theory (Hrs/Week)	Theory (Total)	Laboratory (Hrs/Week)	Laboratory (Total)
B.Sc. (Hons) / B.Sc. (Hons with Research)						
I	Major	4	3	45	2	30
	Major	4	3	45	2	30
	Minor	4	3	45	2	30
	Skill Enhancement Courses	2	2	30	0	0
	Ability Enhancement Courses	2	2	30	0	0
	Value Added Courses	2	2	30	0	0
	Multidisciplinary	4	4	60	0	0
	Total	22	19	285	6	90
II	Major	4	3	45	2	30
	Major	4	3	45	2	30
	Minor	4	3	45	2	30
	Skill Enhancement Courses	2	2	30	0	0
	Ability Enhancement Courses	2	2	30	0	0
	Value Added Courses	2	2	30	0	0
	Multidisciplinary	4	4	60	0	0
	Total	22	19	285	6	90
III	Major	4	3	45	2	30
	Major	4	3	45	2	30
	Major	4	3	45	2	30
	Skill Enhancement Courses	2	2	30	0	0
	Ability Enhancement Courses	2	2	30	0	0
	Value Added Courses	2	2	30	0	0
	Multidisciplinary	4	4	60	0	0
	Total	22	19	285	6	90
IV	Major	4	3	45	2	30
	Major	4	3	45	2	30
	Major	4	3	45	2	30
	Minor	4	3	45	2	30
	Skill Enhancement Courses	2	2	30	0	0
	Ability Enhancement Courses	2	2	30	0	0
	Value Added Courses	2	2	30	0	0
	Total	22	18	270	8	120



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

Teaching Scheme for B.Sc. (Hons) Semester – I to VIII						
Semester	Course Category	Credits	Theory (Hrs/Week)	Theory (Total)	Laboratory (Hrs/Week)	Laboratory (Total)
B.Sc. (Hons) / B.Sc. (Hons with Research)						
V	Major	4	3	45	2	30
	Major	4	3	45	2	30
	Major	4	3	45	2	30
	Minor	4	3	45	2	30
	Minor	4	3	45	2	30
	Skill Enhancement Courses	2	2	30	0	0
	Total	22	17	255	10	150
VI	Major	4	3	45	2	30
	Major	4	3	45	2	30
	Major	4	3	45	2	30
	Minor	4	3	45	2	30
	Skill Enhancement Courses	4	-	-	12	180
	Ability Enhancement Courses	2	2	30	0	0
	Total	22	14	210	20	300
VII	Major	4	3	45	2	30
	Major	4	3	45	2	30
	Major	4	3	45	2	30
	Minor	4	3	45	2	30
	Skill Enhancement Courses	2	2	30	0	0
	Total	18	14	210	8	120
VIII	Major	4	3	45	2	30
	Major	4	3	45	2	30
	Major	4	3	45	2	30
	Minor	4	3	45	2	30
	Skill Enhancement Courses	2	2	30	0	0
	Total	18	14	210	8	120
Semester	Course Category	Credits	Theory (Hrs/Week)	Theory (Total)	Laboratory (Hrs/Week)	Laboratory (Total)
B.Sc. (Hons with Research)						
VII	Research Project	6	2	30	8	120
VIII	Research Project	6	2	30	8	120



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

Evaluation Scheme for B.Sc. (Hons) Semester I to VIII							
Semester	Course Category	Continuous and Comprehensive Evaluation (CCE)			Total CCE	Semester End Examination (SEE)	Grand Total
		CCE	Assignment	Attendance			
B.Sc. (Hons) / B.Sc. (Hons with Research)							
I	Major	30	10	10	50	50	100
	Major	30	10	10	50	50	100
	Minor	30	10	10	50	50	100
	Skill Enhancement Courses	15	5	5	25	25	50
	Ability Enhancement Courses	15	5	5	25	25	50
	Value Added Courses	15	5	5	25	25	50
	Multidisciplinary	30	10	10	50	50	100
II	Major	30	10	10	50	50	100
	Major	30	10	10	50	50	100
	Minor	30	10	10	50	50	100
	Skill Enhancement Courses	15	5	5	25	25	50
	Ability Enhancement Courses	15	5	5	25	25	50
	Value Added Courses	15	5	5	25	25	50
III	Major	30	10	10	50	50	100
	Major	30	10	10	50	50	100
	Major	30	10	10	50	50	100
	Skill Enhancement Courses	15	5	5	25	25	50
	Ability Enhancement Courses	15	5	5	25	25	50
	Value Added Courses	15	5	5	25	25	50
	Multidisciplinary	30	10	10	50	50	100
IV	Major	30	10	10	50	50	100
	Major	30	10	10	50	50	100
	Major	30	10	10	50	50	100
	Minor	30	10	10	50	50	100
	Skill Enhancement Courses	15	5	5	25	25	50
	Ability Enhancement Courses	15	5	5	25	25	50
	Value Added Courses	15	5	5	25	25	50



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

Evaluation Scheme for B.Sc. (Hons) Semester I to VIII							
Semester	Course Category	Continuous and Comprehensive Evaluation (CCE)			Total CCE	Semester End Examination (SEE)	Grand Total
		CCE	Assignment	Attendance			
B.Sc. (Hons) / B.Sc. (Hons with Research)							
V	Major	30	10	10	50	50	100
	Major	30	10	10	50	50	100
	Major	30	10	10	50	50	100
	Minor	30	10	10	50	50	100
	Minor	30	10	10	50	50	100
	Skill Enhancement Courses	15	5	5	25	25	50
VI	Major	30	10	10	50	50	100
	Major	30	10	10	50	50	100
	Major	30	10	10	50	50	100
	Minor	30	10	10	50	50	100
	Skill Enhancement Courses	-	-	-	50	50	100
	Ability Enhancement Courses	15	5	5	25	25	50
VII	Major	30	10	10	50	50	100
	Major	30	10	10	50	50	100
	Major	30	10	10	50	50	100
	Minor	30	10	10	50	50	100
	Skill Enhancement Courses	15	5	5	25	25	50
VIII	Major	30	10	10	50	50	100
	Major	30	10	10	50	50	100
	Major	30	10	10	50	50	100
	Minor	30	10	10	50	50	100
	Skill Enhancement Courses	15	5	5	25	25	50
Semester	Course Category	Continuous and Comprehensive Evaluation (CCE)			Total CCE	Semester End Examination (SEE)	Grand Total
		CCE	Assignment	Attendance			
B.Sc. (Hons with Research)							
VII	Research Project	30	10	10	50	50	100
VIII	Research Project	30	10	10	50	50	100



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII



SARVAJANIK
UNIVERSITY

INCLUSIVE | INTEGRATED | INNOVATIVE

Faculty of Science
B. Sc. (Honors) /
B.Sc. (Honours with Research)
B.Sc. (Hons) (Environmental Science) /
B.Sc. (Hons with Research) (Environmental Science)

SEM - 7

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



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

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	BSES11701	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	B.Sc. (Hons.) / (Hons. with Research) Environmental Science		
Course Type	Major		Version	1.0		
Semester	07		Effective From	June, 2026		
Course Code	BSES11702	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



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

Subject code: BSES-701	Department: Environmental Science
Program: B. Sc.	Type of Subject: Theory
Subject: Environmental Hazards, Ecotoxicology and Disaster Management	
Semester-7	

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)



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

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

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
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

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	BSES11703	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	B.Sc. (Hons.) / (Hons. with Research) Environmental Science		
Course Type	Major		Version	1.0		
Semester	07		Effective From	June, 2026		
Course Code	BSES11704	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
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

Subject code: BSES-702	Department: Environmental Science
Program: B. Sc.	Type of Subject: Theory
Subject: Environmental Pollution Control and Management	
Semester-7	

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
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

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
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

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	BSSES11705	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	B.Sc. (Hons.) / (Hons. with Research) Environmental Science		
Course Type	Major		Version	1.0		
Semester	07		Effective From	June, 2026		
Course Code	BSES11706	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



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

Subject code: BSES-703	Department: Environmental Science
Program: B. Sc.	Type of Subject: Theory
Subject: Environment and Human Health	
Semester-7	

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
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

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
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

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	B.Sc. (Hons.) / (Hons. with Research) Environmental Science		
Course Type	Major		Version	1.0		
Semester	07		Effective From	June, 2026		
Course Code	BSES11708	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
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

Subject code: BSES-704	Department: Environmental Science
Program: B.Sc.	Type of Subject: Theory
Subject: Geospatial Technologies for Environmental Management	
Semester-7	

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



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

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
- 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
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	B.Sc(Hons.) / (Hons. with Research) All		
Course Type	Minor		Version	1.0		
Semester	07		Effective From	June, 2026		
Course Code	BSSES12701	Course Name	Agriculture 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 hrs	50	50	100

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	B.Sc(Hons.) / (Hons. with Research) All		
Course Type	Minor		Version	1.0		
Semester	07		Effective From	June, 2026		
Course Code	BSSES12702	Course Name	Agriculture Management (PR)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CA)	Term end examinations (TEE)	Total
1	0 hrs	0	2 hrs	50	50	100

Subject code: Minor	Department: Environmental Science
Program: B. Sc.	Type of Subject: Theory
Subject: Agriculture Management	
Semester-7	



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

Course Description:

This course aims to provide a

basic understanding of principles and scope of agriculture management. It also explores different crops, their management, and economic importance.

1. Develop a comprehensive understanding of agricultural management principles and sustainable farming systems.
2. Familiarize students with planning, organization, resource utilization, and decision-making in agriculture.
3. Introduce modern agricultural technologies, precision farming, and climate-smart agriculture.
4. Enhance knowledge of agricultural marketing, value chains, agribusiness, and entrepreneurship.
5. Promote scientific management of soil, water, crops, and farm resources for sustainable development.
6. Equip students with practical skills for farm planning, record keeping, and agricultural enterprise management.

Student Learning Outcomes (SLOs):

At the end of the course, students will be able to:

Explain the principles and scope of agricultural management.

1. Prepare farm plans and efficiently manage agricultural resources.
2. Apply sustainable farming practices and precision agriculture technologies.
3. Analyze agricultural markets, supply chains, and farm economics.
4. Evaluate government policies, agricultural schemes, and risk management strategies.
5. Develop entrepreneurial skills for successful agricultural enterprises.

Reference:

1. Brady, N. C. & Weil, R. R. *The Nature and Properties of Soils*. Pearson.
2. Pandey, M. M. *Agricultural Engineering*. CBS Publishers.
3. Reddy, S. R. *Principles of Crop Production*. Kalyani Publishers.
4. Tandon, P. K. & Dhandyal, S. P. *Principles and Methods of Farm Management*. Kalyani Publishers.
5. Lekhi, R. K. & Singh, J. *Agricultural Economics*. Kalyani Publishers.
6. Palaniappan, S. P. & Sivaraman, K. *Cropping Systems in the Tropics*. New Age International.
7. Sharma, A. K. *Biofertilizers for Sustainable Agriculture*. Agrobios.
8. Singh, B. D. *Agricultural Biotechnology*. Kalyani Publishers.
9. National Institute of Agricultural Extension Management (MANAGE). *Agribusiness and Agricultural Extension Study Materials*.
10. ICAR. *Handbook of Agriculture*. Indian Council of Agricultural Research.
11. FAO. *Climate Smart Agriculture Sourcebook*.
12. Government of India. *National Mission on Sustainable Agriculture Guidelines*.

Unit 1: Introduction to Agriculture Management (7 Hours)

- 1.1 Concept, scope, objectives and importance of agriculture management
- 1.2 Indian agriculture: characteristics, challenges and opportunities
- 1.3 Types of farming systems: subsistence, commercial, mixed, organic and integrated farming
- 1.4 Role of agriculture in sustainable development and food security



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

Unit 2: Farm Resource Management (8 Hours)

- 2.1 Management of land, soil, water and farm inputs
- 2.2 Cropping systems, crop planning and crop rotation
- 2.3 Farm machinery, mechanization and resource optimization
- 2.4 Farm records, budgeting, cost analysis and farm accounting

Unit 3: Sustainable Agriculture and Climate Smart Farming (7 Hours)

- 3.1 Principles of sustainable agriculture and natural resource conservation
- 3.2 Organic farming, integrated nutrient management (INM) and integrated pest management (IPM)
- 3.3 Climate-smart agriculture and adaptation strategies
- 3.4 Precision agriculture: GPS, GIS, drones, sensors and smart irrigation

Unit 4: Agricultural Economics and Agribusiness Management (8 Hours)

- 4.1 Agricultural production economics and resource allocation
- 4.2 Agricultural marketing systems and value chain management
- 4.3 Supply chain management, contract farming and Farmer Producer Organizations (FPOs)
- 4.4 Agricultural entrepreneurship, start-ups and agri-business models

Unit 5: Sustainable Agricultural Resource Management (7 Hours)

- 5.1 Soil health management: soil fertility, nutrient management and soil conservation techniques
- 5.2 Water resource management: irrigation methods, rainwater harvesting, watershed management and water-use efficiency
- 5.3 Integrated Farming Systems (IFS), integrated nutrient management (INM) and integrated pest management (IPM)
- 5.4 Climate-smart agriculture, carbon farming and sustainable agricultural practices

Unit 6: Modern Agriculture, Agribusiness and Entrepreneurship (8 Hours)

- 6.1 Precision agriculture: GPS, GIS, drones, sensors and Internet of Things (IoT) in farming
- 6.2 Post-harvest management, storage, value addition and food processing
- 6.3 Agricultural marketing, Farmer Producer Organizations (FPOs), e-NAM and agricultural supply chains
- 6.4 Agricultural entrepreneurship, Agri-tech start-ups, circular agriculture and future trends in Agriculture 4.0

Practicals:

- 1. Determination of seed germination percentage and seed vigour index.
- 2. Isolation of microorganisms commonly used as biofertilizers (Rhizobium, Azotobacter, PSB).
- 3. Determination of soil properties from agriculture soil samples (Soil pH, Electrical Conductivity (EC), Moisture content, Organic carbon (Walkley–Black method).
- 4. Detection and estimation of IAA from agricultural important plants/microorganisms.
- 5. Study of Weather and Weather forecasting.
- 6. Determination of leaf area index (LAI)
- 7. Estimation of chlorophyll content using leaf samples (chlorophyll extraction method).



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	B.Sc(Hons.) / (Hons. with Research) All		
Course Type	Minor		Version	1.0		
Semester	07		Effective From	June, 2026		
Course Code	BSMB12701	Course Name	Bioprocess Engineering-I (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 hrs	50	50	100

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	B.Sc(Hons.) / (Hons. with Research) All		
Course Type	Minor		Version	1.0		
Semester	07		Effective From	June, 2026		
Course Code	BSMB12702	Course Name	Bioprocess Engineering-I (PR)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CA)	Term end examinations (TEE)	Total



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

Name of faculty: Science			Department: Microbiology			
Program: B.Sc. (Hons.) Sem-7			Type: Minor (IFT)			
Subject: Bioprocess Engineering-I						
Credit: 04			Total learning hours: 45 hr			
Course description: This course provides a comprehensive foundation in bioprocess engineering. Student will explore the concepts of thermodynamics, and basics of Engineering principles. The curriculum emphasizes practical behaviour of fluids in the bioreactor. Learners will evaluate commercial production of commercially high-value metabolites.						
Student Learning outcomes: (SLOs) • After completion of this course, students will be able to design, analyse, and optimize industrial fermentation processes. • Students will able to design thermodynamically stable fermentation process. • Students will also able to understand the concepts of Newtonian and non-Newtonian fluid rheology in fermentation broths. • Ultimately, this course prepares students to understand the commercial fermentation operations for industrial metabolites, including organic acids, biofuels and exopolysaccharides.						
1	0 hrs	0	2 hrs	50	50	100



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

References:

Crueger, W., & Crueger, A. (1990). *Biotechnology: A textbook of industrial microbiology*. Sinauer Associates. ISBN: 978-0-87893-131-6

Doran, P. M. (1995). *Bioprocess engineering principles*. Academic Press. ISBN: 978-0-12-220851-5

Waites, M. J., Morgan, N. L., Rockey, J. S., & Higon, G. (Eds.). (2002). *Industrial microbiology: An introduction*. Blackwell Science. ISBN: 978-0-632-05307-0

Nelson, D. L., Cox, M. M., & Hoskins, A. A. (2021). *Lehninger principles of biochemistry* (8th ed.). W. H. Freeman. ISBN: 978-1319381493

Unit: 1: Fundamentals of Bioprocess Engineering (07 Hrs.)

- 1.1 What is Bioprocess Engineering?
- 1.2 Steps in Bioprocess Development
- 1.3 Basic calculations in Engineering
 - 1.3.1 Physical Variables
 - 1.3.2 Dimensions
 - 1.3.3 Units
 - 1.3.4 Force and Weight
 - 1.3.5 Measurement Conventions
 - 1.3.6 Standard Conditions and Ideal Gases
- 1.4 Thermodynamic Preliminaries: System and Process
- 1.5 First and Second Law of thermodynamics
- 1.6 Concept of Work, Entropy, Free Energy and Enthalpy

Unit: 2: Material Balance (08 Hrs.)

- 2.1. Steady State and Equilibrium
- 2.2. Law of Conservation of Mass
 - 2.2.1. General Mass Balance Equation
 - 2.2.2. Types of Material Balance
 - 2.2.3. Simplification of the General Mass Balance Equation
- 2.3. General Procedure for Material Balance Calculation
- 2.4. Material Balance Examples
 - 2.4.1. Continuous Filtration
 - 2.4.2. Batch Mixing
- 2.5. Material Balance with Recycle, Bypass, and Purge streams

Unit: 3: Energy Balance (07 Hrs.)

- 3.1. Basic Concepts of Energy
- 3.2. Energy Balance Equation
 - 3.2.1. General Energy Balance Equation



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

- 3.2.2. Steady-state flow process Energy Balance Equation
- 3.2.3. Energy Balance Equation for Adiabatic process
- 3.3. Calculation of Enthalpy and Enthalpy Change Non-reactive process
- 3.4. General Procedure for Energy Balance Calculation
- 3.5. Energy Balance Examples

Unit: 4: Fluid Rheology

(08 Hrs.)

- 4.1. Classification of fluids and Fluids in motion
- 4.2. Viscosity & it's measurement
- 4.3. Momentum Transfer
- 4.4. Non-Newtonian fluids
- 4.5. Rheological properties of fermentation broths

Unit: 5: Bioproduction of Commercially Important Products-I

(07 Hrs.)

- 5.1. Bioproduction of Organic Acid
 - 5.1.1. Citric Acid
 - 5.1.2. Acetic Acid
 - 5.1.3. Lactic Acid
- 5.2. Bioproduction of industrial alcohols

Unit: 6 : Bioproduction and Biotransformation of Commercially Important Products (08 Hrs.)

- 6.1. Microbial Production of polysaccharides:
 - 6.1.1. Xanthan
 - 6.1.2. Dextran
 - 6.1.3. Alginate
- 6.2. Microbial production of beverages
 - 6.2.1. Production of Beer
 - 6.2.2. Production of Wine
- 6.3. Microbial Transformation of Steroids and sterols

List of Practical

- 1. Bioproduction of Alcohol
- 2. Bioproduction of Citric Acid



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	B.Sc(Hons.) / (Hons. with Research) All		
Course Type	Minor		Version	1.0		
Semester	07		Effective From	June, 2026		
Course Code	BSBT12701	Course Name	Forensic Toxicology (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 hrs	50	50	100

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	B.Sc(Hons.) / (Hons. with Research) All		
Course Type	Minor		Version	1.0		
Semester	07		Effective From	June, 2026		
Course Code	BSBT12702	Course Name	Forensic Toxicology (PR)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CA)	Term end examinations (TEE)	Total
1	0 hrs	0	2 hrs	50	50	100



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

Forensic Toxicology

Unit 1: Introduction to toxicology (07 hours)

- 1.1 Definition and general account
- 1.2 History of toxicology
- 1.3 Forensic medicine in India
- 1.4 Disciplines of toxicology
- 1.5 Toxicants and their classification
- 1.6 Classification of toxicants based on organs

Unit 2: Medical toxicology (07 hours)

- 2.1 Maximum acceptable concentration
- 2.2 Toxic effects
- 2.3 Laws related to poisons
- 2.4 Features of poisoning in the living and dead
- 2.5 General principles of treatment of poisoning

Unit 3: Forensic aspects of some poisons-1 (07 hours)

- 3.1 Corrosive poisoning
- 3.2 Inorganic acid poisoning
- 3.3 Organic acid poisoning
- 3.4 Halogen poisoning
- 3.5 Alkalies

Unit 4: Forensic aspects of some poisons-2 (08 hours)

- 4.1 Irritant Poisons
- 4.2 Vegetable irritants
- 4.3 Non-metallic
- 4.4 Metallic
- 4.5 Animal irritants
- 4.6 Mechanical irritants

Unit 5: Forensic aspects of some poisons-3 (08 hours)

- 5.1 Neurotic poisons
- 5.2 Cerebral poisons
- 5.3 Deliriant poisons
- 5.4 Spinal poisons
- 5.5 Cardiac poisons



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

Unit 6: Miscellaneous poisons and Clinical practice of Forensic toxicology (08 hours)

- 6.1 Asphyxiants
- 6.2 Food poisoning
- 6.3 Legal procedure
- 6.4 Post-mortem examination
- 6.5 Collection and Preservation of Viscera and Biological Sample in Poisoning Cases
- 6.6 Viscera management system

References:

1. Sharma, RK. *Concise textbook of forensic medicine and toxicology*. Global Education Consultants, 2011.
2. Pandey, K, Shukla JP and Trivedi, SP. *Fundamentals of toxicology*. Central, 2009.
3. Sharma, PD. *Toxicology*. Rastogi Publications, 2010.



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	B.Sc(Hons.) / (Hons. with Research) All		
Course Type	Minor		Version	1.0		
Semester	07		Effective From	June, 2026		
Course Code	BSES12703	Course Name	Industrial Disaster and Safety Measures (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 hrs	50	50	100

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	B.Sc(Hons.) / (Hons. with Research) All		
Course Type	Minor		Version	1.0		
Semester	07		Effective From	June, 2026		
Course Code	BSES12704	Course Name	Industrial Disaster and Safety Measures (PR)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CA)	Term end examinations (TEE)	Total
1	0 hrs	0	2 hrs	50	50	100



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

Subject code: Minor	Department: Environmental Science
Program: B. Sc.	Type of Subject: Theory + Practical
Subject: Industrial Disaster and Safety Measures	
Semester-7	
Course Description: 1. The course is designed to develop a scientific understanding of industrial disasters, occupational and process safety, hazardous materials, emergency preparedness, and disaster-management systems. 2. It introduces students to the causes and consequences of industrial accidents involving fire, explosion, toxic releases, chemical spills, structural failures, and other technological hazards. 3. The course emphasizes hazard identification, risk assessment, preventive engineering, personal protection, emergency response, industrial hygiene, environmental monitoring, and post-disaster management. 4. It also develops awareness of Indian industrial safety legislation, institutional responsibilities, and the role of workers, industries, local authorities, and communities in reducing disaster risk.	
Student Learning Outcomes (SLOs): At the end of the course, students will be able to: 1. Explain the causes, types, characteristics, and environmental consequences of industrial disasters. 2. Identify industrial hazards associated with chemicals, machinery, fire, explosions, electricity, storage systems, and industrial processes. 3. Apply basic principles of hazard identification, risk assessment, safety auditing, and emergency planning. 4. Explain fire prevention, chemical safety, occupational health, personal protective equipment, and industrial hygiene practices.	

References and Textbooks:

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. Handbook of Disaster Risk Reduction & Management, Christian N Madu and Chu-Hua Kuei, 1st Edition, 2017, World Scientific.
4. 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.
5. Environmental Pollution and Control in Chemical Process Industries, S.C. Bhatia, 2nd Edition, 3rd Reprint, 2014, Khanna Publishers.
6. Industrial Wastewater Treatment, A.D. Patwardhan, 1st Edition, 2nd Reprint, 2009, PHI Learning Private Limited.
7. Mistry K.U (2012): Fundamentals of Industrial Safety & Health – I, Siddharth Prakashan, Ahmedabad.
8. Mistry K.U (2012): Fundamentals of Industrial Safety & Health – II, Siddharth Prakashan, Ahmedabad.



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

Unit 1: Introduction to Industrial Disasters and Industrial Safety (08 Hours)

- 1.1 Concept and classification of industrial disasters
- 1.2 Causes of industrial disasters
- 1.3 Types of industrial disasters
- 1.4 Consequences of industrial disasters

Unit 2: Industrial Hazards and Risk Assessment (08 Hours)

- 2.1 Chemical and physical hazards
- 2.2 Hazard identification
- 2.3 Risk assessment
- 2.4 Risk-analysis techniques

Unit 3: Fire, Explosion and Chemical Safety (08 Hours)

- 3.1 Fundamentals of fire
- 3.2 Fire prevention and protection
- 3.3 Industrial explosions
- 3.4 Chemical safety

Unit 4: Occupational Health, Industrial Hygiene and Personal Safety (07 Hours)

- 4.1 Occupational health and industrial hygiene
- 4.2 Physical and biological hazards
- 4.3 Personal Protective Equipment
- 4.4 Safe work practices

Unit 5: Industrial Emergency Preparedness and Disaster Management (07 Hours)

- 5.1 Emergency preparedness
- 5.2 Emergency response
- 5.3 Disaster management cycle
- 5.4 Community and institutional preparedness

Unit 6: Industrial Safety Audit, Legislation and Case Studies (07 Hours)

- 6.1 Industrial safety audit
- 6.2 Industrial safety legislation in India
- 6.3 Major industrial disaster case studies
- 6.4 Contemporary approaches to industrial safety

Practical's:

1. Case studies of Bhopal Gas Tragedy (1984), Visakhapatnam LG Polymers Gas Leak (2020), Jaipur IOC Oil Depot Fire (2009).
2. Seminar on Kol-Dam Hydropower Project of Himachal Pradesh, India.
3. Measurement of Noise in various environments.



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	B.Sc. (Hons.) / (Hons. with Research)		
Year	2026		Version	1.0		
Semester	VII		Effective From	June, 2026		
Course Code	BSCH12701	Course Name	Minor: Advanced Analytical Chemistry (TH)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CCE)	Semester end examinations (SEE)	Total
3	3	-	-	40	35	75

Purpose of Course	To Teach the students about different spectroscopy techniques, solvent extraction and ion exclusion chromatography techniques.
Course Objective	To teach about Principle, Instrumentation and Applications of IR-NMR and Advanced Spectroscopy, On-line Analyzers, Solvent Extraction Techniques and Ion Exclusion Chromatography.
Pre-requisite	Basic knowledge of analytical chemistry, instrumental analysis, spectroscopy, and fundamental concepts of organic and inorganic chemistry.
Course Out come	At the end of the course students will be able to learn about • The History, origin, laws, principles, theories, instrumental set up, its' working mechanism, various components and it's working pattern, procedure of analysis and applications in the various field of analysis about: • IR Spectroscopy • NMR Spectroscopy • Florescence, Phosphorescence, Chemiluminescence, Turbidimetry and Nephelometry • Solvent Extraction • Ion Exclusion Chromatography



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

Course Content	Unit-1: Infra-Red Spectroscopy (07 Hrs) 1.1 Introduction and classification of IR region 1.2 Information provided by IR Spectroscopy 1.3 Instrumentation of IR Spectrophotometer - Single and Double Beam 1.4 Differences between IR and UV Spectrum 1.5 Applications of IR Spectroscopy Unit-2: NMR Spectroscopy (06 Hrs) 2.1 Introduction and Basis of NMR Spectroscopy 2.2 NMR Spectroscopy - Classification, Principle and Working 2.3 Chemical Shift in NMR Spectroscopy 2.4 Instrumentation and Techniques of NMR Spectroscopy 2.5 Applications of NMR Spectroscopy Unit-3: Advanced Spectroscopy Techniques (06 Hrs) 3.1 Principle, Instrumental set up & Applications of 3.1.1 Florescence 3.1.2 Phosphorescence 3.1.3 Chemiluminescence 3.1.4 Turbidimetry 3.1.5 Naphelometry Unit-4: On-Line Analyzers (12 Hrs) 4.1 Water quality monitoring: purpose of water quality measurement, sampling system, different sensors and analyzers 4.2 Online pH analyzers: principle, types of different pH electrodes, application 4.3 Online DO analyzers: principle, types of different cells and sensors, application 4.4 ORP measurement: principle, equipment, application, ORP control 4.5 Online FRC analyzers: principle, types of FRC sensors, applications 4.6 On-line Turbidity, Sludge and Suspended Solid measurement: turbidity units, forward scattering transmission types, dual beam design, laser type suspended solid and sludge density sensors, scattered light detectors, backscatter turbidity analyzers Unit-5: Solvent Extraction Techniques (08 Hrs) 5.1.1 Principle and Rules 5.1.2 Classification of extraction methods 5.1.2.1 Chelation 5.1.2.2 Solvation 5.1.2.3 Ion pair formation 5.1.2.4 Synergic extraction 5.1.3 Methods of Extraction 5.1.4 Factors influencing the Extraction Efficiency
-----------------------	---



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

	Unit-6: Ion Exclusion Chromatography (06 Hrs) 6.1 Principle, working procedure and applications of IEC 6.1.1 Gel Permeation Chromatography 6.1.2 Ion Exclusion Technique 6.1.3 Inorganic Molecular Sieves
Practical	-
Reference Books	• Chemistry for Environmental Engineering and Science, C. N. Sawyer and P. L. McCarty, G.F. Parkin, 5th Edition, 21st Reprint, 2015, McGraw Hill Education (India) Private Limited. • Quantitative Analysis, R.A Day, A.L Underwood, 6th Edition, 1991, Prentice-Hall. • Fundamentals of Analytical Chemistry, D.A. Skoog, D.M. West, F.J. Holler and S.R. Crouch, 9th Edition, Reprint 2014, Cengage Learning. • Quantitative Analysis, R.A Day, A.L Underwood, 6th Edition, 1991, Prentice-Hall. • 5.Basic Concepts of Analytical Chemistry, S.M. Khopkar, 3rd Edition, Reprint 2009, New Age International (P) Limited, Publishers. • Theory and Practicals of Engineering Chemistry, Shashi Chawla, 5th Edition, 2008, Dhanpat Rai & Co. Pvt. Ltd. • 7.Engineering Chemistry, P.C. Jain & Monica Jain, 17th Edition, Reprint 2011, Dhanpatrai Publishing Company (P) Ltd. • 8.Handbook of Analytical Instrument, R.S. Khandpur, 2nd Edition, Reprint 2009, Tata McGraw Hill Publishers. • 9.Instrumental Methods of Chemical Analysis (Analytical Chemistry), H. Kaur, 8th Edition, 2012, Pragati Prakashan. • 10.Analytical Instrumentation Handbook, Ewing's, Edited by Jack Cazes, 3rd Edition, 2005, Marcel Dekker Publisher. • 11.Instrumental Methods of Analysis, H.H. Willard, L.L. Meritt, J.A. Dean and F.A. Settle, 7th Edition, 1986, CBS Publishers. • 12.Instrumental methods of analysis, B.K. Sharma, 24th Edition, 2005, Goel Publishing House. • 13.Instrumental Analysis, D.A. Skoog, D.M. West, F.J. Holler and S.R. Crouch, 11th Edition, Reprint 2012, Cengage Learning. • 14. Operation and Maintenance manuals for water, sewage and Effluent treatment plants. • 15.BIOS-Instant Notes-Analytical Chemistry, D. Kealey, P.J. Haines, 2002, Viva Books (P) Ltd. • Analytical Instrumentation, Bela G. Liptak, 1st Edition, 1994, 1st Indian Reprint, 2012, Chilton Book Company. • Theory and Practicals of Engineering Chemistry, Shashi Chawla, 5th Edition, 2008, Dhanpat Rai & Co. Pvt. Ltd.



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	B.Sc. (Hons.) / (Hons. with Research)		
Year	2026		Version	1.0		
Semester	VII		Effective From	June, 2026		
Course Code	BSCH12702	Course Name	Minor: Advanced Analytical Chemistry (PR)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CCE)	Semester end examinations (SEE)	Total
1	-	-	2	10	15	25

Purpose of Course	To provide hands on training for IR-NMR, Advanced Spectroscopy, Water Quality Analyzers, Solvent Extraction Techniques and Ion Exclusion Chromatography Technique.
Course Objective	To Train the students about experimentation in laboratory regarding different parameters of Spectroscopy, On-line Analyzers, Solvent Extraction and Chromatography.
Prerequisite	Basic knowledge of analytical chemistry, water quality parameters, volumetric analysis, laboratory safety, preparation of standard solutions, and operation of common analytical instruments.
Course Out come	At the end of this course, students will be able to determine Turbidity, Suspended Solids of water sample, different water quality parameters like Free Residual Chlorine, Dissolved Oxygen, IR-NMR and Chromatography related hands on training, etc.
Course Content	---
Practical	Any three Determination of Turbidity in water sample. Determination of Suspended Solids in water sample. Determination of Free Residual Chlorine in water sample. Determination of Dissolved Oxygen in water sample.
Reference Books	Standard Methods for Examination of Water & Wastewater, Andrew D. Eaton, Lenore S. Clesceri, Eugene W. Rice, Arnold Greenberg, 23 rd Edition, 2017, published by APHA, AWWA, WEF. Official Methods of Analysis, Dr. William Harwitz, Dr. George W Latimer, 18 th Edition, 2005, published by Association of Officiating Analytical



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

	Chemists (AOAC). Analytical Chemistry, H. Kaur, 1st Edition, 2013, Pragati Prakashan. Operation and Maintenance manuals for water, sewage and Effluent treatment plants. S.K.Bhasin, Sudha Rani, Laboratory Manual on Engineering Chemistry; 3rd Edition, 2011, Dhanpatrai Publishing Company. Theory and Practicals of Engineering Chemistry, Shashi Chawla, 5th Edition, 2008, Dhanpat Rai & Co. Pvt. Ltd.
--	--



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	B.Sc(Hons.) / (Hons. with Research) All		
Course Type	Minor		Version	1.0		
Semester	07		Effective From	June, 2026		
Course Code	BSMB12703	Course Name	Molecular Diagnosis and Cytogenetics (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 hrs	50	50	100

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	B.Sc(Hons.) / (Hons. with Research) All		
Course Type	Minor		Version	1.0		
Semester	07		Effective From	June, 2026		
Course Code	BSMB12704	Course Name	Molecular Diagnosis and Cytogenetics (PR)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CA)	Term end examinations (TEE)	Total
1	0 hrs	0	2 hrs	50	50	100



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

Name of faculty: Science	Department: Microbiology
Program: B. Sc. (Hons.) Sem-7	Type: Minor (MLT)
Subject: Molecular Diagnosis and Cytogenetics	
Credit: 4	Total learning hours: 45
Course description: The main aim of the subject is to inform the knowledge about isolation, amplification, and analysis of nucleic acids (DNA and RNA) to identify infectious agents, genetic mutations, and oncology markers. Also focuses on the structure, function, and abnormalities of human chromosomes utilizing classical cell-culturing and high-resolution imaging technologies.	
Student learning outcome: At the end of the course, the students will get knowledge of • Basics of molecular biology • Principles, mechanics, and diagnostic limitations of nucleic acid analysis • Practical application & Quality control in PCR • Fundamental components & use of cell culture for cytogenetic studies • Basic aspects of clinical cytogenetics • Patterns of Inheritance & Autosomal Disorders • Laboratory diagnosis of inborn error of metabolism • Clinical Cytogenetic testing	

Reference Book:

- P.B. Godkar, (2014), Textbook of Medical Laboratory Technology, 3rd ed., Bhalani Publishing House, Mumbai, India. (ISBN: 9789381496190)
- Mahabal Ram (2010), Fundamentals of Cytogenetics and Genetics, PHI Pub, India. (ISBN: 9788120340336)
- Roger L.Miesfeld,(2013),APPLIED MOLECULAR GENETICS,Wiley pub. (ISBN: 9788126538355)
- Wilson and Walker's Principles and Techniques of Biochemistry and Molecular Biology (2010),,7th ed.,Cambridge Uni. Press (ISBN:9780521178747)
- Susan Carson, Heather B. Miller, D. Scott Witherow, (2012),Molecular Biology Techniques A Classroom Laboratory Manual, 3rd ed. Academic Press (ISBN:9780123855442)
- Mukharjee K.L. (1999), Medical Laboratory Technology, 2nd ed., Tata MacGraw Hill. (ISBN: 9789352606818)

Unit-1: Molecular Pathology

(07 Hrs)

1.1 Introduction

1.2 Nucleic Acid Analysis

1.3 Blotting techniques: Southern, Northern & Western Blotting



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

1.4 Diagnostic application of DNA probes

Unit-2: Polymerase Chain Reaction (PCR) & Advanced Amplification (08 Hrs)

- 2.1 Sources of DNA for PCR
- 2.2 PCR: Components and Protocol
- 2.3 Practical applications & Quality control in PCR
- 2.4 Variations of the PCR: Nested PCR, RT PCR, Real time, Multiplex PCR
- 2.5 Gene Cloning- Methodology, Synthesis of cDNA

Unit-3: Rapid Diagnostics Technology (08 Hrs)

- 3.1 Sequencing
- 3.2 Microarrays
- 3.3 NGS diagnostics

Unit-4: Basics of Clinical Cytogenetics (07 Hrs)

- 4.1 Important definitions & normal chromosome structure
- 4.2 Fundamental components & use of cell culture for cytogenetic studies
- 4.3 Tissue Culture Laboratory
- 4.4 Constitutional Chromosome Patterns analysis

Unit-5: Chromosomal Abnormalities (08 Hrs)

- 5.1 Patterns of Inheritance & Autosomal Disorders
- 5.2 Laboratory diagnosis of inborn error of metabolism
- 5.3 Clinical Cytogenetic testing (CCT)
- 5.4 Prenatal cytogenetics
- 5.5 Chromosomal Aneuploidy syndromes

Unit-6: Diagnosis of Various diseases using Molecular Techniques (07 Hrs)

- 6.1 Hemetopoietic neoplasm & Lymphomas
- 6.2 Genetic diseases & Familial cancers
- 6.3 Use of FISH technique in cancer genetics
- 6.4 Forensic identity and Parentage testing

List of Practical

- 1. Determination of Plasma HIV RNA (Viral load)
- 2. Cytogenetics- Various case studies should be carried out.

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

Faculty	Science		Program	B.Sc. Environmental Science (Hons.)		
Course Type	SEC		Version	1.0		
Semester	07		Effective From	June, 2026		
Course Code	BSES15701	Course Name	Research Methodology - I			
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
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

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

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
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

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



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	B.Sc. Environmental Science (Hons. With Research)		
Course Type	Research Project		Version	1.0		
Semester	07		Effective From	June, 2026		
Course Code	BSES18701	Course Name	Research Project – 1 (TH)			
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	50	50	100

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	B.Sc. Environmental Science (Hons. With Research)		
Course Type	Research Project		Version	1.0		
Semester	07		Effective From	June, 2026		
Course Code	BSES18702	Course Name	Research Project – 1 (PR)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CA)	Term end examinations (TEE)	Total
4	0	0	8 hrs	50	50	100



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

Faculty: Science	Department: Env. Sc. and Biotech.
Program: B.Sc.	Type: SEC
Subject: Research Project - 1	Credits: 2
Semester: VII	

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 Kuhn'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
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

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



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII



**SARVAJANIK
UNIVERSITY**

INCLUSIVE | INTEGRATED | INNOVATIVE

Faculty of Science
B. Sc. (Honors) /
B.Sc. (Honours with Research)
B.Sc. (Hons) (Environmental Science) /
B.Sc. (Hons with Research) (Environmental Science)

SEM - 8

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



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

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



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

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

Student Learning Outcomes (SLOs):

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, hydor, bioenergy, tidal, geothermal)
- 4.3 Rainwater harvesting and water conservation
- 4.4 Sustainable water management practices



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

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
- 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
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

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



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

Subject code:	Department: Environmental Science
Program: B. Sc.	Type of Subject: Theory
Subject: Climate Change Adaptation and Resilience	
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
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

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
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

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
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

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



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

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

- 3.1 Wildlife (Protection) Act, 1972
- 3.2 Forest (Conservation) Act, 1980
- 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:
 - o Plastic pollution
 - o E-waste management
 - o 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.



SARVAJENIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

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
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

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



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

- 4.3 Environmental Management System (EMS)
- 4.4 ISO 14001 standards and certification
- 4.5 Life Cycle Assessment (LCA)
- 4.6 Environmental performance indicators

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
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	B.Sc(Hons.) / (Hons. with Research) All		
Course Type	Minor		Version	1.0		
Semester	08		Effective From	June, 2026		
Course Code	BSMB12801	Course Name	Bioprocess Engineering-II (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 hrs	50	50	100

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	B.Sc(Hons.) / (Hons. with Research) All		
Course Type	Minor		Version	1.0		
Semester	08		Effective From	June, 2026		
Course Code	BSMB12802	Course Name	Bioprocess Engineering-II (PR)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CA)	Term end examinations (TEE)	Total
1	0 hrs	0	2 hrs	50	50	100



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

Name of faculty: Science	Department: Microbiology
Program: B. Sc. (Hons.) Sem-8	Type: Minor (IFT)
Subject: Bioprocess Engineering-II	
Credit: 04	Total learning hours: 45 hr
Course description: This course provides a comprehensive concept of transport phenomena within bioreactors, focusing on mixing mechanics, heat transfer dynamics, and mass transfer. Special emphasis is placed on quantifying oxygen uptake rates and measuring volumetric mass transfer coefficients which is essential for fermenter scale-up. The curriculum bridges fundamental engineering with commercial biotechnology by study of production processes for high-value metabolites.	
Student Learning outcomes: (SLOs) After completion of this course, students will be able to: - Analyse fluid flow patterns, and impeller types for stirred-tank bioreactors. - Apply the principles of heat transfer to control the temperature in fermenter. - Evaluate and measure mass transfer and Oxygen transfer. - Formulate operational strategies for the large-scale industrial cultivation of microbial biomass, commercial vitamins, and industrial enzymes.	

References:

- Crueger, W., & Crueger, A. (1990). *Biotechnology: A textbook of industrial microbiology*. Sinauer Associates. ISBN: 978-0-87893-131-6
- Doran, P. M. (1995). *Bioprocess engineering principles*. Academic Press. ISBN: 978-0-12-220851-5
- Waites, M. J., Morgan, N. L., Rockey, J. S., & Higton, G. (Eds.). (2002). *Industrial microbiology: An introduction*. Blackwell Science. ISBN: 978-0-632-05307-0
- Welty, J., Rorrer, G. L., & Foster, D. G. (2008). *Fundamentals of momentum, heat, and mass transfer* (5th ed.). John Wiley & Sons. ISBN: 978-0-470-12868-8

Further Reading

- Baltz, R. H., Demain, A. L., & Davies, J. E. (Eds.). (2010). *Manual of industrial microbiology and biotechnology*. American Society for Microbiology Press. ISBN: 978-1-55581-512-7
- Mohanty, K., & Sasmal, S. (2025). *Biochemical reaction engineering*. CRC Press. ISBN: 978-1-003-58111-6
- Okafor, N., & Okeke, B. C. (2017). *Modern industrial microbiology and biotechnology*. Science Publishers. ISBN: 978-1-57808-513-2



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

Unit: 1: Mixing (07 Hrs.)

- 1.1. Function of Mixing
- 1.2. Mixing equipment
- 1.3. Flow Patterns in Stirred Tank
- 1.4. Impellers
- 1.5. Mechanisms of Mixing
- 1.6. Assessment of Mixing Effectiveness

Unit: 2: Heat Transfer (07 Hrs.)

- 2.1 Concept of heat transfer
- 2.2 Heat transfer equipment
- 2.3 Mechanisms of Heat transfer
- 2.4 Heat Conduction
- 2.5 Heat transfer between fluids

Unit: 3: Mass Transfer (07 Hrs.)

- 3.1 Concept of Mass transfer
- 3.2 Molecular diffusion
- 3.3 Analogy between Mass, Heat, and Momentum Transfer
- 3.4 Role of Molecular diffusion in bioprocessing
- 3.5 Film theory
- 3.6 Convective mass transfer
- 3.7 Mass Transfer Equipment

Unit: 4: Oxygen Transfer in fermenter (08 Hrs.)

- 4.1 Oxygen uptake in cell culture
 - 4.1.1 Factors Affecting Cellular Oxygen Demand
 - 4.1.2 Mass Oxygen transfer from Gas Bubble to Cell in fermenter
- 4.2 Factors Affecting Oxygen Transfer in Fermenter
- 4.3 Measuring DO Concentration
- 4.4 Measurement of K_La
 - 4.4.1 Oxygen Balance Method
 - 4.4.2 Dynamic Method
 - 4.4.3 Sulphite Oxidation
- 4.5 Measurement of Oxygen Uptake Rate

Unit: 5: Bioproduction of Commercially Important Products: I (08 Hrs.)

- 5.1 Production strain and Production Process of amino acids
 - 5.1.1 L-Glutamate
 - 5.1.2 L-Lysine
 - 5.1.3 L-Threonine
- 5.2 Production strain and Production Process of amino acids
 - 5.2.1 Penicillin
 - 5.2.2 Cephalosporins
- 5.3 Microbial Production of Natural Food Preservatives



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

Unit: 6: Bioproduction of Commercially Important Products: II (08 Hrs.)

6.1 Microbial Production of Vitamins

6.1.1 Vitamin B12

6.1.2 Riboflavin

6.2 Microbial Production of Enzymes

6.2.1 Amylase

6.2.2 Proteases

6.3 Microbial Biomass Production

6.3.1 Baker's Yeast

6.3.2 Single Cell Protein (SCP)

List of Practical

1. Determination of kLa
2. Microbial Production of Amylase
3. Microbiological assay of amino acid / vitamin / antibiotic.



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	B.Sc(Hons.) / (Hons. with Research) All		
Course Type	Minor		Version	1.0		
Semester	08		Effective From	June, 2026		
Course Code	BSMB12803	Course Name	Clinical Laboratory 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 hrs	50	50	100

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	B.Sc(Hons.) / (Hons. with Research) All		
Course Type	Minor		Version	1.0		
Semester	08		Effective From	June, 2026		
Course Code	BSMB12804	Course Name	Clinical Laboratory Management (PR)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CA)	Term end examinations (TEE)	Total
1	0 hrs	0	2 hrs	50	50	100



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

Name of faculty: Science	Department: Microbiology
Program: B. Sc. (Hons.) Sem-8	Type: Minor (MLT)
Subject: Clinical Laboratory Management	
Credit: 4	Total learning hours: 45
Course description: The main objective of this paper is to build the capacity of lab managers to enable them to manage their lab services efficiently and effectively using fundamentals of management. Also included topics like total quality management, GLP & Accreditation to enhance the knowledge in this field.	
Student learning outcome: • The students will understand various lab operations, costing, investment analysis and these will equip them with better decision-making skills in delivering good quality services. • Also know basics of service quality, efficiencies and professionalism in lab management • Understand standards of laboratory practice.	

Reference Book:

- P.B. Godkar, (2014), Textbook of Medical Laboratory Technology, 3rd ed., Bhalani Publishing House, Mumbai, India. (ISBN: 9789381496190)
- Cheesbrough Monica ,District laboratory practice in tropical countries VOL-1 & 2, Cambridge University Press.(ISBN: 9780521665476)
- Shubhangi Tambwekar (2009), Handbook of Quality Assurance in Laboratory Medicine, BI Pub. (ISBN: 9788172253158)
- WHO (2011): Laboratory quality management system: handbook (ISBN: 978924 1548274)
- Endris Mekonnen (2004), Health Laboratory Management and Quality Assurance, Ethiopia Public Health Training Initiative (EPHTI).
- Ochei J. & Kolhatkar A. (2000), *Medical Laboratory Science: Theory & Practice*, Tata McGraw Hill Pub. (ISBN: 9780074632239)

Unit-1: Introduction to Clinical Laboratory Management and Organization. (07 Hrs)

- 1.1 Definition and General Principles
- 1.2 Concepts and function of Management
- 1.3 Laboratory Structure
- 1.4 Role of Laboratory in Health Care and Training of Laboratory Personnel
- 1.5 Code of Conduct

Unit-2: Laboratory Biosafety and waste management (07 Hrs)

- 2.1 Source of Laboratory Hazards
- 2.2 Code of safe Laboratory Practice



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

- 2.3 Safe Laboratory premise & personal safety measures
- 2.4 Biosafety levels & Biosafety cabinet
- 2.5 Bio medical waste management

Unit-3: Human Resource & Financial Management (07 Hrs)

- 3.1 Human Resource Management: Staff training, competency assessment and continuing medical education (CME).
- 3.2 Selection of tests & interpretation of test results
- 3.3 Financial Planning
- 3.4 Selection, procurement & care of equipment

Unit-4: Documents, Records & Information Management (07 Hrs)

- 4.1 Introduction to documents and records
- 4.2 Quality Manual
- 4.3 Storage and control of documents and records
- 4.4 Elements of information management
- 4.5 Manual & Computerized laboratory information systems

Unit-5: Quality Management Systems (QMS) (10 Hrs)

- 5.1 Introduction to QMS: Fundamentals of Quality Assurance (QA), Quality Control (QC), and Total Quality Management (TQM)
- 5.2 Analytical Variables: Accuracy and Precision; Standard and Control; Sensitivity and Specificity; Types of Error; Standard Deviation, Co-Efficient of Variation
- 5.3 Internal and External Quality Control
- 5.4 Preparation of Quality Control Charts: Levy-Jenning Chart and Gaussian Curve: Cusum Chart
- 5.5 Westgard Multirule Charts

Unit-6: Good Laboratory Practices (GLP) & Accreditation Process (07 Hrs)

- 6.1 Introduction to Basics of GLP
- 6.2 Standard Operating Procedures (SOPs)
- 6.3 Criteria, process & advantages of Accreditation
- 6.4 Audit- Internal & External
- 6.5 Accreditation & Standards: Study of national and international standards (e.g., NABL, ISO 15189, CAP, CLIA).

List of Practical

- 1. Preparation of Levy-Jenning Chart
- 2. Use of Westgard rules for internal quality control
- 3. Formulation of SOP of any one routine laboratory procedure



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	B.Sc(Hons.) / (Hons. with Research) All		
Year	2026		Version	1.0		
Semester	VIII		Effective From	June, 2026		
Course Code	BSCH12801	Course Name	Minor: Modern Instrumentation for Analysis (TH)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CCE)	Semester end examinations (SEE)	Total
3	3	-	-	40	35	75

Purpose of Course	This course paper proposes to teach about Principle, Instrumentation and Applications of various spectroscopy and chromatographic techniques and advanced instrumentation techniques.
Course Objective	To teach the students about UV-VIS, AA, ICP-OE and Mossbauer Spectroscopy, NDIR, Elemental Analyzer, TOC, GC, HPLC and IEC Instrumentation Techniques.
Pre-requisite	12 th Science Pass/ B.Sc. Chemistry Pass
Course Out come	At the end of the course students will be able to... Learn about the History, origin, laws, principles, theories, instrumental set up, its' working mechanism, various components and it's working pattern, procedure of analysis and applications in the various field of analysis about: • UV-Visible Spectroscopy • Atomic Absorption Spectrometry • Optical Emission Spectrometry • Advanced Instrumentation Techniques • Gas Chromatography • High Performance Liquid Chromatography • Ion Exchange and Ion Exclusion Chromatography



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

Course Content	Unit-1: UV-Visible Spectroscopy (11 Hrs) 1.1 Characteristics of electromagnetic spectrum 1.2 Origin of spectra and electronics transitions 1.3 Classification of electronic transition 1.4 The chromophore concepts 1.5 Absorption and intensity shifts 1.6 Laws of absorption of radiation - Lambert & Beer's law and its deviation 1.7 The Instrumentation of a spectrophotometer 1.8 Calibration curve and standard addition method - multi component analysis 1.9 Applications of UV-Visible (electronic) spectroscopy Unit-2: Atomic Absorption Spectrometry (08 Hrs) 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 2.5 Applications of atomic absorption spectrometry Unit-3: Optical Emission Spectrometry (07 Hrs) 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 Emission detectors 3.5 Applications of ICP-OES Unit-4: Modern Instrumentation Techniques (05 Hrs) 4.1 Principle, Instrumental set up & Applications of 4.2 Non dispersive IR (gas analyzer) 4.3 Modern elemental analyzer 4.4 Total organic carbon analyzer 4.5 Mossbauer Spectroscopy Unit-5: Gas Chromatography (08 Hrs) 5.1 Introduction of chromatography and principle of separation 5.2 Classification -GSC and GLC & its applications
-----------------------	--



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

	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 (06 Hrs) 6.1 Introduction, principle and types of HPLC 6.2 Components of instruments: pumps 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
Practical	-
Reference Books	• Engineering Chemistry, P.C. Jain & Monica Jain, 17th Edition, Reprint 2011, Dhanpatrai Publishing Company (P) Ltd. • Handbook of Analytical Instrument, R.S. Khandpur, 2nd Edition, Reprint 2009, Tata McGraw Hill Publishers. • Instrumental Methods of Chemical Analysis (Analytical Chemistry), H. Kaur, 8th Edition, 2012, Pragati Prakashan. • Basic Concepts of Analytical Chemistry, S.M. Khopkar, 3rd Edition, Reprint 2009, New Age International (P) Limited, Publishers. • Analytical Instrumentation Handbook, Ewing's, Edited by Jack Cazes. ○ 3rd Edition, 2005, Marcel Dekker Publisher. • Instrumental Methods of Analysis, H. H. Willard, L. L. Meritt, J.A. Dean and F.A. Settle, 7th Edition, 1986, CBS Publishers. • Instrumental methods of analysis, B.K. Sharma, 24th Edition, 2005, ○ Goel Publishing House. • 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. • 11. Theory and Practicals of Engineering Chemistry, Shashi Chawla, 5th Edition, 2008, Dhanpat Rai & Co. Pvt. Ltd.



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	B.Sc(Hons.) / (Hons. with Research) All		
Year	2026		Version	1.0		
Semester	VIII		Effective From	June, 2026		
Course Code	BSCH12802	Course Name	Minor: Modern Instrumentation for Analysis (PR)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CCE)	Semester end examinations (SEE)	Total
1	-	-	2	10	15	25

Purpose of Course	To provide hands on training to students for laboratory experiments in Chemistry and Modern Instrumentation.
Course Objective	To do different analysis by using Modern Instrumentation Techniques.
Prerequisite	12 th Science Pass/ B.Sc. Chemistry Pass
Course Out come	At the end of this course the students will be able to do Chemical Analysis by using UV-Vis Double Beam spectrophotometer of various parameters and hands on training of AAS, ICP-OES, NDIR, Elemental Analyzer, TOC, GC, HPLC and IEC, etc.
Course Content	-
Practical	Any three 1. Determination of Phenol in water sample by Spectrophotometer. 2. Determination of Silica in water sample by Spectrophotometer. 3. Determination of Ni⁺² in water sample by Spectrophotometer. 4. Determination of F⁻¹ in water sample by Spectrophotometer. 5. To determine NO₃⁻¹ of water sample. 6. Determination of NH₃ in water sample by Spectrophotometer.



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

Reference Books	• Standard Methods for Examination of Water & Wastewater, Andrew D. Eaton, Lenore S. Clesceri, Eugene W. Rice, Arnold Greenberg, 23rd Edition, 2017, published by APHA, AWWA, WEF. • Official Methods of Analysis, Dr. William Harwitz, Dr. George W Latimer, 18th Edition, 2005, published by Association of Officiating Analytical Chemists (AOAC). • Analytical Techniques in Agriculture, Biotechnology and Environmental Engineering; A. Nag; 1st Edition, 2006, Prentice Hall of India. • Analytical Chemistry, H. Kaur, 1st Edition, 2013, Pragati Prakashan.
------------------------	--



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	B.Sc(Hons.) / (Hons. with Research) All		
Course Type	Minor		Version	1.0		
Semester	08		Effective From	June, 2026		
Course Code	BSES12801	Course Name	Forest and Wildlife 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 hrs	50	50	100

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	B.Sc(Hons.) / (Hons. with Research) All		
Course Type	Minor		Version	1.0		
Semester	08		Effective From	June, 2026		
Course Code	BSES12802	Course Name	Forest and Wildlife Management (PR)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CA)	Term end examinations (TEE)	Total
1	0 hrs	0	2 hrs	50	50	100



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

Subject code: Minor	Department: Environmental Science
Program: B. Sc.	Type of Subject: Theory
Subject: Forest and Wildlife Management	
Semester-8	
Course Description: The course is designed to: 1. Develop an understanding of forest ecosystems, biodiversity, and wildlife resources. 2. Introduce scientific principles and practices of sustainable forest and wildlife management. 3. Familiarize students with forest policies, legislation, protected area management, and community participation. 4. Explain the role of forests and wildlife in climate change mitigation, ecosystem services, and sustainable development. 5. Develop knowledge of wildlife conservation techniques, habitat restoration, and human-wildlife conflict management. 6. Promote practical skills in forest inventory, biodiversity assessment, and conservation planning using modern technologies.	
Student Learning Outcomes (SLOs): At the end of the course, students will be able to: 1. Explain the structure, composition, and ecological significance of forest ecosystems. 2. Apply principles of sustainable forest and wildlife management. 3. Assess biodiversity, forest health, and wildlife habitats using scientific methods. 4. Interpret forest policies, wildlife laws, and conservation strategies. 5. Evaluate the impacts of climate change, deforestation, and habitat fragmentation. 6. Design management strategies for conservation of forests and wildlife using geospatial and digital technologies.	

Reference:

1. Khanna, L. S. *Principles and Practice of Silviculture*. Khanna Bandhu.
2. Manikandan, K. & Prabhu, S. *Indian Forestry*. Jain Brothers.
3. Negi, S. S. *Forest Management in India*. International Book Distributors.
4. Wildlife Institute of India. *Wildlife Management Training Manuals*.
5. ICAR. *Handbook of Agriculture*.
6. FAO. *Sustainable Forest Management Toolbox*.
7. Ministry of Environment, Forest and Climate Change (MoEFCC). *National Forest Policy, Wildlife Action Plan and Forest Conservation Guidelines*.



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

Unit 1: Introduction to Forests and Wildlife (7 Hours)

- 1.1 Forest ecosystem: concept, structure, functions and ecosystem services
- 1.2 Forest types of India and Gujarat; forest resources and biodiversity
- 1.3 Wildlife diversity, ecological importance and trophic interactions
- 1.4 Role of forests in climate regulation, carbon sequestration and Sustainable Development Goals (SDGs)

Unit 2: Forest Management Principles (8 Hours)

- 2.1 Concept, objectives and principles of sustainable forest management
- 2.2 Silvicultural systems, natural regeneration and artificial regeneration
- 2.3 Forest inventory, mensuration and forest resource assessment
- 2.4 Social forestry, agroforestry, joint forest management (JFM) and community participation

Unit 3: Wildlife Ecology and Conservation (7 Hours)

- 3.1 Wildlife ecology, habitat requirements and population dynamics
- 3.2 Protected area network: National Parks, Wildlife Sanctuaries, Biosphere Reserves and Conservation Reserves
- 3.3 Wildlife census and monitoring techniques
- 3.4 Endangered species conservation, captive breeding and species recovery programmes

Unit 4: Forest and Wildlife Protection (8 Hours)

- 4.1 Threats to forests and wildlife: deforestation, habitat degradation, invasive species and forest fires
- 4.2 Human-wildlife conflict: causes, impacts and mitigation measures
- 4.3 Forest health management, pest and disease control
- 4.4 Forest restoration, ecological restoration and landscape management

Unit 5: Forest Policy, Legislation and Governance (7 Hours)

- 5.1 National Forest Policy (1988 and recent developments), National Wildlife Action Plan
- 5.2 Indian Forest Act, 1927; Forest (Conservation) Act, 1980; Wildlife (Protection) Act, 1972; Biological Diversity Act, 2002
- 5.3 Forest Rights Act, 2006 and participatory forest governance
- 5.4 Role of Forest Department, National Biodiversity Authority, State Biodiversity Boards and local communities

Unit 6: Emerging Trends in Forest and Wildlife Management (8 Hours)

- 6.1 Climate change adaptation and mitigation in forestry
- 6.2 Remote sensing, GIS, GPS, drones and digital technologies in forest and wildlife management
- 6.3 Carbon forestry, REDD+, ecosystem restoration and nature-based solutions
- 6.4 Ecotourism, sustainable livelihood, non-timber forest products (NTFPs) and green entrepreneurship

Practicals

1. Measurement of tree density, frequency, abundance, basal area and Importance Value Index (IVI) using quadrat or transect methods.
2. Identification of common forest flora and fauna and preparation of a biodiversity inventory.
3. Identification of common wildlife species and indirect evidences (pugmarks, hoof marks, feathers, nests, pellets and scats) using museum specimens and photographs.
4. Preparation and analysis of wildlife census data using quadrat and line transect methods (calculation of density, abundance and population estimates from sample datasets).
5. Identification of wildlife diseases and parasites using preserved specimens, photographs and microscopic slides.



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	B.Sc(Hons.) / (Hons. with Research) All		
Course Type	Minor		Version	1.0		
Semester	08		Effective From	June, 2026		
Course Code	BSES12803	Course Name	Occupational Health and Industrial Safety (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) All		
Course Type	Minor		Version	1.0		
Semester	08		Effective From	June, 2026		
Course Code	BSES12804	Course Name	Occupational Health and Industrial Safety (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
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

Subject code: Minor	Department: Environmental Science
Program: B. Sc.	Type of Subject: Theory + Practical
Subject: Occupational Health and Industrial Safety	
Semester-8	
Course Description: 1. This course provides a comprehensive understanding of occupational health and safety principles, workplace hazards, risk assessment, occupational diseases, industrial hygiene. 2. It develops examine ability of students impact of workers, workplace environments, industrial processes, machinery, chemicals, biological agents, and organizational practices that influence occupational health and safety. 3. The course also introduces occupational health surveillance, personal protective equipment, workplace monitoring, accident investigation, safety audits, emergency response, and relevant Indian occupational health and safety legislation.	
Student Learning Outcomes (SLOs): 1. Recognize major classes of occupational and environmental contaminants and how to apply to them the basic industrial hygiene tenets of anticipation, recognition, evaluation and control. 2. Correctly use and handle basic industrial hygiene assessment and analysis instrumentation and will understand the types and selection of Personal Protective Equipment used in practice	

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

1. M. H. Fulekar (I.K. International Publishing House Pvt. Ltd., New Delhi), Industrial Hygiene and Chemical Safety. ISBN: 81-88237-92-2.
2. Koren Herman and Bisesi Michael (Lewis Publishers), Handbook of Environmental Health, Volume 1 and 2. ISBN: 1-56670-536-3.
3. Gatchel Robert J. and Schultz Izabela Z. (Springer Publications) Handbook of Occupational Health and Wellness. ISBN: 978-1-4614-4838-9
4. Farzana Zahir (Bentham Books) Frontiers in occupational health and safety. Introduction to occupational health hazards. Volume 1 and 2. ISBN: 978-981-14-0690-4.

UNIT-1: Industrial Hygiene and Chemical Safety

07 Hours

- 1.1 Industrial Hygiene, principles and practices
- 1.2 Chemical agents at workplace
- 1.3 Chemical Safety
- 1.4 Occupational Safety and Health Legislations - 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)



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

UNIT-2: Concept of Industrial Hygiene **08 Hours**

- 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: Physical and Chemical Stress in Industry **07 Hours**

- 3.1 Introduction
- 3.2 Physical Stress: Noise, Vibrations, Heat and Illumination
- 3.3 Chemical Stress: Pickling, Metal Coating, Electroplating
- 3.4 Basic preventive measures
- 3.5 Proposed Biological Monitoring Methods in Occupational Exposure
- 3.6 Benefits of Environmental Monitoring

UNIT-4: Occupational Diseases **08 Hours**

- 4.1 Pneumoconiosis
- 4.2 Silicosis
- 4.3 Asbestosis
- 4.4 Lead and its Compounds
- 4.5 Mercury, Chromium and its Compounds

UNIT-5: Operational Control Measures **08 Hours**

- 5.1 Introduction and Operation Control
- 5.2 Air Pollution Control Measures
- 5.3 Plant Strategies
- 5.4 Air Sampling Calibration
- 5.5 Interpretation of results

UNIT-6: Personal Protective Equipment **08 Hours**

- 6.1 Introduction, legal requirements and selection guidelines
- 6.2 Head, eye and face protection
- 6.3 Hand, leg and foot protection
- 6.4 Respirators and canisters
- 6.5 Indian Standards on Personal Protective Equipment

Practicals:

1. Assessment of air flora of different places by gravity settling technique.
2. Study of safety in industries by suggesting safety measures and PPE.
3. Prepare OHS Policy for a medium sized organization.
4. Prepare an Organisation Chart & define roles & responsibilities.
5. Conduct any two Active monitoring systems & make a report: (a) Site Inspection (b) Survey of Safe Systems (c) Health surveillance of workers.



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	B.Sc. Environmental Science (Hons.)		
Course Type	SEC		Version	1.0		
Semester	08		Effective From	June, 2026		
Course Code	BSES15801	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
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

Faculty: Science	Department: Env. Sc. and Biotech.
Program: B.Sc. (Hons with Research)	Type: SEC
Subject: Research Project-2	
Semester: 8	

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

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



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	B.Sc. Environmental Science (Hons. With Research)		
Course Type	Research Project		Version	1.0		
Semester	08		Effective From	June, 2026		
Course Code	BSES18801	Course Name	Research Project – 2 (TH)			
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	50	50	100

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	B.Sc. Environmental Science (Hons. With Research)		
Course Type	Research Project		Version	1.0		
Semester	08		Effective From	June, 2026		
Course Code	BSES18802	Course Name	Research Project – 2 (PR)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CA)	Term end examinations (TEE)	Total
4	0	0	8 hrs	50	50	100



SARVAJANIK UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Honours) (Environmental Science) /
B.Sc. (Honours with Research) (Environmental Science)
Sem-VII and VIII

Faculty: Science	Department: Env. Sc. and Biotech.
Program: B.Sc. (Hons with Research)	Type: SEC
Subject: Research Project-2	
Semester: 8	

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

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

