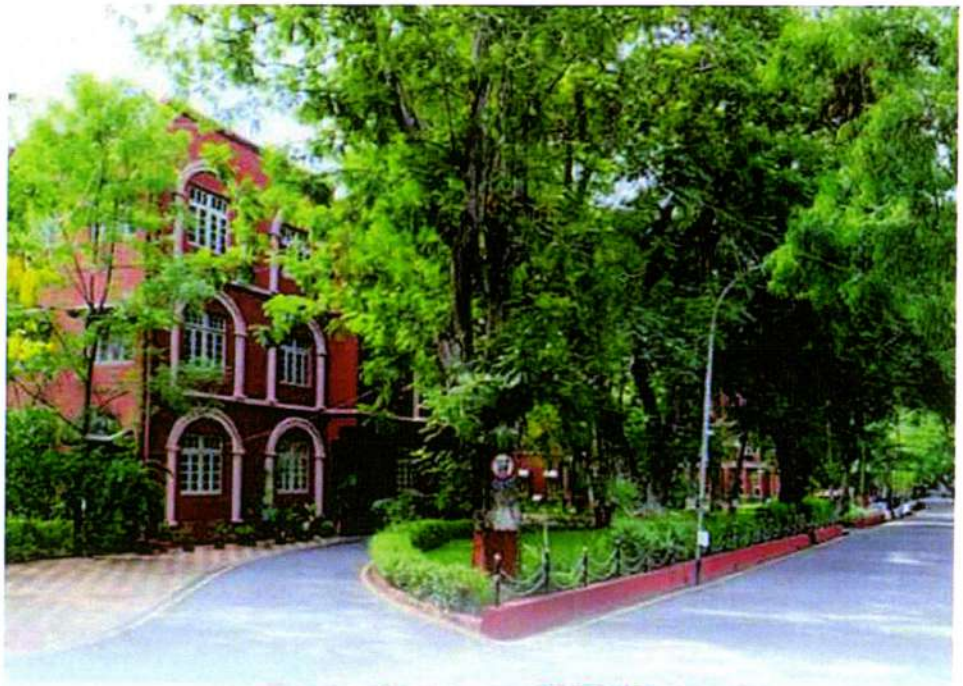

CURRICULUM FOR

"MASTER OF SCIENCE

ENVIRONMENTAL SCIENCE - INDUSTRIAL SAFETY AND MANAGEMENT (M.Sc. ES (ISM))"

w.e.f. Academic Year 2021-'22

॥ 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

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creating an enlightened society...

UNIVERSITY OFFICE
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Constituent Institute:

SHREE RAMKRISHNA INSTITUTE OF COMPUTER EDUCATION AND APPLIED SCIENCES (SRKI)

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Course Curriculum
Master of Science (Industrial Safety & Management)

The Course Curriculum of Master of Science (Industrial Safety & Management) was proposed and drafted by **Academic and Curriculum Committee of Environmental Science** under the Faculty of Science in the meeting held on 10-12-2021 and recommended to **'BOARD OF STUDIES'** for approval.

Prof. Ratna Trivedi **Chairman,** **Academic & Curriculum Committee** **Science**	**Place of the meeting** **Sarvajanik University Office**	R.A.Trivedy **Sign**

The proposed Course Curriculum was approved by **Board of Studies, Science** under the Faculty of Sciencein the meeting held on 10-12-2021 and was recommended to the '**FACULTY**' for approval.

Prof. Chaulami Desai **Chairman,** **Board of Studies-** **Science**	**Place of the meeting** **Sarvajanik University Office**	Desai **Sign**

The Course Curriculum approved by the **Faculty of Science**in the meeting held on 10-12-2021 and was recommended to '**ACADEMIC COUNCIL**' for approval.

Prof. Chaulami Desai **Chairman&** **Dean, Faculty of** **Science**	**Place of the meeting** **Sarvajanik University Office**	Desai **Sign**

The Course Curriculum approved bythe '**Academic Council of Sarvajanik University**'in the meeting held on 10-12-2021.

Prof. Persi Engineer **Chairman, Academic Council** **&Hon'ble Provost,** **Sarvajanik University**	**Place of the meeting** **Sarvajanik University Office**	 **Sign**

- ***The approved curriculum of Masterof Science(Environmental Science)is with effect from the Academic year 2021 – '22 and to be reviewed before 2024 – '25***

SARVAJANIK UNIVERSITY
Faculty of Science
M.Sc Industrial Safety and Management

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Faculty of Science

M.Sc. Environment Science

(Industrial Safety Management)

Semester - I

SARVAJANIK UNIVERSITY
Faculty of Science
M.Sc Industrial Safety and Management

Faculty: Science	**Department:** Environmental Science
Program: M. Sc. Environmental Science (Industrial Safety and Management)	**Type of Subject:** Theory + Practical
Subject: Safety Management	
Semester- I	

Student Learning Outcomes (SLOs):

- The paper will enable students to acquire knowledge, technical skills needed for the modern development in the field of safety management.
- The paper will make students aware regarding accidents and the necessary steps one should take.

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

1. Shah R.C (2018): Safety Management, Capital Offset, Gandhinagar.
2. Mistry K.U (2012): Fundamentals of Industrial Safety & Health – I, Siddharth Prakashan, Ahmedabad.
3. Mistry K.U (2012): Fundamentals of Industrial Safety & Health – II, Siddharth Prakashan, Ahmedabad.

UNIT 1: Concept of Safety **07 Hours**

1.1 Dead Vs Live Resources
1.2 Health Vs Wealth
1.3 Industrialization Vs Accidents
1.4 Nature of the concept of Safety

UNIT 2: Safety Philosophy **07 Hours**

2.1 Terminology in Safety
2.2 Philosophy of Safety
2.3 Philosophy of Accident Causation
2.4 Philosophy of Total Safety Concept

UNIT 3: Safety Psychology **07 Hours**

3.1 Industrial Psychology
3.2 Safety Psychology
3.3 Accident Causative Factors
3.4 Behavior Based Safety

UNIT 4: Accident Causation and Prevention **07 Hours**

4.1 Reasons for Accident Prevention

4.2 Factors Impeding Safety
4.3 Theories of Accident Causation
4.4 Principles of Accident Prevention

UNIT 5: Safety Statistics and Information System **08 Hours**

5.1 Nature, Source and Need of Statistics of Safety
5.2 Accident Costs
5.3 Forms of Accident Statistics
5.4 Management Information System for Safety

UNIT 6: Safety Management **08 Hours**

6.1 Concept of Management

6.2 Safety Management and its Responsibilities
6.3 Safety Organizations
6.4 Safety Departments

UNIT 7: Safety Education and Training **08 Hours**

7.1 Elements of Training Cycle
7.2 Procedure of Training
7.3 Methods of Training
7.4 Types of Training

UNIT 8: Employee and Safety **08 Hours**

8.1 Area of Participation
8.2 Methods of Participation
8.3 Worker and Union Participation
8.4 Approaches to Compliance & Violation

Practicals:

1. Submission of Report based on Industrial Visit.
2. Seminar on "Safety Culture at Construction Sites"
3. Measurement of Humidity in ambient air.
4. Measurement of Illumination by Lux meter.

SARVAJANIK UNIVERSITY
Faculty of Science
M.Sc Industrial Safety and Management

Faculty: Science	**Department:** Environmental Science
Program: M. Sc. Environmental Science (Industrial Safety and Management)	**Type of Subject:** Theory + Practical
Subject: Environmental Epidemiology and Ecotoxicology	
Semester- I	

Student Learning Outcomes (SLOs):

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

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

1. Pepper IL, Gerba CP, Gentry TJ, Maier RM, editors. Environmental microbiology. Academic press; 2011 Oct 13. 978-0123705198.
2. Yates MV. Manual of environmental microbiology. John Wiley & Sons; 2020 Aug 11. 978-1555816025.
3. Allsopp D, Seal KJ, Gaylarde CC. Introduction to biodeterioration. Cambridge University Press; 2004 Jun 28. 978-0521528870.
4. Viswanath Buddolla. (Narosa Publication). Environmental Biotechnology - Concepts and Applications. ISBN: 9788184875478.
5. A. K. Chaterjee (Prentice Hall India Learning) Introduction to Environmental Biotechnology. ISBN: 9788120342989.

UNIT-1 Microbial Source Tracking and Risk Assessment **08 Hours**

1.1 Evolution of microbial source tracking
1.2 Human fecal pollution tracking
1.3 Risk assessment framework
1.4 Exposure assessment

UNIT-2 QA/QC in Environmental Microbiology **08 Hours**

2.1 Introduction to principles of QA
2.2 General quality control
2.3 Quality control for bacteriological analyses
2.4 Quality control for virological analyses

UNIT-3 Microbiology of extreme environments **08 Hours**

3.1 Low temperature environments
3.2 High temperature environments
3.3 Desiccation and UV stress
3.4 Deep-sea hydrothermal vents
3.5 Acidic environments

UNIT-4 Biodeterioration and Biofouling **08 Hours**

4.1 Introduction to biodeterioration
4.2 Fungal, algal and cyanobacterial growth affecting structures
4.3 Investigative biodeterioration
4.4 Control of biodeterioration

UNIT 5: Toxicants in the environment **08 Hours**

5.1 Principles of toxicology, toxicants and toxicity
5.2 Types of toxic substances – degradable and non-degradable; Sources and entry routes
5.3 Ecotoxicology - fate and transport of toxicants in air and water
5.4 Biotransformation, Bioaccumulation and Biomagnification effects

UNIT 6: Pollutants and toxicants in environment **08 Hours**

6.1 Organic Pollutants: Water-borne disease agents, Oxygen demanding wastes, organic chemicals, pesticides
6.2 Inorganic Pollutants: Lead, Mercury, Cadmium, Aluminium, Arsenic
6.3 Toxicants in the atmosphere: Carbon monoxide, NOx, Particulate matter, Radioactive toxicants
6.4 Toxic compounds in food: Natural toxins, Toxic pollutants

UNIT 7: Environmental toxins effects on human **08 Hours**

7.1 Routes of toxicants to the human body, ADME – Absorption, Distribution, Metabolism & Excretion
7.2 Classification of Ecotoxicants
7.3 Acute and chronic toxicity; lethal and sub lethal doses
4.5 Concept of NOEL, LOAEL, LD50, MIC and MLD

UNIT 8: Chemical Ecology and Ecotoxicology **08 Hours**

8.1 Conceptual framework for trophic level processes in Ecotoxicology
8.2 Chemical Ecology: Semiochemical, Allelochemical, Pheromones, Allomone, Kairomone, Synomone
8.3 Impact of pollutants on allelochemical interactions

8.4 Detoxification: Site of detoxification, Mechanisms (Oxidation, Reduction, Hydrolysis, Conjugation), Detoxification by drugs, Antidotes

Practicals:

1. Detection of fecal streptococci by membrane filtration method.
2. Study of microorganisms from bioaerosols.
3. Use of dehydrogenase enzyme activity to study microbial activity.
4. Detection of microbial respiration in soil.
5. Estimation of antioxidants and antioxidant enzymes - Ascorbate peroxidase, Superoxide dismutase, Catalase and Peroxidase.
6. Effect of heavy metal on growth of microorganism.
   Effect of environment parameters (Temperature, pH, Salinity, Alkalinity, Sugar) on microbial growth.

SARVAJANIK UNIVERSITY
Faculty of Science
M.Sc Industrial Safety and Management

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

Student Learning Outcomes (SLOs):

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

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

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

UNIT 1: Environment and Pollution **07 Hours**

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

UNIT 2: Industrial Pollution **07 Hours**

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

UNIT 3: Air Pollution **07 Hours**

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

UNIT 4: Vehicular Pollution **07 Hours**

4.1 Automobile Emissions
4.2 Alternative Fuels
4.3 Biofuels
4.4 Ecofriendly Vehicles

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

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

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

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

UNIT 7: Hazardous Waste **08 Hours**

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

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

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

SARVAJANIK UNIVERSITY
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M.Sc Industrial Safety and Management

Practicals:

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