Department of Environmental Science

Program Outcomes (PO's)

1. **Enrich Environmental Knowledge:** Demonstrate rational understanding of rudimentary concepts, principles and processes underlying the academic field of Environmental Science with its various subfields like Ecology, Biodiversity, Earth Sciences, Pollution Control Technology, Environmental Physics and Chemistry, Environmental Health & Safety, Atmospheric Sciences, Environmental Laws, Environmental Impact Assessment, Environmental Biotechnology, Toxicology, Waste Treatment Techniques, Renewable and Non-Renewable Energy, Restoration, Environmental Economics, Environmental Statistics, Remote sensing and GIS, Climate Change and Sustainability, etc.

2. **Environmental Experts:** Methodological knowledge that creates different types of professionals in the field of Environmental Science and related subfields.

3. **Protection and Conservation of Environment:** Apply knowledge and skills to address the environment related issues and challenges for the protection and conservation of available natural resources and environment.

4. **Enhance Technical and Research Skills:** Ability to identify, formulates, review research literature, and analyse current environment related problems. Use of laboratory and field techniques relevant to academia and industry, generic skills, and global competencies, including knowledge and skills that enable students to undertake further studies in the field of Environmental science.

5. **Modern Tool Usage:** Ability to create, select, and apply appropriate techniques, and to model environmental activities with an understanding of the limitations. Ability to use high end equipments for the analysis of environmental resources.

6. **Importance and Applications:** Identify and appreciate the importance of the Environmental Science and its application in academic, industrial, economic, and social context.

7. **Career Perspectives:** Undertake research and on field activities which develop problem solving abilities required for successful career in Environmental Science.

8. **Development of Skills:** Impart Communication Skills; Ability to work effectively as individual or team; Ability to handle project and to manage finance related issues.

Department of Environmental Science

PROGRAM SPECIFIC OUTCOMES (PSO's)

1. **Disciplinary Knowledge and Interdisciplinarity:** Demonstrate disciplinary knowledge from ecological, social, physical, economic, legal fields; Appreciate the ethical, cross cultural and historical context of environmental issues and the links between human and natural systems; Apply systems concepts and methodologies to analyse and understand interactions between social and environmental processes; Demonstrate appropriate and advanced technical skills in investigating, analysing and synthesizing information, problems, concepts and theories within environment science.

2. **Quantitative Competence:** Understand essential mathematical and statistical approaches used to analyse environmental data; Accurately comprehend and draw appropriate inferences from numeric data, statistical analysis and predictive models; Use state-of-the-art software, hardware and analytical techniques to solve problems in environment science and management

3. **Critical Thinking:** Demonstrate the capability to apply analytic thought to a body of knowledge; analyse and evaluate evidence, arguments, claims and beliefs on the basis of empirical evidence; formulate coherent arguments; critically evaluate practices, policies and theories following the scientific approach to knowledge development.

4. **Problem Solving:** Identify environmental problems, evaluate problem solving strategies and develop science-based solutions; understand the need to integrate relevant social sciences (e.g.: environmental planning, law, economics) in environmental problem solving; Use acquired knowledge, skills and ingenuity to solve complex problems.

5. **Communication:** Clearly communicate complex analyses, interpretations and significance effectively in writing and orally to varied audiences ranging from scientific to policy and the general public; be proficient in contemporary communication tools

6. **Multicultural competence:** Possess knowledge of the values and beliefs of multiple cultures and a global perspective; capability to effectively engage in a multicultural society and interact respectfully with diverse groups.

7. **Moral and ethical awareness/reasoning:** Identify ethical issues related to one's work; formulate a position/argument about an ethical issue from multiple perspectives and use ethical practices in their life and career; avoid unethical behaviour; adopting objective, unbiased and truthful actions in all aspects of work.

8. **Collaboration and Team work:** Collaborate in teams with peers and mentors and work with others in diverse group settings, developing flexibility and leadership skills.

9. **Lifelong learning:** Ability to acquire knowledge and skills, including 'learning how to learn' for meeting changing demands of work place

Department of Environmental Science

COURSE OUTCOMES (CO's)

Semester-I		
Code	**Subject Name**	**Course Outcome**
EVS UT-111	Environmental Biology & Biodiversity (4 Credits)	1. Learns the basic principles and theories of ecology as a science and how these can be applied in today's scenario of climate change and degradation of the environment. 2. Demonstrate the structure and functions of various ecosystems, their natural history and ecology. 3. Understands the importance of biosphere and life sustaining processes on earth. 4. Recognizes the anthropogenic impact on important life supporting systems. 5. Classifies the types of Biomes with its characteristics. 6. Illustrate the different characteristics of population. 7. Enlist the characteristics of community and understand its dynamics. 8. Identify the role of microbes in soil, water and air environment.
EVS UT-112	Environmental Physics & Chemistry (4 Credits)	1. Understands the basic concepts in environmental chemistry and its applications. 2. Introduces to different instrumental methods of analysis with reference to principle, working and applications in the field of monitoring of environmental pollutants. 3. Identify the chemical and physical nature of pollutants with its impact on environment and human health. 4. Understand the basic concepts in environmental physics and its applications 5. Understand the basics and environment related applications of quantum physics, nuclear physics, thermodynamics, and optics.
EVS UT-113	Earth, Ocean and & Atmospheric Sciences (4 Credits)	1. Introduces about the relation with Environmental Geoscience and Atmospheric Sciences. 2. Understands the Earth Sciences about origin, composition, dynamics, surface process, landforms, and catchment hydrology. 3. Understands the importance of Atmospheric Science and Oceanography in Environmental science.

		4. Learns about the patterns of atmospheric radiation, temperature, pressure, and movement of air masses.
		5. Know the stratification of the atmosphere.
		6. Define the weather parameters with its monitoring aspects.
		7. Aware about the functioning and importance of biogeochemical cycles
		8. The origin and current case studies of environmental hazards will enhance their need-based knowledge in this field.
EVS UT-114	Environmental Statistics (4 Credits)	1. Learn the basic concepts of Environmental statistics.
		2. Introduces to various common tools that are used for data classification and analysis.
		3. Understand the importance of hypothesis testing and also learn prediction models.
		4. Applications of statistics in Environmental Science will be introduced through various examples.
		5. Understand the concept of data analysis measures of central tendency and dispersion.
		6. Know the aspects and use of probability and distributions.
		7. Recognize the sampling distribution, Chi-square test for variance, t-test for population mean and equality
		8. Aware about the mathematical models like exponential, logistic models for population growth.
EVS UP-115	Environmental Sciences Practical Paper (4 Credits)	1. Practicals based on field techniques of vegetation studies by using various methods.
		2. Learns the indices to analyze and compare ecological studies.
		3. Introduces to the basic microbiological techniques
		4. Practicals based on Environmental Chemistry will be helpful to increase laboratory skills in Water and Soil Quality monitoring.
		5. Learns about the basics of deification of rocks and minerals.
		6. Learns about Toposheet based analysis and interpretation of various geographical aspects.
		7. Students will understand the mapping system of various atmospheric parameters.
		8. Practicals based on Environmental data analysis will be done using various statistical tools.
		9. Learn various computer-based tools for variable analysis.
CS I	Cyber Security I (1 Credits)	1. Pre requisite in network and information security

Code	Subject Name	Course Outcome
HR I	Human Right I (1 Credits)	1. Understand the historical growth of the idea of human rights 2. Demonstrate an awareness of the international context of human rights 3. Demonstrate an awareness of the position of human rights 4. Understand the importance of the Human Rights Act 5. Analyze and evaluate concepts and ideas.

Semester-II

Code	Subject Name	Course Outcome
EVS UT-121	Water & Soil Pollution: Management & Mitigation (4 Credits)	1. Learn the sources of freshwater, groundwater and marine water pollution 2. Understand the remedial processes for polluted water sources 3. Understand the case studies based on remediation of freshwater, groundwater and marine water pollution 4. Learn the sources of soil pollution 5. Understand the Management & Mitigation of soil pollution 6. Understand the case studies based on remediation of soil pollution
EVS UT-122	Air, Noise & Radiation Pollution: Management & Mitigation (4 Credits)	1. Explain the classification of air pollutants with causes and its effects on environment. 2. Understand the Management & Mitigation of air pollution 3. Study the sources, measurement indices and control of noise pollution. 4. Monitor and analyses the hazards of radiation pollution.
EVS UT-123	Environmental Law, Ethics & Policy (4 Credits)	1. Learns the important provisions of environmental laws in India and international treaties and agreements 2. Introduce to role of constitution and various administrative mechanisms 3. Understand the concept of environmental ethics and challenges associated with it. 4. Explore policies related to various natural resources. 5. Recognize the role of national policies and CPCB, SPCB for environmental management. 6. Aware about the constitutional provisions for environmental protection. 7. Understand the provisions in environmental legislations for water, air and mining.
EVS UT-124	Water & Wastewater Technology	1. Introduces the concepts of waste water treatment and applications. 2. Problems based on population forecasting and its

Code	Subject Name	Course Outcome
	(4 Credits)	computation by various methods will give idea about quantum of waste generation.
		3. The guidelines given by various agencies regarding water quality will help them to understand actual quality and current status of water.
		4. Practical approach on designing of water treatment plants its operation and maintenance
		5. Understand the role of biological treatment processes and advance treatment processes for improving treatment efficiency.
		6. Introduces to the current trends in water treatment
		7. Illustrate the design and functioning of ETP, STP
		8. Describe the concept of hazardous waste and E waste
EVS UP-125	Environmental Sciences Practical Paper (4 Credits)	1. Determine various physiochemical parameters of water and wastewater
		2. Determine various soil quality parameters
		3. Determine air and noise pollutants
		4. Design flow charts for different industries and sewage treatment.
		5. Independent field project planning and execution will be learnt.
		6. Acquire Field surveys and monitoring skills.
		7. Lab scale level treatment methods are introduced to get real sense and applications of wastewater treatment methods
		8. Practicals based on Environmental Law, Ethics and Policy will help students to understand challenges associated with Environmental governance.
CS II	Cyber Security II (1 Credits)	1. Understand the cyber security management
HR II	Human Right II (1 Credits)	1. Understand the human rights of vulnerable and disadvantaged groups
		2. Understand the human rights and duties in India
		3. Demonstrate an awareness of the position of human rights
		4. Understand the importance of Laws, Policies, Society and Enforcement mechanism.
		5. Analyze and evaluate concepts and ideas.
Semester-III		
Code	Subject Name	Course Outcome
EVS UT-231	EIA & Environmental Audit	1. Learn the practices viz. terminologies, practices and methodologies followed for EIA at national and intentional level.
		2. Understanding the scope, importance and opportunities in

	(4 Credits)	EIA practices in relation with sustainable development aspects 3. Importance of public participation in EIA 4. Administrative requirements and policies as per government guidelines 5. Aware about the environmental management system and the requirements for environmental audit 6. Formats and techniques required to assess impacts, perform audits and to protect environment as per guidelines by government agencies 7. Understand the objectives and principals of environmental management with its importance. 8. Recognize the need for environmental planning with demographic considerations. 9. Bring in to light the procedure of EIA for various category projects
EVS UT-232	Remote Sensing & GIS (4 Credits)	1. Understand the basic principles and processes that define Remote Sensing and GIS. 2. Know satellites in space, their applications, data acquisition and recent advances. 3. Interpret satellite images visually and further process and classification using software. 4. Develop spatial thinking in GIS and use its geo-processes and functions. 5. Apply the understandings to address real life field issues using various software.
EVS UT-233	Restoration Ecology & Watershed Management (4 Credits)	1. Understand objectives, principles and functions of Watershed Management 2. Articulate the historical development of restoration concepts and the role that restoration can help in the future stewardship of natural resources. 3. Understand watershed management techniques 4. Describe the major ecological principles underlying the successful restoration of ecosystems including concepts of disturbance and succession. 5. Use ecological and management principles and select appropriate methods and tools for designing and conducting restoration projects
EVS UP-234	Practicals related to Compulsory Theory Papers (231, 232,	1. Introduces to basic techniques for visual image interpretation. 2. Competent to use RS and GIS software for Environmental parameters. 3. Critically prepare EIA/EMP report and can find merits

Code	Subject Name	Course Outcome
(233) (4 Credits)		and demerits of the practices followed in assessment of impacts. 4. Understand various case studies of EIA. 5. Competency to geospatial techniques for biodiversity studies will be developed 6. They will acquire skills related to watershed management. 7. Interpret the data related with restoration ecology.
EVS UT-235 OR EVS UT-236	Environmental Management: EMS, Life Cycle Assessment OR Environmental Resource Monitoring (2 Credits)	1. Students will learn important guidelines of environmental management system standards 2. Learn to identify and define environmental problems and apply appropriate knowledge and skills to selected case studies or real-life situations 3. Assessment of life cycles for environmental managements 4. Demonstrate ability to collect, record, process, interpret and present data using different qualitative and quantitative techniques 1. Monitoring of air quality parameters 2. Sampling and monitoring methods for water quality parameters 3. Monitoring of sol related parameters 4. Identify the potential of forest resources with the concept of natural resource accounting.
EVS UP-237	Practicals related to elective paper (2 Credits)	1. Students will learn various guidelines for Environmental management system management. 2. Students will be introduced to basic techniques for Environmental risk analysis and toxicological studies. 3. Acquaintance with pollution monitoring techniques.
EVS UT-238	In-plant training/ internships (2 Credits)	1. Develop interaction or communication skill with scientists, industrialist and academicians 2. Understand current environment related problems 3. Learns newly emerging technologies to solve environment related problems
CS III	Cyber Security III (1 Credits)	1. Understand the information security 2. Understand the Network security
SD I	Skill Development I (2 Credits)	1. Learns about different environmental audits 2. Prepare the audits according to Environmental Protection Act, 1986 3. Understand the Water audit and Water Budget
Semester-IV		
Code	**Subject Name**	**Course Outcome**
EVS UT-	Solid & Hazardous	1. Define the concepts of hazards and disasters. 2. Introduce the various man-made hazards like industrial

241	Waste Management (4 Credits)	accidents, radiation hazards, oil spills, forest and industrial fires and control. 3. Get acquainted with the natural disasters like earthquake, volcanoes, tsunami, landslides, etc. 4. Aware the different strategies for mitigation disaster management. 5. Relate the technological aspects like remote sensing and GIS in disaster management
EVS UT-242	Renewable and Non-Renewable Energy (4 Credits)	1. Understand the basic principles and technologies of energy resources. 2. Introduces to basic concepts behind energy resources available in the environment. 3. Recognize various ways to harness energy and its importance 4. Analyze recent technologies available for energy harnessing 5. Apply skill of sustainable ways to get energy from available resources 6. Classify the energy resources into renewable and non-renewable resources. 7. Recognize the power and applications of solar energy 8. Get acquainted with the knowledge of biomass energy. 9. Make aware about the energy generation from ocean, tides and hydel power plant. 10. Classify the natural resources into renewable and non-renewable resources. 11. Understand the role of abiotic natural resources like minerals fossil fuels and soil.
EVS UP-243	Practicals related to Compulsory Theory Papers (241, 242) (4 Credits)	1. Understand the Solid & Hazardous Waste Management related practicals 2. Understand the Renewable and Non-Renewable Energy related practicals
EVS UT-244 OR EVS UT-245	Environmental Toxicology, Health & Safety OR Environmental	1. Classify the sources of toxicants in the environment. 2. Aware the concepts in Ecotoxicology. 3. Understand the fate of toxicants and transport of toxicants in food chain. 4. Know the dose response relationship of toxicants 5. Introduce the concept of occupational health hazards with their effects.

	Economics (2 Credits)	1. Understand the basic concepts in Environmental Economics 2. Exploitation of Economics of Natural Resources 3. Learn the Micro Foundations of Environmental Economics 4. Understand the Economic Instruments for Environmental Protection
EVS UP-246	Practical Paper based on Choice based paper (2 Credits)	1. Perform toxicity assays 2. Understand health and safety in industry 3. Learn the effects of heavy metals on plants 4. Learn about the toxicants and their impact on environment
EVS UT-247 OR EVS UT-248	Environmental Biotechnology & Nano technology OR Environmental policy, climate change and sustainability (2 Credits)	1. Introduce the role of biotechnology in Environmental Science. 2. Aware about the innovative practices bioleaching, bio-absorption and bioremediation. 3. Get aware with use of biotechnology in agro-industry and forestry. 4. Familiarize with use of biotechnology for industrial pollution control. 5. Understand the applications of genetic concept in environment management 1. Understand the anthropogenic and natural drivers of climate change and future developments aspects for the sustainability. 2. Identify and evaluate the environmental, social, and economic impacts of anthropogenic activities and required sustainability framework for mitigation of the same. 3. Realize scope, importance, and opportunities for climate change and sustainability studies. 4. Sensitize about Impacts of climate change and future goals and of sustainability 5. Aware of various policies and agreements regarding these two aspects 6. Understand Methodologies for impact assessments and current practices of the societies 7. Learn appropriate tools and techniques for interpreting the impacts of climate change and methods for evaluation of sustainability
EVS	Practical Paper	1. Extract and analyze genetic material from cells

UP-249	based on Choice based paper (2 Credits)	2. Synthesize and characterize various nanoparticles 1. Analyze climatic data 2. Understand various models of Environmental policy, climate change and sustainability 3. Understand carbon sequestration, carbon and water footprints and trading
EVS UT-250	Dissertation (4 Credits)	1. Review the literature. 2. Prepare the project proposal independently 3. Set the methodology for analysis
CS IV	Cyber Security IV (1 Credits)	1. Understand System of Cyber Security 2. Understand Applications of Cyber Security
SD II	Skill Development II (2 Credits)	1. Understand the occupational safety 2. Monitor the air pollutants 3. Monitor the water pollutants