

**MSc. ENVIRONMENTAL
SCIENCES**

**PROGRAMME AND
COURSE OUTCOMES**

MSc. Environmental Sciences

Programme Outcomes

PO1	Articulate the interdisciplinarity of Environmental Sciences and appreciate the interconnectedness of Environment in various other Science and Art subjects and to explain the laws of earth and nature to explain unique occurrences
PO2	Work in various fields such as Effluent Treatment Plants of various Industries/Companies/Factories, Municipal Councils/Corporations, Central Pollution Control Board, State Pollution Control Boards, National Research Institutes/Organizations/Laboratories, NEERI, EIA, GIS, Environmental Monitoring Projects and as Environmental Consultants
PO3	Take up individual Science, Technology and Environmental Projects and perform environmental pollution control technologies and take appropriate measures for pollution control and to undertake individual research in various aspects of environment
PO4	Analyze the problems which lead to Environmental deterioration and perform environmental management activities
PO5	Translate the theoretical and practical knowledge acquired to prevent disasters and alleviate the aftereffects in case of occurrence, solve issues of pollution and take mitigatory measures for climate change
PO6	Develop and strategize action plans to solve the problems based on social and environmental awareness
PO7	Demonstrate environmental monitoring skills, including conduct of experiments and data analysis and practice these and perform environmental management activities in tune with principles of sustainability
PO8	Communicate principles of environment and the state-of-the science principles of environment to scientific and layman community
PO9	Formulate a successful Environment, Disaster and Industrial Safety Management Plan
PO10	Exhibit environmental ethics, academic ethics and research ethics avoiding scientific misconduct, plagiarism and violation of IPR

Course Outcomes

Semester 1

COURSE TYPE	CORE
COURSE NAME	ENVIRONMENTAL BIOLOGY AND ECOSYSTEM DYNAMICS
COURSE CODE	ES 511
HOURS	90 H
COURSE OUTCOMES	
CO1	Describe the structure and functions of various ecosystems
CO2	Explain core concepts of community ecology and identify the stage of ecosystem development
CO3	Describe the interactions of organisms with others and their ecosystem and its significance, also predict prey-predator interactions using Lokta-Volterra Model
CO4	Reflect critically on concepts of populations and their structure and function
CO5	Explain the concept of Limiting Factors, and the laws associated with it, and also describe the principles of Ecoinformatics

COURSE TYPE	CORE
COURSE NAME	ENVIRONMENTAL GEOLOGY
COURSE CODE	ES 512
HOURS	90 H
COURSE OUTCOMES	
CO1	Describe the basic geological concept, principles and theories related to the formation of the earth
CO2	Present Ideas about the Geochemical classification of materials present on the earth's surface
CO3	Explain the concepts of Coastal geomorphology and river basins
CO4	Interpret groundwater pollution and work on finding probable solutions
CO5	Analyse Geological hazards with respect to previous instances and frame disaster management and watershed management strategies. Design and perform experiments in the lab to demonstrate the concepts, principles and theories learned in the classroom

CO6	Interpretation of maps from field-based data and toposheets available. Give presentations using scientific literature and reference information sources effectively
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COURSE TYPE	CORE
COURSE NAME	NATURAL RESOURCES AND ENERGY MANAGEMENT
COURSE CODE	ES 513
HOURS	90 H
COURSE OUTCOMES	
CO1	Identify and list out soils based on their characteristics and suggest and describe reclamation techniques for problem soils
CO2	Describe the major forest types of India with special reference to Kerala and discuss the forest conservation activities
CO3	Describe biodiversity, its threats and conservation strategy and suggest a suitable conservation strategy for peculiar ecosystems
CO4	Discuss the water budget as well as major water resources of India with special reference to Kerala and suggest management and conservation strategy for water resources
CO5	Discuss the sources and classification of energy resources and describe the environmental impact of their use
CO6	Define and discuss energy audit and conduct and record energy audit of household/ institutional setup

COURSE TYPE	CORE
COURSE NAME	PRACTICAL – 1 ENVIRONMENTAL BIOLOGY AND GEOLOGY
COURSE CODE	ES 514
HOURS	180 H
COURSE OUTCOMES	
CO1	Identify the ecologically significant flora and fauna of various environment as well as phyto- and zoo-plankton and comment on their uniqueness in the ecosystem
CO2	Estimate the phyto- and zoo-plankton concentration in water bodies
CO3	Estimate the primary productivity of a waterbody
CO4	Analyze DO and BOD of waterbody

CO5	Estimate the frequency, density and abundance of flora and fauna
CO6	Identify rocks and minerals specimens, identification of common minerals and rocks. Gaining skill for reading a toposheet.
CO7	Analyze and calculate the energy output of solar/ windmill and explain the working principle

Semester 2

COURSE TYPE	CORE
COURSE NAME	ENVIRONMENTAL CHEMISTRY
COURSE CODE	ES 521
HOURS	90 H
COURSE OUTCOMES	
CO1	Describe the structure and chemistry of the atmosphere and the problems which affect the normal state of the atmosphere
CO2	Explain the chemistry and composition of sea and freshwater and discuss the various chemical qualities of water resources
CO3	Describe the composition, physical and chemical properties of soil and the formation and profile of soil
CO4	Write essays on various aspects of pesticides, non-pesticide organic compounds and heavy metals
CO5	Describe radioactivity, nuclear disasters and the environmental and health impacts of nuclear accidents
CO6	Write an essay on the concept, goals and principles, applications, and limitations of green chemistry and discuss the green synthesis of selected materials

COURSE TYPE	CORE
COURSE NAME	ENVIRONMENTAL TECHNIQUES AND RESEARCH METHODS
COURSE CODE	ES 522
HOURS	90 H
COURSE OUTCOMES	
CO1	Enlist and explain the various steps involved in environmental sampling
CO2	Describe the different analytical techniques and identify principles and their importance in applying environmental research
CO3	Perform experiments and data analysis.
CO4	Analyse and determine the pollution status by using Environmental Analytical Techniques, Statistical Methods and Computational Techniques.
CO5	Develop research methodology, collect data and carry out data

	analysis and interpretation for finding a suitable solution and acquire the ability to write the research findings in the form of structured thesis.
CO6	Write dissertation in a scientific manner

COURSE TYPE	CORE
COURSE NAME	ENVIRONMENTAL POLLUTION AND TOXICOLOGY
COURSE CODE	ES 523
HOURS	90 H
COURSE OUTCOMES	
CO1	Identify and explain the various types and sources of air, water and soil pollution along with the local, regional and global implications of environmental pollution
CO2	List the major emerging pollutants and their impacts
CO3	Describe the health impacts of xenobiotic pollutants
CO4	Explain the principles of toxicity and draw a dose-response curve.
CO5	Explain the various occupational health hazards and set terms for occupational health and safety
CO6	Analyse the environmental health risk assessment procedure using a case study

COURSE TYPE	CORE
COURSE NAME	PRACTICAL II ENVIRONMENTAL TECHNIQUES, CHEMISTRY & POLLUTION
COURSE CODE	ES 524
HOURS	180 H
COURSE OUTCOMES	
CO1	Perform soil, water and sediment sampling and analyze the physico-chemical parameters of these samples
CO2	Estimate Na and k using Flame Photometer
CO3	Separate plant pigments from leaf samples and amino acids from a mixture
CO4	Do data analysis manually and in MS excel

Semester 3

COURSE TYPE	CORE
COURSE NAME	REMOTE SENSING AND GIS
COURSE CODE	ES 531
HOURS	90 H
COURSE OUTCOMES	
CO1	Explain the principles, concepts and techniques of Remote Sensing Technology and application of Remote Sensing in various management aspects
CO2	Write notes on the aerial remote sensing, the various sensors on board and the elements of the image of interpretation and write an essay on photogrammetry
CO3	Write an essay on types of sensors and their applications in environmental monitoring
CO4	Explain in detail satellite remote sensing with types of satellite orbits
CO5	Explain Digital Image processing and the utilization of Geomatics Science in Resource Management and thus to monitoring the spatial and temporal environmental changes.

COURSE TYPE	CORE
COURSE NAME	ENVIRONMENTAL METEOROLOGY AND CLIMATE CHANGE
COURSE CODE	ES 533
HOURS	90
COURSE OUTCOMES	
CO1	Articulate and exemplify basic knowledge of environmental meteorology and new concepts of climate change
CO2	Summarise enhanced greenhouse effect, global warming El Nino and ENSO
CO3	Explain the fundamental principles of meteorological instrumentation and measurements
CO4	Define vertical variation in temperature, lapse rate and inversions
CO5	Acquire knowledge on fundamentals of climatology
CO6	Analyze and describe the phenomenon of climate change and address problems of pollution climatology with emphasis on India

COURSE TYPE	CORE
COURSE NAME	PRACTICAL III ENVIRONMENTAL GENETICS, MICROBIOLOGY AND REMOTE SENSING
COURSE CODE	ES 534
HOURS	144
COURSE OUTCOMES	
CO1	Identify models of genetic significance
CO2	Perform sterilization, serial dilution, media preparation, plating and identification of bacteria and fungi using physiological and biochemical characteristics
CO3	Perform simple and gram-staining techniques
CO4	Estimation of the number of microbes and measurement of microbes
CO5	Generate thematic map layer using GIS

COURSE TYPE	CORE
COURSE NAME	PROJECT WORK
COURSE CODE	ES 535
COURSE OUTCOMES	
CO1	Conduct literature survey on a given topic
CO2	Perform meticulous planning of lab work
CO3	Demonstrate precision and practical skills
CO4	Perform statistics in the data acquired
CO5	Express the results and justify it with suitable scientific discussion
CO6	Prepare a well-structured dissertation

Semester 4

COURSE TYPE	CORE
COURSE NAME	ENVIRONMENTAL ENGINEERING AND WASTE MANAGEMENT
COURSE CODE	ES 541
HOURS	90
COURSE OUTCOMES	
CO1	List out and explain the techniques and equipment in air pollution control
CO2	Describe the various waste water and sewage treatment processes
CO3	Describe the various Industrial effluent treatment processes
CO4	Discuss the WHO and BIS standards for drinking water
CO5	Describe and set up a composting unit
CO6	Explain the management strategies of hazardous wastes and also the policies related to this

COURSE TYPE	CORE
COURSE NAME	ENVIRONMENTAL IMPACT ASSESSMENT, DISASTER MANAGEMENT AND SUSTAINABLE DEVELOPMENT
COURSE CODE	ES 542
HOURS	90
COURSE OUTCOMES	
CO1	Explain the process of Environmental Impact Assessment and define various terms associated with EIA
CO2	Explain the impact identification, prediction and evaluation and conduct EIA of High-Rise building, Highway construction, quarrying with case studies applying theoretical principles
CO3	Describe the classification and causative factors of hazards with case studies and define the terms related to disasters and hazards
CO4	List hazard prone belts and describe risk assessment and risk reduction methodologies
CO5	Explain disaster management cycle
CO6	Explain sustainable development and aspects related to SDGs and describe the scope of ecotourism in India and Kerala

COURSE TYPE	CORE
COURSE NAME	ENVIRONMENTAL ECONOMICS, POLICIES AND LAWS
COURSE CODE	ES 543
HOURS	90
COURSE OUTCOMES	
CO1	Comprehend the economics of natural resources exploitation
CO2	Identify the methods of economic valuation
CO3	List out and describe National Environmental Policy and Regulatory Frame Work
CO4	Describe the environmental laws in India
CO5	Explain the various environmental movements in India and International environment conventions and treatise
CO6	Describe and analyze the environmental standards and the scheme of labelling environment friendly products

COURSE TYPE	CORE
COURSE NAME	PRACTICAL IV
COURSE CODE	WASTE MANAGEMENT, IMPACT ASSESSMENT AND DISASTER MANAGEMENT
HOURS	72
COURSE OUTCOMES	
CO1	Perform vermiculture technique
CO2	Design a landfill and activated sludge system as per the criteria
CO3	Perform seed germination by using chosen waste materials
CO4	Perform EIA of the respective category
CO5	Prepare a Disaster Management Plan of the given disaster
CO6	Prepare an Environmental Audit/Green Audit/Energy audit

COURSE TYPE	CORE
COURSE NAME	PROJECT WORK
COURSE CODE	ES 545
COURSE OUTCOMES	
CO1	Conduct literature survey on a given topic
CO2	Perform meticulous planning of lab work

CO3	Demonstrate precision and practical skills
CO4	Perform statistics in the data acquired
CO5	Express the results and justify it with suitable scientific discussion
CO6	Prepare a well-structured dissertation