

M.Tech. (Environmental Science and Engineering) (Revised in 2018)

Programme Educational Objectives:

PEO 1: To impart students with strong knowledge base through theory courses and sessional that makes them suitable for industries, academics, research and consultancies.

PEO 2: To develop students analytical, computational and research skills through assignments, weekly presentations and modelling software.

PEO 3: To train the students on developing practical, efficient and cost-effective solutions on problems and challenges on environmental sciences and engineering.

PEO 4: To inculcate among student's sensitivity towards social and corporate responsibilities.

Programme outcomes:

PO1: Develop an ability to independently carry out research /investigation and development work to solve practical problems.

PO2: Develop an ability to write and present a substantial technical report/document.

PO3: Acquire a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program.

PO4: Acquire in-depth knowledge about various environmental processes, analyze and design solutions for complex problems related to environmental and public health.

PO5: Be able to critically evaluate environmental sustainability and sensitize communities through effective communications and assess alternative solutions for adequate decision making for overall environmental management.

PO6: Acquire professional and intellectual integrity and ethics to produce socially responsible and competent environmental scientists and engineers.

Course outcomes:

Course code: CE 527

Course title: ECOLOGY AND ENVIRONMENT

CO1	understand the multidisciplinary nature of environment, its life supporting factors and their operating principles
CO2	conceptualize the structure and function of ecosystem and to be able to determine the ecosystem characteristics on field.

CO3	develop an understanding of the importance, threats and conservation strategies for biodiversity.
CO4	critically analyze the impacts of ever increasing population, their unending demand for resources and unplanned development on environment.
CO5	analyze and think of different ecological processes for remediation of degraded environment.

Course code: CE 528

Course title: ENVIRONMENTAL CHEMISTRY AND MICROBIOLOGY

CO1.	Apply the fundamentals of environmental chemistry and microbiology, which are important for practice of environmental science and engineering
CO2.	Interpret the chemistry of air, soil and water pollution enabling them to work on its treatment
CO3.	Design and carry out environmental quality management projects
CO4.	Relate the concepts of environmental microbiology in aspects related to public health
CO5.	Appraise microbes for wastewater treatment and environmental remediation

Course code: CE 529

Course title: WATER SUPPLY ENGINEERING

CO1.	Able to assess the water quality for different water supply scheme
CO2.	Able to calculate water demand for upcoming or existing establishment over time
CO3.	Able to identify the sources for specific requirement
CO4.	Able to understand the existing treatment units and recommend the modern technologies required to meet new standards
CO5	Able to understand the existing distribution network and the modernisation of the same

Course code: CE532

Course title: WASTEWATER ENGINEERING

CO1.	Categorise terminology and parameters frequently used in wastewater management
CO2.	Appraise different parameters involved in the design of wastewater treatment plants
CO3.	Interpret and illustrate the basics of wastewater treatment methods
CO4.	Design aerobic and anaerobic wastewater treatment plants
CO5	Solve the routine problems in operations, control and management of wastewater treatment plants

Course code: CE533

Course title: AIR POLLUTION & CONTROL TECHNOLOGY

CO1	Able to identify air pollution problems and interpret air quality data.
CO2	Able to design an air pollution sampling and monitoring plan.
CO3	Able to recognize various meteorological condition and their effects in air pollutant dispersal.
CO4	Able to identify modern equipment usage in air pollution control.
CO5	Able to analyse the causes of vehicular emission and the need for technological advancement for control and able to conduct investigations for monitoring and control of noise pollution.

Course code: CE 534

Course title: SOLID WASTE MANAGEMENT

CO1.	Able to review the components and characteristics of a solid waste management system.
CO2.	Able to identify the various collection, transfer and transport mechanisms of municipal solid waste management.
CO3.	Able to design and operate various processing, material and energy recovery facilities.
CO4.	Able to design and operate solid waste landfill.
CO5.	Able to identify the different industrial solid waste pollutants and their minimisation and recovery technologies.

Course code: CE537

Course title: ENVIRONMENTAL IMPACT ASSESSMENT AND LEGISLATION

CO1.	Identify and analyse the international sustainable development initiatives and reports
CO2.	Understand the features of laws related to environment protection and pollution control
CO3.	Understand the process of Environmental Impact Assessment
CO4.	Analyse and document environmental projects and prepare management plan
CO5	Understand and apply the concepts of environmental audits and Clean development initiatives.

Course code: CE563

Course title: CLIMATE CHANGE AND ADAPTATION

CO1	Able to identify the control factors for climate system.
CO2	Able to analyse the causes of climate change.
CO3	Able to speculate the effects of global warming and the role of anthropogenic activities.
CO4	Able to conduct and formulate a risk and vulnerability assessment plan of climatic impacts on major systems.
CO5	Able to develop sustainable mitigation strategies for climate change AND calculate carbon credits for emission trading..

Course code: CE 564

Course title: INSTRUMENTS FOR ENVIRONMENTAL ENGINEERING

CO1	Understand the principle and the components and function of instruments in environmental engineering
CO2	Able to apply spectroscopic techniques for environmental samples analysis
CO3	Knowing about the application of chromatographic processes
CO4	Capable to select appropriate instrumental method for chemical analysis of air, water and soil

CO5	Able to design studies related for in situ and continuous monitoring of atmospheric and aquatic systems
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Course code: CE565

Course title: EARTH SCIENCES

CO1	Able to apply the knowledge of earth sciences to environmental processes.
CO2	Able to recognize the earth's natural processes and their role for land formation.
CO3	Able to understand the geophysical methods for subsurface investigations.
CO4	Able to identify suitable sites for construction of bridge, tunnels, dams etc.
CO5	Able to analyse the causes of geological hazards and suggest possible management solutions.

Course code: CE566

Course title: ENVIRONMENTAL ECONOMICS

CO1	Justify the necessity of natural resource conservation
CO2	The energy flow within different trophic levels of ecosystem
CO3	Able to relate environmental degradation with the economy
CO4	Assist in decision making in terms of resource valuation and conservation
CO5	understand the role of different bodies in controlling pollution

Course code: CE567

Course title: ENVIRONMENTAL STATISTICS

CO1.	Able to demonstrate the applications of statistical techniques in Environmental Science and Engineering.
CO2.	Able to understand the necessity of frequency distribution in environmental samples.
CO3.	Able to plan and design surveys and experiments.

CO4.	Able to statistically analyse the relation and variability in a set of environmental data.
CO5.	Able to identify the components of statistical data structure needed for various environmental data collection.

Course code: CE568

Course title: ENVIRONMENTAL TOXICOLOGY

CO1	grasp basic concepts of toxicology including movements of toxicants in environment and species and their effects.
CO2	learn about the different types of environmental toxicants in the environment, their fate and distribution.
CO3	understand, how species level effect ultimately impact the ecosystem as a whole
CO4	be familiar with the toxicants arising due to occupational exposure, their monitoring and effects on human health.
CO5	Understand the concept of suitable applications and interpretations of ecotoxicity assays and tests.

Course code: CE569

Course title: ENVIRONMENTAL BIOTECHNOLOGY

CO1.	Understanding the basic concept of environmental biotechnology for applications in environmental protection
CO2.	Knowing about the potential of DNA technology and its impacts on environment and society
CO3.	Able to apply environmental biotechnology for developing solutions for air pollution control
CO4.	Aware about various types of bioremediation processes
CO5.	Able to know the importance of environmental biotechnology in cleaner industrial production processes

Course code: CE570

Course title: ENVIRONMENT AND ENERGY MANAGEMENT

CO 1	Understand the need and origin of Environmental Management Standards
CO 2	Identify environmental aspects and impacts
CO 3	Prepare audit checklist and conduct mock auditing
CO 4	Understand the significance of ecolabels, and processes of life cycle assessment and performance evaluation
CO 5	Assess and understand energy audit and energy management

Course code: CE571

Course title: ADVANCED WASTEWATER TREATMENT

CO1.	evaluate the problem and apply advanced technologies in Wastewater treatment.
CO2.	apply membrane technique for wastewater reclamation
CO3.	apply advanced oxidation processes to treat non-biodegradable wastewater
CO4.	apply advanced treatment processes like adsorption, ion exchange to achieve desired objective
CO5	assess and reclaim the municipal wastewater for reuse

Course code: CE572

Course title: OCCUPATIONAL HEALTH AND INDUSTRIAL SAFETY

CO1	understanding the safety management system in industries, its development and necessity.
CO2	able to identify potential workplace hazards, risks and their mitigatory measures
CO3	knowing about the different methods of hazard control through engineering control, administrative initiatives and protective equipment
CO4	able to learn about the causation, effects and liabilities of industrial accidents.
CO5	aware of the Acts and laws pertinent to Industrial Health and safety.

Course code: CE573

Course title: ECOSYSTEM HEALTH AND ECO RESTORATION

CO1	Understand the role of ecology, ecosystem and human interface in achieving sustainability
CO2	Describe the role of key soil and water conservation concepts in restoration.
CO3	Identify processes and techniques for protecting the health of ecosystems
CO4	Evaluate and apply multidisciplinary approach to restore various ecosystems
CO5	Understand the role of indigenous knowledge in maintaining anthropogenic and natural ecosystem.

Course code: CE574

Course title: RENEWABLE ENERGY RESOURCES

CO1.	Know about the energy demand and crisis globally and learn about prospects of renewable energy sources and ways of energy conservation
CO2.	To critically know the design parameters and potential of solar energy
CO3	Assess the extent to apply wind energy systems
CO4	Understand the mechanism and processes of geothermal and ocean energy options
CO5	Understand the principles, processes and application of energy from biomass.

Course code: CE575

Course title: ENVIRONMENTAL AND NATURAL RESOURCE MANAGEMENT

CO1	Able to explain ecosystem services and necessity of natural resource conservation.
CO2	Able to relate the laws of ecosystem and the concept of carrying capacity with natural resource management.
CO3	Able to outline a plan to implement successful eco-restoration of degraded natural systems.
CO4	Able to reason out the causes of biodiversity loss and propose plan for conservation.
CO5	Able to differentiate between fuel, non- fuel resources and renewable, non-renewable resources.

Course code: CE576

Course title: ENVIRONMENTAL SCIENCE AND MANAGEMENT

CO1	To get introduced to the structure and composition of different spheres of environment and ecosystem and their functioning
CO2	To acquire knowledge about the major environmental challenges faced by the world, their causes, effects and mitigatory efforts
CO3	To understand the sources, sinks and effects of different environmental pollution
CO4	To analyze and evaluate the pollution control technologies to be applied for effective environmental management
CO5	Be exposed to the legal procedures, rules and regulations for management of environment.

Course code: CE577

Course title: INDUSTRIAL POLLUTION AND CONTROL

CO1	Able to identify sources, types, and control equipment's for industrial air pollution.
CO2	Able to analyse the causes and effect of waste water generation from industries and to select the suitable method for waste water treatment for an industry
CO3	Able to distinguish the role of industry in generation of solid waste and to construct a suitable industrial waste management plan.
CO4	Able to interpret the causes of land degradation due to industrialisation and devise its reclamation.
CO5	Able to conduct investigations to identify the causes of industrial risks and hazards and judge the applicability of pollution control laws in industries

Course code: CE578

Course title: WASTE MANAGEMENT

CO1	Identify and interpret the criteria for classification of wastes along with waste minimization source reduction and describe the procedures of various waste processing options
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CO2	Explain and interpret the regulations concerning the handling, transportation and disposal of municipal, hazardous, radioactive and biomedical wastes
CO3	Define and elucidate treatment and management of municipal solid wastes, hazardous wastes, radioactive wastes and biomedical wastes
CO4	Assess various physical/chemical/biological treatment techniques for conversion of wastes to resources
CO5	Evaluate various treatment technologies for wastewater management