

M.Tech. (Environmental Science and Engineering) (2011 Syllabus)

Programme outcomes:

1. To develop environmental scientists and engineers and sensitize them towards environmental issues.
2. To acquire analytical skills in assessing environmental impacts through a multidisciplinary approach.
3. To identify environmental problems and solutions through organized research.
4. To improve the communication and writing skill so as to face the competitive world

Course outcomes:

Name of course	Course outcomes
TES 1001 - Air Pollution and Control Technology	<ol style="list-style-type: none">1. Ability to identify air pollution problems and interpret criteria air quality data2. Ability to recognize various environmental transformation processes of pollutants under extreme weather condition.3. Ability to interpret meteorological data and develop capability to assessment of project proposal, air quality pollution index for any region4. Ability to justify the use of pollution control equipment and their design
TES 1003 - Environmental Chemistry & Microbiology	<ol style="list-style-type: none">1. Ability to identify air pollution problems and interpret air quality data on chemical characteristic.2. Ability to recognize various biotic and abiotic environmental transformation processes of pollutants.3. Skill to monitor and assess the functioning and status of various aquatic systems and devise management strategy to control the identified problems.4. Skill to monitor the health of soils for desired value such as agricultural activity, forestry etc.5. Capability to understand the partitioning of pollutants in various fractions of soil.6. Capacity to assess the bacteriological status of water and aquatic systems.

	<ol style="list-style-type: none"> 7. Ability to understand the importance of various microbial processes in wastewater treatment. 8. Capacity to apply conventional and novel bacterial wastewater treatment processes for nutrient removal.
<p>TES 1005 - Water Supply and Wastewater Management</p>	<ol style="list-style-type: none"> 1. Define and explain the significance of terms and parameters frequently used in water supply engineering and wastewater management. 2. Evaluate the influence of the different parameter in design and treatment of water treatment plant (water quality parameters) and wastewater treatment plant (wastewater characteristics). 3. Understand the uses of pumps and their applications in rural, urban and industrial sectors. Uses of pumps for raw water supply and wastewater supply. Its capacity calculations, costing, head loss, total head etc. 4. Basic methodology for water treatment (viz., sedimentation, coagulation, flocculation, filtration, disinfection and water softening) and wastewater treatment (screening, grit chambers, sedimentation, biological treatment and chemical treatment) 5. Assess methods employed for water reuse, wastewater reclamation and reuse, characterization of wastewater and storm water control. 6. Give design for unit operations specific to wastewater treatment. Operation, control and monitoring of wastewater treatment facilities. Particular emphasis is given to the following areas: <ul style="list-style-type: none"> • Pretreatment practices and methodology • Biological treatment kinetics • Activated sludge, extended aeration and sequencing batch reactors • Aerobic and aerated lagoons • Oxygen utilization and aeration • Trickling filters

<p>TES 1007 - Ecological Dynamics & Energy</p>	<ol style="list-style-type: none"> 1. Develop an understanding of structure and function of an ecosystem with reference to nutrient dynamics and energy flow. 2. Become familiar with the biotic and abiotic components of various ecosystems of the earth and know the variety of ways that organisms interact with both the physical and the biological environment. 3. Develop an understanding of the biogeochemical cycles and their significance in the sustainability of ecosystems. 4. Be familiar with the major energy issues and challenges of the 21st century 5. Have knowledge of the technicalities of Renewable energy resources and their major role in dealing with the recent energy crisis of the world. 6. Be familiar with the energy audit procedure for commercial and industrial units. 7. Become proficient in writing a scientific paper in the format of the journal, Ecology. 8. Be aware of the advantages, disadvantages and hazards related to energy related industrial operations.
<p>TES 1009- Noise Pollution & Control Technology</p>	<p>Students will be able to:</p> <ol style="list-style-type: none"> 1. Understand the causes and effects of noise on human health. 2. Acquire knowledge on noise control mechanisms suitable for various settings.
<p>TES 1011 - ISO 14000- Environmental Management System</p>	<ol style="list-style-type: none"> 1. Ability to understand the need and origin of Environmental Management Standards 2. Ability to identify environmental aspects and impacts 3. Conduct Mock Auditing 4. Assess and understand product life cycle. 5. Identify global and national eco labels
<p>TES 1013 - Environmental Economics & Sustainable Development</p>	<ol style="list-style-type: none"> 1. Explain the functions and structure of different ecosystems. 2. Sketch the energy flow within different trophic levels of ecosystem.

	<ol style="list-style-type: none"> 3. List the various categories of natural resource. 4. Justify the necessity of natural resource conservation. 5. Design ecological restoration plan for different types of degraded ecosystems. 6. Identify the reasons for biodiversity loss and evaluate the status of biodiversity in a particular region. 7. Explain different biodiversity conservation measures. 8. Interpret earth's behavior as natural system. 9. Justify the need of sustainable development. 10. Judge the applicability of life cycle assessment, product stewardship, cleaner production and corporate social responsibility as tools of environmental management.
<p>TES 1015 - Environmental & Natural Resource Management</p>	<ol style="list-style-type: none"> 1. Understand the structure and function of different ecosystems either terrestrial or aquatic in nature 2. Become familiar with the biotic and abiotic components of various ecosystems of the earth and know the variety of ways that organisms interact with both the physical and the biological environment. 3. Develop an understanding of the biogeochemical cycles and their significance in the sustainability of ecosystems. 4. Learn about the rich biodiversity of India 5. Understand the energy scenario of india, its major challenges, options and policy of our country 6. Have knowledge of the technicalities of Renewable energy resources and their major role in dealing with the recent energy crisis of the world. 7. Be familiar with the cost-benefit analysis of energy installations including their fixed

	<p>and operating costs</p> <ol style="list-style-type: none"> 8. Learn about the cost incurred with shifting of technologies or adopting new technologies for environmental control in industries. 9. Have an overall concept about the importance of environment and holistic decision taking ability keeping environmental betterment in mind.
TES 1017 - Ecological Science & Management	<p>After successful completion of the course, students will be able to:</p> <ol style="list-style-type: none"> 1. Understand the fundamentals of ecosystem structure and function 2. Study and interpret vegetation community structures in environment 3. Understand the components, threats and management options of biodiversity 4. Further study about non- conventional and renewable energy resources
TES 1002 - Geospatial Laboratory	<ol style="list-style-type: none"> 1. Ability to interpretation of satellite imagery. 2. Ability to download data and its processing. 3. Preparation of LULC maps. 4. Analysis of maps.
TES 1004 - Environmental Lab.- I	<p>After successful completion of the course, students will be able to:</p> <ol style="list-style-type: none"> 1. Determine various water quality parameters through various techniques 2. Design sampling and analysis protocols for monitoring of various environmental quality at local, regional, national and international level 3. Interpret the data of environmental variables and write report on the environmental quality
TES 2001 - Solid Waste Management	<ol style="list-style-type: none"> 1. An ability to identify and interpret the criteria for the classification of a substance as a solid/hazardous wastes. 2. An ability to recognize waste minimization and source reduction, assess and describe the procedure for solid and hazardous waste identification and characterization and various waste processing options. 3. Define and elucidate the management,

	<p>treatment and disposal of hazardous wastes.</p> <ol style="list-style-type: none"> 4. Skill to assess and develop physical/chemical/biological treatment techniques for the control of hazardous wastes. 5. Skill to address and describe solid waste management including landfill operation. 6. Skill to manage industry specific solid waste issues. 7. Ability to design and execute land reclamation projects. 8. Ability to apply ecological concepts in reclamation of degraded lands.
<p>TES 2003 - EIA, Laws and Protocols</p>	<ol style="list-style-type: none"> 1. Understand the various international and national treaties, and convention that laid the foundation for environmental awareness and revolution globally. 2. Understand the protocols responsible for GHG control, ozone hole depletion, control on transboundary movement of hazardous waste and their dumping into forum island. 3. Elucidate and assess the Indian regulations on control and prevention of air pollution, water pollution; protection of forest and wildlife, and public liability insurance. 4. Understand project clearance process, the authorities and EIA process. 5. Identify term of references for various projects and respective mitigation measures. 6. Assess the impacts of various projects based on EIA methodologies. 7. Identify the components of conflicts and the need of public participation in EIA. 8. Develop plan for Disaster management. 9. Analyse the concept of ISO 14000 and EA with reference to Life cycle of a product.
<p>TES 2005 - Environmental System Engineering</p>	<ol style="list-style-type: none"> 1. An ability to apply the knowledge of science, mathematics and engineering and work with multidisciplinary team

	<ol style="list-style-type: none"> 2. An ability to analyze , interpret data and use appropriate optimization techniques 3. An ability to design & formulate a system and its components as per the desired need and solve engineering problems 4. An understanding of professional , ethical responsibility and knowledge of contemporary issues 5. An ability to minimize the environmental impact and opt for cost-effective remediation techniques
<p>TES 2007 - Environmental Biotechnology & Ecotoxicology</p>	<p>Students will be able to:</p> <ol style="list-style-type: none"> 1. Understand the basic concepts of biotechnology and its application in environmental engineering 2. Correlate the effects of different toxicants on body systems 3. Apply the knowledge of remediation in environmental engineering
<p>TES 2009- Industrial Health and Safety</p>	<ol style="list-style-type: none"> 1. Understand the role of occupational health and safety in the workplace in the prevention of incidents, injury and illness. 2. Develop an understanding about the role of plant layout, housekeeping and machine guards to assure health and safety in workplaces. 3. Have a basic understanding of fire hazards in industry, its causes, types, detection and extinguishing procedures. 4. Be familiar with Safety training and education to be imparted to employees and employers of an organisation to ensure health and safety. 5. Understand the safety organisational structure and function to implement OHSAS 18001 in industries. 6. Have knowledge about the different types of effective personal protective gears used in industry for specific operations, their maintenance and disposal methods. 7. Have knowledge about Hazard assessment studies and ways to handle hazard situations in industry acting as Environment

	<p>and Safety officers.</p> <ol style="list-style-type: none"> 8. Understand the modus operandi of onsite and offsite emergency control plans in industry. 9. Know the structure and function of Disaster management group to handle emergency situations. 10. Understand the economics of safety regarding individual and family, organisation and society.
TES 2011 - Industrial Pollution Control	<ol style="list-style-type: none"> 1. Identify sources, types, and control equipment's for industrial air pollution. 2. Identify sources of water pollution, general water treatment, wastewater treatment and issues pertaining water quality degradation 3. Understand reasons for land degradation, soil quality loss, and identify essential nutrients for productivity. 4. Define reclamation process with specification for on mining area reclamation, grassland reclamation and wetland reclamation. 5. Specify the components of OHSAS and its requirement in hazard identification and management. 6. Classify various health problems emerging out off industrial activities.
TES 2013 - Remote Sensing for Environmental Studies	<ol style="list-style-type: none"> 1. Ability to understand remote sensing technology and download and interpret satellite imageries. 2. Ability to assess environmental and ecological status and changes. 3. Apply GIS tools in environmental assessment & management. 4. Ability to use GIS techniques in disaster studies.
TES 2015 - Atmospheric Science	<p>Students will be able to:</p> <ol style="list-style-type: none"> 1. Understand the concepts of atmospheric sciences and meteorology.

	<ol style="list-style-type: none"> 2. Correlate the implication of atmospheric changes with climate change
<p>TES 2017 – Waste Management</p>	<ol style="list-style-type: none"> 1. An ability to identify and interpret the criteria for the classification of a substance as a solid/hazardous wastes. 2. An ability to recognize waste minimization and source reduction, assess and describe the procedure for solid and hazardous waste identification and characterization and various waste processing options. 3. An ability to explain and interpret the regulations concerning the handling, transportation and disposal of municipal, hazardous, radioactive and biomedical wastes. 4. Define and elucidate the management, treatment and disposal of hazardous, radioactive, biomedical wastes. 5. Skill to assess and develop physical/chemical/biological treatment techniques for the control of hazardous wastes. 6. Skill to address and describe solid waste management including landfill operation. 7. An ability to explore various options such as biogas and biofuel production for energy recovery from biomass and wastes 8. Capability to describe and assess various biotreatment technologies for solid and liquid waste management.
<p>TES 2002 - Environmental System Engineering Lab.</p>	<ol style="list-style-type: none"> 1. An ability to apply the knowledge of science, mathematics and engineering and work with multidisciplinary team 2. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability 3. An ability to design & formulate a system and its components as per the desired need and solve engineering problems 4. An ability to use the techniques, skills, and modern engineering tools necessary for

	<p>engineering practice</p> <ol style="list-style-type: none"> 5. An understanding of professional , ethical responsibility and knowledge of contemporary issues 6. An ability to minimize the environmental impact and opt for cost-effective remediation techniques 7. Have established careers in Industrial and Systems Engineering in industry, service, consulting, or government organizations.
<p>TES 2004 - Environmental Lab. -II</p>	<p>After successful completion of the course, students will be able to:</p> <ol style="list-style-type: none"> 1. Distinguish between species, populations, communities in ecosystems. 2. Compare and contrast terrestrial, and aquatic ecosystems. 3. Perform flora inventory survey in Environmental Impact Assessment studies