

M.S. Ramaiah University of Applied Sciences

New BEL Road, MSR Nagar, Bangalore – 560054



**RAMAIAH
UNIVERSITY**
OF APPLIED SCIENCES

PO, PSO, PEO & CO

**Programme: M.Tech. in Environmental
Engineering & Management**

Programme Code: 125

Programme Outcome (PO)

Programme Specific Outcome (PSO)

Program Educational Objectives (PEO)

Course Outcomes (CO)

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Bangalore-560058

Registrar
M.S. Ramaiah University of Applied Sciences
Bangalore - 560 054

Faculty of Engineering and Technology (FET)

Programme Name: M.Tech. (Environmental Engineering and Management)

Programme Outcomes (POs)

M.Tech. graduates will be able to:

- PO-1. Acquire, comprehensive knowledge and understanding of the methodologies, principles, practices and technologies of the engineering domain to solve complex problems with technical competence
- PO-2. Conceptualize, apply, analyze, synthesize and evaluate information related to complex engineering problems using principles of mathematics, science and engineering to create new and innovative solutions
- PO-3. Provide solutions to engineering problems by designing systems, components or processes to meet the specified needs considering public health, safety, societal and the environmental considerations
- PO-4. Review research literature, standards, guidelines, best practices, research methods and laboratory techniques to solve engineering problems through experimental investigations, analysis and interpretation of results
- PO-5. Create, select and apply appropriate techniques and IT tools to model and solve complex engineering activities and utilize available resources effectively
- PO-6. Understand the effect of engineering solutions on legal, cultural, social, public health and safety aspects and the consequent responsibilities
- PO-7. Develop sustainable engineering solutions and assess their effect on society and environment
- PO-8. Understand and apply ethical principles to engineering practices and professional responsibilities
- PO-9. Function effectively as an individual or a team player to handle diverse problems in multi-disciplinary settings
- PO-10. Make oral and written presentations to communicate technical ideas effectively to engineering community and society at large
- PO-11. Apply the knowledge of engineering and management principles to manage projects in multi-disciplinary environments with consideration to cost and time
- PO-12. Engage in lifelong learning and adapt to changing engineering/technology and societal requirements



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Program Educational Objectives (PEOs)

The Programme educational objectives of the M.Tech. (Environmental engineering & Management) Programme are:

- PEO-1.** To provide in-depth knowledge in the specialized engineering domain to enable them to deliver efficient solutions for complex engineering problems by critical thinking
- PEO-2.** To enable students to design and develop sustainable innovative solutions for industry and societal requirements through applied research by conducting engineering investigations through experimentation and usage of modern tools
- PEO-3.** To inculcate ethics, communication, leadership, soft, managerial and entrepreneurial skills for successful career in industries and to engage in lifelong learning

Programme Specific Outcomes (PSOs)

At the end of the M.Tech. (Environmental engineering & Management) program, the graduate will be able to:

- PSO-1.** Apply the knowledge and principles of aerospace design to conceptualize and develop efficient solutions to complex engineering problems through critical analysis
- PSO-2.** Design and develop sustainable aerospace design solutions to industry and societal requirements through applied research, concepts and techniques involving experimentation and usage of modern design and modelling tools
- PSO-3.** Demonstrate ethics, leadership qualities, communication, entrepreneurial skills and involvement in lifelong learning for betterment of organisation, environment and society

Course Outcomes (COs)

Course Title & Code: Public Health Engineering (20ESCS501A)

After undergoing this module students will be able to:

- CO-1.** Discuss classification of sources of water, demands of water and conduct survey
- CO-2.** Discuss classification of wastewater, characteristics of sewage and industrial waste water, various treatment processes available
- CO-3.** Estimate sewage and storm water flow
- CO-4.** Distinguish different water treatment processes, sewage lines, process of Effluent Treatment – Pretreatment, Primary, Secondary, Tertiary treatments and their design
- CO-5.** Compare various disposal standards for sewage and sludge and recommend treatments for a given Industrial waste water


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CO-6. Apply environmental treatment technologies and design processes

Course Outcomes (COs)

Course Title & Code: Modern Methods of Waste Characterization (20ESC502A)

After undergoing this Course students will be able to:

- CO-1. Discuss the importance of waste characterization
- CO-2. Recognize the advantages of instrumental methods over wet chemical methods for waste characterization
- CO-3. Recommend suitable spectroscopic method to analyze a particular type of waste
- CO-4. Identify chemical compounds in the waste using chromatographic techniques
- CO-5. Predict the quality of water using electro and radio analytical method

Course Outcomes (COs)

Course Title & Code: Waste Water Treatment Plant Design (20ESC503A)

After undergoing this module students will be able to:

- CO-1. List and explain the characteristics of effluents generated in industries
- CO-2. Classify and explain mechanical, chemical and biological treatment methods with respect to on site and combined effluent treatment plants (CETP)
- CO-3. Calculate residence time and proportioning of flow variations, state the design criteria for treatment and draw plant layout
- CO-4. Suggest Instrumentation for measurement of important characteristics of sewage/effluent including measurement of flow
- CO-5. Perform sizing calculations for different units and design an effluent treatment plant for a given influent of waste

Course Outcomes (COs)

Course Title & Code: Air pollution and control (20ESE511A)

After undergoing this module students will be able to:

- CO-1. Discuss outdoor and indoor air pollution, ambient air quality, emission standards, noise pollution and their effect on global environment including human health and vegetation
- CO-2. Evaluate the current practices available in air quality monitoring, control of gaseous, particulate pollutants and automobile emission control and their design
- CO-3. Analyze dispersion of air pollutants and modeling approaches for air pollution profile
- CO-4. Interpret meteorological data, air pollution data and develop capability to assessment of project proposal, air quality pollution index for any region
- CO-5. Develop air pollution model and engineering solutions to air pollution and noise pollution problem


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Course Outcomes (COs)

Course Title & Code: Toxicology and environmental risk assessment (20ESE512A)

After undergoing this module students will be able to:

- CO-1. Discuss fate and effects of pollutants, pollution distribution in the environment (including air, water, soil and food chains) both on a local and a global scale
- CO-2. Discuss the interaction between environmental toxicants and organisms, and how their impacts on populations and ecosystems. competencies by augmenting the Environmental Law awareness
- CO-3. Discuss the methods of field work and/or experimental exposure studies in laboratory on individual organisms

Course Outcomes (COs)

Course Title & Code: Aquatic biodiversity and environmental pollution (20ESE514A)

After undergoing this module students will be able to:

- CO-1. Discuss systematic examination of the full array of organisms.
- CO-2. Discuss the methods by which diversity can be maintained and used for the benefit of mankind in India.

Course Outcomes (COs)

Course Title & Code: Energy in built environment (209ESE521A)

After undergoing this module students will be able to:

- CO-1. Discuss various energy use and energy processes in building
- CO-2. Discuss interaction of various external parameters influencing building energy requirements
- CO-3. Discuss the energy requirements for lighting, air-conditioning, etc.
- CO-4. Discuss energy audit and energy conservation measures in buildings
- CO-5. Discuss management of indoor environmental requirements

Course Outcomes (COs)

Course Title & Code: Renewable energy sources and environmental Impact (20ESE522A)

After undergoing this module students will be able to:

- CO-1. Understand and realize the importance of renewable sources of energy
- CO-2. Gain sufficient knowledge about the various renewable energy sources such as wind, solar, bioenergy etc.
- CO-3. Describe different technologies involved in the utilization of various renewable energy sources
- CO-4. Illustrate the environmental impacts of various renewable energy sources
- CO-5. Implicate the health and safety impacts of various renewable energy sources


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Course Outcomes (COs)

Course Title & Code: Alternative fuels (20ESE523A)

After undergoing this module students will be able to:

- CO-1. Discuss importance of alternative fuels and various sources of its production
- CO-2. Discuss combustion and emission characteristics of various gaseous and liquid alternative flues
- CO-3. Discuss engine requirements and adaptability of engines to alternative fuels

Course Outcomes (COs)

Course Title & Code: Industrial and commercial applications of renewable energy (20ESE524A)

After undergoing this module students will be able to:

- CO-1. Discuss the effects of power generated by renewable energy sources, renewable energy production technology, energy efficiency, and market regulation on carbon emissions
- CO-2. Discuss direct and indirect effects on carbon emission reduction.
- CO-3. Discuss renewable energy consumption, production technology, market regulation, and their relations
- CO-4. Develop the structure of a marketplace for renewable energy sources and outlined the requirements for this market to function effectively.

Course Outcomes (COs)

Course Title & Code: Solid waste and hazardous waste management (20ESC511A)

After undergoing this module students will be able to:

- CO-1. Discuss causes for the generation of municipal, industrial solid waste, Air pollution and concepts of recycling, reuse and reclamation of solid wastes
- CO-2. Evaluate the current practices available in solid waste management and Air pollution control
- CO-3. Compare different solid waste storage and collection methods
- CO-4. Develop best techniques for municipal and industrial solid waste management satisfying safety and environmental norms

Course Outcomes (COs)

Course Title & Code: Solid waste and hazardous waste treatment plant design (20ESC512A)

After undergoing this module students will be able to:

- CO-1. Discuss the process of aerobic, anaerobic digestion, composting of solid waste, absorption, adsorption principles of gaseous air pollutants and different gaseous control equipments


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- CO-2. Explicate thermal treatment of solid waste, compare different treatment methods
- CO-3. Determine factors affecting aerobic , anaerobic digestion, composting and thermal treatment
- CO-4. Choose appropriate treatment method based on characteristics of solid waste
- CO-5. Perform design calculations for energy extraction from solid waste
- CO-6. Design a treatment plant for a given amount of solid waste

Course Outcomes (COs)

Course Title & Code: Environmental biotechnology (20ESC513A)

After undergoing this module students will be able to:

- CO-1. Discuss environmental management processes water and wastewater quality monitoring by biotechnological processes
- CO-2. Analyse wastewater and air pollution control by biotechnological methods
- CO-3. Evaluate alternative methods for combined biological nutrient removal
- CO-4. Application of bioaccumulation, biodegradation and bioremediation processes in wastewater, municipal solid waste and hazardous waste management

Course Outcomes (COs)

Course Title & Code: Rural water supply and sanitation (20ESE531A)

After undergoing this module students will be able to:

- CO-1. Discuss the impact and use of safe water supply facilities in rural areas
- CO-2. Discuss sanitation and hygiene practises for rural communities
- CO-3. Develop the sector to ensure actually response to the demand of rural population

Course Outcomes (COs)

Course Title & Code: Integrated waste management in smart cities (20ESE532A)

After undergoing this module students will be able to:

- CO-1. Discuss comprehensive knowledge of municipal waste management
- CO-2. Develop knowledge on construction-demolition waste and electronic waste management
- CO-3. Develop practical skills to facilitate effective engagement with Swachh Bharat, Smart Cities development mission
- CO-4. Discuss new rules with respect of C&D Waste and E-Waste Management

Course Outcomes (COs)

Course Title & Code Entrepreneurship in waste management (20ESE533A)

After undergoing this module students will be able to:

- CO-1. Understand business scope of waste to wealth value chain

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- CO-2. Discuss on business opportunities and challenges in waste to wealth value chain
- CO-3. Develop waste to wealth entrepreneurship proposals
- CO-4. Prepare project feasibility report
- CO-5. Develop a framework for maintenance and operations of waste to wealth systems

Course Outcomes (COs)

Course Title & Code: Transport process and modelling of aquatic system (20ESE534A)

After undergoing this module students will be able to:

- CO-1. Discuss evaluation and control techniques of water quality management in streams, lakes, and estuaries.
- CO-2. Develop Mathematical analyses of patterns of water movement and their relation to water quality.
- CO-3. Discuss Fate and transport of contaminants in natural aquatic systems
- CO-4. Develop the design and management of environmental and water resource systems

Course Outcomes (COs)

Course Title & Code: Geo-environmental engineering (20ESE541A)

After undergoing this module students will be able to:

- CO-1. Discuss the causes for soil pollution and behaviour of the pollutants.
- CO-2. Discuss current practice for waste disposal.
- CO-3. Develop remediation of contaminated sites, evaluate and monitor to bring natural attenuation

Course Outcomes (COs)

Course Title & Code: Remote sensing and GIS in environmental engineering (20ESE542A)

After undergoing this module students will be able to:

- CO-1. Discuss the principles and practices of Remote Sensing and GIS
- CO-2. Comprehend the knowledge to societal monitoring requirements
- CO-3. Develop strong interdisciplinary understanding of critical perspective on Remote Sensing and GIS in monitoring the environment.
- CO-4. Discuss application of remote sensing and GIS data in Environmental modeling

Course Outcomes (COs)

Course Title & Code: Treatment Plants Operation and Maintenance (20ESE543A)

After undergoing this module students will be able to:

- CO-1. Discuss treatment plant operating procedures for waste water, sewage, effluent, solid and hazardous wastes



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- CO-2. Demonstrate effective and safe operating procedures of treatment plants Optimize plant operating parameters
- CO-3. Perform indoor / outdoor air pollution sampling and explain noise pollution control
- CO-4. Propose appropriate maintenance activities (mechanical equipment, electrical / instruments and annual maintenance procedures)
- CO-5. Develop standard operating procedures (SOPs) and operating and maintenance

Course Outcomes (COs)

Course Title & Code: Environmental policies and legislation (20ESE544A)

After undergoing this module students will be able to:

- CO-1. Discuss comprehensive knowledge to the participants in Environmental Law and policy
- CO-2. Understanding on key issues related to National as well as International Environmental Law & Policies
- CO-3. Develop knowledge on the International Legal & Policy context on thematic issues related to environment
- CO-4. Develop practical skills to facilitate effective engagement with the Environmental Law
- CO-5. Discuss well-informed professionals in Environmental Law and to upgrade the professional competencies by augmenting the Environmental Law awareness
- CO-6. Develop networking and sharing of experiences among participants to actively contribute towards conservation



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