M.Tech - Energy and Environmental Management

PROGRAM OUTCOMES (POs)

On completion of programme our graduates will be able to

- **PO1:** Independently carry out research /investigation and development work in the field of energy and environmental engineering to solve practical problems.
- **PO2:** Write and present a substantial technical report/document.
- **PO3:** Demonstrate competencies, sensitivity, and adaptability to deal with the challenges of the energy and environmental management.
- **PO4:** Apply domain knowledge to provide sustainable solution to energy security from the global and Indian perspective.
- **PO5:** Practice ethical and responsible actions while managing energy and environment related problems.
- **PO6:** Develop model, analyze and system simulation for performance evaluation and optimization of energy systems

Course outcomes Cos

Batch: 2019-2021

I	18MTEEM101	**Foundation for Energy Engineering**	CO1 :Apply laws of thermodynamics to various processes and systems
			CO2: Apply Bernoulli's equation for flow measurements.
			CO3: Describe the principles of heat transfer mechanisms and importance of efficient energy utilization.
			CO4: Demonstrate knowledge on the basic concepts of electrical machines.
			CO5:Discuss on potential application of various sources of energy
			CO6 :Comprehend the concepts related to energy management.
I	18MTEEM102	**Non conventional Energy Conversion System**	CO1 : Comprehend energy scenario of world as well as India
			CO2: Discuss on the concepts of Biomass power generation
			CO3: Explain working of wind power generation systems
			CO4: Elucidate on OTEC, wave and Tidal power generation systems
			CO5: Discuss on the geothermal energy conversion and fuel cells
			CO6 : Demonstrate the working principle of non conventional energy conversion
I	18MTEEM101L	**Heat Transfer Lab**	CO1 :determine thermal conductivity of metal rod
			CO2: determine Effectiveness of a metallic fin
			CO3: determine radioactive properties of a surface
			CO4: evaluate performance of heat exchangers
			CO5: apply Bernoulli's equation for flow measurement
			CO6 :determine fluid properties
I	18MTEEM102L	**Energy Conversion Lab**	CO1 :discuss on various instrument applied in the field of energy management
			CO2: analyze energy conversion efficiency internal combustion engines with gasoline
			CO3:determine fuel properties
			CO4:explain the construction and working of Solar Energy Minilab Apparatus
			CO5:Determination of efficiency of solar panel
			CO6 : evaluate performance of a solar flat plate thermosyphon water heating system
1	18MTEEM131	Energy conservation	CO1 : Discuss about energy conservation in various thermal and electrical utilities.
			CO2: Describe working principle and applications of waste heat recovery systems
			CO3: Discuss on the methods for improvement of thermal comfort and energy efficiency of buildings
			CO4: Explain the design, significance and applications of various energy storage systems

			CO5: Apply the methods of energy conservation in industrial and residential sector based on similar case studies
			CO6 : Discuss in the significance, application and management of energy conservation technologies.
1	18MTEEEM132	Smart Grid Technologies	CO1 : Discuss smart grids and analyze grid policies and development in smart grids.
			CO2: Develop concepts of smart grid technologies in hybrid electrical vehicles etc.
			CO3: Describe smart substation, feeder automation, and GIS.
			CO4: Analyze micro grids and distributed generation systems.
			CO5: Analyze the effect of power quality in smart grid
			CO6 : Discuss on the latest developments in ICT for smart grid
1	18MTEEEM133	Instrumentation for thermal systems	CO1 : Discuss on characteristics of measurements. experimental planning and selection of measuring instruments
			CO2: Discuss on application of microprocessors and computers in measurements
			CO3: Select suitable instrument for measurement of thermo-physical properties,
			CO4: Discuss on advanced measurement techniques
			CO5: Apply suitable analyzers based on situations
			CO6 : implement measurements systems for various thermal systems
1	18MTEEEM141	Industrial Waste Management And Recycling	CO1 : Develop sustainable strategies to support the application of ISWM plan
			CO2: Discuss on landfills, leachate production and storm water management
			CO3: Categorize the waste from various industries & recycle for energy extraction.
			CO4: Discuss on basics of water treatment processes
			CO5: Elucidate on environmental issues in agriculture
			CO6 : To realize the importance of treatment, Disposal and energy recovery of waste from various industries
1	18MTEEM142	Environmental Impact Analysis	CO1 :carry out scoping and screening of developmental projects for environmental and social assessments
			CO2: explain different methodologies for environmental impact prediction and assessment
			CO3: environmental impact assessments and environmental management plan
			CO4: address the issues related to the Project Affected People
			CO5: evaluate environmental impact assessment reports
			CO6 : carryout environment assessment for infrastructure projects, dams, highways and multi storey buildings
1	18MTEEM143	Ecology and Eco system Dynamics	CO1 : discuss on scope of ecology, population ecology and species interactions
			CO2: explain community structure and organization
			CO3:elucidate on ecological pyramids and biogeochemical cycles
			CO4:create awareness about the consequences of our actions on aquatic biome
			CO5: comprehend changes in ecosystem structure caused by

			environmental disturbances or by internal forces
			CO6 : demonstrate knowledge on the interdependence between people and nature that is vital for food production, maintaining clean air and water, and sustaining biodiversity in a changing climate.
2	18MTEEM201	Design of water and Waste water treatment systems	CO1 :Select the appropriate processes necessary to supply potable water or to treat wastewater system for a community
			CO2: Develop the conceptual schematics required for the treatment of water and wastewater
			CO3:Discuss the role and importance of industrial wastewater management.
			CO4: Explain the basics of industrial waste water treatment methodologies.
			CO5: Select the effective residual management system and methods.
			CO6 : Describe suitable treatment processes and develop a water and wastewater management plan.
2	18MTEEM202	Photovoltaic and Solar Thermal Energy	CO1 :Demonstrate the fundamentals of solar radiation and its measurements
			CO2: Understand the physics of PV system
			CO3:Explain the principles of various PV cell manufacturing technologies
			CO4:Design the ON grid and OFF grid PV system for the given application
			CO5:Explain the importance of various solar thermal systems
			CO6 :Estimate the system size requirement for different PV systems.
2	18MTEEM201L	Water treatment Lab	CO1 :determine the phenolphthalein alkalinity and methyl orange alkalinity or total alkalinity
			CO2: determine the methyl orange acidity and phenolphthalein acidity or total acidity of a given sample of water.
			CO3:determine the carbonate, non carbonate, calcium hardness and magnesium hardness of a given sample of water
			CO4:determine the amount of chloride in a given sample of water
			CO5:estimate of residual chlorine and percentage of chlorine available in a given sample
			CO6 :determine the quantity of Dissolved Oxygen present in a given sample using Wrinkler's method
2	18MTEEM202L	Solar and wind energy Lab	CO1 :Discuss on greenhouse effect, various types of wind mill, direct and diffused beam solar radiation
			CO2: Evaluate performance of solar flat plate collector
			CO3:Analyse the effect of solar flat plate collector in parallel combination
			CO4:Evaluate performance of concentrating solar collector, solar PV panel and PV panel in series and parallel combination
			CO5:Analyse the effect of tilt angle on solar PV panel
			CO6 :Discuss on the effect of surrounding temperature on PV panel

2	18MTEEM231	Design And Optimization Of Energy Systems	CO1 :Discuss on basic concepts of energy systems design
			CO2: Simulate energy systems based on system models
			CO3:Formulate optimization problems for energy systems
			CO4:Select suitable search methods and gradient methods for unconstrained optimization problems
			CO5:Apply dynamic and geometric programming for energy systems
			CO6 :Apply suitable optimization techniques in energy system design
2	18MTEEM232	Environment laws, Standards & Certifications	CO1 :Discuss on need, origin and development of environmental laws
			CO2: Explain how climate change is measured and the reason for it
			CO3:Discuss on acts and effects of air pollutions related to automobile and industrial sectors
			CO4:Explain laws and standards related to water pollution
			CO5:Control noise pollution through proper identification of source and suitable mitigation measures
			CO6 :Comprehend climate changes and suggest mitigation actions
2	18MTEEM233	Energy Auditing	CO1 : Demonstrate knowledge on the energy auditing procedures and types.
			CO2: Discuss on the energy conservation opportunities in lighting and electrical load management.
			CO3: Discuss on the energy conservation opportunities in boilers
			CO4: Assess the performance and efficiency of thermal fluid heaters and compressed air networks.
			CO5: Discuss on the energy conservation opportunities in refrigeration and air conditioning systems.
			CO6 : prepare energy audit report for industrial, residential and commercial applications.
2	18MTEEM234	Climate Change and Mitigation	CO1 :Discuss on climate change and elements of the climate
			CO2: Explain how climate change is measured and the reason for it
			CO3:Discuss on ecological effects of climate change
			CO4:Explain technologies of carbon capturing and storage
			CO5:Elucidate on carbon dioxide transportation
			CO6 :Comprehend climate changes and suggest mitigation actions
2	18MTEEM241	Energy systems Modeling and Analysis	CO1 :Identify the suitable method of optimization
			CO2: model thermal systems and thermal equipments
			CO3:Apply various methods of numerical simulation
			CO4:Solve problems related to linear and dynamic programming and geometric programming
			CO5:Compare different elimination methods
			CO6 :Apply Uniform Exhaustive Search and Dichotomous Search Methods for thermal systems

2	18MTEEM242	Energy Scenario and Energy Policy	CO1 :Explain on role of energy in economic development and social transformation and energy resources
			CO2: Discuss on future energy options, energy crisis and energy security
			CO3:Elucidate on various modes of consumption of energy
			CO4:Comprehend the acts enacted related to energy conservation
			CO5:Discuss on energy polices of various countries, industries and organizations
			CO6 :Suggest alternate energy resources and policy implications
2	18MTEEM243	Wind Power conversion	CO1 :Describe the concepts of atmospheric stability and wind mechanics
			CO2: Measure and analyse wind patterns
			CO3:Specify the aerodynamics and engineering components of wind turbines and power systems
			CO4:Discuss on principles of horizontal, vertical and combined wind turbines
			CO5: Conduct economic and environmental assessment of wind power plants
			CO6 :Analyse the capacities and efficiencies of wind power systems as per the industrial requirements
2	18MTEEM244	Energy Management	CO1: Discuss on the basics of energy scenario and energy security CO2: Evaluate the energy saving potentials in boilers, furnaces and steam & condensate systems. CO3: Conduct financial evaluation of various alterntives of energy management solutions CO4: Discuss on the methods and applications of waste heat recovery. CO5: Apply the energy conservation solutions to electrical utility systems CO6: Implement the energy management systems for various industrial backgrounds
3	18MTEEM311	**Design of Heat Transfer Equipments**	CO1 :Apply design procedures of double pipe heat exchanger, shell and tube heat exchanger, recuperative air pre Heater and economizers
			CO2: Estimate sulphur acid due point
			CO3:Estimate flow in each element of a tub assembly, attenuation factor and direct radiation from furnace
			CO4:Discuss on the effect of tube side velocity on surface area and pressure drop for various tube sizes
			CO5:Use of psychometric chart for the design of cooling tower
			CO6 :Apply design procedures of double Pipe Heat Exchanger, design of shell and tube heat exchanger
3	18MTEEM312	Pollution Control in Power Plants	CO1 :Enumerate pollutants from power generation points
			CO2: Discuss on effects, measurement and monitoring of air pollution caused by power plants
			CO3:Develop air pollution models to predict the effects

			CO4:Discuss on fundamentals of sound generation, propagation and measurement
			CO5:Elucidate on noise prevention and mitigation measures
			CO6 :Suggest measures to minimize impacts on the environment emissions of air pollutants emitted from power stations
3	18MTEEM313	Energy Storage Devices	CO1 :Explain the importance of various energy storage technologies
			CO2: Demonstrate the fundamentals and components of electrochemical storage technology
			CO3:Analyze the thermodynamics of hydrogen fuel cell
			CO4:Discuss the various types of fuel cells
			CO5:Apply energy storage technology in Food preservation, Waste heat recovery, Solar energy storage applications
			CO6 :Implement the energy storage technology in mechanical, chemical and electrical systems
3	18MTEEM314	Energy Management in Buldings	CO1 :Discuss factors affecting the energy usage in buildings
			CO2: Analyse heat transmission in and out of buildings
			CO3: Discuss on the fundamentals of lighting load and means of managing it in buildings
			CO4: Apply technuques for energy consumption in buildings through active and passive methods
			CO5:Discuss on the building design required for different climate conditions
			CO6 :Provide solutions for setting energy efficient buildings
3	18MTEEM315	Nuclear Engineering	CO1 : Discuss on the fundamentals of nuclear physics
			CO2: explain the mechanism of nuclear fission and fusion reactions and characteristics of reactor materials
			CO3: Explain reprocessing techniques employed in nuclear reactors.
			CO4: Discuss on the construction and working principles of different nuclear reactors.
			CO5: Demonstrate knowledge on the safety measure implemented in nucelar reactors
			CO6 : Discuss on the latest developments in construction, working principle and environmental concerns related to nuclear power generation.
3	18MTOE322	Industrial Safety	CO1 :Understand various types of hazards and its prevention by applying suitable equipment and methods
			CO2: Students will demonstrate the knowledge of industrial safety in various fields
			CO3:Apply the knowledge of maintenance, replacement economy and Service life of equipment
			CO4:Familiarize with knowledge on failure of materials with respect to wear, corrosion and its prevention methods
			CO5:Apply the knowledge of recognizing the types of faults in machine tools and their general causes
			CO6 :Design and analyze the safety practices, measures and policies in industrial workplace.