Mandsaur University

Subject Code: - EEE080
Subject Name: - Hydro & Nuclear Power Generation
Semester: II

L	T	P	C
3	1	-	4

Course Objectives:

- Describe different hydro power generation with different elements of the system.
- Evaluate cycle efficiency and performance of a gas cooled reactor power plant.
- List types, principles of operations, components and applications of steam turbines, steam generators, condensers, feed water and circulating water systems.
- List the principal components and types of nuclear reactors.
- Calculate present worth depreciation and cost of different types of power plants.

Fundamental of Hydraulic Engineering – Water resource and its potential. Hydrology- Hydrological cycles, hydrograph, steam flow char acteristics, flow duration curve, mass curve storage, pond age, site selection. Environmental Impacts and its mitigation- Burdens and impacts identification, impacts in the construction phase; Hydropower Economics.

Hydro Power: Potential, Hydropower Generation and Distribution, Mini and Microhydel Power (MHP) Generation: Classification of hydel plants, Concept of micro hydel, merits, MHP plants: Components, design and layout, Turbines - Classification and selection criteria, efficiency and performance characteristics, Status in India. Integrated Energy systems and their cost benefit analysis; case studies of hydro power plants.

Nuclear Engineering: Introduction, Why Nuclear Power for Developing Countries, Radioactivity and Radioactive Change Rate of Radioactive Decay, Irradiation of Medical products and other application of artificial radioactive, Mass – Energy Equivalence, Binding Energy, Release of Energy by Nuclear Reaction, types of Nuclear Reactions, Initiation of Nuclear Reaction, Nuclear Cross – section, Nuclear Fission, The Fission Chain Reaction, moderation, Fertile Materials and Breeding. Fick's law.

Nuclear Materials: Introduction, Fuels, Cladding and Structural Materials Coolants, Moderating and Reflecting Materials, Control Rod Materials, Shielding Materials; Fuel rod design.

Safety Rules: Personal Monitoring, Radiation Protection (Radiation Workers, Non-Radiation Workers, Public at large), Radiation Dose (Early effect, Late effect hereditary effect); Nuclear Safety regulation & Standards;

Nuclear Reactors: Introduction, General Components of Nuclear Reactor, General Problems of Reactor Operation, Different Types of Reactors, Pressurized Water Reactors (PWR), Boiling Water Reactors (BWR), Heavy Water – cooled and Moderated CANDU (Canadian Deuterium Uranium) Type Reactors, Gas-cooled Reactors, Breeder Reactors, Reactor Containment Design, Location of Nuclear Power Plant, Nuclear Power Station in India, India's 3-stage Programme for Nuclear Power Development; Peaceful application of Nuclear Energy –Power Generation and Isotope application; case studies of Nuclear power plants.

Course Outcomes:

- Identify elements and their functions of hydro, nuclear power plants.
- Operate equipments of both power plants.
- Analyze economics of power plants and list factors affecting the power plants.
- Determine performance of power plants based on load variations.

References:

1. Layman's Guidebook on how to develop a small hydro site
2. Finn R. Forsund – Hydropower Economics
3. Hydro Power an Indian Perspective Author-Cum-Editor Dr. B.S.K. Naidu , Director General , NPTI.
4. Micro Hydroelectric Power Stations – By L.Monition, Power Stations- By L.Monition , Mle Nir,
1. J. Roux translated by Joan Mc Mullan, John Wiley & Sons.
5. Nuclear Physics by J.B. Rajam
6. Introduction to Nuclear reactor theory, Wesley, 1966 by J.R. Lamrash
7. M.M. E1-Wakil: Nuclear Power Engineering, McGraw Hill, 1962.
8. R.L. Murray: Introduction to Nuclear Engineering, Prentics Hall, 1961

Mandsaur University

Subject Code: - EEE090
Subject Name: - Waste Management & Energy Generation Technologies
Semester: II

L	T	P	C
2	1	2	4

Course Objectives:

- To present an overview on MSW generation, characteristics and existing disposal practices.
- To comprehend the feasibility of various energy recovery options (using life cycle approach),
- To present the case studies from developing as well as developed countries.

Sources, Types, Compositions, Properties Physical, Chemical and Biological -Collection - Transfer Stations – Waste minimization and recycling of Municipal Waste.

Size Reduction - Aerobic Composting - Incineration for Medical /Pharmaceutical Waste - Environmental Impacts -Environmental Effects due to Incineration.

Land Fill Method- Types, Methods & Sitting Consideration – Composition, Characteristics, generation, Control of Landfill Leachate & Gases – Environmental monitoring System for Land Fill Gases.

Sources and Nature of Hazardous Waste - Impact on Environment – Hazardous Waste -Disposal of Hazardous Waste, Underground Storage Tanks Construction, and Installation & Closure.

Biochemical Conversion - Industrial , Agro Residues – Anaerobic Digestion - Biogas Production - Types of Biogas Plant-Thermo chemical Conversion - Gasification - Types - Briquetting - Industrial Applications of Gasifiers - Environment Benefits.

Course Outcomes:
After completing this subject, student should be able to:

- Identify emissions from incinerators and their control.
- Estimate the energy generation potential of wastes.
- Assess the environmental impacts of wastes.

References:
1. Shah, Kanti L., Basics of Solid & Hazardous Waste Management Technology, Prentice Hall, 2000.

Suggested List of Experiment:

1. Determine the motor loading by following method:
   a. Input Power Method
   b. Slip Method
2. Determine the Installed Load Efficacy Ratio (ILER) for given areas.
3. To determine Spectral Response of a PV Cell.
4. To determine Power Output Vs Azimuth and Tilt Angle.
5. Preparation of bio-diesel and determination of it physical properties.
6. To study the Comparison Yield of Methane Generation from Different Feed Stock in Batch Type Digesters.

Mandsaur University

Subject Code: - EEE100
Subject Name: - Environmental Issues, Policy, Standards & Regulations
Semester: II

L	T	P	C
2	1	2	4

Course Objectives:

- Develop, implement, monitor and maintain environmental strategies, policies, programs and systems that promote sustainable development.
- Lead the implementation of environmental policies and practices and raise awareness, at all levels of an organization, about the emerging environmental issues.

Global environmental concerns: The Scenario, The Changing Global atmosphere &common concerns. United Nations Framework Convention on Climate Change (UNFCC), Kyoto Protocol, Conference of Parties (COP), Various Clean Development Mechanism (CDM), Prototype Carbon fund (PCF), Earth Summit, Sustainable development.

Green Certificate The Global Program for protected area management, Strategies for environmental improvement plan. Organizations working in the field of energy and environment - UNEP, IPCCC, CPCB etc. Basic features of ISO 14000.

Water Quality: Parameters: Physical, Chemical and Bacteriological .Potable Water Standards, Waste Waster Effluent Standards. Minimal National Standards (MINAS).

Environment Policies: Water Act 1974, the Air Act, 1981, Environmental (Protection) Act.-1986, M. P. State Environment Policy, Municipal Solid Waste (Management & Handling) Rules, 1998, Biomedical Waste (Management & Handling) Rules 1998.

Course outcomes: Understand the environmental, social and economic framework in which environmental management decisions are made understand the life cycle perspective, systems approach and environmental technologies for converting process, products and service related industrial environmental problems into opportunities to improve performance.

References:

1. Environmental Issues and Polices, Prentice Hall—Stephon Ison, Stephen Peake, Stuart Wall.
2. ISO 14000 Environmental Management y Goetsch, Davis. Prentice Hall.
3. Standard methods for the Examination of Water and Wastewater. (1989). 17th Ed. APHA, Washington D.C., 2-12.
4. Energy Management by Paul O'Callaghan –McGraw Hill.
5. Cleaner Production – Energy Efficiency Manual for GERIAP, UNEP, Bangkok prepared by National Productivity Council.
6. Training material on 'Environmental concerns' prepared by National Productivity Council.
7. Parivesh, October 2002 – Central Pollution Control Board.

Suggested List of Experiment:

1. To Find Alkalinity of given Water Sample.
2. Determination & comparison of DO of water sample from different sources.
3. Determination of chloride of water sample.

4. To Determine Suspended Solids of Given Water Sample.
5. To study treatment methods of Drinking Water.
6. To study Hazardous waste management system.

Mandsaur University

Subject Code: - EEE110
Subject Name: - Energy Modeling & Project Management
Semester: II

L	T	P	C
3	1	-	4

Course Objectives:
This Course introduces basic concept of econometrics and statistical analysis, Energy and environmental Input-output analysis, financial analysis etc.

Introduction: Basic concept of econometrics and statistical analysis; The 2-variable regression model; The multiple regression model; Tests of regression coefficients and regression equation; Econometric techniques used for energy analysis and forecasting with case studies from India; Operation of computer package.

Input – Output Analysis Basic concept of Input-output analysis; concept of energy multiplier and implication of energy multiplier for analysis of regional and national energy policy; Energy and environmental Input - Output analyses using I-O model.

Energy Modeling Interdependence of energy-economy-environment; Modeling concept, and application, Methodology of energy demand analysis; Methodology for energy forecasting; Sectoral energy demand forecasting; Inter fuel substitution models; SIMA model, and I-O model for energy policy analysis; Simulation and forecasting of future energy demand consistent with macroeconomic parameters in India; Energy Economics and Policies: National and Sectoral energy planning; Integrated resource planning; Energy pricing.

Project Evaluation & Management Financial analysis: Project cash flows, time value of money, life cycle approach & analysis, conception, definition, planning, feasibility and analysis; Project appraisal criteria; Risk analysis; Project planning matrix; Aims oriented project planning; Social cost benefit analysis. Network analysis for project management; Time estimation; Critical path determination; PERT, CPM and CERT; Fuzzy logic analysis; Stochastic based formulations; Project evaluation techniques; Funds planning; Project material management, evaluation & analysis; Implementation and monitoring; Performance indices; Case studies.

Course Outcomes:
Student after completion of this course must be able to apply the technical and non technical concepts of econometrics and statistical analysis, Energy and environmental Input-output analysis, financial analysis etc. used in energy technology.

References:

1. Energy Modeling in Architectural Design— Kaveh Alagheh Bandhosseini, Timothy L. Hemsath.
2. Energy and Power Risk Management— Alexander Eydeland and Krzysztof Wolyniec.

Mandsaur University

Subject Code: - EEE120
Subject Name: - Energy Efficiency in Electrical utilities
Semester: II

L	T	P	C
3	1	-	4

Course Objectives:
This Course introduces basic concept of energy management system viz. Electricity billing, electrical load management and maximum demand control, power factor improvement and its benefit etc. and also applications of different electrical utilities.

Electrical system: Electricity billing, electrical load management and maximum demand control, power factor improvement and its benefit, selection and location of capacitors, performance assessment of PF capacitors, distribution and transformer losses.

Electric motors: Types, losses in induction motors, motor efficiency, factors affecting motor performance, rewinding and motor replacement issues, energy saving opportunities with energy efficient motors.

Compressed Air System: Types of air compressors, compressor efficiency, efficient compressor operation, Compressed air system components, capacity assessment, leakage test, factors affecting the performance and savings opportunities.

HVAC and Refrigeration System: Vapour compression refrigeration cycle, refrigerants, coefficient of performance, capacity, and factors affecting Refrigeration and Air conditioning system performance and savings opportunities.

Vapour absorption refrigeration system: Working principle, types and comparison with vapour compression system, saving potential.

Fans and blowers: Types, performance evaluation, efficient system operation, flow control strategies and energy conservation opportunities.

Pumps and Pumping System: Types, performance evaluation, efficient system operation, flow control strategies and energy conservation opportunities.

Cooling Tower: Types and performance evaluation, efficient system operation, flow control strategies and energy saving opportunities assessment of cooling towers.

Lighting System: Light source, choice of lighting, luminance requirements, and energy conservation avenues.

Diesel Generating system: Factors affecting selection, energy performance assessment of diesel conservation avenues.

Energy Efficient Technologies in Electrical Systems: Maximum demand controllers, automatic power factor controllers, energy efficient motors, soft starters with energy saver, variable speed drives, energy efficient transformers, electronic ballast, occupancy sensors, energy efficient lighting controls, energy saving potential of each technology.

Course Outcomes:

Student after completion of this course must be able to apply the technical concepts of energy management system used in energy technology and working principle, types, performance evaluation, efficient system operation, flow control strategies and energy conservation opportunities in different electrical utility systems.

References:

1. Bureau of Energy Efficiency Reference book: No.1, 2, 3 4.
2. National Certificate Examination for Energy Managers and Energy Auditors.