Course Title: Conventional and Renewable energy Power Plants **(Elective course)**

Course Code TEE-803

Course Objectives:

Understanding of the principles of operation, configuration, characteristics, and key implementation issues of various types of power plant including renewable energy thermal power plants

Learning Outcomes.

On successful completion of the module the student will be able to:

- Recognize and demonstrate a comprehensive understanding of the fundamentals and laws governing energy conversion.
- Debate issues related to the performance of conventional power-generation plants.
- Propose appropriate technologies for improving energy-utilization efficiency of power-generation plants.
- Assess the need of a particular industrial/commercial site for a CHP system, identify the appropriate systems and undertake design, sizing, and economic analyses.
- Criminally review technologies employed for fuel-cell systems and advances in their applications.
- Continue to advance their knowledge and assimilate new future technologies.

Detailed Contents:

Steam power plants: Thermodynamic principles. Fuels. Steam power generation cycles. Steam Generators, Steam turbines. Gas turbine and combined-cycle power plants: Gas turbine engines and performance. Gas turbine cycles. Combined cycle power plants. Diesel- and gas-engine power plants: Diesel engines. Fuels. Emission control. Heat recovery systems.

Nuclear power generation: Basic nuclear physical processes (fission and fusion). Nuclear fuels. Types of reactors. Safety considerations in the nuclear industry. Developments in nuclear fusion. Decommissioning problems of nuclear sites. Nuclear-waste disposal systems.

CHP systems: CHP schemes (micro-scale CHP systems, small scale CHP systems, large scale CHP systems including district heating schemes). Application of CHP systems for the provision of heating, cooling, and electric power. Selection criteria of CHP prime-movers. Integration of CHP systems into site services. Feasibility analysis of CHP schemes using spreadsheets/software tools. Case study (site appraisal for CHP scheme and evaluation of economic and environmental viability).

Solar thermal Power Generation: Selection of Site and Data Requirements. Solar radiation and their conversions'. Modeling of System Components. Validation of Model

and System Design. Thermal Energy storage for solar thermal power generation systems. Economic consideration.

Geothermal power generations Systems

Text/Ref Books:

- Powerplant Technology – by M. M. El-Wakil
- Thermal Power Plant Performance Analysis by Gilberto Francisco Martha de Souza; Springer;
- Steam Plant Operation, 10th Edition; by Everett Woodruff (Author), Herbert Lammers (Author), Thomas Lammers (Author); McGraw Hill;

Solar Electric Power Generation by Stefan C.W. Krauter (Author), Springer.