M.TECH SECOND SEMESTER
DISTRIBUTED GENERATION

17EEPC2T6B **Credits: 4**
Lecture: 4 periods/week **Internal Assessment: 40 marks**
End Semester Assessment: 60 marks

Course Objective

To provide knowledge on the various aspects of distributed generation and hybrid energy systems.

Course Learning Outcomes: At the end of the course the student will be able to

1. Illustrate the concept of distributed generation.
2. Understand various non conventional energy sources.
3. Analyze the impact of grid integration.
4. Study concept of protection in distributed generation.

UNIT – 1:

Distributed Generation Definition, Distributed generation advantages, challenges and needs.- Non conventional and renewable energy sources-Wind Power- wind turbine and rotor types, wind speed –power curve, power coefficient, tip speed ratio, wind energy distribution, environmental impact.

UNIT-II

Photovoltaic and Thermo-solar power-Solar cell technology, Photovoltaic power characteristics and Thermo-solar power generation- Biomass Power, Fuel cells types, types of Tidal power generation schemes, mini and micro hydro power schemes, and Micro turbines for DG, bulb and tubular turbines. Energy Storage for use with Distributed Generation-Battery Storage, Capacitor Storage, ultra capacitors and Mechanical Storage: Flywheels, Pumped and Compressed Fluids.

UNIT-III

Grid Interconnection Options, Pros and Cons of DG – Grid Interconnection, Standards of interconnection. Recent trends in power electronic DG interconnection. General power electronic DG interconnection topologies for various sources and control. Control of DG inverters, current control and DC voltage control for stand alone and grid parallel operations. Protection of the converter, Control of grid interactive power converters, phase locked loops ,synchronization and phase locking techniques, current control, DC bus control during grid faults, converter faults during grid parallel and stand alone operation.

UNIT-IV

Intentional and unintentional islanding of distribution systems. Passive and active detection of unintentional islands, non detection zones. Reactive power support using DG. Power quality improvement using DG, Power quality issues in DG environment. Economic aspects of DG- Generation cost, investment, tariffs analysis. Hybrid energy systems. Distributed generation in the Indian scenario.

TEXT BOOKS:

1. H. Lee Willis & Walter G. Scott, “Distributed Power Generation, Planning & Evaluation”, CRC Press - Taylor & Francis Group.
2. Godfrey Boyle, “Renewable energy power for a sustainable future” Oxford University Press.

REFERENCE BOOK:

Mukherjee, S.Chakrabarti, “Fundamentals of renewable energy systems” New Age International Publishers.