4/4 B.Tech. SECOND SEMESTER

EE8T3B **SMART GRID (Elective –III)** **Credits: 4**

Lecture: 4 periods/week **Internal assessment: 30 marks**
Tutorial: 1 period /week **Semester end examination: 70 marks**

Objectives:
Distributed generation is the order of the day. To make the student conversant with the fundamentals of smart grid, provides the design criteria and the tools and techniques and technology needed for building smart grid, offer guideline in the design, analysis and development of Smart Grid. The automation and computational techniques need to ensure that the Smart Grid guarantees adaptability is discussed.

Learning outcomes :

1. In this subject knowledge about electrical energy will be part in order to unify their knowledge gained in various subjects learned earlier.
2. Distribution, stability power grid quality concepts will be highlighted as well as effects of renewable energy into grid.
3. The concept of distributed sensation is also discussed

Unit-I Introduction to Smart Grid
Computation intelligence- Stake holder roles and function- Definition of smart grid- Functions of smart grid components.

Unit II Communication and Measurement
Introduction-Wide area monitoring system-Phasor measurement unit-Smart meters and appliances-Advanced metering infrastructure-GIS Technology-MAS Technology-Comparison between micro grid and smart grid.

Unit III Performance Analysis Tools For Smart Grid Design
Load flow studies in smart grid- Challenges- Load flow state- Congestion management effect.

Unit IV Static Security Assesment
Introduction- Contingencies- Classification- Steady state contingency analysis- Performance indices-Sensitivity based approaches- Contingency studies for smart grid.

Unit V Stability Analysis for Smart Grid
Introduction to stability- Voltage stability assessment types- Voltage stability assessment technique-voltage stability indexing- Analysis techniques.

Unit VI Angle Stability Assesment
Types- State estimation- WLSE- Detection and identification of bad data- Pre and post estimation analysis- Robust static estimation- state estimation for smart grid- Dynamic state estimation.

Unit VII Computational Tools for Smart Grid
Introduction-Decision support tools- Optimization techniques- Classical optimization techniques- Linear programming- Non linear programming- Integer Programming- Dynamic programming- Stochastic programming- Chance constant programming.

Unit VIII Heuristic Optimization Techniques

ANN- Expert systems- Genetic algorithm- Particle Swarm optimization- ANT colony optimization- Computational challenges.

Learning resources

Text books:

1. smart grid – fundamentals of design and analysis by james mamoh

Reference books:

1. smart grid technology and application by janaka ekanakye, kithsiri liyanage, jianzhang wu, akiihiko yokoyama and nick jeenkins