



Subject Code: 19EEE50E03T	Subject Name: Smart Grids	L-T-P	Credit: 3
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COURSE OBJECTIVES:

The objectives of the course are to make the students,

1. To understand the basic concepts, components and architecture of smart grid
2. To understand the various measurement technologies in smart grid
3. To educate the importance of renewable energy in smart
4. To know about battery technology and energy storage
5. To brief about role of Electric Vehicles in smart grid

SYLLABUS

Module-I (6 Hours)

Introduction to Smart Grid

Basics of power systems, definition of smart grid, need for smart grid, smart grid domain, enablers of smart grid, smart grid priority areas, regulatory challenges, smart-grid activities in India, differences between traditional grid and smart grid.

Module-2

Concept of Microgrids (7 Hours)

Introduction to the concept of microgrid, the overview of the structure and architecture of microgrid with brief control, operational aspects. Recent pilot microgrid projects and their outcomes.

Module-3

Control of Smart Power Grid System (8 Hours)

Load Frequency Control (LFC) in Micro Grid System Voltage Control in Micro Grid System –
Reactive Power Control in Smart Grid

Module-4 (7 Hours)

Energy Storage Systems

Batteries, Super Conducting Magnetic Energy Storage System, Pumped Hydro, Compressed Air Energy Storage, Flywheel, Ultra capacitors.

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Module-5

(8Hours)

Phasor Measurement Units Importance of PMUs, Phasor Measurement Units and Phasor Data Concentrators Wide Area Monitoring: WAMS concept, data collection, WAMS architecture, Advanced data processing, optimal placement of PMUs.

COURSE OUTCOMES:

After completion of the course, the student will be able to

1. Understand the features of Smart Grid.
2. Understand the basic concepts of micro grid and characteristics of energy storage devices.
3. Understand the concepts of Phasor measurements in power system.
4. Analyze the power system behavior using synchronized phasor measurements.

TEXT BOOKS:

1. S. Borlase, "Smart Grids, Infrastructure, Technology and Solutions", CPC Press, 1st Edition, 2013.
2. N. D. Hatziargyriou, "Microgrids Architecture and control", IEEE Press Series, John Wiley & Sons Inc, 1st Edition, 2013.
3. A. R. Messina, "Wide Area Monitoring of Interconnected Power Systems", IET publisher, 1st Edition, 2015.

REFERENCE BOOKS:

1. Arun G. Phadke, James S. Thorp, "Synchronized Phasor Measurements and Their Applications", Springer International Publishing AG 2008, 2nd Edition, 2017.
2. Ali Keyhani, "Design of Smart power grid renewable energy systems", Wiley IEEE, 2011.
3. Clark W. Gellings, "The Smart Grid: Enabling Energy Efficiency and Demand Response", CRC Press, 2009.
4. Stuart Borlase, "Smart Grid: Infrastructure, Technology and solutions " CRC Press.
5. Janaka Ekanayake, Nick Jenkins, Kithsiri Liyanage, Jianzhong Wu, Akihiko Yokoyama, "Smart

Grid: Technology and Applications", Wiley.