18PEE51	SMART GRID TECHNOLOGY	L	T	P	C
		3	0	0	3

Course Objectives:

1.	To introduce the concepts of Smart Grid, architecture and Functions.
2.	To familiarize the role of communications technologies in Smart Grid.
3.	To familiarize control and automation technologies for Smart Grid.
4.	To study the green energy integration and energy storage systems.

Unit I	INTRODUCTION TO SMART GRID	9	+	0

Definitions and Need for Smart Grid, Today's Electric Grid versus Smart Grid, key aspects of Smart Grid development, Smart Grid architecture, Functions of Smart Grid Components, challenges and benefits.

Unit II	COMMUNICATIONS TECHNOLOGIES	9	+	0

Communication infrastructure for the Smart Grid, IEEE 802 architecture and, communication technologies specified under IEEE 802, Wireless LANs, ZigBee and 6LoWPAN, ZigBee communication network for smart metering, Power line communication, Standards for smart metering, Modbus, DNP3, IEC 61850 data structure and usage.

Unit III	CONTROL AND AUTOMATION TECHNOLOGIES	9	+	0

Smart metering: Benefits, Architecture, Key components and operation, communications architecture for smart metering, Demand-side integration (DSI): Definitions and services provided by DSI, Substation automation equipment: architecture, components and functions,Intelligent electronic devices (IED), Relay IED and other types, Bay controller.

Unit IV	ENERGY STORAGE SYSTEMS	9	+	0

Need for energy storage in smart grid, Energy storage technologies: operation, features and use of Flow battery, Fuel cell, Superconducting magnetic energy storage systems, Super capacitors; power converter configurations for energy storage integration, Energy storage system for solar and wind power plant-case study.

Unit V	GREEN ENERGY INTEGRATION	9	+	0

Sustainable energy options for the smart grid- Solar PV System, Wind Energy and Fuel Cell: Conversion and Power electronics technology for grid integration, Penetration and variability issues associated with sustainable energy technology, PHEV technology, Impact of PHEV on the Smart Grid.

Total (45+0) = 45 Periods

Course Outcomes:

Upon completion of this course, the students will be able to:

CO1	:	*Understand the concepts of Smart Grid and its present developments.*
CO2	:	*Get acquainted with the smart resources and other smart devices*
CO3	:	*Acquire knowledge of automation and control infrastructure.*
CO4	:	*Select an energy storage system and its integration with Smart Grids*
CO5	:	*Identify suitable communication networks for smart grid applications*

Text Books:

1.	James Momoh "SMART GRID Fundamentals of Design and Analysis", Wiley, 2012.
2.	Janaka Ekanayake, Nick Jenkins, KithsiriLiyanage, Jianzhong Wu, Akihiko Yokoyama, "SmartGrid: Technology and Applications", Wiley, 2012.
3.	Mini S. Thomas, John D McDonald, 'Power System SCADA and Smart Grids', CRC Press, 2015

PO / CO	CO Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	*Understand the concepts of Smart Grid and its present developments.*			1		1	1	2			3	
CO2	*Get acquainted with the smart resources and other smart devices*	1							2	1		
CO3	*Acquire knowledge of automation and control infrastructure.*		1									1
CO4	*Select an energy storage system and its integration with Smart Grids*	3	1		1							
CO5	*Identify suitable communication networks for smart grid applications*				1		1				2	