18EEP13	DISTRIBUTED GENERATION AND MICROGRID	L	T	P	C
		3	0	0	3

Course Objectives:

1.	To understand the concept of microgrid
2.	To impart knowledge about distributed generation technologies, their interconnection in grid
3.	To understand relevance of power electronics in DG,

Unit I	INTRODUCTION	9	+	0

Conventional power generation: advantages and disadvantages, Energy crises, Non-conventional energy (NCE) resources: review of Solar PV, Wind Energy systems, Fuel Cells, micro-turbines, biomass, and tidal sources

Unit II	DISTRIBUTED GENERATIONS (DG	9	+	0

Concept of distributed generations, topologies, selection of sources, regulatory standards/ framework, Standards for interconnecting Distributed resources to electric power systems: IEEE 1547. DG installation classes, security issues in DG implementations. Energy storage elements: Batteries, ultra-capacitors, flywheels. Captive power plants

Unit III	IMPACT OF GRID INTEGRATION	9	+	0

Requirements for grid interconnection, limits on operational parameters,: voltage, frequency, THD, response to grid abnormal operating conditions, islanding issues. Impact of grid integration with NCE sources on existing power system: reliability, stability and power quality issues.

Unit IV	BASICS OF A MICROGRID	9	+	0

Concept and definition of microgrid, microgrid drivers and benefits, review of sources of microgrids, typical structure and configuration of a microgrid, AC and DC microgrids, Power Electronics interfaces in DC and AC microgrids

Unit V	CONTROL AND OPERATION OF MICROGRID	9	+	0

Modes of operation and control of microgrid: grid connected and islanded mode, Active and reactive power control, protection issues, anti-islanding schemes: passive, active and communication based techniques, microgrid communication infrastructure, Power quality issues in microgrids, regulatory standards, Microgrid economics, Introduction to smart microgrids.

Total (45+0)=45 Periods

Course Outcomes:

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

CO1	:	Explain various distributed generation systems
CO2	:	Understand various developments happening in the field of Grid integration.
CO3	:	Understand the microgrids and their control schemes.
CO4	:	Implement distributed generation in a hilly or remote place
CO5	:	Configure a microgrid for a group of energy sources

Text Books:

1.	H. Lee Willis, Walter G. Scott , 'Distributed Power Generation – Planning and Evaluation', Marcel Decker Press, 2018, 1st edition.
2.	M.GodoySimoes, Felix A.Farret, 'Renewable Energy Systems – Design and Analysis with Induction Generators', CRC press.2007
3	Robert Lasseter, Paolo Piagi, ' Micro-grid: A Conceptual Solution', PESC 2004, June 2004.

Reference Books:	
1	John Twidell and Tony Weir, "Renewable Energy Resources" Tyalor and Francis Publications, 2015, 3rd edition
2	DorinNeacsu, "Power Switching Converters: Medium and High Power", CRC Press, Taylor & Francis, 2006.
3	AmirnaserYezdani, and Reza Iravani, "Voltage Source Converters in Power Systems: Modeling, Control and Applications", IEEE John Wiley Publications, 2009
4	F. Katiraei, M.R. Iravani, 'Transients of a Micro-Grid System with Multiple Distributed Energy Resources', International Conference on Power Systems Transients (IPST'05) in Montreal, Canada on June 19-23, 2005.
5	Z. Ye, R. Walling, N. Miller, P. Du, K. Nelson, 'Facility Microgrids', General Electric Global Research Center, Niskayuna, New York, Subcontract report, May 2005
E-Reference	
1	www.onlinecourses.nptel.ac.in
2	www.class-central.com
3	www.mooc-list.com

CO/PO Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	2	2	2	1	2	1				2
CO2	1	2	2	2	2	1	2	1				2
CO3	1	2	2	2	2	1	2	1				2
CO4	1	2	2	2	2	1	2	1				2
CO5	1	2	2	2	2	1	2	1				2