

Branch Name:	Electrical Engineering
ProgramCode:	ET213
CourseName:	Smart Grid & Distributed Generation
CourseCode:	2ET2130104T
Pre-requisiteCourse:	Fundamentals of Generation and Transmission

Course Objectives:

1. To understand the concept of distributed generation.
2. To analyze the impact of grid integration.
3. To study concept of Micro grid and its configuration.

Teaching and Examination Scheme:

Credit	Teaching Scheme Hours per week				Evaluation Scheme (Marks)								
					Theory (Marks)				Practical (Marks)				Total (Marks)
	L	T	P	Total	SEE		CCA		SEE		CCA		
					Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
3	3	-	-	3	24	60	16	40	-	-	-	-	100

Course Contents:

Sr. No	Topic	Total Hours	Weightage (%)
1	Introduction Conventional power generation: advantages and disadvantages, Energy crises, Non- conventional energy (NCE) resources: review of Solar PV, Wind Energy systems, micro-turbines and tidal sources.	06	15%
2	Distributed Generation (DG) Concept of distributed generations, topologies, selection of sources, regulatory standards/ framework, Standards for interconnecting Distributed resources to electric power systems, DG installation classes, security issues in DG implementations.	09	20%
3	Impact of grid Integration Requirements for grid interconnection, limits on operational parameters: voltage, frequency, response to grid abnormal operating conditions, islanding issues. Impact of grid integration with NCE sources on existing power system: reliability, stability.	09	20%
4	Basics of Micro-grid Concept and definition of micro-grid, micro-grid drivers and benefits, review of sources of micro-grids, typical structure and configuration of a micro-grid, AC and DC micro-grids.	06	15%
5	Control & Operation of Micro grid Modes of operation and control of micro grid: grid connected and islanded mode, Active and reactive power control, protection issues, micro grid communication infrastructure, Micro grid economics, Introduction to smart micro grids.	06	15%

6	Demand side management of Smart Grid: Demand response analysis of Smart Grid, Pricing and Energy Consumption Scheduling, Controllable Load Models, Dynamics and Challenges, Electric Vehicles and Vehicle-to-Grid Systems, Demand Side Ancillary Services Energy Management, Practical study of Smart Grid.	06	15%
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Text Books:

1. Distributed generation Micro grid operation By Hatem Hussein MagdyZeineldin, Universityof Waterloo (Canada).
2. Micro grids and Active Distribution Networks By S. Chowdhury, S.P. Chowdhury and P. Crossley - The Institution of Engineering and Technology,London.

Reference Books:

- 1.Control and optimization of Distributed generation system ByMagdi S Mahmoud –Springer.
2. Distributed generation and its implications for the utility industry By Fereidoon P SioshansiAcademicPress.

Reference Journal papers:

- Electric power systemsresearch.
- Int. Journal of electric power and energysystems
- IEEE Power & EnergyMagazine

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom'sTaxonomyLevel
CLO1	Analyze and design of distributed generators.	4Analyze 6 Creating
CLO2	Know about the function of smartgrid.	2 Understanding
CLO3	Understand the analysis of grid interconnection.	2 Understanding 4Analyze
CLO4	Know about the issues while implementing the smart gridapproach.	1Remembering
CLO5	Know about use of micro grid to electrical powersystems.	1Remembering
CLO6	Understand the concept of micro grid and it's control.	2 Understanding

Mapping of CLOs with POs & PSOs

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CLO1			L		M			M		L		M		M	H	
CLO2	L			M			L				M		M			L
CLO3		L		H		M	L				M	M	M			L
CLO4		L		H		M						M				L
CLO5				L		H			M			M				L
CLO6	L			M			L				M		M			

H: High, M: Medium, L: Low