

COURSE CODE: 1152EE138	COURSE TITLE: GENERATION PLANNING	L	T	P	C
		3	0	0	3

COURSE CATEGORY:

Program Elective

PREAMBLE :

It is aimed to provide the basics of power system planning, particularly on generation capacity expansion planning and provide the information about the impact of environmental pollution and reliability on integration of demand and supply side management activities and renewable energy sources penetration.

PREREQUISITE COURSES:

Power System Analysis

RELATED COURSES: Nil

COURSE EDUCATIONAL OBJECTIVES :

The objectives of the course are to make the students,

- To understand the load forecasting approaches and techniques
- To understand the various power generation reliability indices
- To understand basic concept of generation expansion planning and WASP-IV module
- To analyze the integration of demand side and supply side management in GEP studies
- To analyze the effect of penetration of renewable energy resources in to the power system

COURSE OUTCOMES :

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

CO Nos.	Course Outcomes	Knowledge Level (Based on revised Bloom's Taxonomy)
CO1	Understand the load forecasting techniques	K2
CO2	Explain the different types of reliability indices for power generation system	K2
CO3	Illustrate the basic concept of GEP problem	K2
CO4	Analyze the effect of DSM and SSM activities in GEP	K3
CO5	Analyze the impact of renewable energy on environmental pollution and reliability of power system	K3

CORRELATION OF COs AND POs

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M			M					L			
CO2	M			M					L			
CO3	H			M	M				L			
CO4	H	H	M	M	M		M		L			
CO5	H	H	M	M	M	M	H		L			

COURSE CONTENT:		
UNIT I	LOAD FORECASTING	9
Power system planning- Objective- Stages in planning and design - need for accurate load forecasting - factors affecting forecasting- approaches- methodology- Short-run and long run- Time series techniques-Peak demand and Energy forecasting		
UNIT II	POWER GENERATION RELIABILITY	9
Static Generating Capacity Reliability Evaluation- Outage definitions-reliability indices- loss of load probability (LOLP) - expected energy not served (EENS) - capacity outage probability table (COPT) - simple problems.		
UNIT III	GENERATION COST OPTIMIZATION	9
Definition-Formulation of least cost optimization problem- capital, operation and maintenance costs - candidate units - different types- Wien Automatic System Planning- IV (WASP-IV) model- WASP-IV modules-simple simulation studies		
UNIT IV	DEMAND SIDE MANAGEMENT (DSM) AND SUPPLY SIDE MANAGEMENT (SSM)	9
DSM –Introduction- driving factors- benefits- DSM measures-Energy reduction programmes -Load management programmes - Load growth and conservation programmes - challenges of implementing DSM programmes SSM –Introduction-options and opportunities - constraints and challenges - integration of DSM and SSM in generation planning		
UNIT V	GENERATION PLANNING WITH RENEWABLE ENERGY	9
Benefits of renewable energy sources- Modelling of wind and solar plants in planning studies- negative load modelling- environmental analysis and reliability analysis		
TOTAL: 45 PERIODS		
TEXTBOOKS:		
<ol style="list-style-type: none"> 1. Sullivan, R. L. <i>Power system planning</i> McGraw-Hill New York, 1977 2. James McDonald, Wang Xifan, <i>Modern power system planning</i>, McGraw-Hill (1994) 		
REFERENCE BOOKS:		
<ol style="list-style-type: none"> 1. Roy Billinton and Ronald N. Allan, <i>Reliability Evaluation of Engineering Systems: Concepts and Techniques</i>, Springer science-Business media, 1992. 2. Roy Billinton and Rajesh Karki, <i>Reliability and Risk Evaluation of Wind Integrated Power Systems (Reliable and Sustainable Electric Power and Energy Systems Management)</i>, Springer, 2013. 3. Seifi, Hossein, Sepasian, Mohammad Sadegh, <i>Electric Power System Planning-Issues, Algorithms and Solutions</i>, Springer, 2011. 4. Leon K. Kirchmeyer, <i>Economic Operation of Power Systems</i>, Wiley, 2009. 		
ONLINE RESOURCES:		
https://www-pub.iaea.org/MTCD/Publications/PDF/CMS-16.pdf		