ECONOMIC OPERATION OF POWER SYSTEMS

I Semester: EEE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
BPSB02	Core	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

OBJECTIVES:

The course should enable the students to:

I. Formulate and derive the necessary conditions for economical load scheduling problem.
II. Understand various constraints, problem formulation and methods to solve the UNIT commitment problem.
III. Explain the constraints related to hydro power plants, problem formulation and solution techniques for hydro- thermal scheduling problem.
IV. Describe the necessity, factors governing the frequency control and analyze the uncontrolled and controlled LFC system.
V. Explain the basic difference between ELS and OPF problem, formulation of the OPF problem and solution techniques.

COURSE OBJECTIVES (COs):

I. To understand the electrical power plant operation and control with respect to its economic aspect.
II. To know the importance of compensation in power system and study the different compensating techniques.
III. Study about different transients and their protection those are introduced in power system.

COURSE LEARNING OUTCOMES (CLOs):

1. Identify and explain the different methods of generation, distribution, control and compensation involved in the operation of power systems.
2. Design the mathematical models of the mechanical and electrical components involved in the operation of power systems and demonstrate the understanding of the open loop and closed loop control practices associated with the voltage and frequency control of single area or interconnected multi area power systems.
3. Specify the equivalent electrical parameters of transmission line to prepare and analyze models to predict the range and ratings of the equipments to be used, the protection required against line transients and determine the appropriate methods of compensation required for operational stability.
4. Solve the problems related to the economic dispatch of power, plant scheduling, unit commitment and formulate strategies to minimize transmission line losses and penalties imbibed.
5. Devise protection schemes required for the system to safeguard against transients after identifying and determining the severity of the transients occurring during the period of operation and design testing strategies to determine the performance characteristics of the compensating equipment to be used in the system.
6. Assess the different methods of control and compensation to choose the best option so that social and environmental problems are minimized and recognize the need to continuously follow the advancements in technology and incorporate them in the present system to improve efficiency and increase the flexibility and quality of operation.

Unit-I	ECONOMIC LOAD SCHEDULING	Classes: 09
Characteristics of steam turbine, variations in steam UNIT characteristics, economic dispatch with piecewise linear cost functions, Lambda iterative method, LP method, economic dispatch under composite generation production cost function, base point and participation factors, thermal system dispatching with network losses considered.		
Unit-II	**UNIT COMMITMENT**	**Classes: 10**
UNIT Commitment, definition, constraints in UNIT commitment, UNIT commitment solution methods, priority, list methods, dynamic programming solution.		
Unit-III	**HYDRO THERMAL SCHEDULING**	**Classes: 08**
Characteristics of Hydroelectric UNITs, introduction to hydrothermal coordination, long range and short range hydro scheduling. Hydroelectric plant models, hydrothermal scheduling with storage limitations, dynamic programming solution to hydrothermal scheduling.		
Unit-IV	**LOAD FREQUENCY CONTROL**	**Classes: 09**
Control of generation, models of power system elements, single area and two area block diagrams, generation control with PID controllers, implementation of Automatic Generation control (AGC), AGC features.		
Unit-V	**OPTIMAL POWER FLOW**	**Classes: 09**
Introduction to Optimal power flow problem, OPF calculations combining economic dispatch and power flow, OPF using DC power flow, algorithms for solution of the ACOPF, optimal reactive power dispatch.		

Text Books:

1. J J Grainger & W DStevenson, "Power system analysis", McGraw Hill,2nd Edition, 2003.
2. Allen JWood, Bruce F Wollenberg, Gerald B Sheblé, "Power Generation, Operation and Control", WileyInterscience2ndEdition, 2013.

Reference Books:

1. Olle, Elgerd, "Electric Energy Systems Theory an Introduction", TMH, 2nd Edition, 1983.

Web References:

1. https://pdfs.semanticscholar.org/b99b/cedc7f9e06d8b21d910767bb886a6d038283.pdf
2. https://core.ac.uk/download/pdf/33363832.pdf

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