IV B.Tech – I Semester
(20EE7322) POWER SYSTEM OPERATION & CONTROL

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

Pre-Requisite: Power Systems Generation and utilization, Power System Analysis and Control System

Course Objectives

1. To understand optimal dispatch of generation with and without losses
2. To study the optimal scheduling of hydro thermal systems and the optimal unit commitment problem.
3. To study the load frequency control for single area system with and without controllers
4. To study the load frequency control for two area system with and without controllers
5. To understand the reactive power control and compensation of transmission lines.

Syllabus

Unit – 1: Economic Operation of Power Systems

Optimal operation of Generators in Thermal power stations, – Heat rate curve – Cost Curve – Incremental fuel and Production costs – Input–output characteristics – Optimum generation allocation with line losses neglected – Optimum generation allocation including the effect of transmission line losses – Loss Coefficients – General transmission line loss formula.

Unit – 2: Hydrothermal Scheduling & Unit Commitment

Optimal scheduling of Hydrothermal System: Mathematical Formulation – Solution Technique. Optimal unit commitment problem – Need for unit commitment – Constraints in unit commitment – Cost function formulation – Solution methods – Priority ordering – Dynamic programming.

Unit – 3: Load Frequency Control-I

Modeling of steam turbine – Generator – Mathematical modeling of speed governing system – Transfer function – Necessity of keeping frequency constant – Definitions of Control area – Single area control system – Block diagram representation of an isolated power system – Steady state analysis – Dynamic response – Uncontrolled case. Proportional plus Integral control of single area and its block diagram representation – Steady state response.

Unit – 4: Load Frequency Control-II

Block diagram development of Load Frequency Control of two area system uncontrolled case and controlled case. Tie-line bias control. Load Frequency Control and Economic dispatch control

Unit – 5: Compensation in Power Systems

Overview of Reactive Power control – Reactive Power compensation in transmission systems – Advantages and disadvantages of different types of compensating equipment for transmission systems – Load compensation – Specifications of load compensator – compensated transmission lines – Introduction of FACTS devices – Types of FACTS devices - Need of FACTS controllers.

Course Outcomes

S. No	Course Outcomes	BTL
1.	Compute optimal scheduling of Generators.	L4
2.	Understand hydrothermal scheduling and unit commitment problem.	L2
3.	Construct a mathematical model of the power system to understand how to regulate the load frequency in a single area under various conditions.	L4
4.	Understand importance of PID controllers in single area and two area systems.	L2
5.	Identify transmission line reactive power enhancement and control.	L3

Correlation of COs with POs& PSOs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	**3**	**2**	**1**	**1**	**1**	**1**	**1**				**2**		**2**	**1**
CO 2	**3**	**2**	**1**	**1**	**1**		**1**				**2**		**2**	**1**
CO 3	**3**	**2**	**1**	**1**	**1**						**2**		**2**	**1**
CO 4	**3**	**2**	**1**	**1**	**1**						**2**		**2**	**1**
CO 5	**3**	**2**	**1**	**1**	**1**	**1**	**1**				**2**		**2**	**1**

1 – Weak, 2 – Moderate and 3 - Strong

Text Books:

1. Power Generation, Operation and Control by Allen J Wood, Bruce F WollenBerg 3rd Edition, Wiley Publication 2014.
2. Electric Energy systems Theory – by O.I.Elgerd, Tata McGraw–hill Publishing Company Ltd., Second edition.
3. Modern Power System Analysis – by I.J.Nagrath&D.P.Kothari Tata McGraw Hill Publishing Company Ltd, 2nd edition.

Reference Books:

1. Power System Analysis and Design by J. Duncan Glover and M. S. Sarma., Thompson, 3rdEdition.
2. Power System Analysis by Grainger and Stevenson, Tata McGraw Hill.
3. Power System Analysis by Hadi Saadat – TMH Edition.
4. Power System stability & control, Prabha Kundur,TMH.