POWER SYSTEM OPERATION AND CONTROL

Course Code	20EE4701A	**Year**	IV	**Semester(s)**	I
Course Category	Professional Elective-III	**Branch**	EEE	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	PSA
Continuous Internal Evaluation:	**30**	**Semester End Evaluation:**	**70**	**Total Marks:**	**100**

Course Outcomes	
Upon successful completion of the course, the student will be able to	
CO1	**Understand** the basic concepts of economic load dispatch, hydrothermal scheduling, load frequency control, power factor improvement and voltage control (L2).
CO2	**Demonstrate** the different types of hydrothermal scheduling, economic operation of power systems and load frequency control. (L3)
CO3	**Illustrate** the concepts of power factor improvement and voltage control in power systems. (L3)
CO4	**Analyze** the optimal operation of hydro and thermal power plants**,** single area and two area systems. (L4)
CO5	**Analyze** the most economical power factor for constant KW& KVA loads, and various voltage control devices. (L4)
CO6	**Learn** various power system operation concepts and **submit a report.**

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1														
CO2	3					2							3	2
CO3	2							2				2	3	2
CO4		3				1							3	2
CO5		2						1				1	3	2
CO6	3	3							3	3			3	2

SYLLABUS		
Unit No.	**Contents**	**Mapped CO**
I	**Economic Operation of Power Systems:** Economic dispatch in Thermal Power Station, - Heat rate Curve - Cost Curve - Incremental fuel Cost and Incremental Production costs, Input-output characteristics, Optimum operation of thermal units without and with transmission losses Numerical problems - Loss Coefficients, General transmission line loss formula (Descriptive treatment only).	**CO 1 CO 2 CO 4 CO 6**

II	**Hydrothermal Scheduling:** Optimal scheduling of hydrothermal system, hydroelectric power plant models, types of scheduling problems, Mathematical formulation and solution Technique of hydrothermal scheduling problem using gradient method.	**CO 1** **CO 2** **CO 4** **CO 6**
III	**Single area load frequency control:** Necessity of keeping frequency constant, concept of control area, Block diagram representation of an isolated power system, Steady state analysis , Dynamic response , Proportional plus Integral control of single area and its block diagram representation.	**CO 1** **CO 2** **CO 4** **CO 6**
I V	**Two area load frequency control**: Development of block diagram of a two area system and its Static and dynamic responses, Tie-line bias control, comparison of load frequency control and Economic dispatch control.	**CO 1** **CO 2** **CO 4** **CO 6**
V	**Power factor and Voltage Control:** Causes of low p.f, methods of improving p.f, static capacitor, synchronous condensers and phase advancers, most economical p.f. for constant KW load and constant KVA type loads. Importance of voltage control, shunt capacitors, series capacitors and their location in the power system.	**CO 1** **CO 3** **CO 5** **CO 6**

Learning Resources
Text Books
1. I.J.Nagrath and D.P.Kothari, "Modern Power System Analysis", Tata McGraw Hill Publishing Company Ltd, 4th edition, 2011. 2. AbhijitChakrabarti, SunitaHalder, "Power System Analysis: Operation and Control", Prentice Hall of India3rd edition, 2010.
Reference Books
1. O.I.Elgerd, "Electric Energy systems Theory", Tata McGraw-hill Publishing Company Ltd., 2nd edition,2004. 2. Allen J.Wood and bruceF.Wollenberg, "Power generation, operation and control", 2nd edition. 3. John Grainger and William Stevenson, "Power System Analysis", Tata McGraw Hill, 2017. 4. HadiSaadat, "Power System Analysis", McGraw Hill, 2004.
Web Links 3. https://nptel.ac.in/courses/108102047