SEMESTER S7

POWER SYSTEM OPERATION AND CONTROL

Course Code	PEEET741	CIE Marks	40
Teaching Hours/Week (L: T:P: R)	3:0:0:0	ESE Marks	60
Credits	3	Exam Hours	2 Hrs. 30 Min.
Prerequisites (if any)	PCEET501, PBEET604	Course Type	PE -Theory

Course Objectives:

1. To introduce analysis techniques for the operation and control of power system.
2. To discuss load scheduling and scheduling of energy.
3. To study power system security and state estimation.

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	Introduction- Optimum load dispatch - First order gradient method base point and participation factors. Economic dispatch versus unit commitment. Unit Commitment Solution Methods - Priority-List Methods – Security Constrained Unit Commitment.	9
2	Generation with limited supply-Take or pay fuel supply contract-Introduction to Hydrothermal coordination-Long range and short range scheduling Hydro-electric plant models-scheduling energy problems - types of scheduling problems. Scheduling energy - The Hydrothermal Scheduling Problem - Hydro scheduling with storage limitation - Introduction to Pumped storage hydro plants.	9
3	Inter change evaluation and power pools- Interchange contracts – Energy interchange between utilities - Interchange evaluation with unit commitment - Energy banking- power pools. Power system security- Factors Affecting Power System Security - Contingency Analysis: Detection of Network Problems - Generation Outages - Transmission Outages - An Overview of Security Analysis.	9
4	Introduction to State estimation in power system, Maximum Likelihood Weighted Least Squares Estimation - State Estimation of an AC Network - Sources of Error in State Estimation - Detection and Identification of Bad	9

Measurements - Estimation of Quantities Not Being Measured - Network Observability and Pseudo-measurements - The Use of Phasor Measurement Units (PMUs) - Application of Power Systems State Estimation - Importance of Data Verification and Validation.	

Course Assessment Method
(CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
5	**15**	**10**	**10**	**40**

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
• 2 Questions from each module. • Total of 8 Questions, each carrying 3 marks **(8x3 =24marks)**	• Each question carries 9 marks. • Two questions will be given from each module, out of which 1 question should be answered. • Each question can have a maximum of 3 sub divisions. **(4x9 = 36 marks)**	**60**

Course Outcomes (COs)

At the end of the course students should be able to:

	Course Outcome	Bloom's Knowledge Level (KL)
CO1	Analyse various methods of generation scheduling.	**K4**
CO2	Formulate hydro-thermal scheduling problems.	**K5**
CO3	Evaluate power exchange in interconnected power systems.	**K5**
CO4	Analyse security issues in power system networks.	**K3**
CO5	Analyse various state estimation methods.	**K4**

Note*: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

CO-PO Mapping Table (Mapping of Course Outcomes to Program Outcomes)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	3	3					3
CO2	3	3	3	3	3	3	3					3
CO3	3	3	3	3	3	3	3					3
CO4	3	3	3	3	3	3	3					3
CO5	3	3	3	3	3	3	3					3

Note: *1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation*

Text Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Power Generation Operation and Control	Allen J. Wood & Bruce F. Wollenberg	John Wiley & Sons	3rd edition 2023
2	Power System Analysis	John Graigner & William Stevenson	McGraw Hill	1994
3	Power System State Estimation: Theory and Implementation	Ali Abur, Antonio Gomez	CRC Press	2004