

Course Code EPE 800	Credit Hours (Th-Pr) 3.0-0	<b>Power System Operation, Control and Optimization (Core)</b>	Contact Hrs/Week (Th-Pr) 3.0-0	Total Contact Hrs (Th-Pr) 45-0
------------------------	----------------------------------	--	--------------------------------------	--------------------------------------

**Course Outline:**

1. Topics include Introduction & Characteristics of Power Generating Units, Economic Dispatch : Principles ,Economic Dispatch: Numerical Methods, Economic Dispatch: Dynamic Programming ,Transmission Losses: Load Flow, Transmission Losses: Loss Coefficients, Unit Commitment: Principles, Unit Commitment: Methods, Generation with Limited Energy Supply, Generation with Limited Energy Supply, Production Models and Probabilistic Computations, Interchange of power and energy, Power System Security, Optimal Power Flow, Hydrothermal modeling and scheduling

**Eligibility Criteria:**

2. B.E (Electrical Engineering)

**Recommended Books:**

S. No.	Title	Author(s)	Assigned Code	Remarks
1.	Power Generation, operation and Control	Allen J.Wood	A	Text
2.	Operation and Control in Power Systems	P.S Murty	P	Text
3.	Power System Operation	Robert Miller	R	Reference
4.	Power System Operation and control	S. Sivanagaraju	S	Reference

**Course Objectives:**

3. Primary objective is to develop a sound understanding in the students regarding operation of power system, what corrective decisions need to made in case of emergencies and how to optimally dispatch power from different generation sources.

**Learning outcome:**

4. A student who has met the objectives of the course will be able to perform detailed analyses on the operation and control of power system

**Topics Covered:**

No	Topics	Text Book	Contact Hours
1.	<p><b>Characteristics of Power Generation Units</b></p> <ul style="list-style-type: none"> <li>• Characteristics of Steam Units</li> <li>• Variations in Steam Unit Characteristics</li> <li>• Cogeneration Plants</li> <li>• Light-Water Moderated Nuclear Reactor Units</li> <li>• Hydroelectric Units</li> </ul>	A	08
2.	<p><b>Economic Dispatch of Thermal Units and Methods of Solution</b></p> <ul style="list-style-type: none"> <li>• The Economic Dispatch Problem</li> <li>• Thermal System Dispatching with Network Losses Considered</li> <li>• The Lambda-Iteration Method</li> <li>• Newton's Method 47</li> <li>• Economic Dispatch Using Dynamic Programming</li> <li>• Economic Dispatch Versus Unit Commitment</li> </ul>	A & P	08
3.	<p><b>Transmission System Effects</b></p> <ul style="list-style-type: none"> <li>• The Power Flow Problem and Its Solution</li> <li>• The Power Flow Problem on a Direct Current Network</li> <li>• The Formulation of the AC Power Flow</li> <li>• The Gauss-Seidel Method</li> <li>• The Newton-Raphson Method</li> <li>• The Decoupled Power Flow</li> <li>• The "DC" Power Flow</li> <li>• Transmission Losses</li> <li>• Two-Generator System</li> </ul>	A,P & R	08

	<ul style="list-style-type: none"> <li>• Coordination Equations, Incremental Losses, and Penalty Factors</li> <li>• The B Matrix Loss Formula</li> </ul>		
4.	<p><b>Introduction to Unit Commitment</b></p> <ul style="list-style-type: none"> <li>• Constraints in Unit Commitment</li> <li>• Spinning Reserve</li> <li>• Thermal Unit Constraints</li> <li>• Generation with Limited Energy Supply</li> <li>• Take-or-Pay Fuel Supply Contract</li> <li>• Composite Generation Production Cost Function</li> <li>• Solution by Gradient Search Techniques</li> <li>• Hard Limits and Slack Variable</li> <li>• Fuel Scheduling by Linear Programming</li> </ul>	A	08
5.	<p><b>Hydrothermal Coordination</b></p> <ul style="list-style-type: none"> <li>• Long-Range Hydro-Scheduling</li> <li>• Short-Range Hydro-Scheduling</li> <li>• Hydroelectric Plant Models</li> <li>• Scheduling Problems</li> </ul> <p><b>Control of Generation</b></p> <ul style="list-style-type: none"> <li>• Generator Model</li> <li>• Load Model</li> <li>• Prime-Mover Model</li> <li>• Governor Model</li> <li>• Tie-Line Model</li> <li>• Generation Control</li> </ul>	A	08
6	<p><b>Interchange of Power and Energy</b></p> <ul style="list-style-type: none"> <li>• Introduction</li> <li>• Economy Interchange between Interconnected Utilities</li> <li>• Inter utility Economy Energy Evaluation</li> <li>• Interchange Evaluation with Unit Commitment</li> <li>• Multiple-Utility Interchange Transactions</li> </ul>	A,P & S	05

	<ul style="list-style-type: none"><li>• Other Types of Interchange</li></ul>		
--	--	--	--