SCHEME OF COURSE WORK

Course Details:

Course Title	**: RESTRUCTURED POWER SYSTEMS**		
Course Code	**:** 15EE2108	**L T C**	**:3 0 3**
Program:	**: M.Tech.**		
Specialization:	**: Power System and Control Automation**		
Semester	**: II**		
Prerequisites	**: Power System Operation and Control**		

Course Outcomes (COs):

After completion of the course student acquire knowledge in

1	Understand the need for restructuring of Power Systems, discuss different market models, different stakeholders and market power.
2	Understand and generalize the functioning and planning activities of ISO.
3	Understand transmission open access pricing issues and congestion management.
4	Define transfer capability and estimate the transfer capability of a small power systems. (Numerical examples)
5	Define ancillary services and understand reactive power as ancillary service and management through synchronous generator.

Program Outcomes (POs):

A graduate of Power System Control & Automation will be able to

PO 1: Acquire in depth knowledge in the area of power system control and automation.

PO 2: Analyze the models with respect to any kind of problem on hand and try to solve related to power system control and automation.

PO 3: Develop the capability of problem solving and original thinking to arrive at feasible and optimal solutions considering societal and environmental factors.

PO 4: Interpret and demonstrate sufficient knowledge base, to apply the techniques and tools either individually or in groups to solve power system problems.

PO 5: Select state-of-the-art tools for modeling, simulation and analysis of problems related to power systems.

PO 6: Recognize positively any collaborative and multidisciplinary research to achieve common goals.

PO 7: Demonstrate knowledge and understanding of power system engineering and management principles and apply the same for efficiently carrying out projects with due consideration to economical and financial factors.

PO 8: Communicate confidently, make effective presentations and write good reports to engineering community and society.

PO 9: Recognize the need for life-long learning and have the ability to do it independently.

PO 10: Understand Social responsibilities and follow ethical practices to contribute to the community for sustainable development.

PO 11: Predict and self examine critically the outcomes of actions, reflect on to make corrective measures and move forward positively.

Course Outcome Versus **Program Outcomes:**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO-1	S	S	S	-	-	-	M	M	M	-	-
CO-2	S	S	-	-	-	-	-	-	-	-	-
CO-3	S	S	-	M	S	S	M	-	-	-	-
CO-4	S	S	M-	M	S	S	M	-	-	-	-
CO-5	S	-	S	M	S	-	M	-	M	-	-

S - Strongly correlated, *M* - *Moderately* correlated, *Blank* - *No correlation*

Assessment Methods:	Assignment / Quiz / Seminar / Case Study / Mid-Test / End Exam

Teaching-Learning and Evaluation

Week	TOPIC / CONTENTS	Course Outcomes	Sample questions	TEACHING-LEARNING STRATEGY	Assessment Method & Schedule
1	Introduction – What is Deregulation?; Deregulation Vs Restructuring; Restructuring Models.	CO1	What is the necessity of restructuring and its benefits. What are the differet models of restructuring?	• Classroom • Case study presentation	Test-I (Week-9) Assignment-I (Week 3-5)
2	Key Stakeholders in Restructured Power System – Independent System Operator, Power Exchange, Load Serving Entities.	CO1	Explain the role of each stakeholder in Restructured Power Industry.	• Classroom • Case study presentation	Test-I (Week-9) Assignment-I (Week 3-5)
3	Market Operations – Day ahead and Hour ahead markets, elastic and non-elastic markets; Market Power; Benefits from Competitive Electricity Markets.	CO1	Explain how a typical market operations are carried out in a restructured electricity market. What are the benefits of Competitive Electricity Markets?	• Classroom • Case study presentation	Test-I (Week-9) Assignment-I (Week 3-5)
4	Introduction; Role of the Independent System Operator; Operational planning activities of ISO – in pool markets.	CO2	What is ISO and its Role? What are the activities of ISO – day-ahead, hour-ahead in realtime.	• Classroom • Case study presentation	Test-I (Week-9) Assignment-I (Week 3-5)

5	Operational planning activities of ISO - in bilateral markets;	CO2	Explain the operation of ISO in a bilateral market using trasaction matrix.	• Classroom • Case study presentation	Test-I (Week-9) Assignment-I (Week 3-5)
6	Market participation issues; Unit Commitment in Deregulated Environment; Competitive Bidding.	CO2	What is Transfer Capability? How is it different from Transmission Capaciity?	• Classroom • Case study presentation	Test-I (Week-9) Assignment-I (Week 6-8)
7	Introduction; Power Wheeling; Transmission Open Access – Types of Transmission services, cost components;	CO3	What is Power Wheeling? And how Transmission Pricing is done?	• Classroom • Case study presentation	Test-I (Week-9) Assignment-I (Week 6-8)
8	Pricing of Power Transactions – Embedded Cost Based Transmission Pricing, Incremental Cost Based Pricing;.	CO3	What are the different methods of Transmission Pricing? Discuss their advantages and disadvantages.	• Classroom Case study presentation	Test-I (Week-9) Assignment-I (Week 6-8)
9	Congestion Pricing –Congestion Pricing Methods, Transmission Rights; **Test-I**	CO3	What is Congestion? And what is the need of congestion pricing. Discuss.	• Classroom • Case study presentation • Demo of ATC Calculation using Open Source Software.	Test-I (Week-9) Assignment-I (Week 6-8)
10	Congestion Management: Management of Inter-zonal/Intra-zonal congestion.	CO3	How congestion management is carred out using inter-zonal and intra-zonal concept?	• Classroom • Case study presentation	Test-II (Week-18) Assignment-II (Week 10-14)
11	Definitions, Transfer Capability issues, ATC Calculation	CO4	What is Available Transmission Capability? How is it different from Transmission Capacity? Describe how ATC is calculated?	• Classroom • Demo of ATC Calculation using Open Source Software.	Test-II (Week-18) Assignment-II (Week 10-14)
12	Methodologies to calculate ATC.	CO4	Describe various methods of calculating ATC.	• Classroom • Demo of ATC Calculation using Open Source Software.	Test-II (Week-18) Assignment-II (Week 10-14)
13	Methodologies to calculate ATC.	CO4	Describe various methods of calculating ATC.	• Classroom • Demo of ATC Calculation using Open Source Software.	Test-II (Week-18) Assignment-II (Week 10-14)
14	Introduction to Ancillary Services. General description of some ancillary services.	CO5	What are ancillary services and their role in a restructured environment?	• Classroom • Case study presentation	Test-II (Week-18) Assignment-II (Week 10-14)

15	Ancillary Services Management in various countries;	CO5	Compare the ancillary services in different countries.	• Classroom • Case study presentation	Test-II (Week-18)
16	Reactive Power as an ancillary service – a review – synchronous generators as ancillary service providers.	CO5	How a synchronous generator capability to supply reactive power is used as anscillary service business?	• Classroom Case study presentation	Test-II (Week-18)
17	Reactive Power as an ancillary service – a review – synchronous generators as ancillary service providers.	CO5	What are the constraints in the supply of reactive power by a synchrounous generator?	• Classroom • Case study presentation	Test-II (Week-18)
18	Review of the course **Test - II**				
19/20	End Semester Examinations				