

Course Contents

1. Give details of the course, on the following lines:
 - a. Course Code EPE 816
 - b. Title Electric Power Markets
 - c. Credit Hours 3

Objectives

2. The outcomes of this course are:
 - a. To impart the understanding of electric power sector to the students.
 - b. To comprehend models and management of electric power markets
 - c. To comprehend interplay of economics and electrical engineering that underlies modern electric power market operations
 - d. To discuss and understand electric power markets emerging in Pakistan

3. Outcomes

- a. The students will be able comprehend the policy options and management of electric power sector.
- b. The students will be able to understand generation dispatch, demand response, and optimal network flows under regulated and liberalized environments.
- f. Contents with suggested contact hours

No.	Topics	Text Book	Contact Hours
1	Electric Power Industry in the Context of Microeconomics Power Production Cost Marginal Costs and the Supply Curve of the Firm Types of Markets for Commodities, Resources, and Services Markets with Perfect Competition, Monopoly and Oligopoly	DB	6
2	Models of Electricity Market Organization Basic Electricity Market Models: Regulated Natural Monopoly, Single Buyer, Competition in the Wholesale and Retail Markets Qualitative Analysis and Comparison of Models : Criteria,	DB	6

	<p>Factors, Competition, and Regulation</p> <p>Flaws of the Competitive Electricity Market</p> <p>Case Studies of different market models</p>		
3	<p>Risks of Participation in Electricity Markets</p> <p>Price risk management and contracts;</p> <p>Principles of portfolio design</p> <p>Forward and spot (balancing) markets; power exchanges</p> <p>Perspectives of producers, retailers, customers, hybrid participants</p>	DB	3
4	<p>Efficient Short-Term Operation of an Electricity Industry</p> <p>Optimal Dispatch of Both Generation and Load Assets</p> <p>Total Surplus Maximisation and Generation Cost Minimisation</p> <p>The Benefit or Utility Function</p> <p>Startup Costs and the Unit-Commitment Decision</p>	DB	6
5	<p>Efficient Use of Generation and Load Resources by a Market Mechanism</p> <p>Decentralisation, Competition and Market Mechanisms</p> <p>Achieving Optimal Dispatch Through Competitive Bidding</p> <p>Compulsory Gross Pool and Net Pool</p> <p>Pay-as-Clear versus Pay-as-Bid Mechanisms</p> <p>Day-Ahead versus Real-Time Markets</p> <p>Reducing the Exercise of Market Power</p>	DB	6
6	<p>Representing Networks Constraints</p> <p>Representing Networks Mathematically</p> <p>Net Injections, Power Flows and the DC Load Flow Model</p> <p>The Matrix of Power Transfer Distribution Factors</p> <p>Constraint Equations and the Set of Feasible Injections</p>	DB	3
7	<p>Efficient Dispatch of Generation and Consumption Resources in the Presence of Network Congestion</p> <p>Achieving Optimal Dispatch Using a Smart Market</p> <p>Optimal Dispatch in a Meshed Network with Constraints</p> <p>The Merchandising Surplus, Settlement Residues</p> <p>Congestion Rents and Network Losses</p>	DB	6
8	<p>Transmission Cost Allocation Methods and Congestion Management</p>	DB	6

	Transmission Cost Allocation Methods Locational Marginal Price (LMP) LMP Application in Determining Zonal Boundaries Financial Transmission Right (FTR) FTR Auction Zonal Congestion Management Case Studies of Transmission Cost Allocation Methods		
9	Guest lecture by professionals from industry		3
	Total		45

4. Recommended Reading (including Textbooks and Reference books).

S. No.	Title	Author(s)	Assigned Code	Remarks
1	The Economics of Electricity Markets (2014)	Darryl R. Biggar, Mohammad Reza Hesamzadeh	DB	Text Book
2	Electricity Market Reforms (2011)	Lev S. Belyaev	LB	Reference
3	Market Operations in Electric Power Systems (2002)	Mohammad Shahidehpour, Hatim Yamin	MS	Reference
4	Fundamentals of Power System Economics (2004)	Daniel S. Kirschen, Goran Strbac	DK	Reference
5	Power Exchange as a Deregulated Electricity Market (2010)	Kashif Imran	KI	Reference

5. Details of online resources (N/A)

6. Recommended Journals/Conference Proceedings

- a. IEEE Transactions on Power Systems
- b. IEEE Transactions on Smart Grid
- c. Electric Power Systems Research (Elsevier Journal)
- d. Energy Policy (Elsevier Journal)