

COURSE TITLE	RESTRUCTURED POWER SYSTEM
COURSE CODE	01EE0712
COURSE CREDITS	3

Objective:

- 1 To develop comprehensive knowledge of need, key players and operational aspects of restructured power system

Course Outcomes: After completion of this course, student will be able to:

- 1 Describe the rationale behind restructuring the power industry and identify the key players in a restructured market.
- 2 Illustrate the components of restructured power markets based on relevant economic principles.
- 3 Assess the strategies for managing transmission congestion and ancillary services.
- 4 Elaborate the specific reforms undertaken in the Indian power sector.

Pre-requisite of course: Knowledge of inter-connected power system operation.

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	0	0	50	30	20	0	0

Contents : Unit	Topics	Contact Hours
1	Introduction to restructuring of power industry Introduction, Reasons for restructuring/deregulation of power industry, Understanding the restructuring process, Introduction to issues involved in deregulation, Reasons and objectives of deregulation of various power systems across the world	4
2	Fundamentals of Economics Introduction to fundamentals of Economics, Consumer behaviour, Supplier behaviour, Market equilibrium, Short-run and Long-run costs, Various costs of production, Perfectly competitive market	7
3	The Philosophy of Market Models Introduction to the Philosophy of Market Models, Market models based on contractual arrangements, Comparison of various market models, Electricity vis-à-vis other commodities, Market architecture	8
4	Transmission Congestion Management Introduction, Classification of congestion management methods, Calculation of ATC, Non-market methods, Nodal pricing, Inter-zonal Intra-zonal congestion management	8

Contents : Unit	Topics	Contact Hours
5	Ancillary Service Management Introduction to ancillary services, Types of ancillary services, Classification of ancillary services, Load-generation balancing related services, Voltage control and reactive power support services, Black start capability service, Co-optimization of energy and reserve services, International comparison	9
6	Reforms in Indian Power Sector Introduction, Framework of Indian power sector, Reform initiatives during 1990-1995, The availability based tariff (ABT), The Electricity Act 2003, Open Access issues, Power exchange	6
Total Hours		42

Textbook :

- 1 Fundamentals of Power System Economics, Daniel Kirschen, and Goran Strbac, John Wiley & Sons Ltd., 2004
- 2 Operation of restructured power systems, Bhattacharya, Kankar, Math HJ Bollen, and Jaap E. Daalder, Springer Science & Business Media, 2012

References:

- 1 Understanding electric utilities and de-regulation, Understanding electric utilities and de-regulation, Willis, H. Lee, and Lorrin Philipson, CRC Press, 2018

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery					
Remember / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking / Creative
10.00	20.00	25.00	25.00	10.00	10.00

Instructional Method:

- 1 The course delivery method will depend upon the requirement of content and the needs of students. The teacher, in addition to conventional teaching methods, may also use any tools such as demonstration, role play, Quiz, brainstorming, MOOCs, etc
- 2 The internal evaluation will be done on the basis of continuous evaluation of students in the classroom
- 3 Students will use supplementary resources such as online videos, NPTEL videos, e-courses, and Virtual Laboratory

Supplementary Resources:

- 1 <http://nptel.iitm.ac.in/courses/108101005/>
- 2 www.cercind.gov.in
- 3 www.nrldc.org
- 4 www.wrldc.com
- 5 www.iexindia.com
- 6 www.powermin.nic.in