National Institute of Technology Meghalaya

(An Institute of National Importance)

CURRICULUM

Programme	**Bachelor of Technology in Electrical and Electronics Engineering**	Year of Regulation	**2019-20**
Department	**Electrical Engineering**	Semester	**V**

Course Code	Course Name	Credit Structure				Marks Distribution			
		L	T	P	C	INT	MID	END	Total
EE321	**Restructured Power Systems**	**3**	**0**	**0**	**3**	**50**	**50**	**100**	**200**

Course Objectives	Course Outcomes	
To familiarize the students with concepts and need for deregulated power systems	CO1	**Understand the basic reasons and motivations for restructuring worldwide.**
To impart the knowledge of power market development in India and across the world.	CO2	**Understand the roles and responsibilities of different entities in electricity market.**
To understand the key factors in equipment specification and system design.	CO3	**Explore issues like congestion management, Transmission pricing, Ancillary Services.**
	CO4	**Understand the Power market scenarios in India.**

No.	COs	Mapping with Program Outcomes (POs)												Mapping with PSOs		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	CO1	**2**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**1**
2	CO2	**2**	**1**	**2**	**1**	**1**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**2**	**0**	**1**
3	CO3	**2**	**2**	**2**	**1**	**1**	**1**	**0**	**1**	**0**	**0**	**0**	**0**	**2**	**0**	**1**
4	CO4	**1**	**0**	**1**	**0**	**1**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**2**	**0**	**1**

SYLLABUS

No.	Content	Hours	COs
I	**Introduction to restructuring of power industry:** Deregulation of power industry, unbundling of electric utilities, Issues involved in deregulation, Deregulation of various power systems –Fundamentals of Economics: Consumer behavior, Supplier behavior, Market equilibrium, Short and long run costs, Various costs of production –Market models: Market models based on Contractual arrangements, Comparison of various market models, Market Mechanism.	**08**	**CO1**
II	**Power System Operation In Competitive Environment** Role of the independent system operator, Operational planning activities of ISO: ISO in Pool markets, ISO in Bilateral markets, Operational planning activities of a GENCO: GENCOs in Pool and Bilateral markets, market	**07**	**CO1, CO2**

	participation issues, competitive bidding		
II	**Transmission congestion management:** Definition of Congestion, reasons for transfer capability limitation, Importance of congestion management, Features of congestion management –Classification of congestion management methods –Calculation of ATC -Non –market methods –Market methods –Nodal pricing –Inter zonal and Intra zonal congestion management –Price area congestion management –Capacity alleviation method	**07**	**CO3**
IV	**Ancillary service management and pricing of transmission network:** Introduction of ancillary services –Types of Ancillary services –Classification of Ancillary services –Load generation balancing related services –Voltage control and reactive power support devices –Black start capability service -ancillary service –Co-optimization of energy and reserve services -International comparison - Transmission pricing –Principles –Classification –Role in transmission pricing methods –Marginal transmission pricing paradigm –Composite pricing paradigm –Merits and demerits of different paradigm	**07**	**CO2** **CO3**
V	**Power market development in India:** Institutional structure in Indian Power sector, generation, transmission and distribution utilities.SO& LDCs.PFC, REC, ERCs, traders, Power Exchanges and their roles. Availability based tariff, Open access, Industry structure and regulatory framework, market development, RE policies, RPO, Tariff policies. Policy changes, regulatory changes, Critical issues / challenges before the Indian power sector.	**07**	**CO1** **CO4**
Total Hours		**36**	

Essential Readings

1. Lorrin Philipson, H. Lee Willis, “Understanding Electric Utilities and De-Regulation”, CRC Press, 2nd edition, 2005.
2. Kankar Bhattacharya,Jaap E. Daadler and Math H.J. Boolen, “Operation of restructured power systems”, Springer, 1st edition, 2001.
3. Loi Lei Lai : Power system Restructuring and Deregulation: Trading, Performance and Information Technology, John Wiley & Sons, Pvt. Ltd., 1st edition, 2001.

Supplementary Readings

1. Steven Stoft, “Power system economics: designing markets for electricity”, John Wiley & Sons, 1st edition, 2002.
2. Mohammad Shahidehpour and Muwaffaq Alomoush, “Restructured electrical power systems: operation, trading and volatility”, CRC Press; 1st edition, 2017