SANKALCHAND PATEL UNIVERSITY
।। अथातो ज्ञानजिज्ञासा ।।

Ph. D. Program
(July-2019 Batch)

Subject Code: 1RI3000102	**Subject Title:** Essentials of Disciplinary Research Subject-1 **Subject Sub-Title: Power System Restructuring**
Pre-requisite Subject	Computer methods in Power System Analysis and Power System Management

Objectives of course:

- This course is intended to provide a comprehensive treatment towards understanding of the new dimensions associated with deregulation of the power system.

Learning outcomes:

- The course will bring out the differences between the conventional power system operation and the restructured one. The course will prepare a background with fundamentals of microeconomics.

Teaching Scheme (Credit Distribution)				Assessment Scheme (Weightage)	
Lecture	Tutorial	Practical	Credit	Hall Exam	Continuous Evaluation
4	--	--	4	60%	40%

Continuous evaluation is based on assignments/quiz/presentation/small projects as per the supervisor instructions.

Subject Contents			
Unit	**Topic**	**No of Lectures**	**Weightage %**
1.	**Introduction to restructuring of power industry** Reasons for restructuring of power industry; Understanding the restructuring process, Entities involved, The levels of competition, The market place mechanisms, Sector-wise major changes required; Reasons and objectives of deregulation of various power systems across the world	**6**	**15%**
2.	**Fundamentals of Economics** Consumer and suppliers behavior, Total utility and marginal utility, Law of diminishing marginal utility, Elasticity of demand and supply curve, Market equilibrium, Consumer and supplier surplus, Global welfare.	**6**	**15%**
3.	**The Philosophy of Market Models** Monopoly model, Single buyer model, Wholesale competition model, Retail competition model, distinguishing features of electricity as a commodity, Four pillars of market design, Cournot, Bertrand and Stackelberg competition model.	**8**	**20%**
4.	**Transmission Congestion Management** Transfer capability, Importance of congestion management, Effects of congestion, Classification of congestion management methods, ATC, TTC, TRM, CBM, ATC calculation using DC and AC model, Nodal pricing, Locational Marginal Prices (LMPs), Implications of nodal pricing, Price area congestion management Capacity alleviation methods, Re-dispatching, Counter-trade, Curtailment.	**12**	**30%**
6.	**Pricing of transmission network usage and loss allocation** Introduction to transmission pricing, Principles of transmission pricing, Classification of transmission pricing, Rolled-in transmission pricing paradigm, Marginal transmission pricing paradigm, Composite pricing paradigm, Merits and de-merits of different paradigms, Classification of loss allocation methods.	**8**	**20%**

List of References:

1. NPTEL Cource-Restructured Power Systems, A. R. Abhyankar, S. A. Khaparde, Available: http://nptel.iitm.ac.in/courses/108101005/

2. Fundamentals of Power System economics Daniel Kirschen and Goran Strbac, John Wiley & Sons Ltd, 2004 (for chapter 1,2,3 &5)

3. Making competition work in electricity Sally Hunt, John Wiley & Sons, Inc., 2002

4. Power system restructuring and deregulation by Loi Lei Lai Wiley India.

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Ph. D. Program
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Subject Code: 1RI3000103	**Subject Title: Essentials of Disciplinary Research Subject-2** **Subject Sub-Title: Power System Analysis**
Pre-requisite Subject	The candidate/reader should have the background of **Inter-Connected Power System.**

Objectives of course: : 1. To model the power system components.
2. To simulate the power system model using various load flow methods.
3. Comparatively study the load flow results.

Learning outcomes: Current operating state of the power system can be found.
Effect of variation in load and generation on system operating conditions.

Teaching Scheme (Credit Distribution)				**Assessment Scheme (Weightage)**	
Lecture	**Tutorial**	**Practical**	**Credit**	**Hall Exam**	**Continuous Evaluation**
2	--	--	2	60%	40%

Continuous evaluation is based on assignments/quiz/presentation/small projects as per the supervisor instructions.

Subject Contents			
Unit	**Topic**	**No. of Lecture**	**Weightage %**
1	**Network Formulation and Graph Theory:** Introduction, Network Equations, Graph Theory, Development of Network Matrices from Graph Theoretic Approach.	05	22%
2	**Load Flow Studies:** Introduction, Different techniques such as Gauss Saidal method, Newton Raphson method, De-Coupled method, Fast Decoupled method, Modified Fast Decoupled, DC load flow.	15	50%
3	**Optimal Power Flow:** Concept of Optimal Power Flow, Solution of Optimal power flow by Gradient method, Security constrained optimal power flow.	08	28%

List of References:

1. Modern Power System Analysis by D. P. Kothari &I. J. Nagrath, Tata- McGraw-Hill.
2. Power System Analysis by Hadi Saadat, Tata-McGraw-Hill.
3. Electrical Power Systems by C. L. Wadhwa, New Age International.
4. Power System Analysis by T. K. Nagsarkar & M. S. Sukhija, Oxford University Press.