Kadi Sarva Vishwavidyalaya

Faculty of Engineering & Technology

Master of Engineering Semester I

(Electrical Power System)

(With effect from Academic Year 2017-18 (CBCS))

Subject Code: MEEE103-N	Subject Title: Economics of Power System
Pre-requisite	

A. Course Objective:

- Recapture of basic concepts of economic load dispatch problem
- Understanding the conventional optimization techniques used in economic load dispatch
- Overviews of existing practices in electrical energy market and thereby, gauge the direction of future growth.

Teaching scheme				Total Credit	Evaluation Scheme					
L	T	P	Total		Theory		IE Marks	CIA Marks	Pract. Marks	Total Marks
Hrs	Hrs	Hrs	Hrs		Hrs	Marks				
04	00	02	06	05	03	70	30	20	30	150

B. **Outline of the Course:**

Sr. No	TitleoftheUnit	Minimum Hours
1	**Introduction And Production Cost Models**	8
2	**Economic Dispatch Of Thermal Units And Methods Of Solution**	12
3	**Hydrothermal Co-Ordination**	10
4	**Unit Commitment**	10
5	**Fundamentals Of Economics And Deregulated Markets**	16
6	**Availability Based Tariff**	04

Total Hours (Theory): 60
Total Hours (Lab): 30
Total Hours: 90

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Detailed Syllabus

Sr. N	Topic	Lecture Hours	Weightage(%)
1	**Introduction And Production Cost Models** Introduction; Economic importance; Uses and types of production cost programs: Production costing using load duration curves, outages considered; Probabilistic production cost programs: Probabilistic production cost computations, simulating economic scheduling with the unserved load method, Expected cost method, Discussion on practical problems; Sample computation and exercise: Excluding forced outages, including forced outages.	**08**	**10%**
2	**Economic Dispatch Of Thermal Units And Methods Of Solution** Economic dispatch problem; Thermal system dispatching with network losses considered; Lambda iteration method; Gradient methods of economic dispatch: Gradient search, economic dispatch by gradient search; Newton's method; Economic dispatch with piecewise linear cost functions; Economic dispatch using dynamic programming; Base point and participation factors.	**12**	**20%**
3	**Hydrothermal Co-Ordination** Introduction: Long range hydro-scheduling, short range hydro-scheduling; Hydroelectric Plaint Models; Scheduling Problems: Types of scheduling problems, Scheduling energy; Short term hydrothermal scheduling problems: Gradient approach; Dynamic programming solution to the hydrothermal scheduling problem: Extension to other cases, dynamic programming solution to multiple hydro plant problem; Hydro-scheduling using linear programming.	**10**	**15%**
4	**Unit Commitment** Introduction: Constraints in unit commitment, spinning reserve, thermal unit constraints, other constraints; Unit commitment solution methods: Priority list methods, dynamic programming solution, Lagrane relaxation solution; Economic dispatch v/s Unit Commitment.	**10**	**15%**
5	**Fundamentals Of Economics And Deregulated Markets** Introduction; Fundamentals of markets: Modeling the consumers and producers, market equilibrium and Pareto efficiency; Concepts from the theory of the firm: Long run and short run; Types of markets: Spot market, Forward contracts and forward markets, Future contracts and future markets; Markets with imperfect competition: Market power, models of imperfect markets, monopoly; Deregulation of electric utilities; Need for a managed spot market; Types of electricity markets: Bilateral markets and pool markets; Open electrical energy markets: Comparison of pool and bilateral trading; Managed spot market: Obtaining balancing resources, Gate closures, operation of the managed spot market; Independent system operator (ISO): Types of ISO, Role of ISO; Power system operation – Old v/s New.	**16**	**25%**

6	**Availability Based Tariff:** Introduction to Availability based tariff, daily scheduling process, deviation from schedule, trading opportunity, UI rate vs system marginal cost, ABT operation guidelines for SLDC, Optimum utilization of intra-state resources, Open Access, Wheeling and energy banking	**04**	**15%**
	Total	**60**	**100**

C. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern , prerequisite of the subject will be discussed
- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc.
- Two internal exams may be conducted and average of the same may be converted to equivalent of 15 marks as a part of internal theory evaluation.
- Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carry an importance of five marks in the overall internal evaluation.

D. Learning Outcome

- The student can identify different areas of energy management and economic supply of energy.

E. Text Books & Reference Books:

- Allen J. Wood & Bruce F. Wollenberg "Power Generation Operation And Control" A Wiley- Interscience Publication.
- Daniel Kirschen&GoranStrbac "Fundamentals of Power System Economics" John Wiley Publication.
- Jizhong Zhu, "Optimization of Power System Operation", John Wiley & sons Publication.
- L. K. Kirchamayer, "Economic Operation of Power Systems", John Wiley & sons Publication.
- Kankar Bhattacharya, Math H.J. Bollen and Jaap E. Daalder, " Operation of Restructured Power Systems", Kluwer Academic Publishers.
- ABC of ABT- A primer on availability based tariff' by BhanuBhushan, open access on web

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List of experiments:

Sr. No.	Name of experiment
1.	MATLAB program for filtering out α, β and γ values from the given fuel cost function of three generators.
2.	MATLAB program for displaying final summary of fuel cost functions from the details provided by the user.
3.	MATLAB program that gives the optimal load division of two thermal plants using Lambda iteration method.
4.	MATLAB program that gives the optimal load division over a full range of load values
5.	MATLAB program for minimizing a multivariable function using newton's algorithm.
6.	MATLAB program for economic dispatch of thermal generators using newton method
7.	MATLAB program for economic load dispatch of thermal generators using Gradient method.
8.	MATLAB program for economic load dispatch of thermal generators using Reduced Gradient method.
9.	MATLAB program for investment problem using dynamic programming
10.	MATLAB program for economic dispatch using dynamic programming.