M.E Semester: 1

Electrical Engineering (Electrical Power System)

Subject Name: Economics of Power System

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.

B. Teaching / Examination Scheme

SUBJECT		Teaching Scheme				Total Credit	Evaluation Scheme					Total Marks
		L	T	P	Total		THEORY		IE	CIA	PR. / VIVO	
CODE	NAME	Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	
MEEPS-103	Economics of Power System	4	0	2	6	5	3	70	30	20	30	150

C. Detailed Syllabus

SR No.	Unit No	Topics	No. of Hours	Weightage In Exam.
1	**Unit: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	**Unit: 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	**Unit: 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: 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	**Unit: 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	**Unit: 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%

D. Instructional Methods

- 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.

E. Students Learning Outcomes

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

F. Recommended Study Materials

Text & Reference Books:

TEXT BOOKS:

1. Allen J. Wood & Bruce F. Wollenberg "Power Generation Operation And Control" A Wiley- Interscience Publication.
2. Daniel Kirschen&GoranStrbac "Fundamentals of Power System Economics" John Wiley Publication.

REFERENCES:

1. Jizhong Zhu, "Optimization of Power System Operation", John Wiley & sons Publication.
2. L. K. Kirchamayer, "Economic Operation of Power Systems", John Wiley & sons Publication.
3. Kankar Bhattacharya, Math H.J. Bollen and Jaap E. Daalder, " Operation of Restructured Power Systems", Kluwer Academic Publishers.
4. ABC of ABT- A primer on availability based tariff' by Bhanu Bhushan, open access on web

