ECONOMIC OPERATION OF POWER SYSTEMS

ISemester: EPS								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
BPSC02	Core	L	T	P	C	CIA	SEE	Total
		3	0	0	3	30	70	100
Contact Classes: 45	Total Tutorials: Nil	Total Practical Classes: Nil				Total Classes: 45		

I. COURSE OVERVIEW:

This course will illustrate the difference between economic load dispatch and unit commitment problem and provide the mathematical platform to solve economic load scheduling (with and without network losses) and unit commitment problem, solve hydro-thermal scheduling problem This subject will also cover the analyze of single area and two area systems for frequency deviation and help students to solve the OPF problem using ac and dc load flow methods.

II. COURSE OBJECTIVES:

The students will try to learn:

I. Necessary conditions for economical load scheduling problem.
II. Various constraints, problem formulation and methods to solve the unit commitment problem.
III. Constraints related to hydel power plants, problem formulation and solution techniques for hydro-thermal scheduling problem.
IV. Necessity, factors governing the frequency control and analyze the uncontrolled and controlled LFC system.
V. Basic difference between ELS and OPF problem, formulation of the OPF problem and solution techniques.

III. COURSE OUTCOMES:

CO 1	**Solve the unit Commitment problem with various constraints using conventional optimization techniques and general transmission line loss formula**	Apply
CO 2	**Identify an optimal operation setup of power system for minimizes operation costs and meet desired needs**	Apply
CO 3	**Categorize single area load frequency control and two area load frequency control to minimize the transient deviations and steady state error to zero**	Analyze
CO 4	**Analyse the importance of Reactive power control and Power Factor in power systems for efficient and reliable operation of power systems.**	Apply
CO 5	**Develop the appropriate control scheme for compensating reactive power**	Apply
CO 6	**Identify the different types of compensating equipment for reducing reactive power to improve system's efficiency**	Apply

IV. SYLLABUS

MODULE –I: ECONOMIC LOAD SCHEDULING(09)

Characteristics of steam turbine, variations in steam unit characteristics, economic dispatch with piecewise linear cost functions, Lambda iterative method, LP method, economic dispatch under composite generation production cost function, base point and participation factors, thermal system dispatching with network losses considered.

MODULE -II: UNIT COMMITMENT(10)

Unit Commitment, definition, constraints in unit commitment, unit commitment solution methods, priority, list methods, dynamic programming solution.

MODULE -III:HYDRO THERMAL SCHEDULING(08)

Characteristics of Hydroelectric units, introduction to hydrothermal coordination, long range and short-range hydro scheduling.

Hydroelectric plant models, hydrothermal scheduling with storage limitations, dynamic programming solution to hydrothermal scheduling.

MODULE -IV: LOAD FREQUENCY CONTROL(09)

Control of generation, models of power system elements, single area and two area block diagrams, generation control with PID controllers, implementation of Automatic Generation control (AGC), AGC features.

MODULE -V: OPTIMAL POWER FLOW(09)

Introduction to Optimal power flow problem, OPF calculations combining economic dispatch and power flow, OPF using DC power flow, algorithms for solution of the ACOPF, optimal reactive power dispatch.

V. Text Books:

1. J J Grainger & W DStevenson, “Power system analysis”, McGraw Hill,2nd Edition, 2003.
2. Allen JWood, Bruce F Wollenberg, Gerald B Sheblé, “Power Generation, Operation and Control”, Wiley Interscience, 2ndEdition, 2013.

VI. Reference Books:

1. Olle, Elgerd, “Electric Energy Systems Theory an Introduction”, TMH, 2ndEdition, 1983.

VII. Web References:

1. https://pdfs.semanticscholar.org/b99b/cedc7f9e06d8b21d910767bb886a6d038283.pdf
2. https://core.ac.uk/download/pdf/33363832.pdf

VIII. E-Text Books:

1. https://core.ac.uk/download/pdf/33363832.pdf
2. http://vbn.aau.dk/files/226382872/seyedmostafa_farashbashiastaneh.pdf