Course Number and Name

BEE**0**47 & Power System Operation and Control

Credits and Contact Hours

3 & 45

Course Coordinator's Name

Dr.V.Jayalakshmi

Text Books and References

Text Books:

1. Olle.I.Elgerd, 'Electric Energy Systems theory - An introduction', Tata McGraw Hill Education Pvt.Ltd., New Delhi, 34th reprint, 2010.
2. Allen. J. Wood and Bruce F. Wollenberg, 'Power Generation, Operation and Control', John Wiley & Sons, Inc., 2003.

AbhijitChakrabarti, SunitaHalder, 'Power System Analysis Operation and Control', PHI learning Pvt. Ltd., New Delhi, Third Edition, 2010.

References:

1. Nagrath I.J. and Kothari D.P., 'Modern Power System Analysis', Tata McGraw-Hill, Fourth Edition,2011.
2. Kundur P., 'Power System Stability and Control, Tata McGraw Hill Education Pvt. Ltd., New Delhi,10th reprint, 2010.
3. HadiSaadat, 'Power System Analysis', Tata McGraw Hill Education Pvt. Ltd., New Delhi, 21streprint, 2010.
4. http://nptel.ac.in/courses/108104052/

Course Description

To understand the economics of power system operation with thermal and hydro units, To realize the requirements and methods of real and reactive power control in power system and to be familiar with the power system security issues and contingency

Prerequisites	Co-requisites
Transmission & Distribution	Nil

required, elective, or selected elective (as per Table 5-1)

Required

Course Outcomes (COs)

CO1: An overview of power system operation and control.

CO2: Basics of speed governing mechanism, modelling and speed-load characteristics.

CO3:Generation and absorption of reactive power.

CO4: Formulation of economic dispatch problem and incremental cost curve coordination equations without and with loss (No derivation of loss coefficients).

CO5: Know the concept of energy control centre.

Student Outcomes (SOs) from Criterion 3 covered by this Course

COs/SOs	a	b	c	d	e	f	g	h	i	j	k	l
CO1	M	H	M	M	M	L	M	L	M	L	L	M
CO2	H	H	M	M	H	M	M	L	H	M	L	M
CO3	H	H	M	H	H	H	M	M	M	M	L	M
CO4	H	H	H	H	H	H	M	M	L	M	L	M
CO5	H	H	H	H	M	M	M	M	L	M	L	M

List of Topics Covered

UNIT I INTRODUCTION 9

An overview of power system operation and control - system load variation - load characteristics load curves and load-duration curve - load factor - diversity factor - Importance of load forecasting and quadratic and exponential curve fitting techniques of forecasting – plant level and system level controls.

UNIT II REAL POWER - FREQUENCY CONTROL 9

Basics of speed governing mechanism and modelling - speed-load characteristics – load sharing between two synchronous machines in parallel - control area concept - LFC control of a singlearea system - static and dynamic analysis of uncontrolled and controlled cases - two-area system modelling - static analysis of uncontrolled case - tie line with frequency bias control - state variable model - integration of economic dispatch control with LFC.

UNIT III REACTIVE POWER–VOLTAGE CONTROL 9

Generation and absorption of reactive power - basics of reactive power control - excitation systems – modelling - static and dynamic analysis - stability compensation - methods of voltage control: tap changing transformer, SVC (TCR + TSC) and STATCOM – secondary voltage control.

UNIT IV UNIT COMMITMENT AND ECONOMIC DISPATCH 9

Formulation of economic dispatch problem – I/O cost characterization – incremental cost curve – coordination equations without and with loss (No derivation of loss coefficients) - solution by direct method and λ-iteration method - statement of unit commitment problem – priority-list method – forward dynamic programming.

UNIT V COMPUTER CONTROL OF POWER SYSTEMS 9

Need for computer control of power systems - concept of energy control centre - functions – system monitoring - data acquisition and control - system hardware configuration – SCADA and EMS functions - network topology - state estimation – WLSE - Contingency Analysis - state transition diagram showing various state transitions and control strategies.