Course Type	Course Code	Name of Course	L	T	P	Credit
DC	NEEC502	Power System Analysis	3	1	0	4

Course Objective

This course deals with modern power system operational and control problems and solution techniques. Main objectives are:

- Estimation of system variables during fault.
- To understand the solution methods of economic dispatch and explain the automatic generation control of a single/multi-area power system.
- To provide the knowledge of hydrothermal scheduling and reactive power control in power system.

Learning Outcomes

Upon successful completion of this course, students will acquire:

- Knowledge on most of the operational aspects of power system.
- Knowledge in developing basic research skills in the area of power system operation and control.
- Knowledge which will be helpful to the students when they will work in real power system engineering jobs.

Unit No.	Topics to be Covered	Lecture +Tutorial Hours	Learning Outcome
1	**Introduction:** Concept on structure of power system; Necessity of control of power system; Different control methods.	2L+1T	Knowledge gain on structure of real power system and their control approaches.
2	**Network Modelling:** Concept of primitive network; Formulation of [Y]-bus matrix using singular transformation; Formulation of [Y]-bus matrix with the inclusion of regulating transformer; tap-changing transformer; Formulation of [Z]-bus matrix; Fault calculations using Z-bus.	8T+3L	Knowledge gain on the formation of Y-bus and fault study using Z-bus approach.
3	**Economic Operation:** Constraints in economic operation; Analytical approach for economic operation of thermal units: without line loss and with line loss; Transmission loss formula and economic operation; Algorithm and solution of optimal generation allocation.	10L+2T	Knowledge gain on economic operation of thermal power generators.
4	**Hydro-thermal Scheduling:** Optimum scheduling of Hydro-thermal system; Aspects of Hydro-thermal system: Long term and short term scheduling.	8L+4T	Knowledge gain on optimal scheduling of hydro-thermal systems.
5	**Automatic Generation Control (AGC):** Review of automatic load frequency control (ALFC); Responses of primary and secondary ALFC loops, ALFC of single area and multi area power systems; Static and dynamic performance; AGC in a deregulated environment, Recent advances in AGC	9L+3T	Knowledge gain on various aspects of automatic generation control.
6	**Reactive Power Control:** Application of automatic voltage regulator, OLTC Transformer, FACTS devices, synchronous condenser, static VAR compensators.	5L+1T	Knowledge gain on reactive power control in power system using different approaches.
	Total Contact Hours	**42L+14T**	

Text Books:

1. J.J. Grainger and W.D. Stevenson, "Power System Analysis", McGraw Hill Int. Student Ed.
2. A.J. Wood and B.F. Wollenburg, "Power Generation Operation and Control", Willey, Student Ed.

Reference Books:

1. H. Saadat, *'Power System Analysis'*, TMH Publication, 2012