BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, Pilani
Pilani Campus
AUGS/ AGSR Division

SECOND SEMESTER 2020-21
COURSE HANDOUT

Date: 02.01.2021

In addition to part I (General Handout for all courses appended to the Time table) this portion gives further specific details regarding the course.

Course No : **EEE F312**
Course Title : **Power Systems**
Instructor-in-Charge : **Dheerendra Singh**
Instructor(s) :
Tutorial/Practical Instructors: Dheerendra Singh, Hari Om Bansal, Rajneesh Kumar

1. Course Description: Review and importance of power system, Present power system scenario, Transmission line parameters and modeling, Characteristics and performance of lines, Load flow studies, Optimal system operation, Automatic Generation and voltage Control, Power system fault analysis, Power Systems stability, Introduction of power system protection, Introduction of HVDC Transmission.

2. Scope and Objective of the Course: This course aims at introducing the students to the basic features of the modern power systems, analysis and operation under steady state and transient conditions. Students will be also familiar with Power system related simulation tools

3. Text Books: Nagrath I.J. & D.P.Kothari, "Power System Engineering" 2nd Edition, TMH, 2008

4. Reference Books: 1- P. Kundur " Power System Stability And Control" 1st Edition, TMH, 1994

2- C.L. Wadhwa "Electrical Power Systems" Sixth Edition, New Age Int. Publishers

5. Course Plan:

Module No.	Lecture Session	Learning outcomes	Reference
1 Transmission Line Parameters Calculation	**L 1.1 Introduction**	**Basics of power system, Indian power system scenario**	**1.1-1.4 (RB)**
	L 1.2-1.4 Transmission line modeling	**Inductance calculations for single and three phase configurations**	**2.1 to 2.8 (TB)**
	L 1.5-1.6 Transmission line modeling	**Inductance calculations for double circuit bundle conductors resistance, skin & proximity effect**	**2.9 to 2.12(TB)**
	L 1.7-1.8 Transmission line modeling	**Simple capacitance calculations**	**3.1 to 3.6 (TB)**

	L 1.9 Transmission line modeling	**Effect of earth, methods of GMD (Modified) bundle conductors.**	**3.7 to 3.9 (TB)**

2 Modelling & Performance Analysis of Transmission Lines	**L 2.1 P.U System**	**One line diagram and per unit system**	**4.3 to 4.4 (TB)**
	L 2.2-2.4 Characteristics and performance of lines	**Analysis of short and medium lines**	**5.1 to 5.3 (TB)**
	L 2.5 Characteristics and performance of lines	**Long transmission lines, Equivalent circuit of long lines,**	**5.4 to 5.5 (TB)**
	L 2.6-L2.7 Characteristics and performance of lines	**Ferranti effect, tuned power lines.**	**5.7 to 5.8 (TB)**
3 Load Flow Studies, Economic Load Dispatch, Load freq. Control	**L3.1 Load flow studies**	**Introduction and importance**	**6.1 to 6.2 (TB)**
	L3.2-3.3 Load flow studies	**Y Bus formulation, load flow problem**	**6.3 to 6.4 (TB)**
	L3.4 Optimal system operation	**Optimal operation, Unit commitment**	**7.1 to 7.3 (TB)**
	L3.5-L3.6 Automatic Generation and Voltage Control	**Load frequency control**	**8.1 to 8.2 (TB)** **11.1-11.2 (RB)**
4 Fault Analysis	**L4.1-4.2 Symmetrical Fault Analysis**	**Transient Short Circuits**	**9.1 to 9.3 (TB)**
	L4.3-4.4 Symmetrical Fault Analysis	**Short circuit and load selection of circuit breakers**	**9.4 to 9.5 (TB)**
5	**L5.1-5.2 Symmetrical Components**	**Transformation, phase shift**	**10.1 to 10.3 (TB)**

Symmetrical Components	**L5.3-5.4 Symmetrical Components**	**Sequence impedances of line generation and transformers**	**10.4 to 10.8 (TB)**
	L5.5-5.6 Symmetrical components	**Construction of sequence networks**	**10.9 (TB)**
	L5.7 Unsymmetrical fault analysis	**Line to ground, line to line, and double line to ground faults, open conductor fault**	**11.1 to 11.6 (TB)**
6 Power System Stability	**L6.1 Power Systems stability**	**Dynamic of a synchronous machine**	**12.1 to 12.2 (TB)**
	L 6.2-6.3 Power system stability	**Steady-state stability of simple systems**	**12.3 to 12.6 (TB)**
	L 6.4 Power system stability	**Equal area criterion**	**12.7 to 12.8 (TB)** **12.1-12.2 (RB)**
7 Power System Protection	**L 7.1 Circuit Breakers**	**Transients, rating and arc extinction**	**14.1 to 14.3**
	L7.2 Power system protection	**Protective zones**	**15.1 to 15.2**
8	**L 8.1 Advanced topics in Power Systems**	**Advanced topics in Power Systems (Data Analytics for Smart Grid)**	**Course material**

6. Evaluation Scheme:

Component	Duration	Weightage (%)	Date & Time	Nature of component (Close Book/ Open Book)
Mid-Semester Test	90 Min.	30% (90 Marks)	<TEST_1>	CB
Comprehensive Examination	2 h	40% (120 Marks)	<TEST_C>	CB + OB
Assignment		10% (30 Marks)		
Quizzes	15 Min	20% (60 Marks)		

Division website (https://academic.bits-pilani.ac.in/)* for revised comprehensive exam date and time.

7. Chamber Consultation Hour: To be announced in the class.

8. Notices: Notices will be posted on Nalanda.

9. Make-up Policy: Make-up will be granted on genuine grounds only.

10. Note (if any):

Instructor-in-charge
Course No. EEE F312