

Course title: Power System Engineering				
Course code: ENR 135		No. of credits: 3		L-T-P: 37-08-0
Learning hours: 45				
Pre-requisite course code and title (if any): No				
Department: Sustainable Engineering				
Course coordinator: Prof. Naqui Anwer			Course instructor(s): Prof. Naqui Anwer	
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Course type: Programme Core			Course offered in : Semester 1	
Course description				
<p>It is very important to understand the characteristics, technologies and operation of conventional power system for generation, transmission and distribution of electrical energy. The programme is focused on renewable energy and therefore, it becomes more important to understand the functioning of conventional power system infrastructure first, so that the effects of increasing share of renewable energy can be understood. The course is designed to impart the knowledge of conventional power system equipments to the students. To work in a power industry, it is very important to understand the basic concepts of power systems and the related issues. Restructuring of power industry has increased the challenges even more. Hence, it is important for the renewable energy engineer to understand the basic concepts of power system operation, planning and analysis.</p>				
Course objectives				
<p>This course is designed to bring students of different disciplines to a certain level and to equip them with necessary knowledge of power systems. The objectives of the course are:</p> <ul style="list-style-type: none"> ▪ To impart knowledge about the methods of power generation, ▪ Understanding the transmission and distribution of electric power and related issues, ▪ Understanding the behaviour of power systems on variable load, and ▪ Determination of load flow analysis and economic load dispatch. 				
Course content				
Module	Topic	L	T	P
1	Methods of power generation	8	0	0
	Thermal power plants Hydro-electric power plants Nuclear power plant Diesel power plant Combined cycle power plant Pumped storage plants Introduction to renewable energy sources			
2	Synchronous machines and transformer	9	2	0
	<i>Transformer:</i> construction, working, equivalent circuit, losses <i>Synchronous machines:</i> construction, principle of operation (generator/motor action), equivalent circuits, phasor diagram, operation of synchronous generator on infinite busbar/grid, excitation control			
3	Transmission & distribution	10	3	0
	Classification of transmission lines – short, medium and long transmission line, transmission line parameters, modelling of lines and transmission line performance: Voltage regulation and efficiency; Distribution systems configurations Loadability of lines, Basic concepts of HVDC			
4	Variable load on power stations	2	0	0
	Load and load duration curves, important terms and factors Important points in selecting generating units, interconnected grid system			

5	Power system analysis			
	Load flow analysis: Gauss Seidel, Newton Raphson, Economic load Dispatch and unit commitment	8	3	0
		37	8	0
Evaluation criteria				
<ul style="list-style-type: none"> ▪ Assignments (after completion of modules 1) - 10% ▪ Minor Test 1: Written test (after completion of modules 2 and 3) - 20% ▪ Minor Test 2: Written test (after completion of modules 4 and 5) - 20% ▪ Major Test: Written test (at the end of the semester, after completion of all the modules) - 50% 				
Learning outcomes				
<ul style="list-style-type: none"> ▪ Understanding the construction and operation of major conventional power plants (Test 1 and 2). ▪ Understanding the features of transformer, synchronous machine, transmission line, distribution lines and HVDC system (Test 2 and 3). ▪ Solving the problems related to transmission and distribution lines and their applications (Test 3 and 4). ▪ Evaluating power systems for load flow analysis and economic load dispatch (Test 4). 				
Pedagogical approach				
A combination of class-room interactions, tutorials, assignments and projects.				
Materials				
Recommended readings				
<p>John J. Grainger and William D. Stevenson, "Power system analysis", Tata Mc Graw-Hill Publication, 2010</p> <p>B.L. Theraja, A.K. Theraja, "A text book of Electrical Technology", S.Chand Publication, 2012</p> <p>D.P. Kothari, I.J. Nagrath, "Modern Power system analysis", Tata Mc Graw-Hill Publication, 2016</p> <p>Prabha Kundur, "Power system stability and control", Tata Mc Graw-Hill Publication, 1994</p> <p>Daniel Krischen and Goran Strbac, "Fundamentals of Power System Economics", John Wiley & Sons Ltd., 2011</p> <p>William H. Kersting, "Distribution System Modeling and Analysis", CRC Press, 2012</p>				
Additional information (if any): NA				
Student responsibilities				
Attendance, feedback, discipline: as per university rules				

Reviewers

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