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

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, sothat 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.

Course objectives

This course is designed to bring students of different disciplines to a certain level and to equip them with necessaryknowledge of power systems. The objectives of the course are:

- 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** Thermal power plants Hydro-electric power plantsNuclear power plant Diesel power plant Combined cycle power plantPumped storage plants Introduction to renewable energy sources	8	0	0
2	**Synchronous machines and transformer** ***Transformer:*** construction, working, equivalent circuit, losses ***Synchronous machines:*** construction, principle of operation (generator/motor action), equivalent circuits, phasor diagram, operation of synchronous generator on infinite busbar/grid, excitation control	9	2	0
3	**Transmission & distribution** Classification of transmission lines – short, medium and long transmission line, transmission line parameters, modelling of lines and transmission line performance: Voltage regulation andefficiency; Distribution systems configurations Loadability of lines, Basic concepts of HVDC	10	3	0
4	**Variable load on power stations** Load and load duration curves, important terms and factors Important points in selecting generating units, interconnected grid system	2	0	0

5	**Power system analysis** Load flow analysis: Gauss Seidel, Newton Raphson, Economic load Dispatch andunit commitment	8	3	0
		37	**8**	**0**

Evaluation criteria

- 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

- 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 HVDCsystem (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

John J. Grainger and William D. Stevenson, "Power system analysis", Tata Mc Graw-Hill Publication, 2010
B.L.Theraja, A.K.Theraja, "A text book of Electrical Technology", S.Chand Publication, 2012
D.P.Kothari, I.J.Nagrath, "Modern Power system analysis", Tata Mc Graw-Hill Publication, 2016
Prabha Kundur, "Power system stability and control", Tata Mc Graw-Hill Publication, 1994
Daniel Krischen and Goran Strbac, "Fundamentals of Power System Economics", John Wiley & Sons Ltd., 2011
William H. Kersting, "Distribution System Modeling and Analysis", CRC Press, 2012

Additional information (if any): NA

Student responsibilities

Attendance, feedback, discipline: as per university rules

Reviewers

1. Dr. Sanjay Agrawal, Associate Professor, Department of Electrical Engineering, SOET, IGNOU, New Delhi
2. Dr. M. Rizwan, Associate Professor, Department of Electrical Engineering, Delhi Technological University, New Delhi