

POWER GENERATION AND ECONOMICS(Core Subject) B.E., IV Semester, Electrical and Electronics Engineering [As per Choice Based Credit System (CBCS) scheme]			
Subject Code	17EE42	CIE Marks	40
Number of Lecture Hours/Week	04	SEE Marks	60
Total Number of Lecture Hours	50	Exam Hours	03
Credits - 04			
Course objectives:			
<ul style="list-style-type: none"> • Explain the arrangement and operation of hydroelectric, steam, diesel, gas turbine and nuclear power plants and working of major equipment in the plants. • Classification of substation and explain the operation of different substation equipment. • Explain the importance of grounding and different grounding methods used in practice. • Explain the economics of power generation and importance of power factor. 			
Module-1			Teaching Hours
Hydroelectric Power Plants: Hydrology, run off and stream flow, hydrograph, flow duration curve, Mass curve, reservoir capacity, dam storage. Hydrological cycle, merits and demerits of hydroelectric power plants, Selection of site. General arrangement of hydel plant, elements of the plant, Classification of the plants based on water flow regulation, water head and type of load the plant has to supply. Water turbines – Pelton wheel, Francis, Kaplan and propeller turbines. Characteristic of water turbines Governing of turbines, selection of water turbines. Underground, small hydro and pumped storage plants. Choice of size and number of units, plant layout and auxiliaries. ■			10
Revised Bloom's Taxonomy Level	L ₁ – Remembering, L ₂ – Understanding.		
Module-2			
Steam Power Plants: Introduction, Efficiency of steam plants, Merits and demerits of plants, selection of site. Working of steam plant, Power plant equipment and layout, Steam turbines, Fuels and fuel handling, Fuel combustion and combustion equipment, Coal burners, Fluidized bed combustion, Combustion control, Ash handling, Dust collection, Draught systems, Feed water, Steam power plant controls, plant auxiliaries. Diesel Power Plant: Introduction, Merits and demerits, selection site, elements of diesel power plant, applications. Gas Turbine Power Plant: Introduction, Merits and demerits, selection site, Fuels for gas turbines, Elements of simple gas turbine power plant, Methods of improving thermal efficiency of a simple steam power plant, Closed cycle gas turbine power plants. Comparison of gas power plant with steam and diesel power plants. ■			10
Revised Bloom's Taxonomy Level	L ₁ – Remembering, L ₂ – Understanding.		
Module-3			
Nuclear Power Plants: Introduction, Economics of nuclear plants, Merits and demerits, selection of site, Nuclear reaction, Nuclear fission process, Nuclear chain reaction, Nuclear energy, Nuclear fuels, Nuclear plant and layout, Nuclear reactor and its control, Classification of reactors, power reactors in use, Effects of nuclear plants, Disposal of nuclear waste and effluent, shielding. ■			10
Revised Bloom's Taxonomy Level	L ₁ – Remembering, L ₂ – Understanding.		
Module-4			
Substations: Introduction to Substation equipment; Transformers, High Voltage Fuses, High Voltage Circuit Breakers and Protective Relaying, High Voltage Disconnect Switches, Lightning Arresters, High Voltage Insulators and Conductors, Voltage Regulators, Storage Batteries, Reactors, Capacitors, Measuring Instruments, and power line carrier communication equipment. Classification of substations – indoor and outdoor, Selection of site for substation, Busbar arrangement schemes and single line diagrams of substations.			10

B.E ELECTRICAL AND ELECTRONICS ENGINEERING (EEE) CHOICE BASED CREDIT SYSTEM (CBCS) SEMESTER - IV				
17EE42 Power Generation and Economics (Core Subject) (continued)				Teaching Hours
Module-4 (continued)				
Substations (continued): Interconnection of power stations. Introduction to gas insulated substation, Advantages and economics of Gas insulated substation. Grounding: Introduction, Difference between grounded and ungrounded system. System grounding – ungrounded, solid grounding, resistance grounding, reactance grounding, resonant grounding. Earthing transformer. Neutral grounding and neutral grounding transformer. ■				
Revised Bloom's Taxonomy Level	L ₁ – Remembering, L ₂ – Understanding.			
Module-5				
Economics: Introduction, Effect of variable load on power system, classification of costs, Cost analysis. Interest and Depreciation, Methods of determination of depreciation, Economics of Power generation, different terms considered for power plants and their significance, load sharing. Choice of size and number of generating plants. Tariffs, objective, factors affecting the tariff, types. Types of consumers and their tariff. Power factor, disadvantages, causes, methods of improving power factor, Advantages of improved power factor, economics of power factor improvement and comparison of methods of improving the power factor. Choice of equipment. ■				10
Revised Bloom's Taxonomy Level	L ₁ – Remembering, L ₂ – Understanding, L ₃ – Applying, L ₄ – Analysing.			
Course outcomes: At the end of the course the student will be able to:				
<ul style="list-style-type: none"> • Describe the working of hydroelectric, steam, nuclear power plants and state functions of major equipment of the power plants. • Classify various substations and explain the importance of grounding. • Understand the economic aspects of power system operation and its effects. • Explain the importance of power factor improvement. 				
Graduate Attributes (As per NBA) Engineering Knowledge, Problem analysis, Engineers and Society, Environment and Sustainability.				
Question paper pattern:				
<ul style="list-style-type: none"> • The question paper will have ten questions. • Each full question is for 16 marks. • There will be 2 full questions (with a maximum of four sub questions in one full question) from each module. • Each full question with sub questions will cover the contents under a module. • Students will have to answer 5 full questions, selecting one full question from each module. ■ 				
Text Books				
1	Power Plant Engineering	P.K. Nag	McGrawHill	4 th Edition, 2014
2	Generation of Electrical Energy	B.R.Gupta	S. Chand	2015
3	Electrical power Generation, Transmission and Distribution	S.N. Singh	PHI	2 nd Edition, 2009
Reference Books				
4	A Course in Power Systems	J.B. Gupta	Katson	2008
5	Electrical Power Distribution Systems	V. Kamaraju	McGrawHill	1 st Edition, 2009
6	A Text Book on Power System Engineering	A.Chakrabarti, et al	DhanpathRai	2 nd Edition, 2010
7	Electrical Distribution Engineering	Anthony J. Pansini	CRC Press	3 rd Edition, 2006
8	Electrical Distribution Systems	Dale R PatrickEt al	CRC Press	2 nd Edition, 2009