







# SARDAR PATEL UNIVERSITY, BALAGHAT (M.P.)

SCHOOL OF ENGINEERING AND TECHNOLOGY

SYLLABUS

COURSE – BACHELOR OF TECHNOLOGY BRANCH – ELECTRICAL ENGINEERING  
SEMESTER – 6th ACADEMIC SESSION 2024-25

**BEE- 062**

## **ELECTRICAL POWER GENERATION**

**Course Outcomes-** The student will be able to

CO1. Describe different Sources of Energy Generation.

CO2. Explain the Working and layout of steam power plant & hydro power plant.

CO3. Discuss working principle & basic component of Nuclear, Diesel & gas power plant

CO4. Illustrate various terms related to power plant economics & tariff.

CO5. Understand the importance of economics theories in power and energy system.

### **Unit I**

#### **General consideration on various sources of energy**

General consideration on various sources of energy, energy conversion employing steam, energy conversion using water gas turbine a) MHD generation b) Solar generation c) Wind power station d) Geothermal power generation.

### **Unit II**

#### **Thermal, nuclear and gas power station:**

Thermal, nuclear and gas power station: Block diagram of thermal power station, selection of site. Different types of auxiliaries used in thermal power station. Nuclear Power Station: Different types of reactors and fuels, safety methods, waste disposal..

### **Unit III**

#### **Gas Power Station & Hydro Power Station:**

Gas Power Station: Block diagram, gas cycles, combined cycle power plants. Comparison between these power stations Hydro Power Station: Choice of site, block diagram including surge tank and penstock, Hydrographs, flow duration curve. Types of turbines, base load & peak load power station.

### **Unit IV**

#### **Economic aspects of power plant operations:**

Economic aspects of power plant operations: Definitions load factor, demand factor and Diversity factor. Calculation of cost of generation, fixed charges, interest and depreciations, Methods of Depreciation. Tariffs: Different types of tariffs, power factor improvement.

### **Unit V**

#### **Economic Scheduling of Power Stations:**

Economic Scheduling of Power Stations: Economic operation of power system, criteria of loading of power plants with and without transmission loss, load dispatching in power system, co-generation and coordination of power plants.









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## **POWER ELECTRONICS**

**Course Outcomes-** The student will be able to

CO1. Explain the concepts and techniques used in power electronics.

CO2. Apply knowledge of series & parallel connection of SCRs in power control applications

CO3. Analyze various power converter circuits.

CO4. Analyze the single phase and three phase Inverter circuits.

CO5. Explain the operation of DC/DC converter circuits.

CO6. Demonstrate the applications of power electronic circuits.

### **Unit-I**

Advantages and application of power electronic devices characteristics, Symbol & application of power diodes, power transistors, GTO, Triac, Diac, Power MOSFET, IGBT, LASCR, Fast recovery diode, schotkey diode MCTs. Principle of operation of SCR, Two transistor analogy, brief idea of construction of SCR, Static characteristics of SCR, Condition of turn on & off of SCR Gate characteristics, Method for turning on of SCR, Turnoff methods, different commutation techniques (Class A,B,C,D,E, & F Commutation) firing of SCR.

### **Unit-II**

Operation and analysis of single phase (Half wave & Full Wave) and multiphase (Three Phase) uncontrolled and controlled rectifier circuit with resistive, resistive & inductive load (continuous & non continuous conduction, Fwd. small & very large inductive loads) and RLE loads. Estimation of average load voltage and load current for above rectifier circuits active and reactive power input. Effect of freewheeling diode and source inductance on performance of these rectifier circuits. Comparison of mid-point & Bridge rectifier circuits.

### **Unit-III**

Series and parallel inverter, Voltage source & current source inverter, Single phase and three phase bridge inverter, Self-cumulated inverters,, Mc- Murray & MC Murray bed ford inverters, Voltage control of single phase and three phase bridge inverter, Harmonics & their reduction techniques.

### **Unit-IV**

Principle of chopper operation, Various control strategies in chopper, Step up & step-up/step down choppers, chopper configuration (Type A,B, C,D, & E), Steady state analysis of chopper circuits, Current & voltage commutation of chopper circuits Jones & Morgens chopper

### **Unit-V**

Single phase (mid-point & bridge configuration) and three phase cyclo convertor configuration and operating principles. AC voltage controllers (using SCRs & Traics) single phase full wave controller with R and RL load, Estimation of RMS load voltage, RMS load current and input power factor, three phase AC voltage controller (Without analysis) Dual converter Switched mode voltage regulator buck, Boost, Buch & Boost, Ck regulators.





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**BEE-065**

## **Energy Conservation & Management**

**Course Outcomes-** The student will be able to

- CO-1 Identify the demand supply gap of energy in Indian scenario.
- CO-2 Carry out energy audit of an industry/Organization.
- CO-3 Draw the energy flow diagram of an industry and identify the energy wasted or a waste stream.
- CO-4 Select appropriate energy conservation method to reduce the wastage of energy
- CO-5 Evaluate the techno economic feasibility of the energy conservation technique adopted

### **UNIT-I**

General energy problem: Energy use patterns and scope for conservation. Energy audit: Energy monitoring, Energy accounting and analysis, Auditing and targeting. Energy conservation policy, Energy management & audit, Energy audit, Types of energy audit, energy management (audit), qualities and function of energy managers, language of an energy manager, Questionnaire, Check list for top management, Loss of energy in material flow, energy performance, Maximizing system efficiency, Optimizing, input energy requirements, Energy auditing instruments, Material load energy balance diagram.

### **Unit-II**

Thermodynamics of Energy Conservation. Basic principle. Irreversibility & second law efficiency analysis of systems. Primary energy sources, optimum use of prime-movers, energy efficient house keeping, energy recovery in thermal systems, waste heat recovery techniques, thermal insulation. Thermal energy audit in heating, ventilation and air conditioning. Maintenance & Energy audit – friction, lubrication & tribo-logical innovations. Predictive & preventive maintenance.

### **Unit-III**

Load curve analysis & load management DSM, Energy storage for power systems (Mechanical, Thermal, Electrical & Magnetic) Restructuring of electric tariff from energy conservation consideration, Economic analysis depreciation method, time value of money, Evaluation method of projects, replacement analysis, special problems inflation risk analysis. Pay back period, Energy economics, Cost Benefit Risk analysis, Pay back period.

### **Unit-IV**

Energy efficient electric drives, Energy efficient motors V.S.D. power factor improvement in power system. Energy Conservation in transportation system especially in electric vehicle. Energy flow networks, Simulation & modeling, formulation & Objective & constraints, alternative option, Matrix chart.





