BOS Date: 05.06.2021

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE,
(ENGINEERINGCOLLEGE)
VIDISHA (M.P.) – 464001
DEPARTMENT OF ELECTRICAL ENGINEERING

Branch	Subject Title	Subject Code	Hours per week			Total Credits
			L	T	P	
B.E. Electrical V sem.	Control System	EE-1851	3	0	2	4

Pre-requisite: Dynamics; Differential equations; Laplace transforms; basic Electrical circuits

Course Objective:

1. To illustrate the students with concepts of block diagrams and transfer functions.
2. To explain the students characteristics of closed-loop control systems, including steady-state and transient response, parametric sensitivity, disturbances, error, and stability.
3. To classify the basic performance criteria for first and second order systems.
4. To teach students basic control system design methods, including root locus diagrams and frequency response methods.
5. Explain students to the basic concepts of proportional, integral, and derivative (PID) control.
6. Illustrate the students to existing software tools used for control system design.

Unit 1: Introduction to control system

Industrial Control examples. Mathematical models of physical systems. Control hardware and their models. Transfer function models of linear time-invariant systems. Feedback Control: Open-Loop and Closed-loop systems. Benefits of Feedback. Block diagram algebra. Signal flow graph, Mason's formula, Error detectors (Synchros & Potentiometer), Servomotors (AC & DC), techo-generators.

Unit 2: Time Response Analysis

Standard test signals. Time response of first and second order systems for standard test inputs. Application of initial and final value theorem. Design specifications for second-order systems based on the time-response. Steady state error & error constants.

Unit 3: Frequency-response analysis

Concept of Stability. Routh-Hurwitz Criteria. Relative Stability analysis. Root-Locus technique. Construction of Root-loci. Effect of adding poles and Zeros on the loci, Stability by root loci.

Relationship between time and frequency response, Polar plots, Bode plots. Nyquist stability criterion. Relative stability using Nyquist criterion – gain and phase margin. Closed-loop frequency response.

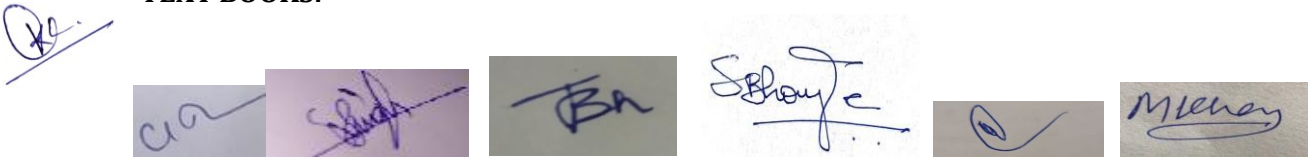
Unit 4: Introduction to Controller Design

Design specifications in frequency-domain. Frequency-domain methods of design. Application of Proportional, Integral and Derivative Controllers, Lead and Lag compensation in designs.

Unit 5: State variable Analysis

Concepts of state variables. State space model. Diagonalization of State Matrix. Solution of state equations. Eigenvalues and Stability Analysis. State Transition Matrix

TEXT BOOKS:



1. B.S. Manke Linear control system Khan Publisher.
2. S. Hassan Squeed Automatic Control system, Katson Book.

Reference Books:

1. I.J. Nagrath and M. Gopal, "Control system Engineering", New Age International.
2. K. Ogata, Modern Control Engineering, PHI.
3. B.C. Kuo, Automatic Control systems, PHI
4. Gopal M., Control System : Principles & Design, TMH.
5. N.K. Sinha, Control Systems, New Age International
6. Stefani, Shahian, Savant, Hostetter – "Design of feedback control System's", Oxford.
7. Bishop and Dorf, Modern Control System, Pearson

Course Outcomes:

At the end of this course, students will demonstrate the ability to

CO 1: Acquire knowledge and understand of different types of systems and their representation, stability, time domain and frequency domain behavior controllers and compensators to obtain mathematics. (BL1,BL2)

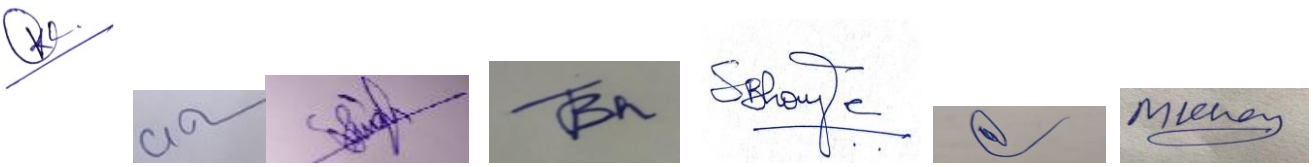
CO 2: Apply knowledge to obtain mathematical modeling of different systems, find out transfer function and obtain knowledge, signal flow graph and state space representation.(BL3)

CO 3: Analyze the time domain and frequency domain behavior of different types of signal & system stability(BL3,BL4)

CO 4: Design feedback controllers and compensation circuits.-(BL3, BL5)

List of Experiments (Need correction)

1. **To plot Poles and zeros in s plane and analyze system stability in MatLAB (CO1)**
2. **To plot speed torque characteristics of D.C. servo motor. (CO2)**
3. **To plot speed torque characteristics of A.C. servo motor. (CO2)**
4. **Study of a D.C. position servo system. (CO2)**
5. **Step response of a second order system. (CO4)**
6. **To study synchronous characteristics. (CO2)**
7. **To draw SFG in MATLAB (CO3)**
8. **Sketch different frequency methods in MATLAB. (CO5)**
9. **To study the time response of PI and PIDcontroller. (CO6)**
10. **11. To study Temperature Control System. (CO6)**
12. **To study the frequency response of the lag and lead process. (CO6)**



SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
(Engineering College), VIDISHA M.P.
(An Autonomous Institute Affiliated to RGPV Bhopal)
Department of Electrical Engineering

Semester/Year		V sem	Program		B.Tech.
Subject Category	DC	Subject Code:	EE-1852	Subject Name:	Analog & Digital Electronics

Maximum Marks Allotted						Contact Hours			Total Credits
Theory			Practical		Total Marks				
ES	MS	Assig Quiz	ES	LW/ Quiz		L	T	P	
70	20	10	30	10	150	3	0	2	4

Prerequisites:

Mathematics, Basic Physics, Basic Electronics and Logic and Boolean Algebra

Course Objective:

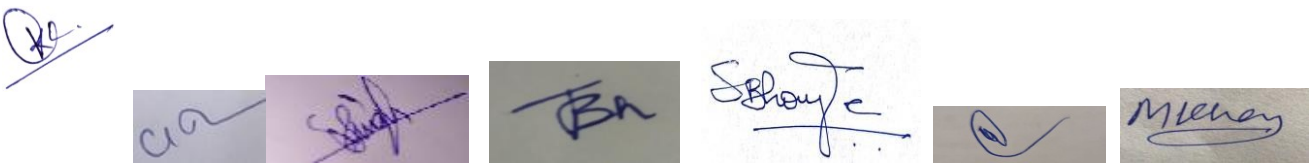
1. The objective of this course is to provide the fundamental concepts associated with the digital logic and circuit design.
2. To familiarize students with the different number systems, logic gates, minimization of logic circuits and combinational and sequential circuits utilized in the different digital circuits and systems.
3. The course will help student to design and analyze the digital circuits and systems.

Course Outcomes:

Upon completion of this course, the student will be able to:

CO1. Analyse the op-amp in different mode as peak detector, comparator, zerocrossing detector.
CO2. Understand the different number systems, codes and analyze the digital logic circuits using Boolean algebra and other mapping techniques.
CO3. Analyze and design different combinational logic circuits using K- Map techniques.
CO4. Analyze and design sequential circuits and their application is registers and Flip-flop.
CO5. Analyse and design different type of asynchronous and synchronous counter.

UNITs	Descriptions	Hrs.	CO's
I	**Application of Operational Amplifiers** Voltage Controlled Oscillator, precision rectifiers, sample and hold circuit, basic op-amp comparator circuit, zero crossing detector, function generator, peak detectors, PLL using CD4046.	8	CO1
II	**Combinational circuits** Review of number systems and mutual conversion, Boolean algebra, Minterms and maxterms, Truth table and Karnaugh mapping, reduction of Boolean expression with SOP, POS and mixed terms, incompletely specified functions multiple output minimization, variable mapping, minimization by labular/ Quine Mc cluskey method.	8	CO2



III	**Encoder/Decoder and Codes** Encoders, Decoders, Multiplexers, Demultiplexers, code convertors, Half adder and full adder, parity checker/ generator, programming logic Array (PLA). Weighted, non-weighted codes, error detecting and correcting codes, alphanumeric codes, ASCII codes.	9	CO3
IV	**Sequential circuits:** State tables and diagrams, flip flop and its various types- JK, RS, T, D, pulse and edge triggered flip flops transition and excitation tables, timing diagrams.	7	CO4
V	**Unit V** Shift registers: Series and parallel data transfer, asynchronous and synchronous counters, ripple counter, Modulo N counter design, Up down counters, Ring counter, DAC and ADC.	8	CO4
Expert Lecture		--	
Total Hours		40	

List of Experiments:

1. Implementation of Logic gate on bread board. (CO2)
2. Implementation of Logic function using Gates on bread board. (CO2)
3. Implementation of reduction of Boolean expression using universal gates.(CO2)
4. Implementation of half adder on bread board. (CO3)
5. Implementation of full adder on bread board. (CO3)
6. Converting half adder to half substractor. (CO3)
7. Converting full adder to full substractor on bread board. (CO3)
8. Implementation of 4×1 Multiplexer on bread board. (CO3)
9. Implementation of 3-bit Binary to gray code converter circuit on bead board. (CO3)
10. Analysis of flip-flop using kit. (CO4)
11. Implementation of 7-segment display using up counter. (CO4)
12. Analysis of up and down synchronous/ asynchronous counter using kit. (CO5)

Text Books-

1. "Digital Logic and Computer Design", M. Morris Mano, Pearson Education (PHI).
2. “Fundamentals of Digital Circuits”, A. Anand Kumar, PHI.

Reference Books:

1. “Digital Fundamentals”, T. L. Floyd, Pearson Education.
2. “Digital Electronics, principle and integrated circuits”, Anil K Maini, Wiley Publication.
3. “Digital Electronics”, G.H.Kharate, Oxford, higher Education.

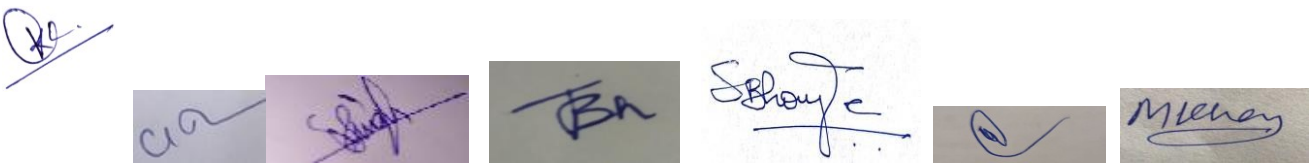
Modes of Evaluation and Rubric

Theory 60	Attendance (10)	Mid Sem (10 + 10)	Performance (10)	Total (100)
Practical (30)	Attendance (10)	Viva/lab performance (10)		Total (50)

List/Links of e-learning resource

https://de-iitr.vlabs.ac.in/
MOOC, NPTL, Coursera

Recommendation by Board of studies on	7th June 2023
Approval by Academic council on	
Compiled and designed by	Dr. Monika Jain
Subject handled by department	Electrical Engg.



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DEPARTMENT OF ELECTRICAL ENGINEERING

Branch	Subject Title	Subject Code	Hours per week			Total Credits
			L	T	P	
B.E. Electrical V sem.	Power Electronics	EE-1853	3	0	2	4

Pre Requisites: Electronics-1, Network Analysis

Course Objective:

1. To outline the working of uncontrolled devices.
2. To introduce the basic theory of power semiconductor devices and passive components, their practical application in power electronics.
3. To familiarize the operation principle of AC-DC, DC-DC, DC-AC conversion circuits and their applications.
4. To analyze power electronics circuits and understand circuit operation by drawing output waveforms.

Topic Covered:

Unit I

Introduction and Power Semiconductor Devices : Power Electronics : Scope and applications, Introduction to power electronics devices, SCR, Power Transistor, MOSFET, GTO, IGBT, MCT etc. Thyristor V-I and Gate Characteristics, Two transistor analogy of SCR., methods of triggering and commutation (A,B,C,D,E,F), ratings and protection of device, snubber circuits and safe operating area.

Unit II

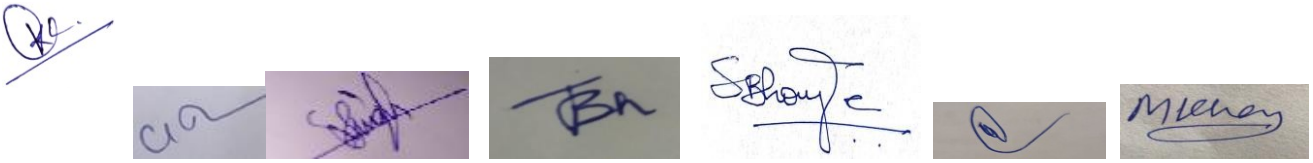
Phase Controlled Rectifiers : Principle of phase control, single phase half wave controlled rectifiers with R, R-L, R-L-E load, single phase full wave controlled converters, 2-pulse mid-point converters, 2-pulse half and fully controlled bridge converters with R, R-L, R-L-E load, Three phase uncontrolled & controlled rectifier, triggering schemes, flyback diode, effect of source inductance.

Unit III

Choppers: Basic Principle of step down chopper operation with R-L Loads, control strategies-time ratio control and current limit control. Types of chopper circuits, four quadrant chopper, steady state time domain analysis of type a chopper, effect of source inductance, step up and step down Chopper, chopper circuit design.

Unit IV

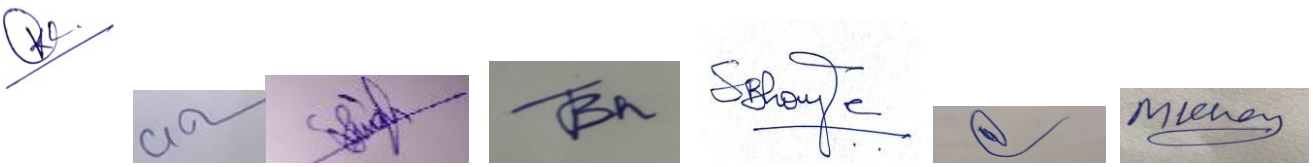
Inverters : Forced commutated inverters, single phase voltage source inverters, Half bridge inverter, full bridge inverter (with R and RL load), steady state analysis, voltage control in single phase inverters, 3-phase bridge inverters (with R and RL load) 120, 150 and 180 mode, pulse width modulated inverters, harmonics reduction techniques, current source inverter, inverter circuit design.



Unit V

AC Voltage Controllers and Cycloconverters: Principle of AC voltage controllers-phase control and integral cycle control, types of AC voltage controllers, single-phase and three-phase AC controllers with R and RL loads, fan and temperature control.

Cycloconverter: Principles of operation, advantages, disadvantages and applications of single cycloconverters on R and RL load.



TEXT BOOK:

1. "Power Electronics: Devices, converters and applications", Vedam Subramanyam, New Age International Publishers.
2. Power Electronics Principles and Applications, Joseph vithayathil, McGraw Hill Education India P. Ltd
3. Power Electronics : Essentials & Applications, L. Umanand, Wiley India Pvt Ltd
4. "Thyristor Engineering", M.S. Berde, Khanna Publishers.
5. "Power Electronics and Variable Frequency Drives", Bimal K.Bose, IEEE Press.
6. "Power Electronics Systems: Theory and Design", Jai P. Agrawal, Pearson Education Pvt.Ltd.

REFERENCE BOOKS:

1. **"**Power Electronics", P.C. Sen, , Tata McGraw Hill.
2. "Thyristorised Power Controllers", G.K. Dubey, S.R. Doradla, A. Joshi and R.M.K. Sinha, New Age International Pub.
3. **"**Power Electronics converters, Applications and Design", Ned Mohan, T.M. Undeland and W.P. Robbins, Wiley India Pvt.Ltd.
4. **"**Power Electronics Circuits, Devices and Applications", M.H. Rashid, Pearson Education Pvt.Ltd.
5. **"**Power Electronics", P.S. Bimbhra, Khanna Pub.
6. **"**Power Electronics Circuits and MATLAB simulations", Alok Jain, Penram International Pub.(India) Pvt.Ltd.

Course Outcomes:

On the successful completion of this course student should be able to:

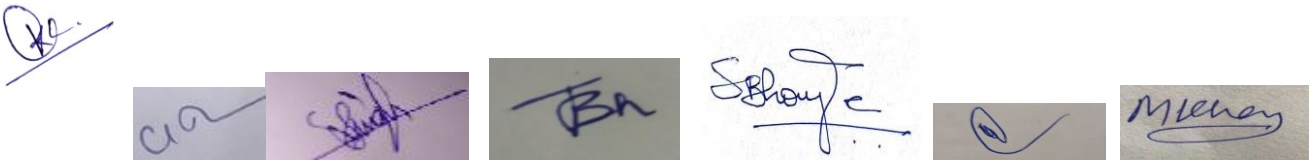
CO1: Acquire fundamental concepts and identify techniques used in power electronics, and develop an understanding about structure and working rectifiers, inverters, choppers, controllers, cyclo-converters and their industrial applications.-(BL1, BL2)

CO2: Analyze the operation of semiconductor devices like, rectifiers, inverters, choppers, controllers, and , cyclo-converters for their performance.-(BL3, BL4)

CO3: Design power electronics circuits and devices.-(BL3, BL6)

List of Experiments (Need correction)

1. To study various static switches (SCR, TRIAC, DIAC, IGBT and MOSFET) and their control. (CO1)
2. To study R and RC based triggering circuits for thyristor. (CO1)
3. Design a relaxation oscillator circuit using Unijunction Transistor (UJT) to be used as a firing circuit for single-phase phase controlled rectifiers. (CO1)
4. To study the phase control of TRIAC using DIAC & RC circuit. (CO1)
5. To study single phase half controlled rectifier configurations for R and RL loads. (C02)
6. To study single phase half controlled rectifier configurations for RLE loads. (C02)
7. To study single phase fully controlled rectifier configurations for R and RL loads. (CO2)
8. To study three phase fully controlled rectifier configurations for R and RL loads. (CO2)
9. To study the working of step up chopper. (CO3)
10. To study the working of 180 degree inverter circuit. (CO4).



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DEPARTMENT OF ELECTRICAL ENGINEERING

Branch	Subject Title	Subject Code	Hours per week			Total Credits
			L	T	P	
B.E. Electrical V sem.	Electromagnetic Field Theory	EE-1854	3	1	0	4

Pre-requisite: Knowledge of Electrostatics and Magneto statics and Fundamentals of Mathematics.

Course Objective:

1. To outline importance and necessity of subject in curriculum.
2. To illustrate the studentswith basic concepts of coordinate geometry.
3. To familiarize the importance of Maxwell's equations.
4. To develop the expression for electric and magnetic field of various charge and current expression.
5. Explain the students about behavior of EM wave and Transmission line.

Topic Covered:

Unit 1: Review of Vector Calculus

Vector algebra-addition, subtraction, components of vectors ,scalar and vector multiplications,Triple products, three orthogonal coordinate systems (rectangular, cylindrical and spherical). Vector calculus differentiation, vector operator del, gradient, divergence and curl.

Unit 2: Static Electric Field

Coulomb's law, Electric field intensity, Electrical field due to point charges. Line, Surface and Volume charge distributions. Gauss law and its applications. Absolute Electric potential, potential difference, Calculation of potential differences for different configurations. Electric dipole, Electrostatic Energy and Energy density.

Conductors, Dielectrics and Capacitance

Current and current density, Ohms Law in Point form, Continuity of current, Boundary conditions of perfect dielectric materials. Permittivity of dielectric materials, Capacitance, Poisson's equation, Laplace's equation, Solution of Laplace and Poisson's equation, Application of Laplace's and Poisson's equations.

Unit 3: Static Magnetic Fields

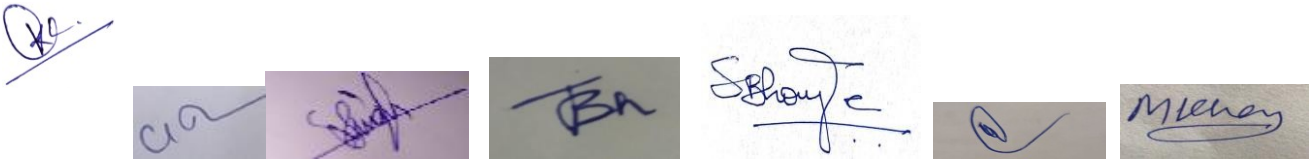
Biot-Savart Law, Ampere Law, Magnetic flux and magnetic flux density, Scalar and Vector Magnetic potentials. Steady magnetic fields produced by current carrying conductors.

Magnetic Forces, Materials and Inductance

Force on a moving charge, Nature of magnetic materials, Magnetization and permeability, Magnetic boundary conditions, Magnetic circuits, inductances and mutual inductances.

Unit 4: Time Varying Fields and Maxwell's Equations

Faraday's law for Electromagnetic induction, Displacement current, Point form of Maxwell's equation, Integral form of Maxwell's equations. Boundary Conditions.



Unit 5: Electromagnetic Waves

Derivation of Wave Equation, Uniform Plane Waves, Maxwell's equation in Phasor form, Wave equation in Phasor form, Plane waves in free space and in a homogenous material. Wave equation for a conducting medium, Plane waves in lossy dielectrics, Propagation in good conductors, Skin effect. Poynting theorem.

Text Books:

1. "Element of electromagnetics Electromagnetic", Mathew N.O Sadiku, Oxford University Press.
2. "Elements of Engineering Electromagnetics", N. Rao, Prentice Hall.
3. "Electromagnetics for Engineers", Fawwaz T.Ulaby, Pearson Education.

REFERENCE BOOKS:

1. "Engineering Electromagnetics", William H. Hayt; Mc-Graw Hill.
2. "Electromagnetics Fields", P.V. Gupta Dhanpat Rai & Sons.
3. "Theory and Problems of Electromagnetics" Joseph A. Edminister, McGraw Hill.

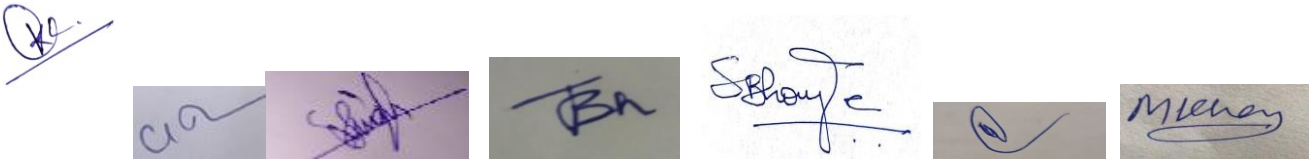
Course Outcomes:

At the end of the course, students will be able to

CO 1: Acquire knowledge of orthogonal coordinate system, gradient, divergence, curl, different theorem, static and time varying fields, circular and elliptical polarization, refraction and reflection of waves (BL1).

CO 2: Analyze orthogonal coordinate system, gradient, divergence, curl, different theorem, static and time varying fields, circular and elliptical polarization, refraction and reflection of waves (BL3, BL4).

CO 3: Develop solution of Laplace equation in systems of dielectric and conducting boundaries. (BL3, BL6).



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DEPARTMENT OF ELECTRICAL ENGINEERING

Branch	Subject Title	Subject Code	Hours per week			Total Credits
			L	T	P	
B.E. Electrical V sem.	Generation of Electrical Power	EE-1855 (OC)	3	1	0	4

Course Objective:
To explain the working of different types of power generation systems and to realize the necessity for interconnected operation of different power stations.

Unit I

Non conventional sources of energy
IntroductionofMHD generation, Solar generation, Wind power station, Geothermal power generation, Hybrid Power Generation.

Unit II

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

Unit IV

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 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.

Text Books :

1. B.R.Gupta, Generation of Electrical Energy, S.Chand.
2. Generation, distribution of C.L.Wadhwa, Utilization of Electrical energy New age Internation.

Reference Books:

1. G.R.Nagpal,Power Plant Engineering, Khanna Publisher
2. M.V.Deshpandey,Modern Design of Power Station.
3. J. B. Gupta, A course in power system, J.K. Katariya & Sons

Course Outcomes – Upon completion of the course the students would be able to:

C01. Acquire knowledge and demonstrate the block diagram, working principle of conventional and nonconventional sources of energy (BL1, BL2).
C02. Analyse the economics aspects of load dispatch. (BL3, BL4)
C03. Evaluate load, loss, tariff, power factor of a power plant (BL3, BL5)
C04. Provide cost effective solution for load dispatch, cogeneration and coordination of power plants (BL3, BL6).