SANDIP FOUNDATION

SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S.Y. B. Tech(Electrical Engineering) ***(2023 Pattern)***

Sem-III

2311201: Electrical Machines-I

Teaching Scheme:	**Credits**	**Examination Scheme**	
Theory: 3 hrs/week	**Th:03**	**Theory**	**CIA: 50**
Practical: --	**Lab: --**		**End-Sem: 50**
Prerequisite:Nil		**Pract:**	**--**
		Oral:	**--**
		Termwork	**--**

Course Objectives: The student should be able to

1. Apply energy conversion process.
2. Identify the machines for specific applications.
3. Make use of the construction, principle of operation of transformers, DC Machine & Induction Machine.
4. Test & analyze the performance of machine.

Course Outcomes:

On completion of the course, learner will be able to–

CO1: Demonstrate construction of transformer along with specifications as per standards. Evaluate performance parameters of transformer with experimentation.

CO2: Distinguish between various types of transformer connections as per vector groups with application.

CO3: Demonstrate construction of DC machines, and evaluate performance parameters.

CO4: Characteristics and applications of D.C machines along with speed control methods. Justify the need of starters in electrical machines with merits and demerits.

CO5: Classification of AC Motors, Test and evaluate performance of Induction motors as per IS with different types of starters.

SANDIP FOUNDATION

SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S.Y. B. Tech(Electrical Engineering) ***(2023 Pattern)***

Sem-III

2311201: Electrical Machines-I

Unit 01: Transformers: **7 Hrs**	**CO**
Single Phase Transformer- Construction, working principle, core and shell type, EMF equation of transformer, Voltage transformation ratio, Equivalent circuit, Transformer tests- Polarity, open circuit, short circuit, Regulation of transformer, Losses, Efficiency of transformer, condition for maximum efficiency, all day efficiency. Autotransformer, parallel operation of single phase transformer and their condition.	CO1
Unit 2: Three Phase Transformers: **7 Hrs**	CO2
Standard connections of three phase transformers and their suitability for various applications, voltage, phasor diagrams and vector groups. Descriptive treatment of Parallel operation of three phase transformers Scott connection and V connections. Three winding (tertiary windings) transformers.	
Unit 3: D.C. Machines (Part-I) **7 Hrs**	CO3
Construction, main parts, magnetic circuits, poles, yoke, field winding, armature core, Armature windings: Simple lap and wave winding, commutator and brush assembly. E.M.F equation, Generating and Motoring action. Types of DC motors, significance of back E.M.F, torque equation, working at no-load and on-load. Losses, power flow diagram and efficiency. Descriptive treatment of armature reaction.	
Unit 4: D.C. Machines (Part-II) **7 Hrs**	CO4
Characteristics and applications of D.C. Shunt and Series Motors, Starting of DC motors, study of starters for series and shunt motor, speed control of various types of DC motors. Commutation: Process of commutation, time of commutation, reactance voltage, different form of commutations, causes of bad commutation and its remedies (Descriptive treatment only)	
Unit 5: Three Phase Induction Motor (Part-I): **7 Hrs**	CO5
Classification of AC Motors, working principle, Construction: Stator, Squirrel cage & wound rotors. Production of rotating mmf. Slip, frequency of rotor emf and rotor currents, mmf produced by rotor currents, its speed w.r.t. rotor and stator mmf. Production of torque, torque-slip relation, condition for maximum torque, torque-slip Characteristics, effect of rotor resistance on torque-slip characteristics. Relation between starting torque, full load	

torque and maximum torque. Losses, power-flow diagram, Relation between rotors input power, rotor copper loss & gross mechanical power developed efficiency.	
Unit 6: Three Phase Induction Motor (Part-II) : 7 Hrs	CO5
Induction motor as a generalized transformer; Phasor diagram. Exact & approximate equivalent circuit. No load and blocked rotor tests to determine the equivalent circuit parameters and plotting the circle diagram. Computation of performance characteristics from the equivalent circuit and circle diagram. Performance curves. Necessity of starter for 3-phase induction motors. Starters for slip-ring and cage rotor induction motors,	

Textbooks

1. B. L Theraja, "Electrical Technology Volume - II" S. Chand Publication
2. S. K. Bhattacharya, "Electrical Machine", Tata McGraw Hill publishing Co. Ltd, 2nd Edition.
3. Nagrath & Kothari, "Electrical Machines", Tata McGraw Hill.

Reference books

1. A.E. Clayton and N. N. Hancock, "Performance and Design of Direct Current Machines", CBS Publishers, Third Edition.
2. A.E. Fitzgerald, Charles Kingsley, Stephen D. Umans, "Electrical Machines", TataMcGraw
3. A.S. Leinsdorf, "Theory and performance of DC machines", Tata McGraw Hill
4. M.G. Say, "Performance and Design of AC. Machines", CBS Publishers and Distributors.

SANDIP FOUNDATION

SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S.Y. B. Tech(Electrical Engineering) ***(2023 Pattern)***

Sem-III

2311202: Electrical Measurements and Instrumentation

Teaching Scheme:	**Credits**	**Examination Scheme**	
Theory: 3hrs/week	**Th:03**	**Theory**	**CIA: 50**
Practical: --	**Practical: --**		**End-Sem:50**
Prerequisite : Nil		**Pract:**	**--**
		Oral:	**--**
		Termwork	**--**

Course Objectives: The student should be able to

1. Build the knowledge of system of units, classification and essentials of measuring instruments.
2. Develop the knowledge about the construction & operation of various electrical & non electrical measuring instruments.
3. Apply the knowledge to identify the measuring instruments & make use of it for quantifying measurements of electrical parameters.

Course Outcomes:

On completion of the course, learner will be able to–

CO1: Illustrate various characteristics of measuring instruments, their classification and range extension technique.

CO2: Apply measurement techniques for measurement of resistance, inductance.

CO3: Demonstrate construction, working principle of dynamometer type wattmeter for measurement of power under balance and unbalance condition.

CO4: Explain Construction, working principle of 1-phase and 3-phase induction, static energy meter.

CO5: Make use of CRO for measurement of various electrical parameters, importance of transducers, their classification, selection criterion and various applications.

CO6: Measure various physical parameters using transducers.

SANDIP FOUNDATION

SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S.Y. B. Tech(Electrical Engineering) *(2023 Pattern)*

Sem-III

2311202: Electrical Measurements and Instrumentation

Unit 1: Classification of Measuring Instruments and Range Extension **7hrs**	**CO**
Characteristics of measuring instruments: static and dynamic, accuracy, linearity, speed of response, dead zone, repeatability, resolution, span, reproducibility, drifts. Necessity of calibration, standards and their classification, absolute and secondary instruments, types of secondary instruments: indicating, integrating, and recording, analog / digital. Ammeter and Voltmeter Theory: Essentials of indicating instruments deflecting, controlling and damping systems. Construction, working principle, torque equation, advantages and disadvantages of Moving Iron (MI) (attraction and repulsion), and Permanent Magnet Moving Coil (PMMC), block diagram and operation of digital ammeter & voltmeter.PMMC ammeters and voltmeters using shunts, multipliers. Universal shunt, universal multiplier. Instrument Transformers : Construction, connection of CT & PT in the circuit, advantages of CT / PT over shunt and multipliers for range extension of MI Instruments, transformation ratio, turns ratio, nominal ratio, burden, ratio and phase angle error.(descriptive treatment only)	CO1
Unit 2: Measurement of Resistance & Inductance **7hrs**	CO2
Measurement of low, medium and high resistance. Wheatstone bridge, Kelvin's double bridge, ammeter-voltmeter method, megger, loss of charge method. Earth tester for earth resistance measurement.Introduction, sources and detectors for A.C. bridge, general equation for bridge at balance. Measurement of inductance: Maxwell's inductance & Maxwell's inductance – Capacitance Bridge, Anderson's bridge.	
Unit 3: Measurement of Power **7hrs**	CO3
Construction, working principle, torque equation, errors and their compensation, advantages and disadvantages of dynamometer type wattmeter, low power factor wattmeter, poly-phase wattmeter. Active & reactive power measurement in three phase system for balanced and unbalanced load using three wattmeter method, two wattmeter method & one wattmeter method. Power analyzer, Multi meter.	

Unit 4: Measurement of Energy 7hrs	CO4
Construction, working principle, torque equation, errors and adjustments of single phase conventional (induction type) energy meter. Calibration of energy meter. Block diagram and operation of electronic energy meter. Three phase energy meter, TOD meter.	
Unit 5: Measuring Equipment's Oscilloscope, Transducers, Pressure Measurement 7hrs	CO5
Introduction, various parts, front panel controls, use of CRO for measurement of voltage, current, period, frequency. Introduction, classification, types: resistive, inductive, capacitive, basic requirements for transducers. Introduction, classification of pressure as low, medium & high, absolute, gauge, vacuum, static, dynamic & head pressure. High pressure measurement using electric methods, low pressure measurement by McLeod gauge and pirani gauge, capacitive pressure transducer.	
Unit 6: Level, Displacement and Sensing Equipment's 7hrs	CO6
Level Measurement: Introduction and importance of level measurement, level measurement methods: mechanical, hydraulic, pneumatic, electrical, nucleonic and ultrasonic.Displacement Measurement: LVDT & RVDT – construction, working, application, null voltage, specifications, advantages & disadvantages, effect of frequency on performance. Strain Gauge: Introduction, definition of strain, types of strain gauge: Wire strain gauge, foil strain gauge, semiconductor strain gauge etc.; their construction, working, advantages and disadvantages.	

Text Books.

1. A Course in Electrical and Electronic measurements & Instrumentation – by A. K. Sawhaney, Dhanpat Rai & Suns

2. A Course in Electronic and Electronic measurements by J. B. Gupta, S. K. Kataria & Sons.

3. Instrumentation: Measurement and Analysis by Nakra & Chaudhari Sixth Reprint, Tata McGraw Hill, New Delhi.

4. Mechanical and Industrial Measurements by R. K. Jain, Khanna Publishers, New Delhi.

Reference Books

1. Electrical measurement & measuring instrument by E.W. Golding & widing, Fifth edition, A. H. Wheeler & Co. ltd.

2. Electronic measurement and instrumentation by Dr. Rajendra Prasad, Khanna Publisher, New Delhi.

3. Introduction to Measurements and instrumentation by Ghosh, Second Edition PHI Publication.

4. Introduction to Measurements and instrumentation by Anand PHI Publication.

SANDIP FOUNDATION

SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S.Y. B. Tech(Electrical Engineering) ***(2023 Pattern)***

Sem-III

2311203: Energy Resources and Generation

Teaching Scheme:	**Credits:2**	**Examination Scheme**	
Theory: 2hrs/week	**Th:02**	**Theory**	**CIA: 25**
Practical: --	**Practical: --**		**End-Sem:50**
Prerequisite : Nil		**Pract:**	**--**
		Oral:	**--**
		Termwork	**--**

Course Objectives: The student should be able to

1. Interpret conventional energy conversion system with steam, hydro based and nuclear based power plant.
2. Develop non-conventional energy conversion system with solar, wind, fuel cell, tidal ocean, geothermal, biomass etc.
3. Build interconnection of energy source to gird, stand alone and hybrid system.

Course Outcomes:

On completion of the course, learner will be able to–

CO1: Identify components and elaborate working principle of conventional power plants.

CO2: Calculate and control power output of wind solar, and hydro power plant.

CO3: Explain process of grid interconnection of distributed generation and requirements.

CO4: Interpret the environmental and social impact of various generation technologies

SANDIP FOUNDATION

SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S.Y. B. Tech(Electrical Engineering) *(2023 Pattern)*

Sem-III

2311203: Energy Resources and Generation

Unit 1: Thermal Power Plant **7hrs**	**CO**
Site selection, Main parts and its working. Types of boilers (FBC, Fire tube, and Water tube). Assessment of heat recovery systems Steam turbines Fuel Handling, Ash disposal and dust collection, Draught systems, electrostatic precipitator.	CO1
Unit 2: Nuclear & Diesel Power Plant **7hrs**	CO2
A. Nuclear Power Plant: Introduction, atomic physics, nuclear reaction, materials, site selection, nuclear reactors and working of each part, classification of nuclear reactor, nuclear waste disposal. B. Diesel Power Plants: Main components and its working, Diesel plant efficiency and heat balance (Numerical), Site selection of diesel power plant.	
Unit 3: Hydro Power Plant **7hrs**	CO3
Site selection, Hydrology, storage and pondage, general arrangements and operation of hydro power plant, Hydraulic turbines, turbine size, pelton wheel turbine, Francis and Kaplan turbines, selection of turbines, Dams, Spillways, gates, intake and out take works, canals and layout ofpenstocks, water hammer and surge tank, Small, mini and micro hydro power plant (Introduction only).	
Unit 4: Wind Energy Systems **7hrs**	CO4
Historical Development of Wind Power, Types of wind turbine, Impact of Tower Height, Power in the Wind. Maximum Rotor efficiency, Speed control for Maximum Power, Average Power in the wind (Numerical). Wind Turbine Generators (WTG) - Synchronous and Asynchronous (block diagrams only), Wind Turbine Economics, Simple Estimates of Wind Turbine Energy, Environmental Impacts of Wind Turbines. Change in wind pattern and its effect on power generation. Control of wind turbine generator	

Text Books

1. P. K. Nag, "Power Plant Engineering", Tata McGraw Hill Publications.
2. Dr. P. C. Sharma, "Power Plant Engineering", S.K. Kataria Publications.
3. R. K. Rajput, "A text book on Power System Engineering", Laxmi Publications (P) Ltd.
4. Chakrabarti, Soni, Gupta, Bhatnagar, "A text book on Power System Engineering",DhanpatRai publication.
5. R.K. Rajput, "Non-Conventional Energy Sources and Utilization", S. Chand Publications.
6. M.M. Wakil, "Power Plant Engineering", McGraw Hill, Indian Edition.

Reference Books

1. Arora and Domkundwar, "A Course in Power Plant Engineering", DhapatRai Publication.
2. Dr. S. P. Sukhatme, "Solar Energy", Tata McGraw Hill Publication.
3. Mukund Patel, "Wind and Solar Power Plants", CRC Press.
4. Gilbert Masters John, "Renewable Energy", Wiley and sons' publications.
5. Robert Foster, Majid Ghassemi, Alma Cota "Solar Energy" CRC Press

SANDIP FOUNDATION

SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S.Y. B. Tech(Electrical Engineering) ***(2023 Pattern)***

Sem-III

2311204: Electrical Machines-I Lab

Teaching Scheme:	**Credits**	**Examination Scheme**	
Theory: --	**Th:--**	**Theory**	**CIA:--**
Practical: 02 hrs/week	**Lab: 01**		**End- Sem:--**
		Pract:	**25**
		Oral:	**--**
		Termwork	25

Course Objectives: The student should be able to

1. Interpret the safe handling of electrical equipment and the importance of safety protocols.
2. Analyze the behavior of electrical machines under different operating conditions, load variations, and control settings.
3. Determine the performance characteristics of electrical machines, including efficiency, power factor, torque-speed characteristics, and losses.
4. Demonstrate electrical machines, such as Transformer, DC machines, induction motors.

Course Outcomes:

On completion of the course, learner will be able to–

CO1: Adapt safety protocols and guidelines while working with electrical equipment, ensuring a safe and secure laboratory environment.

CO2: Determine the performance characteristics of Transformer, including efficiency, and losses. .

CO3: Determine the performance characteristics of DC Motor, including speed control methods, efficiency and losses. .

CO4: Determine the performance characteristics of Induction motor, including efficiency, power factor, torque-speed characteristics, and losses.

SANDIP FOUNDATION

SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S.Y. B. Tech(Electrical Engineering) ***(2023 Pattern)***

Sem-III

2311204: Electrical Machines-I Lab

Sr. No.	Title	CO
1	O.C. and S.C. test on single phase Transformer a. Determination of equivalent circuit parameters from the test data b. Determination of voltage regulation and efficiency.	**CO1, CO2**
2	Polarity test on single phase and three phase transformer.	**CO1, CO2**
3	Parallel operation of two single phase transformers and study of their load sharing under various conditions of voltage ratios and leakage impedance.	**CO1, CO2**
4	Speed control of D.C. Shunt motor	**CO1, CO3**
5	Study of starters for Induction Motor and D.C motor.	**CO1, CO3, CO4**
6	Load test on 3-phase induction motor.	**CO1, CO4**
7	No load & blocked-rotor test on 3-phase induction motor: Determination of parameters of equivalent circuit.	**CO1, CO4**
8	Plotting of circle diagram and calculation of motor performance from 7	**CO1, CO4**

SANDIP FOUNDATION

SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S.Y. B. Tech(Electrical Engineering) ***(2023 Pattern)***

Sem-III

2311205: Electrical Measurements lab

Teaching Scheme:	**Credits**	**Examination Scheme**	
Theory: --	**Th:--**	**Theory**	**CIA: --**
Practical: 2hrs/week	**Practical: 1**		**End-Sem:--**
Prerequisite : Nil		**Pract:**	**25**
		Oral:	**--**
		Termwork	**--**

Course Objectives: The student should be able to

1. Experiment with a wide range of measuring instruments commonly used in electrical engineering.
2. Adapt the principles and working mechanisms of different measurement techniques, including voltage, current, resistance, and capacitance and inductance measurement.
3. Measure precise and accurate measurements using various instruments and methods. This includes learning about instrument calibration and error analysis to ensure reliable results.

Course Outcomes:

On completion of the course, learner will be able to–

CO1: Explain the principles and working mechanisms of various electrical measuremen instruments.

CO2: Demonstrate the proper use of electrical measurement instruments to measure voltage, current, liquid level, pressure resistance and inductance in different electrical circuits.

CO3: Apply extension procedures to ensure accurate measurements of instruments and Earth resistance.

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S.Y. B. Tech(Electrical Engineering) *(2023 Pattern)*

Sem-III

2311205: Electrical Measurements lab

List of Experiments	
1. Measurement of active & reactive power in three phase balanced circuit using one wattmeter method with two way switch.	CO1 CO2
2. Measurement of Reactive power in three phase balanced circuit using one wattmeter method.	CO1 CO2
3. Measurement of three phase active & reactive power power in three phase circuit using two wattmeter method	CO1 CO2
4. Earth resistance measurement by Earth Tester.	CO3
5. Electrical methods for measurement of liquid level.	CO2
6. Displacement measurement by LVDT.	CO2
7. Extension of instrument range: ammeter, voltmeter, watt meter using CT / PT.	CO3
8. Study and use of CRO for measurement of Current, Voltage, Time period, frequency, Phase angle.	CO1
9. Measurement of medium resistance by Ammeter- Voltmeter method.	CO1
10. Study and demonstration of net meter and four quadrant TOD Meter.	CO1

SANDIP FOUNDATION

SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S.Y. B. Tech(Electrical Engineering) *(2023 Pattern)*

Sem-III

2311206A : Analog and Digital Electronic

Teaching Scheme:	**Credits**	**Examination Scheme**	
Theory: 3 hrs/week	**Th:03**	**Theory**	**CIA: 50**
			End-Sem:50
Prerequisite : Nil		**Pract:**	**--**
		Oral:	**--**
		Termwork	**--**

Course Objectives:

The student should be able to

1. Outline of K map for Boolean algebra reduction and design digital circuit
2. Explain digital memories and logical families.
3. Construct sequential and combinational circuits using flip flops and K map
4. Develop the concept of basics of operational Amplifier and its applications.
5. Design uncontrolled rectifier

Course Outcomes:

On completion of the course, learner will be able to–

CO1: Design logical, sequential and combinational digital circuit using K-Map.

CO2: Demonstrate different digital memories and programmable logic families.

CO3: Apply and analyze applications of OPAMP in open and closed loop condition.

CO4: Design uncontrolled rectifier with given specifications

SANDIP FOUNDATION

SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S.Y. B. Tech(Electrical Engineering) ***(2023 Pattern)***

Sem-III

2311206A : Analog and Digital Electronic

Unit 01 : K-map and Design of combinational circuit **7 Hrs**	**CO**
Introduction to Booleans algebra, Binary arithmetic: Addition and subtraction by 1's and 2's complement, De-Morgan theory Karnaugh map: structure for two, three and four Variables, SOP and POS form reduction of Boolean expressions by K-map. Design of combinational circuits using Boolean expression and K-map.	CO1
Unit 02: Design of sequential circuit **7 Hrs**	CO1
Introduction to sequential circuit. Design of synchronous (K-map) and asynchronous counters. Up down counters, N modulo counters, Shift registers, ring and twisted ring counters.	
Unit 03: Digital memories and logic families **7 Hrs**	CO2
A) Digital memories: SRAM, DRAM, ROM, EPROM **B) Digital logic families:** PAL,PLA, CPLD, FPGA	
Unit 04: Operational Amplifier Applications **7 Hrs**	CO3
Open loop and close loop configuration of Op-Amp. Applications of Op- Amp- zero crossing detectors, Comparator, Schmitt trigger, V-I and I-V converters, Instrumentation amplifier, peak detector, Waveform generation using Op-amp - sine, square, saw tooth and triangular generator.	
Unit 05: Other Analog circuits **7 Hrs**	CO3
Active filters-Its configuration with frequency response, Analysis of first order low pass and high pass filters using OPAMP, IC 555 –construction, working and modes of operation- astable and monostable multi vibrators, Sequence generator, voltage regulators using IC78xx, 79xx, LM 317	
Unit 06: Diode & Precision Rectifires **7 Hrs**	CO4
Diode rectifiers: Introduction , single phase half wave rectifier with R,RL loads ,Single phase full wave rectifier-center tap and bridge rectifier supplying R and RL load and performance parameter. Three phase full wave bridge rectifier with R load. Comparison of single phase half wave and full wave rectifier. Precision rectifier: Half wave and full wave	

Text Books

1. R.P. Jain, "Modern Digital Electronics", 4th Edition, Tata McGraw Hill
2. Ramakant A. Gayakwad, "Op-Amps and Linear Integrated Circuits", 4th Edition, Pearson.
3. Mottershed, "Electronics Devices & Circuits", PHI New Delhi

Reference books

1. **K**. R. Botkar, "Integrated Circuits", Khanna Publication, New Delhi.
2. Tokheim, "Digital Electronics-Principles and Application", 6th edition, Tata McGraw Hill, New Delhi.
3. P. S. Bimbhra, "Power Electronics", Khanna Publications.

SANDIP FOUNDATION

SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S.Y. B. Tech(Electrical Engineering) *(2023 Pattern)*

Sem-III

2311206B : Microprocessor and its Applications

Teaching Scheme:	**Credits:3**	**Examination Scheme**	
Theory: 3hrs/week	**Th:03**	**Theory**	**CIA: 50**
Practical: -- Nil	**Practical: -- Nil**		**End-Sem:50**
Prerequisite : Nil		**Pract:**	**--**
		Oral:	**--**
		Termwork	**--**

Course Objectives: The student should be able to

1. Explain the Architecture of Microprocessor.
2. Interpret Interfacing of Input and Output devices
3. Outline the application of Microprocessors.
4. Make use of simple sequence programs

Course Outcomes:

On completion of the course, learner will be able to–

CO1: Examine various types of Microprocessor Architectures and its Feature.

CO2: Analyze Interface the Input and output devices

CO3: Make use of Microprocessor for different applications.

SANDIP FOUNDATION

SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S.Y. B. Tech(Electrical Engineering) ***(2023 Pattern)***

Sem-III

2311206B : Microprocessor and its Applications

Unit 1: Architecture of 8085 Microprocessor **7 hrs**	**CO**
Basic Concepts of Microprocessor **,** Architecture of 8085 & It's operations, Memory, Input and output devices(I/O),Addressing modes of 8085 **Instruction set for 8085** (i) Data transfer operations (ii) Arithmetic operations (iii)Logical operations (iv)Branch operations ,Assembly Language Programs	CO1
Unit2:Interfacing I/O Devices **7 hrs**	CO2
Basic Interfacing concepts, Interfacing Output displays, Interfacing input devices, Memory Mapped I/O, Testing and Troubleshooting I/O interfacing circuits	
Unit3:Counters & Time Delays **7hrs**	CO3
Counters & time delays, Program for Hexadecimal Counter, Zero to Nine Counter, Debugging counter, Stack ,Subroutine, Restart-Conditional call, Return instructions	
Unit4: BCD and 16-bit data operations **7hrs**	CO3
BCD to binary conversion, Binary to BCD conversion, BCD to seven segment LED code conversion, Binary to ASCII conversion, ASCII to binary code conversion, BCD addition, BCD subtraction, Multiplication, Subtraction with carry	
Unit5: Interfacing Peripherals(I/Os) **7hrs**	CO3
The 8085 Interrupt, Digital to Analog converters(D/A), Analog to Digital Converter(A/D),Basic concepts in serial I/O, The 8085-Serial I/O lines: SOD,SID **General purpose Programmable Peripheral Devices**-The 8255A programmable peripheral interface, Illustration:interfacing keyboard and seven segment display, Direct Memory Access(DMA) & 8237 DMA Controller	
Unit 6: Architecture of 8086 Microprocessor **7hrs**	CO1
8086 Microprocessor Family, Architecture of 8086 ,Jumps, Flags, Conditional jumps, Simple sequence programs, IF-Then, IF-Then-Else programs, While-Do-Programs,8086 Interrupts and application	

SANDIP FOUNDATION

SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S.Y. B. Tech(Electrical Engineering) *(2023 Pattern)*

Sem-III

2311206B : Microprocessor and its Applications

Text Books

1. Microprocessor Architecture, Programming, and Applications with the 8085 By Ramesh Gaonkar
2. Thiyagarajan," Microprocessor and Microcontroller", BS Publications
3. B. Ram, "Fundamentals of Microprocessors & Microcontrollers" Dhanpat Rai Publication, 2014

Reference Books

1. **N**. Senthil Kumar, M. Saravanan, S. Jeevananathan, "Microprocessors & Microcontrollers" Oxford
2. University Press, 2nd Edition, 2016.
3. Leventhal, "8085 Assembly Languages Programming" Tata McGraw Hill.
4. Muhammad Ali Mazidi, Janice GillispieMazidi and Rolin D. McKinlay, "The 8051 Microcontroller
5. and Embedded Systems Using Assembly and C", Second Edition.

SANDIP FOUNDATION

SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S.Y. B. Tech (Common) ***(2023 Pattern)***

Sem-III

2300201: Principles of Management

Teaching Scheme:	**Credits**	**Examination Scheme**	
Theory: 2 hrs/week	**Th:02**	**Theory**	**CIA: 25**
Practical:--			**End-Sem:50**
		Pract:	**--**
		Oral:	**--**
		Termwork	**--**

Course Objectives: The student should be able to

1. Comprehend the nature and characteristics of management, its scope, and various functional areas.
2. Recognize the importance of ethical values in managerial decision-making and actions.
3. Explore the concepts of authority, delegation, decentralization, and their impact on organizational structure.
4. Analyze the techniques of coordination in managing complex organizational tasks.

Course Outcomes:

On completion of the course, learner will be able to–

CO1: Inculcate The Ability To Apply Multifunctional Approach To Organizational Objective.

CO2: Apply Process Based Thinking And Risk Based Thinking For Managing And Improving The Functioning Of An Organization

CO3: Examine The Inter-Relationships Between The Planning And Organising, Directing And Communicating, Controlling And Coordinating Etc.

CO4: Develop Skills For Corrective Action Management And Continual Improvement Project Management.

SANDIP FOUNDATION

SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S.Y. B. Tech (Common) ***(2023 Pattern)***

Sem-III

2300201: Principles of Management

Unit 1:Introduction to Management **7hrs**	**CO**
Definition and scope of management, Evolution of management theories, Functions of management: planning, organizing, leading, and controlling, Managerial roles and skills, Challenges and opportunities in contemporary management, Management As A Science, Art Or Profession; Management And Administration; Difference Between management And Administration. Significance Of Values And Ethics In Management	CO1
Unit 2: Planning, Organizing and Decision Making **7hrs**	CO2
Nature, Scope, Objective And Significance Of Planning, Elements And Steps Of Planning, Decision Making Organizing Principles, Span Of Control, Line And Staff Relationship, Authority, Delegation And Decentralization. Effective Organizing, Organizational Structures, Formal And Informal Organizations, Staffing, Importance of planning in achieving organizational goals, Types of plans: strategic, tactical, operational, Process of decision making, Decision-making models and techniques, Setting objectives and formulating strategies	
Unit 3:Organizing and Organizational Structure, Leading and Managing Human Resources **7hrs**	CO3
Principles of organizing, Types of organizational structures, Departmentalization and delegation of authority, Coordination and integration of activities, Formal and informal organization, The role of leadership in management, Leadership styles and their impact on organizational culture, Recruitment,Selection,Placement,Promotion,Separation,Performance Appraisal,Meaning And Nature Of Direction, Motivation theories and their application in the workplace, Communication and its importance in effective leadership, Managing diversity and fostering inclusivity.	
Unit 4: Communicating, Controlling And Coordinating **7hrs**	CO4
Communication - Meaning And Importance, Communication Process, Barriers To Communication, Steps To Overcome Communication Barriers, Types Of Communication; Motivation Theories – Maslow's Need Hierarchy Theory, Herzberg's Two Factor Theory.	

Leadership – Meaning, Formal And Informal Leadership, Characteristics Of Leadership; Leadership Styles – Autocratic Style, Democratic Style, Participative Style, Laissez Faire Leadership Styles, Transition Leadership, Charismatic Leadership Style, Elements Of Managerial Control, Control Systems, Management Control Techniques, Effective Control Systems. Coordination Concept, Importance, Principles And Techniques Of Coordination, Concept Of Managerial Effectiveness.	

Text Books

1. Principles of Management" by P. C. Tripathi and P. N. Reddy
2. Fundamentals of Management" by R. S. Dwivedi
3. "Management: Theory and Practice" by Kris Cole
4. "Principles of Management" by V. S. Ramaswamy and S. Namakumari
5. Essentials of Management" by Harold Koontz and Heinz Weihrich (Indian adaptation by A. Aryasri)

Reference Books

1. Management: Tasks, Responsibilities, Practices" by Peter F. Drucker
2. The Practice of Management" by Peter F. Drucker
3. "Management: Text and Cases" by V. S. P. Rao
4. Management: Concepts and Practices" by Tim Hannagan
5. Management: Principles and Practice" by S. K. Chakraborty and D. Chatterjee
6. Modern Management: Concepts and Skills" by Samuel C. Certo and S. Trevis Certo
7. Management: A Global and Entrepreneurial Perspective" by Heinz Weihrich, Mark Cannice, and Harold Koontz

SANDIP FOUNDATION

SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S. Y. B. Tech (Common) ***(2023 Pattern)***

Sem - III

2300202:Industrial Psychology

Teaching Scheme:	**Credits**	**Examination Scheme**	
Theory: 2hrs/week	**Th:02**	**Theory**	**CIA: 25**
Practical:--			**End-Sem:50**
		Pract:	**--**
		Oral:	**--**
		Termwork	**--**

Course Objectives: The student should be able to

1. Develop an awareness of the major perspectives underlying the field of Industrial Psychology.
2. Apply the principles of human psychology to the corporate field and familiarize them with the current practices in the corporate. .
3. Develop an understanding of group dynamics, norms, and cohesiveness, enabling them to build and lead effective teams within the organization.
4. Familiarize with the field of occupational psychology and its applications in selection, placement, counseling, and training of employees.

Course Outcomes:

On completion of the course, learner will be able to–

CO1: Learn about theories of motivation and group behavior.

CO2: Understanding of key concepts, theoretical perspectives, and trends in industrial psychology.

CO3: Analyze and interpret the role of motivation & Morale in behavior modification.

CO4: Analyze the impact of human engineering and physical environment on job performance and employee well-being**.**

CO5: Apply psychological principles in addressing work-related challenges**...**

CO6: Design the role of psychologists in industrial settings and appreciate their impact on employee well-being and organizational performance**.**

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SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S. Y. B. Tech (Common) *(2023 Pattern)*

Sem - III

2300202:Industrial Psychology

Unit 1:Introduction **6hrs**	**CO**
The role of the psychologist in industry, the field of occupational Psychology: Study of behavior in work situation and applications of Psychological principles to problems of selection, Placement, Counseling and training	CO1
Unit 2: Design of Work Environments **7hrs**	
Human engineering and physical environment techniques of job analysis, Social environment: Group dynamics in Industry Personal psychology, Selection, training, placement, promotion, counseling, job motivations, job satisfaction. Special study of problem of fatigue, boredom and accidents	CO2
Unit 3: Individual and Group Behavior **7 hrs**	
Introduction, Objectives, Individual Behavior, Individual Differences: Meaning, Nature, Dimensions and Values, Factors Influencing Individual Behavior, Group Behavior: Introduction, Objectives, Meaning, Definition and Advantages of Groups, Types of Groups, Group Dynamics, Group Norms Group Cohesiveness	CO3, CO4
Unit 4: Morale, Motivation& Counseling **8hrs**	
Morale: Meaning, Types and Aspects, Characteristics of High and Low Morale and Essential and Psychological Requirements for High Morale, Introduction, Objectives, Meaning, Importance and Types of Motivation in Industry, Monetary and Non-Monetary Incentives, Fatigue, Boredom and Monotony: Meaning, Causes and Remedies, Introduction, Objectives, Counseling: Meaning, Significance, Types and Process, Employee Health, Safety and Security, Industrial Accidents: Accident Proneness and Prevention	CO5, CO6

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SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S. Y. B. Tech (Common) *(2023 Pattern)*

Sem - III

2300202:Industrial Psychology

Text Books

1. Tiffin, J and Mc Cormic E.J., Industrial Psychology, Prentice Hall, 6th Edn., 1975.
2. Mc Cormic E.J., Human Factors Engineering and Design, McGraw Hill, 4th Edn.,1976.
3. Mair, N.R.F., Principles of Human relations
4. Gilmer, Industrial Psychology
5. Ghiselli & Brown, Personnel and Industrial Psychology.
6. Myer, Industrial Psychology.
7. Dunnete, M.D., Handbook of Industrial and Organizational Psychology.
8. Blum & Taylor, Industrial Psychology

Reference books

1. Miner J.B. (1992) Industrial/Organizational Psychology. N Y : McGraw Hill.
2. Blum & Naylor (1982) Industrial Psychology. Its Theoretical & Social Foundations CBSPublication.
3. Aamodt, M.G. (2007) Industrial/Organizational Psychology : An Applied Approach
4. (5 th edition) Wadsworth/Thompson : Belmont, C.A.Blum M.L. Naylor J.C., Horper& Row, IndustrialPsychology, CBS Publisher, 1968
5. Luthans, Organizational Behaviour, McGraw Hill, International, 1997
6. Morgan C.t.,KingR.A.,JohnRweisz & JohnSchoples, Introduction to Psychology, McHraw Hill, 1966
7. Schermerhorn J.R.Jr., Hunt J.G &Osborn R.N., Managing, Organizational Behaviour, John Willy

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SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S.Y. B. Tech (Common) ***(2023 Pattern)***

Sem-III

2300203: Design Thinking

Teaching Scheme:	**Credits**	**Examination Scheme**	
Theory: 1hrs/week	**Th:01**	**Theory**	**CIA: 25**
Practical: 2 hrs/week	**Practical: 01**		**ESE:--**
Prerequisite :		**Pract:**	**--**
		Oral:	**25**
		Termwork	**25**

Course Objectives:

The student should be able to

1. Learn design thinking concepts and principles
2. Use design thinking methods in every stage of the problem
3. Learn the different phases of design thinking
4. Apply various methods in design thinking to different problems

Course Outcomes:

On completion of the course, learner will be able to

CO1. Define key concepts of design thinking

CO2. Practice design thinking in all stages of problem solving

CO3. Apply design thinking approach to real world problems

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SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S.Y. B. Tech (Common) ***(2023 Pattern)***

Sem-III

2300203: Design Thinking

Unit 1 Introduction, Understand, Observe and Define The Problem7hrs	**CO**
Why Design? - Four Questions, Ten Tools - Principles of Design Thinking - The process of Design Thinking - How to plan a Design Thinking project. Search field determination - Problem clarification - Understanding of the problem - Problem analysis - Reformulation of the problem - Observation Phase - Empathetic design - Tips for observing - Methods for Empathetic Design - Point-of-View Phase - Characterization of the target group - Description of customer needs	CO1 CO2 CO3
Unit 2 Ideation, Prototyping, Testing and Implementation 7hrs	
Ideate Phase - The creative process and creative principles - Creativity techniques - Evaluation of ideas - Prototype Phase - Lean Startup Method for Prototype Development - Visualization and presentation techniques. Test Phase - Tips for interviews - Tips for surveys - Kano Model - Desirability Testing - How to conduct workshops - Requirements for the space - Material requirements - Agility for Design Thinking	CO1 CO2 CO3

TEXT BOOKS

1. Christian Mueller-Roterberg, Handbook of Design Thinking - Tips &Tools for how to design thinking.
2. Designing for Growth: a design thinking tool kit for managers By Jeanne Liedtka and Tim Ogilvie.
3. Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation by Tim Brown.

REFERENCES

1. Johnny Schneider, “Understanding Design Thinking, Lean and Agile”, O'Reilly Media, 2017.
2. Roger Martin, "The Design of Business: Why Design Thinking is the Next Competitive Advantage", Harvard Business Press , 2009.
3. HassoPlattner, ChristophMeinel and Larry Leifer (eds), "Design Thinking: Understand – Improve – Apply", Springer, 2011
4. http://ajjuliani.com/design-thinking-activities/
5. https://venturewell.org/class-exercises

LIST OF EXPERIMENTS

1. Case study on understanding of the design thinking problems.
2. Case study on observations of the parameters of design thinking problems.
3. Case study on defining design thinking problems.
4. Case study on description of customer needs of the parameters of design thinking problems.
5. Case study of ideation phase of solving design thinking problems
6. Case study of prototyping phase of solving design thinking problems
7. Case study of testing phase of solving design thinking problems
8. Case study of implementation phase of solving design thinking problems

SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S.Y. B. Tech (Common) ***(2023 Pattern)***

Sem-III

2300204 : Community Engagement Project

Teaching Scheme:	Credits	Examination Scheme	
Theory: --	Th:--	Theory	CIA: --
Practical: 4 hrs/week	PR:02		End-Sem:--
		Pract:	--
		Oral:	25
		Termwork	25

Course Objectives: The student should be able to

1. Sensitize the students to the living conditions of the people in the surroundings.
2. Bring about an attitudinal change in the students and help them to develop societal consciousness, sensibility, responsibility and accountability.
3. Make students aware of their inner strength and help them to find new /out of box solutions to the social problems.
4. Make students socially responsible citizens who are sensitive to the needs of the disadvantaged sections.
5. Help students to initiate developmental activities in the community in coordination with public and government authorities.
6. Develop a holistic life perspective among the students by making them to study culture, traditions, lifestyles, resource utilization, wastages and its management, social problems, public administration system and the roles and responsibilities of different persons across different social systems.

Course Outcomes:

On completion of the course, learner will be able to–

CO1: Survey for the development of the community.

CO2: Interpret the social issues that confront the vulnerable / marginalized sections of the society.

CO3: Build team for societal change.

CO4: Create an opportunity to familiarize themselves with urban / rural community they live in.

CO5: Plan activities based on the focused groups.

CO6: Implement the ways of transforming the society through systematic programme implementation.

PROCEDURE

Students in a group (Maximum 5) can take up a planned community work for minimum of 50 hours. Evaluation of student's work will be based on the planning, execution and documentation of work, and a viva-voce by Departmental panel.

A group of students could be assigned for a particular habitation or village or municipal ward, as far as possible, in the near vicinity of their place of stay, so as to enable them to commute from their residence and return back by evening or so.

The Community Service Project is a twofold one

i. First, the student/s could conduct a survey of the habitation, if necessary, in terms of their own domain or subject area. For ex., a student of Arts will focus on socio-economic conditions, social survey and about the Government's social security schemes. This should not be viewed as a duplication of work by the Village or Ward volunteers; rather, it could be another primary source of data.

ii. Secondly, the student/s could take up a project work related to following domains.

   a. Agriculture
   b. Health
   c. Marketing and Cooperation
   d. Animal Husbandry
   e. Horticulture
   f. Fisheries
   g. Sericulture
   h. Revenue and Survey
   i. Natural Disaster Management
   j. Irrigation
   k. Law & Order
   l. Excise and Prohibition
   m. Mines and Geology
   n. Energy

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SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S.Y. B. Tech (Common) ***(2023 Pattern)***

Sem-III

2300204 : Community Engagement Project

The assessment is to be conducted for 50 marks. The number of credits assigned is 2. Later as per the present practice the marks are converted into grades and grade points to include finally in the SGPA and CGPA.

The weightings shall be:

Project Report	50%
Presentation	50%

SANDIP FOUNDATION	**SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE** **S.Y. B. Tech(Electrical Engineering) *(2023 Pattern)*** Sem- III 2311701 : Maintenance and Repair of home appliance **Skill Development Program**

Teaching Scheme:	**Credits**	**Examination Scheme**	
Theory:	**Th:**	**Theory**	**CIA:**
Practical: 2 hrs/Week			**End-Sem:**
Prerequisite : Nil		**Pract:**	**--**
		Oral:	**--**
		Termwork	**--**

Course Objectives: The student should be able to

1. Explain working principle and construction of common domestic appliances

2. Show the cause of faults in these appliances

3. Build the skills to testing and repairs of appliances

4. Infer manufacturing of different appliances

Course Outcomes:

On completion of the course, learner will be able to–

CO1-Make use of different types of appliances service & repairing tools.

CO2-Apply knowledge of Safety precautions while working on electrical appliance.

CO3-Experiment with repair and maintenance of electrical home appliance.

CO4- Distinguish quality and technique of repairing for different home appliance.

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SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S.Y. B. Tech(Electrical Engineering) *(2023 Pattern)*

Sem- III

2311701 : Maintenance and Repair of home appliance

Skill Development Program

Module 1 **7 Hrs**	**CO**
Study and use of **Electrical** appliances service & repairing tools.(Pliers, combination, side cutting, round nose, long nose, Screw drivers, connectors, electrical knife, neon tester, test lamp), Study of Earth resistance tester : Megger	**CO1**
Module 2 **7 Hrs**	
Study of Safety precautions while working on electrical installations & necessity of earthing (Grounding)	**CO2**
Module 3 **7 Hrs**	
Dismantling, reassembling, testing & repairs of Tea- coffee maker , Electric toaster. Dismantling, reassembling, testing & repairs of Electric fan	**CO3**
Module 4 **7 Hrs**	
Dismantling, reassembling, testing & repairs of Water Heater & Geyser. Testing & repairing of Electric door bell, Fan Regulator.	**CO3**
Module 5 **7 Hrs**	
Dismantling, reassembling, testing & repairs of Electric Iron, Testing & repairing of Tube -light, Torch, Table Lamp. Study of Thermocouple & Thermostat.	**CO3**
Module 6 **7 Hrs**	
Market survey: Comparative study of electrical appliances, Visit to Electrical appliances service & repair shop.	**CO4**

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SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S.Y. B. Tech(Electrical Engineering) *(2023 Pattern)*

Sem-III

2311801: Python Programming

Employability Enhancement Course

Teaching Scheme:	**Credits**	**Examination Scheme**	
Theory:	**Th:**	**Theory**	**CIA:**
Practical: 2 hrs/week	**Audit Course**		**End-Sem:**
		Pract:	--
		Oral:	--
		Termwork	--

Course Objectives: The student should be able to

1. Identify the syntax and basic elements of the Python programming language.
2. Identify the roles of Python in various application domains.
3. Comprehend the importance of indentation and how it affects Python code execution.

Course Outcomes:

On completion of the course, learner will be able to–

CO1: Recall fundamental Python syntax, data types and operations used in programming.

CO2: Apply loops and conditionals in Python to handle repetitive tasks and make decisions.

CO3: Write Python scripts to solve simple electrical engineering problems

CO4: Apply python's built-in functions and libraries to perform basic data analysis.

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SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S.Y. B. Tech(Electrical Engineering) *(2023 Pattern)*

Sem-III

2311801: Python Programming

Employability Enhancement Course

Module 1:Introduction to Python **7Hrs**	**CO**
Python Introduction, History of Python, Introduction to Python Interpreter and program execution, Python Installation Process in Windows and Linux, Python IDE, Introduction toanaconda, python variable declaration, Keywords, Indents in Python, Python input/output operations	CO1 CO3
Module 2: Python's Operators **7Hrs**	CO1 CO3
Arithmetic Operators, Comparison Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Ternary Operator, Operator precedence.	
Module 3: Python's Built-in Data types **7Hrs**	CO1 CO3
String, List, Tuple, Set, Dictionary (characteristics and methods)	
Module 4: Conditional Statements & Loop **7Hrs**	CO2 CO3
Conditional Statements (If, If-else, If-elif-else, Nested-if etc.) and loop control statements (for, while, Nested loops, Break, Continue, Pass statements)	
Module 5: Function in python. **7Hrs**	CO4 CO3
Introduction to functions, Function definition and calling, Function parameters, Default argument function, Variable argument function, in built functions in python, Scope of variable in python.	
Module 6: File Processing **7Hrs**	CO3
Concept of Files, File opening in various modes and closing of a file, Reading from a file, Writing onto a file, some important File handling functions e.g open(), close(), read(), readline() etc.	

Text Books

1. Introduction to Computer Science Using Python- Charles Dierbach,Wiley Publication Learning with Python", Green Tea Press, 2002
2. Introduction to Problem Solving with Python by E balguruswamy,TMH publication - 2016
3. Beginning Programming with Python for Dummies Paperback – 2015 by John Paul Mueller

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SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S.Y. B. Tech(Electrical Engineering) *(2023 Pattern)*

Sem-III

VAC111 : Testing of electrical components

Value Added Courses

Teaching Scheme:	**Credits**	**Examination Scheme**	
Theory: --	**Th:00**	**Theory**	**CIA: --**
Practical: 2 hrs/week	**01**		**End-Sem:--**
		Pract:	**--**
		Oral:	**--**
		Termwork	**25**

Course Objectives: The student should be able to

1. Identify and test components physically and confirm its pin configuration.
2. Illustrate function and use of different parameter measuring device.
3. Interpret its function and application in models and circuit.
4. Build curiosity about electrical and electronic circuit and project on it.

Course Outcomes: On completion of the course, learner will be able to–

CO1: Build ability understand uses and application of parameter measuring device.

CO2: Perceive ability to identified name and rating of component.

CO3: Build ability to test and finding fault in components.

CO4: Build ability to design basic electrical and electronic circuit.

SANDIP FOUNDATION

SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S.Y. B. Tech(Electrical Engineering) *(2023 Pattern)*

Sem-III

VAC111 : Testing of electrical components

Value Added Courses

Module 1: **7 Hrs**	CO1
Study and use of electrical parameter measuring equipment Digital Multimeter , Clip on ammeter, AC,DC ammeter, AC,DC, voltmeter	
Module 2: **7 Hrs**	CO1
Study and use of DSO, CRO, and Function generator.	
Module 3: **7 Hrs**	CO2
Study of datasheet of diode , transistor , relay,MOSFET,SCR,IGBT etc, Study of finding out value of resistor from cooler coding.	
Module 4: **7 Hrs**	CO3
Testing and fault finding of linear and nonlinear resistor using Digital Multimeter. Testing and fault finding of Ceramic capacitor, Polyester capacitor, paper capacitor, mica Capacitor, Electrolytic capacitor using Digital Multimeter.	
Module 5: **7 Hrs**	CO3
Testing of Electromagnetic relay , Testing of different type of fuse.	
Module 6: **7 Hrs**	CO4
Design of regulated power supply on breadboard and testing on CRO.	

Reference Books

1. Kalsi H S, Electronic Instrumentation, Mcgraw Higher Ed
2. Albert D. Helfrick, William David Cooper, Modern Electronic Instrumentation and Measurement, PHI
3. A Course in Electrical and Electronic Measurements and Instrumentation, A. K. Sawhney, Puneet Sawhney, Rai Publication

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SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

MAHIRAVANI, TRIMBAK ROAD, TAL & DIST: NASHIK-422213, MAHARASHTRA,INDIA

B. Tech Electrical Engineering

Semester – IV

Sr. No.	Course Type	Course Code	Course Name	Teaching Scheme (Hrs./Week)				Examination Scheme				Total Marks
				L	T	P	C	Formative Assessment CIA		Summative Assessment ESE		
								Theory	Lab	Theory	Lab	
1	PC	2311207	Electrical Circuit Analysis	3	--	--	3	50	--	50	--	100
2	PC	2311208	Optimization Techniques	3	--	--	3	50	--	50	--	100
3	PC	2311209	Power System-I	2	--	--	2	25	--	50	--	75
4	PC (MD)	2311210	Electrical Engineering Materials	2	--	--	2	25	--	50	--	75
5	PC	2311211	Electrical Circuit Analysis Lab	--	--	2	1	--	--	--	25[a]	25
6	PC	2311212	Optimization Techniques Lab	--	--	2	1	--	--	--	25[a]	25
7	OE	2311213	Open Elective-II	2			2	25	--	50	--	75
8	IE (VEC)	2300205	First Level Course inForeign Language	2	--	--	2	25	--	50	--	75
9	IC (HSSM)	2300206	Industrial Economics	2	--	--	2	25	--	50	--	75
10	SDC (VSEC)	2311702	Methods and types of earthing	--	--	2	1	--	25	--	--	25
11	EEC	2311802	Basics of AutoCAD	--	---	--	--	---	--	--	--	--
12	IC (AEC)	2300207	Industrial Work Study	2	--	--	2	25	--	50	--	75
TOTAL				**18**	**00**	**06**	**21**	**250**	**25**	**400**	**50**	**725**
First Level Course in Foreign Language (Any One)												
8	IE (VEC)	2300205A	German Language	2	--	--	2	25	--	50	--	75
8	IE (VEC)	2300205B	French Language	2	--	--	2	25	--	50	--	75
Open Elective II												
7	OE	2311213A	Energy Storage System	2			2	25	--	50	--	75
7	OE	2311213B	Electromagnetic Theory	2			2	25	--	50	--	75
Value Added Course												
13	VAC (VSEC)	VAC112	Introduction to Energy Audit	--	--	2	1	--	25	--	--	25
Course Work (for Exit Criterion to UG Diploma)												
Minor Project				--	--	--	2	--	50	--	--	50
Internship (2 Weeks)				--	--	--	2	--	50	--	--	50

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SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S.Y. B. Tech(Electrical Engineering) *(2023 Pattern)*

Sem-IV

2311207: Electrical circuit Analysis

Teaching Scheme:	**Credits**	**Examination Scheme**	
Theory: 3 hrs/week	**Th:03**	**Theory**	**CIA: 50**
Practical :--	**Pr: --**		**End-Sem:50**
		Pract:	**--**
		Oral:	**--**
		Termwork	**--**

Course Objectives:

1. Develop the strong foundation for Electrical Networks.
2. Develop analytical qualities in Electrical circuits by application of various theorems.
3. Explain the behavior of circuits by analyzing the transient response using classical methods and Laplace Transform approach.
4. Apply knowledge of laws and Network theory for analysis of 2-port networks and design of other circuits like filters.

Course Outcomes:

On completion of the course, learner will be able to–

CO1: Evaluate current/voltage in electrical circuits using simplification techniques, Mesh, Nodal analysis and network theorems.

CO2: Analyze the response of RLC circuit with electrical supply in transient and stead state.

CO3: Apply Laplace transform to analyze behaviour of an electrical circuit.

CO4: Explain formula and solve numerical of two port network and Design of filters

CO5: Apply knowledge of network theory to find transfer function, poles and zeroes location to perform stability analysis and parallel resonance

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SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S.Y. B. Tech(Electrical Engineering) *(2023 Pattern)*

Sem-IV

2311207: Electrical circuit Analysis

Unit 1 Types of Network, Mesh and Nodal analysis **7Hrs**	**CO**
Lumped and Distributed, Linear and Nonlinear, Bilateral and Unilateral, Time-variant and Time-invariant. Independent and Dependent (controlled) voltage and current sources. Concept of voltage and current divider, Source transformation and shifting. Network Equations: Network equations on Loop basis and Node basis, choice between Loop analysis and Nodal analysis. Concept of super node and super mesh, mutual inductance, Dot convention for coupled circuits, Concept of duality and dual networks.	**CO1**
Unit 2: Network Theorem: **7Hrs**	**CO1**
Superposition, Thevenin, Norton, Maximum Power Transfer Theorem, Reciprocity, Millman theorems applied to electrical networks with all types of sources. Graph Theory : Tree ,Co-tree, Incidence matrix ,F-cutest Matrix, Tie set B Matrix	
Unit 3: Transients in RLC circuit **7Hrs**	CO2
Solutions of differential equations and network equations using classical method for R-L, R-C and R-L-C circuits, Initial and Final Condition (series and parallel).	
Unit 4: Laplace Transform **7Hrs**	CO3
Basic Properties of Laplace Transform, Laplace Transform of Basic R, L and C components, Solutions of differential equations and network equations using Laplace transform method for RL, R-C and R-L-C circuits (series and parallel), Inverse Laplace transforms, transformed networks with initial conditions. Analysis of electrical circuits with applications of step, pulse, impulse & ramp functions, shifted & singular functions the convolution integral,application of initial and final value theorem.	
Unit 5 Two port network and Filters **7Hrs**	CO4
Two Port Network: Z, Y, H and transmission parameters, Interrelations between parameters. Introduction to passive filters, low pass filters, high pass filters and m-derived LPF and HPF filters and design.	

Unit 6 Network Functions: **7Hrs**	
Poles and Zeros: Terminal pairs or ports, network functions for the one port and two ports, the calculation of network functions, general networks. Poles and zeros of network functions, Restrictions on poles and zeros locations for transfer functions and driving point function, Time – Domain behavior from the pole and zero plot. Stability of active networks. Parallel Resonance, Resonance frequency, Quality factor, Current and resonance.	CO5

Text Book:

1) Network Analysis Third Edition by M. E. Van Valkenburg, Prentice Hall of India Private Limited.

2) Network Analysis & Synthesis by G. K. Mittal, Khanna Publication.

3) Network Analysis and Synthesis by Ravish R Singh, McGraw Hill.

4) Introduction to Electric Circuits by Alexander & Sadiku, McGraw Hill.

5) Introduction to Electric Circuits by S. Charkarboorty, Dhanpat Rai & Co.

Reference Books:

1) Network Analysis by Cramer, McGraw Hill Publication.

2) Engineering Circuit Analysis by William H. Hayt, Jr. Jack E. Kemmerly, McGraw Hill Publication.

3) Schaum's Outline of Electric Circuits, McGraw-Hill Education; 7 edition

SANDIP FOUNDATION

SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S.Y. B. Tech(Electrical Engineering) *(2023 Pattern)*

Sem-IV

2311208:Optimization Techniques

Teaching Scheme:	**Credits**	**Examination Scheme**	
Theory: 3hrs/week	**Th:03**	**Theory**	**CIA: 50**
Practical: --	**Practical: --**		**End-Sem:50**
Prerequisite : Nil		**Pract:**	**--**
		Oral:	**--**
		Termwork	**--**

Course Objectives: The student should be able to

1. Recall and understand the fundamental concepts of optimization techniques, including different algorithms, mathematical models.
2. Apply optimization techniques to solve problems, through different methods.
3. Evaluate the effectiveness and efficiency of optimization solutions, considering factors such as convergence, accuracy, and computational resources.

Course Outcomes:

On completion of the course, learner will be able to–

CO1: Recall and list various optimization techniques.

CO2: Apply optimization algorithms to solve mathematical problems.

CO3: Analyze and compare the performance of different optimization methods.

CO4: Judge the suitability of optimization techniques for different types of problems.

SANDIP FOUNDATION

SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S.Y. B. Tech(Electrical Engineering) *(2023 Pattern)*

Sem-IV

2311208:Optimization Techniques

Unit 1: Concept of roots of an equation, Curve fitting **7hrs**	**CO**
Concept of roots of an equation. Descartes' rule of signs, Intermediate value theorem, Strum's theorem, synthetic division method, Roots of Polynomial Equations using Birge-Vieta method. Curve fitting using least square approximation – First order and second order	CO1 CO2
Unit 2: Solution of Transcendental and polynomial equation and Curve Fitting **7hrs**	CO1 CO2
Solution of Transcendental and polynomial equation for single variables using Bisection, Secant method, Regula- Falsi, Chebyshev method and Newton-Raphson method.	
Unit 3: Interpolation **7hrs**	CO3 CO4
Forward, Backward, Central and Divided Difference operators, Introduction to interpolation. A)Interpolation with equal Intervals - Newton's forward, backward interpolation formula , Stirling's central difference formula B) Interpolation with unequal Intervals- Newton's divided difference formula and Lagrange's interpolation.	
Unit 4: Numerical Differentiation and Integration **7hrs**	CO3 CO4
A) Numerical Differentiation using Newton's forward and backward interpolation formula (Derivation and numerical). B) Numerical Integration: Trapezoidal and Simpson's 1/3 and 3/8 rules as special cases of Newton-Cote's quadrature technique for single integral.	
Unit 5: Solution of linear simultaneous equation **7hrs**	CO1 CO2
Direct methods - Gauss elimination method, concept of pivoting – partial and complete. Gauss Jordan method. Iterative methods – Jacobi method and Gauss Seidel method.	
Unit 6: Linear Programming **7hrs**	CO1 CO2
Introduction - Formulation of linear programming model-Graphical solution–solving LPP using simplex algorithm.	

SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S.Y. B. Tech(Electrical Engineering) *(2023 Pattern)*

Sem-IV

2311208:Optimization Techniques

Text Books.

1. R. Paneerselvam, “Operations Research”, PHI, 2006

2. M. K. Jain, S.R.K. Iyangar, R. K. Jain, “Numerical Methods for Scientific and Engineering Computations”, New Age Publications.

3. Dr. B. S. Grewal, “Numerical Methods in Engineering & Sciences”, Khanna Publishers.

4. P.P. Gupta & G.S Malik, “Calculus of Finite Difference and Numerical Analysis”, Krishna Prakashan Media Ltd, Meerut**.**

5. T. Veerarajan and T. Ramchandran, “Numerical Methods with Programs in C and C++”, Tata McGraw Hill Publication.

6. S Arumugam, “Numerical Methods” Scitech Publication

Reference Books

1. Ronald L.Rardin, “Optimization in Operation Research” Pearson Education Pvt. Ltd. New Delhi, 2005.

2. Balagurusamy, E., “Numerical Methods”, Tata McGraw-Hill Pub. Co. Ltd., New Delhi, 1999.

3. J. B. Scarborough, “Numerical Mathematical Analysis”, Oxford & IBH, New Delhi.

4. Steven Chapra, Raymond P. Canale, “Numerical Methods for Engineers”, Tata McGraw Hill Publication.

5. S.S. Sastry, “Introductory methods of Numerical Analysis”, PHI Learning Private Ltd.

6. P. Thangaraj, “Computer oriented Numerical Methods”, PHI Learning Private Ltd.

SANDIP FOUNDATION

SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S.Y. B. Tech(Electrical Engineering) ***(2023 Pattern)***

Sem-IV

2311209: Power System -I

Teaching Scheme:	**Credits:**	**Examination Scheme**	
Theory: 2 hrs/week	**Th:02**	**Theory**	**CIA: 25**
Practical:--			**End-Sem:50**
Prerequisite: Nil.		**Pract:**	**--**
		Oral:	**--**
		Termwork	**--**

Course Objectives: The student should be able to

1. Define the basic structure of electrical power systems, various electrical terms related with power system and understand various types of tariff.
2. Interpret the specifications and applications of various major electrical equipment present in power plant.
3. Define the knowledge of mechanical and electrical design of overhead and underground transmission system.
4. Illustrate representation of transmission lines for performance evaluation.

Course Outcomes:

Upon successful completion of this course, the students will be able to

CO1: Identify different patterns of load curve and calculate associated different factors with it and tariff.

CO2: List of specifications of electrical equipment in power station.

CO3: Develop electrical and mechanical aspects in overhead transmission and underground cables.

CO4: Evaluate the inductance and capacitance of different transmission line configurations.

CO5: Analyze the performance of short and medium transmission lines

SANDIP FOUNDATION

SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S.Y. B. Tech(Electrical Engineering) *(2023 Pattern)*

Sem-IV

2311209: Power System -I

Unit 1: Structure of Electrical Power Systems & Major Electrical Equipment's in Power Station 7 hrs	**CO**
Structure of Electrical Power Systems: Structure of electrical power system, Different factors associated with generating stations such as Connected load, Maximum demand, Demand factor, Average load, Load factor, Diversity factor, Plant capacity factor, Reserve capacity, Plant use factor, Load curve, Load duration curve, Concept of base load and peak load stations, Advantages of interconnected grid system, Fitting of available generating station into the area load duration curve Major Electrical Equipment's in Power Station: Descriptive treatment of ratings of various equipment used in power station, Special features, field of use of equipment like alternators, necessity of exciters, various excitation systems such as dc excitation, ac excitation and static excitation systems, Power transformers, voltage regulators, bus-bars, current limiting reactors, circuit breakers, protective relays. Current transformers, potential transformers, Lightning arresters, Earthing switches, isolators, Carrier current equipment's (P.L.C.C)	CO 1 & CO 2
Unit2: Mechanical Design of Overhead lines and Insulators 7 hrs	
Mechanical Design of Overhead lines: Main components of overhead lines, Various types of line supports, Conductor spacing, Length of span, Calculation of sag for equal and unequal supports and effect of ice and wind loading. Overhead Line Insulators: Types of insulators, its construction and their applications such as Pin type, Suspension type, Strain type, Shackle type, Post insulators, bushing. Potential distribution over suspension insulators, String efficiency, (Numerical on string efficiency and up to four discs only), Methods of improving string efficiency (Descriptive treatment only).	CO 3
Unit 3:Resistance,Inductance & Capacitance of Transmission Line 7 hrs	
Resistance of transmission line, Skin effect and proximity effect, Factors responsible for production of these effects, Internal and external flux linkages of single conductor, Inductance of single phase two wire line, Necessity of transposition, Inductance of three phase line with	CO 4

symmetrical and unsymmetrical spacing with transposition, Concept of G.M.R and G.M.D Electric potential at single charged conductor, Potential at conductor in a group of charged conductors, Capacitance of single phase line, Capacitance of single phase line with effect of earth's surface on electric field, Concept of G.M.R and G.M.D for capacitance calculations, need of transposition for capacitance calculations, Capacitance of three phase line with symmetrical and unsymmetrical spacing with transposition. Capacitance of single circuit and double circuit three phase line with symmetrical and unsymmetrical spacing considering transposition (without considering earth effect).	
Unit 04: Performance of Transmission Line **7 hrs**	
Classification of lines based on length and voltage levels such as short, medium and long lines, Performance of short transmission lines with voltage current relationship and phasor diagram, Representation of medium lines as 'Nominal Π' and 'Nominal T' circuits using R,L and C parameters, Ferranti effect, Representation of 'T' and 'Π' models of lines as two port networks, Evaluation and estimation of generalized circuit constants (ABCD) for short and medium lines, Estimation of efficiency and regulation of short and medium lines.	CO 5

SANDIP FOUNDATION

SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S.Y. B. Tech(Electrical Engineering) *(2023 Pattern)*

Sem-IV

2311209: Power System -I

Text Books

[T1] V.K.Meheta, Rohit Mehta, "Principles of Power System", S. Chand Publication.

[T2] J.B.Gupta, "Transmission and Distribution", S.K.Kataria and Sons, New Delhi.

[T3] J.B.Gupata,"Generation and Economic Considerations",S.K.Kataria & Sons, New Delhi.

[T4] Dr.B.R.Gupta, "Generation of Electrical Energy", S. Chand Publication.

[T5] A Chakraborty, M.L.Soni, P.V. Gupta, U.S.Bhatnagar,"A text book on Power System Engineering", Dhanpatrai & Co, Delhi.

[T6] S.N.Singh, "Electric Power Generation, Transmission and Distribution", Prentice Hall of India.

Reference Books

[R1] Nagrath & Kothari, "Power System Engineering", Tata McGraw Hill Publications

[R2] D. Das," Electrical Power System", New Age Publication

[R3] W.D.Stevenson, "Power System Analysis", Tata McGraw Hill Publications.

[R4] M.V.Deshpande," Elements of Power Station Design", Wheeler Publishing.

[R5] I.J. Nagrath and D.P.Kothari," Modern Power System Analysis", Tata McGraw Hill

[R6] NPTEL course on Power System Engineering, IIT Kharagpur
https://nptel.ac.in/courses/108/105/108105104/

[R7] NPTEL course on Power System Analysis, IIT Kharagpur
https://nptel.ac.in/courses/108/105/108105067/

[R8] NPTEL Power System Analysis, IIT Kharagpur
https://www.youtube.com/playlist?list=PLRWKj4sFG7-6gWwDMLI0Wy5DDRqyKP1uQ

[R9] MAHADISCOM Website for tariff:
https://wss.mahadiscom.in/wss/wss?uiActionName=getEnergyBillCalculator

[R10] Maharashtra Electricity Regulatory Commission www.merc.gov.in

SANDIP FOUNDATION

SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S.Y. B. Tech (Electrical Engineering) ***(2023 Pattern)***

Sem-IV

2311210: Electrical Engineering Material

Teaching Scheme:	**Credits**	**Examination Scheme**	
Theory: 2 hrs/week	**Th:02**	**Theory**	**In Sem: 25**
Practical: --	**Lab: --**		**End Sem: 50**
		Pract:	**--**
		Oral:	**--**
		Termwork	**--**

Course Objectives: To understand

1. Explain the basic concepts of materials science and engineering, including the classification of materials (metals, semiconductors, insulators), and material properties.
2. Discuss the electrical properties of materials, such as conductivity, resistivity, dielectric constant, and their influence on the behavior of electrical components and devices.
3. Apply magnetic materials, their properties, and their applications in devices such as transformers, inductors, and magnetic storage systems.
4. Compare properties of dielectric materials, their polarization mechanisms, and their use in capacitors and insulating applications.

Course Outcomes:

On completion of the course, learner will be able to–

CO1: Identify and classify various materials used in electrical engineering, including metals, semiconductors, insulators, and magnetic materials, based on their properties and applications.

CO2: Illustrate the electrical and magnetic properties of materials, such as conductivity, resistivity, permittivity, permeability.

CO3: Interpret the behavior of magnetic materials and their use in various electrical devices, such as transformers and inductors.

CO4: Utilize the suitability of dielectric materials for capacitor and insulator applications based on their electrical properties and breakdown characteristics.

SANDIP FOUNDATION

SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S.Y. B. Tech (Electrical Engineering) ***(2023 Pattern)***

Sem-IV

2311210: Electrical Engineering Material

Unit 01: Conducting Material **7 Hrs**	**CO**
Classify various materials used in electrical engineering, including metals, semiconductors, insulators, and magnetic materials, based on their properties and applications General Properties of Conductor, Electrical Conducting Materials - Copper, Aluminum and its applications, Materials of High and Low Resistivity-Constantan, Nickel-Chromium Alloy, Tungsten, Kanthal, Silver and Silver alloys, Characteristics of Copper Alloys (Brass & Bronze), Electrical Carbon Materials. Materials used for Lamp Filaments, Solders, Metals and Alloys for different types of Thermal Bimetal and Thermocouples.	CO1
Unit 2: Magnetic Material : **7 Hrs**	CO2
Introduction, Parameters of Magnetic material [Permeability, Magnetic Susceptibility, Magnetization], Classification of Magnetic Materials, Diamagnetism, Para-magnetism, Ferromagnetism, Ferri-magnetism, Ferro-magnetic behavior below Critical Temperature, Spontaneous Magnetization, Anti-ferromagnetism, Ferrites, Applications of Ferro magnetic Materials, Magnetic materials for Electric Devices such as Transformer Core, Core of Rotating Machines, Soft Magnetic Materials, Hard Magnetic Materials.	
Unit 3: Insulating Material **7 Hrs**	CO3
Introduction, Characteristics of Good Insulating Material, Classification, Solid Insulating Materials-Paper, Press Board, Fibrous Materials, Ceramics, Mica, Asbestos, Resins, Liquid Insulating Materials such as Transformer Oil, Varnish, Askarel. Insulating Gases like Air, SF6.Insulating Materials for Power and Distribution Transformers, Rotating Machines, Capacitors, Cables, Line Insulators and Switchgears.	
Unit 4: Dielectric properties of Insulating Material **7 Hrs**	CO4
Static Field, Parameters of Dielectric material [Dielectric constant, Dipole moment, Polarization, Polarizability], Introduction to Polar and Non- Polar dielectric materials. Mechanisms of Polarizations-Electronic, Ionic and Orientation Polarization (descriptive	

treatment only), Clausius Mossotti Equation, Piezo-Electric, Pyro-Electric & Ferro-Electric Materials, Dielectric loss and loss tangent, Concept of negative tan delta. **Dielectric Breakdown** Introduction, Concept of Primary and Secondary Ionization of Gases (descriptive treatment only), Breakdown Voltage, Breakdown Strength, Factors affecting Breakdown Strengths of Solid, Liquid and Gaseous dielectric materials.	

Textbooks

1. "A Course in Electrical Engineering Materials", by S.P. Seth, Dhanpat Rai and Sons publication.
2. A Textbook of "Electrical Engineering Materials" by R.K.Rajput, Laxmi Publications (P) Ltd.
3. "Electrical Engineering Materials", by T.T.T.I, Madras.
4. "Electrical Engineering Materials", by K. B. Raina and S. K. Bhattacharya, S. K. Kataria Sons.
5. "Material Science for Electrical Engineering", by P.K. Palanisamy, Scitech Pub. Pvt. Ltd., Chennai (India).

Reference books

1. "High Voltage Engineering" by Kamraju and Naidu, Tata McGraw Hill Publication.
2. "Electrical Engineering Materials", by C. S. Indulkar and S. Thiruvengadam, S. Chand and Company Ltd.
3. "Electrical Engineering Materials", by S. P. Chalotra and B. K. Bhattacharya, Khanna Publishers, Nath Market.
4. "Electrical Power Capacitors-Design & Manufacture", by D. M. Tagare, Tata McGraw Hill Publication.

SANDIP FOUNDATION

SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S.E. B. Tech(Electrical Engineering) ***(2023 Pattern)***

Sem- IV

2311211: Electrical circuit Analysis

Teaching Scheme:	**Credits**	**Examination Scheme**	
Theory: --	**Th:--**	**Theory**	**In Sem:--**
Practical: 2 hrs/Week	**Pr:01**		**End-Sem:--**
		Pract:	**--**
		Oral:	**25**
		Termwork	**--**

Course Objectives:

1. Develop the strong foundation for Electrical Networks.
2. Develop analytical qualities in Electrical circuits by application of various theorems.
3. Explain the behavior of circuits by analyzing the transient response using classical methods and Laplace Transform approach.
4. Apply knowledge of laws and Network theory for analysis of 2-port networks and design of other circuits like filters.

Course Outcomes:

On completion of the course, learner will be able to–

CO1: Elaborate calculation of current/voltage in electrical circuits using simplification techniques, Mesh, Nodal analysis and network theorems.

CO2: Illustrate the Analyses response of RC,RL, RLC series and parallel circuit with electrical supply in transient and stead state.

CO3: Examine formula and solve numerical of two port network and Design of filters.

SANDIP FOUNDATION

SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S.E. B. Tech(Electrical Engineering) *(2023 Pattern)*

Sem- IV

2311211: Electrical circuit Analysis

Serial No.	List of Experiments	Satisfying CO
1	Verification of Superposition theorem.	CO1
2	Verification of Thevenin's theorem.	CO1
3	Verification of Reciprocity theorem.	CO1
4	Verification of Millmans' theorem.	CO1
5	Verification of Maximum Power Transfer theorem.	CO1
6	Determination of time response of R-C circuit to a step D.C. voltage input. (Charging and discharging of a capacitor through a resistor)	CO2
7	Determination of time response of R-L circuit to a step D.C. voltage input. (Rise and decay of current in an inductive circuit)	CO2
8	Determination of time response of R-L-C series circuit to a step D.C. voltage input.	CO2
9	Determination of parameter of Two Port Network.	CO3
10	Determination of current under parallel Resonance condition.	CO2
11	Determination of Resonance, Bandwidth and Q factor of R-L-C series circuit.	C02
12	Verification of KCL and KVL in DC Circuit.	CO1

SANDIP FOUNDATION

SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S.Y. B. Tech(Electrical Engineering) *(2023 Pattern)*

Sem-IV

2311212: Optimization Techniques Lab

Teaching Scheme:	**Credits**	**Examination Scheme**	
Theory: --	**Th:--**	**Theory**	**CIA: 00**
Practical: 2hrs/week	**Practical: 01**		**End-Sem:00**
Prerequisite : Nil		**Pract:**	**--**
		Oral:	**25**
		Termwork	**--**

Course Objectives: The student should be able to

1. Interpret the significance of results and solutions.
2. Utilize software and tools to analyze and optimize scenarios.
3. Compare and contrast various methods for specific problem domains.

Course Outcomes:

On completion of the course, learner will be able to–

CO1: Explain the working principles and theories behind various algorithms.

CO2: Apply algorithms to solve a variety of problems.

CO3: Compare and contrast various techniques in terms of effectiveness.

SANDIP FOUNDATION

SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S.Y. B. Tech(Electrical Engineering) *(2023 Pattern)*

Sem-IV

2311212: Optimization Techniques Lab

List of Experiments	
1. Solution of a polynomial equation using Birge-Vieta method.	CO1
2. Solution of a transcendental equation using Bisection or Regula-Falsi method.	CO2 CO3
3. Program for interpolation using Newton's forward or backward interpolation.	CO2 CO3
4. Program for interpolation using Lagrange's or Newton's Divided difference interpolation.	CO2 CO3
5. First order curve fitting using Least square approximation.	CO1
6. Solution of simultaneous equation using Gauss Seidel or Jacobi method.	CO2 CO3
7. Solution of simultaneous equation using Gauss elimination or Jordon method.	CO2 CO3
8. Solution of Numerical Integration using Simpson's (1/3) rd or (3/8) th rule.	CO2 CO3
9. Solution of first order ODE using 4th order RK method or Modified Euler method	CO2 CO3

SANDIP FOUNDATION

SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S.Y. B. Tech(Electrical Engineering) *(2023 Pattern)*

Sem-IV

2311213A: Energy Storage System

Teaching Scheme:	**Credits:**	**Examination Scheme**	
Theory: 2hrs/week	**Th:02**	**Theory**	**CIA: 25**
Practical: -- Nil	**Practical: -- Nil**		**End-Sem:50**
Prerequisite : Nil		**Pract:**	**--Nil**
		Oral:	**-- Nil**
		Termwork	**-- Nil**

Course Objectives: The student should be able to

1. Explain the various energy storage technologies and their major applications
2. Classify various energy storage systems
3. Make use of various aspects such as hybridization, selection of storage system.

Course Outcomes:

On completion of the course, learner will be able to

CO1: Illustrate the importance of energy storage systems in Power systems and other application domains

CO2: Interpret the operational features of various energy storage technologies

CO3: Explain the principles and classify thermal, mechanical, electrochemical and electrical energy storage systems.

CO4: Illustrate the hybridization of various ES technology to improve the performance

CO5: Evaluate capacity of ES system for various application requirements

SANDIP FOUNDATION

SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S.Y. B. Tech(Electrical Engineering) *(2023 Pattern)*

Sem-IV

2311213A: Energy Storage System

Unit 1: Energy Storage Fundamentals **7Hrs**	**CO**
Introduction to Energy Storage systems and components: Historical Perspective, Storage Needs, Variations in Energy Demand, Interruptions in Energy Supply, Demand for Portable Energy, Environmental and sustainability issues Battery : Energy Density, Power Density, Cycle life, C-rate, State of Charge (SoC), State of Health (SoH), Depth of Discharge (DoD), Characteristic. Types of Batteries, : Nickel Metal Hydrate, Nickel Cadmium, Lithium ion, Lithium Polymer, Flow Batteries (Vanadium, Zinc, Manganese) Super capacitor, Superconducting Magnetic Energy Storage, Compressed Air Energy Storage, Flywheel storage Hybridization of energy storage Energy storage sizing, Selection of storage as per application	CO1 & CO4
Unit2: Electrical Energy Storage **7Hrs**	
Necessity of energy storage – types of energy storage – comparison of energy storage technologies – Applications. **Fundamental concept of batteries** – measuring of battery performance, charging and discharging, power density, energy density, and safety issues. Types of batteries – Lead Acid, Nickel -Cadmium, Zinc Manganese dioxide, Li-ion batteries – Mathematical Modelling for Lead Acid Batteries – Flow Batteries	CO2
Unit 3: Other types of Energy Storage Systems **7Hrs**	
Thermal Energy Storage: Principles and applications, Latent heat, sensible heat storage. Molten salt, Solar pond, seasonal thermal energy storage, Ice storage; Energy and energy analysis of thermal energy storage **Mechanical Energy Storage:** Potential Energy Storage, Energy Storage in Pressurized Gas, Compressed air energy storage (CAES), Flywheel, Applications **Electrochemical Energy Storage:** Parameters to be considered, Cyclic behavior, equivalent circuit of electrochemical cell, self-discharge, Battery technologies: Flow battery, Rechargeable battery, Lead acid, Nickel-Metal hydride, Lithium Ion; Battery system model, parameters; emerging trends in batteries. Fuel Cell: types, comparison and applications	CO3

Unit 4: Design, Sizing and Applications of Energy Storage **7Hrs**	
Design considerations for sizing of different types of energy storage systems for various applications, case studies; Renewable energy storage- Battery sizing for stand-alone applications; Small scale application-Portable storage systems; (Numerical) .E-mobility storage applications-Electric vehicles (EVs), batteries, super-capacitors and fuel cells, future technologies. Electric vehicle: V2X, G2V and V2G modes of operation. Hybrid Energy storage systems: configurations and applications. Energy Storage - Charging methodologies, SoC, SoH, SoS estimation techniques Solid state batteries, Aluminum air and Aluminum ion batteries, Lithium ion Capacitor, Advances in Thermal energy storage systems. Batteries recycling techniques and policies ,Case studies	CO5

Textbook

1. Robert Huggins, Fundamentals, Materials and Applications Second Edition, Springer, 2016
2. Dincer I., and Rosen M. A. (2011); Thermal Energy Storage: Systems and Applications,Wiley
3. Leo J.M.J. Blomen and Michael N. Mugerwa, "Fuel Cell System", New York, Plenum Press, 1993.
4. Ahmed Faheem Zobaa, Energy storage – Technologies and Applications, InTech Publication 2013.
5. Jiuchun Jiang and Caiping Zhang, Fundamentals and Applications of Lithium-Ion Batteries In Electric Drive
   Vehicles, Wiley, 2015
6. K.T. Chau, Energy Systems for Electric and Hybrid Vehicles, IET, UK, 2016
7. M. Broussely and G. Pistoia, Industrial Applications of Batteries From Cars to Aerospace and Energy Storage, Elsevier, 2007.

Reference books

1. S. Kalaiselvam and R. Parameshwaran , Thermal Energy Storage Technologies for Sustainability Systems Design, Academic Press, 2014
2. Trevor M. Letcher, Storing Energy with Special Reference to Renewable Energy Source, Elsevier, 2016.
3. Frank S. Barnes and Jonah G. Levine, Large Energy Storage Systems Handbook, CRC Press, 2011
4. Aiping Yu, Victor Chabot, and Jiujun Zhang, Electrochemical Super-capacitors For Energy Storage And Delivery Fundamentals And Applications, CRC Press, 2013.
5. Younghyun Kim and Naehyuck Chang, Design and Management of Energy-Efficient Hybrid Electrical Energy Storage Systems, Springer, 2014

SANDIP FOUNDATION

SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S.Y. B. Tech(Electrical Engineering) *(2023 Pattern)*

Sem-IV

2311213B:Electromagnetic Theory

Teaching Scheme:	**Credits**	**Examination Scheme**	
Theory: 2hrs/week	**Th:02**	**Theory**	**CIA: 25**
Practical: --	**Practical: --**		**End-Sem:50**
Prerequisite : Nil		**Pract:**	**--**
		Oral:	**--**
		Termwork	**--**

Course Objectives: The student should be able to

1. Illustrate the basics of Static Electric and Static Magnetic Field and the associated laws.
2. Explain the boundary conditions
3. Analyze time varying electric and magnetic fields.
4. Explain Maxwell's equation in different form and media.

Course Outcomes:

On completion of the course, learner will be able to–

CO1: Interpret Electric and Magnetic Field with the help of associated laws.

CO2: Solve electromagnetic problems with the help of mathematical tools.

CO3: Solve simple electrostatic and magnetic boundary conditions.

CO4: Analyze and solve electromagnetic problems using Maxwell's equations.

SANDIP FOUNDATION

SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S.Y. B. Tech(Electrical Engineering) *(2023 Pattern)*

Sem-IV

2311213B: Electromagnetic Theory

Unit 1: Static Electric Field and Static Magnetic Fields **7hrs**	**CO**
Gradient, Divergence basics, Curl, the vector operator del, Divergence theorem, Coulombs law, Electric field intensity, Point, Line, Surface and Volume charge distributions, Electric flux density, Gauss law and its applications, Gauss divergence theorem, Absolute Electric potential, Potential difference, Calculation of potential differences for different configurations. Electric dipole, Electrostatic Energy and Energy density. Biot -Savart Law, Ampere's Circuital Law, Curl, Stokes theorem, Magnetic flux and magnetic flux density, The Scalar and Vector Magnetic potentials, Derivation of Steady magnetic field Laws.	CO1
Unit 2: Conductors, Dielectrics and Capacitance **7hrs**	CO2 CO3
Current and current density, Continuity of current, Boundary conditions of perfect dielectric materials, Boundary conditions for perfect dielectric materials, Capacitance, Capacitance of a two wire line, Poisson's equation, Laplace's equation, Solution of Laplace and Poisson's equation, Application of Laplace's and Poisson's equations.	
Unit 3: Magnetic Forces, Materials and Inductance **7hrs**	CO2 CO3
Force on a moving charge, Force on a differential current element, Force between differential current elements, Force and torque on a closed circuit, The nature of magnetic materials, Magnetization and permeability, Magnetic boundary conditions, The magnetic circuit, Potential energy and forces on magnetic materials, Inductance and mutual inductances.	
Unit 4: Time Varying Fields and Maxwell's Equations **7hrs**	CO4
Faraday's law for Electromagnetic induction, Displacement current, Point form of Maxwell's equation, Integral form of Maxwell's equations, Motional Electromotive forces.	

SANDIP FOUNDATION

SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S.Y. B. Tech(Electrical Engineering) *(2023 Pattern)*

Sem-IV

2311213B: Electromagnetic Theory

Text Books.

1. W H.Hayt & J A Buck: "Engineering Electromagnetics" TATA McGraw-Hill, 7th Edition2007.
2. S. P. Ghosh, Lipika Datta, "Electromagnetic Field Theory" McGraw-Hill Education India Private Limited.
3. Matthew N.O. Sadiku, "Principles of Electromagnetics", Oxford University Press Inc, New Delhi, 2009.
4. Edward C. Jordan and Keith G. Balmain, "Electromagnetic waves and Radiating Systems " , PHI, 2nd Edition.

Reference Books

1. Ashutosh Pramanik, " Electromagnetism", PHI Learning Private Limited, 2014
2. Kraus Fleisch, "Electromagnetics with applications", McGraw Hill, 5thEdition.
3. Bhag Singh Guru, Huseyin R. Hiziroglu, "Electromagnetic Field Theory Fundamentals", Cambridge University Press, 2nd Edition

SANDIP FOUNDATION

SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S.Y. B. Tech (Common) *(2023 Pattern)*

Sem-IV

2300205A : German Language

Teaching Scheme:	**Credits**	**Examination Scheme**	
Theory: 2 hrs/week	**Th:02**	**Theory**	**CIA: 25**
Practical: Nil			**End-Sem:50**
		Pract:	--
		Oral:	--
		Termwork	--

Course Objectives: The student should be able to

1. Understand grammar & structure of the German language and use it in daily basic conversations and communication
2. Speak and write German language
3. Critically think in German

Course Outcomes:

On completion of the course, learner will be able to–

CO1: Do the proper pronunciation of the sounds of the German language

CO2: Understand a basic vocabulary

CO3: Comprehend the basic grammatical structures.

CO4: Understand German that is spoken at a moderate conversational speed andthat deals with everyday topics and will be able to engage in simple conversations in everydaysituations.

CO5: Demonstrate that they can think critically, read& write with a basic knowledge of non-technical German

SANDIP FOUNDATION

SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S.Y. B. Tech (Common) *(2023 Pattern)*

Sem-IV

2300205A : German Language

Module 1: Introduction **7Hrs**	**CO**
Greetings , Introduction To Basic Phonetics; Writing System; Tones; Spelling Rules , Introducing Oneself And Others , Talk About Family and Family Members, Express likes and dislikes , Hobbies, Asking For Personal Information ,Talking About Date, Month, Year, Talking About Time ,Talking About Age	CO1
Module 2: Grammar **7Hrs**	CO1 , CO2, CO3
Alphabet- Numerals - Nominal Classifiers – Sentences with Adjectival Predicate – Names of Countries and places- Personal Pronoun- Interrogative Sentences - Structural Particle - Verbs and Verb Conjugation – Articles- Singular and Plural- Prepositions – Negative articles – Ja/Nein and W-Fragen (Yes/No and W- Questions) - Negation – Adjective- Possessive Article – Nominative and Accusative cases – Writing notes, SMS and filling up forms- Listen and Understand Telephonic Conversation and Conversations at specific places- Songs and Quiz	
Module3: Oral Communication **7Hrs**	CO4, CO5
Stellungnahme (Taking a particular stance on a given topic)/ Debate/ Discussions/ Interview/ Role play/ group discussion/ Narration, interview skills etc.	
Module4:Writing Communication **7Hrs**	CO1 & CO5
Writing skills: Formal and Informal letters, Email, SMS blogs, Essays, Report, Article, statistical Analysis, book/Film review etc	

SANDIP FOUNDATION

SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S.Y. B. Tech (Common) *(2023 Pattern)*

Sem-IV

2300205A : German Language

Text Books

1. Kraft, Wolfgang S. Deutsch Aktuell 1, 7th edition (2017). St. Paul: EMC/ParadigmPublishing. ISBN 978-0-8219-8076-7
2. Kraft, Wolfgang S. Deutsch Aktuell 1 Workbook, 7th edition (2017). St. Paul:EMC/Paradigm Publishing. ISBN 978-0-8219-8078-1

Reference books

1. Funk, Hermann u.a. (hrsg.): Studio D A1. Deutsch AlsFremdsprache. Kurs Und Übungsbuch.Cornelsen and GOYAL SaaB. , 2009.
2. Funk, Hermann, u.a. (hrsg.): Studio D A1. Deutsch AlsFremdsprache. Sprachtraining. Cornelsenand GOYAL SaaB. , 2009.
3. Hirschfeld, Ursula, Reinke, Kerstin, Stock, Eberhard (hrsg.): Phonothekintensiv. München.Langenscheidt, 2007.
4. Studio 21 A1 Glossardeutsch-englisch, CornelsenVerlag, Berlin, 2013.
5. Tangram aktuell 1, Max HueberVerlag, Ismaning 2005 and GOYAL Publishers, Delhi2005.
6. Swick, Ed: Complete German Grammar.Mcgraw-Hill Publ. Comp. New York City, 2012.
7. Evans, Richard J.: Rereading German History, 1800-1996. From Unification to
8. Reunification.Routledge.London& New York, 1997.
9. Fraser, Catherine C. & Hoffmann, Dierk O. (hrsg.): Pop Culture in Germany! Media, Art andLifestyle.ABC-CLIO.England, 2006.

SANDIP FOUNDATION

SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S.Y. B. Tech (Common) *(2023 Pattern)*

Sem-IV

2300205B : French Language

Teaching Scheme:	**Credits**	**Examination Scheme**	
Theory: 2 hrs/week	**Th:02**	**Theory**	**CIA: 25**
Practical: Nil			**End-Sem:50**
		Pract:	--
		Oral:	--
		Termwork	--

Course Objectives: The student should be able to

1. Understand grammar & structure of the French language and use it in daily basic conversations and communication
2. Speak and write French language
3. Critically think in French

Course Outcomes:

On completion of the course, learner will be able to–

CO1: Do the proper pronunciation of the sounds of the French language

CO2: Understand a basic vocabulary

CO3: Comprehend the basic grammatical structures.

CO4: Understand French that is spoken at a moderate conversational speed andthat deals with everyday topics and will be able to engage in simple conversations in everydaysituations.

CO5: Demonstrate that they can think critically, read& write with a basic knowledge of non-technical French

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SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S.Y. B. Tech (Common) *(2023 Pattern)*

Sem-IV

2300205B : French Language

Module 1: Introduction **7Hrs**	**CO**
Greetings , Introduction To Basic Phonetics; Writing System; Tones; Spelling Rules , Introducing Oneself And Others , Talk About Family and Family Members, Express likes and dislikes, Hobbies, Asking For Personal Information ,Talking About Date, Month, Year, Talking About Time, Talking About Age	CO1
Module 2: Grammar **7Hrs**	CO1, CO2, CO3
Alphabet- Numerals - Nominal Classifiers – Sentences with Adjectival Predicate – Names of Countries and places- Personal Pronoun- Interrogative Sentences - Structural Particle - Verbs and Verb Conjugation – Articles- Singular and Plural- Prepositions – Negative articles –- Negation – Adjective- Possessive Article – Nominative and Accusative cases – Writing notes, SMS and filling up forms- Listen and Understand Telephonic Conversation and Conversations at specific places- Songs and Quiz	
Module3:Oral Communication **7Hrs**	CO4, CO5
Stellungnahme (Taking a particular stance on a given topic)/ Debate/ Discussions/ Interview/ Role play/ group discussion/ Narration, interview skills etc.	
Module4:Writing Communication **7Hrs**	CO1, CO5
Writing skills: Formal and Informal letters, Email, SMS blogs, Essays, Report, Article, statistical Analysis, book/Film review etc	

SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S.Y. B. Tech (Common) *(2023 Pattern)*

Sem-IV

2300205B : French Language

Text Books

1. Alter Ego, A1 (ISBN: 9782011554208); Publisher: Hachette; Author: Annie Berthet, Catherine Hugot et al.; Published: 2006;
2. Alter Ego, A1 – Cahier d'activités - A1 (ISBN: 9782011558114); Publisher: Hachette; Author:Annie Berthet, Catherine Hugot et al.; Published: 2006

Reference books

10. Écho (2e edition), A1 (ISBN: 9782090385885); Publisher: CLE International; Authors: Jacky Girardet, Jacques Pecheur; Published: 2013
11. Écho (2e edition), A1 - Cahier personnel d'apprentissage (ISBN: 9782090385892); Publisher: CLE International; Authors: Jacky Girardet, Jacques Pecheur; Published: 2013.

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SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S. Y. B.Tech. (Common) *(2023 Pattern)*

Sem - IV

2300206:Industrial Economics

Teaching Scheme:	**Credits**	**Examination Scheme**	
Theory: 2hrs/week	**Th:02**	**Theory**	**CIA: 25**
			End-Sem:50
		Pract:	--
		Oral:	--
		Term work	--

Course Objectives: The student should be able to

1. Upon completion of the course, students will gain comprehensive knowledge of industrial organization, serving as a cornerstone for exploring various interconnected fields within the industry.
2. Students will develop a profound understanding of how firms interact within the economy, encompassing areas such as business strategy, corporate finance, marketing, international trade, banking, and organizational economics.
3. The course will offer insights into the historical progression of industrial economies, with a primary focus on contemporary advancements in studying firms' behavior.
4. By the end of the curriculum, learners will be equipped with a holistic perspective on industrial organization, paving the way for exploration into numerous other disciplines linked to the industrial sector.

Course Outcomes:

On completion of the course, learner will be able to–

CO1: Including its definition, scope, and economic significance in various sectors.

CO2: Recognize the importance of studying Industrial Economics and its role in economic analysis, decision-making, and influencing diverse fields such as marketing, finance, and international trade.

CO3: Analyze the interplay between economic development and industrialization, as well as the impact of industrialization on the agricultural sector.

CO4: Identify and assess key factors influencing industrial development, considering socioeconomic and political influences on industrial growth.

CO5: Comprehend the dynamics of competition and cooperation among firms, their implications on industrial outcomes, and the strategies like mergers, takeovers, and acquisitions.

CO6: Analyze industrial location decisions, determine the determinants of industrial location, and evaluate theories like Weber's and Florence's to understand industrial location patterns.

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SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S. Y. B.Tech. (Common) *(2023 Pattern)*

Sem - IV

2300206:Industrial Economics

Unit 1 - Introduction to Industrial Economics **7Hrs**	**CO**
Definition of Industrial Economics and its scope of study, Understanding the industrial sector's economic significance, Importance of Industrial Economics, Need and Significance of Studying Industrial Economics, Role of Industrial Economics in Economic Analysis, Economic Development, Agricultural Development, and Industrialization, Interplay between Economic Development and Industrialization, Impact of Industrialization on Agricultural Sector, Factors Influencing Industrial Development, Analysis of Key Factors Affecting Industrial Growth, Socioeconomic and Political Factors in Industrial Development.	CO1, CO2
Unit 2- Industrial Decisions and Market Structure **7Hrs**	CO3, CO4
Competition and Cooperation in Industries, The concept of Competition and Cooperation among Firms, Implications of Different Approaches on Industrial Outcomes, Firm Behavior and Market Outcomes, Understanding Firm Behavior under Different Market Structures, Relationship between Firm Behavior and Market Outcomes, Cartels, Collusion, Mergers, Takeovers, and Acquisitions, Overview of Cartels and Collusion in Industries, Merger, Takeover, and Acquisition Strategies.	
Unit 3- Price Competition and Pricing Strategies **7Hrs**	CO5
Factors Influencing Pricing Decisions, General Considerations for Pricing Decisions in Various Industries, Market Conditions and Pricing Strategies, Pricing under Perfect & Imperfect Competition: Theoretical Perspectives, Pricing Strategies in Perfectly Competitive Markets, Pricing Challenges in Imperfectly Competitive Markets, Pricing Procedures and Methods in Practice, Practical Approaches to Pricing Decisions, Comparative Analysis of Pricing Methods, Pricing in Public Enterprises, Pricing Policies and Practices in Public Sector Enterprise, Economic and Social Implications of Public Enterprise Pricing, Price Wars: Theories and Empirical Evidence, Theoretical Explanations of Price Wars, Empirical Evidence and Impact on Industries	

Unit 4 - Non-Price Competition and Product Differentiation **7Hrs**	
Non-Price Competition and Product Differentiation, Understanding Non-Price Competition and Product Differentiation, Importance of Product Differentiation in Competitive Markets, Horizontal Product Differentiation, Analysis of Horizontal Product Differentiation and Consumer Behavior, Case Studies and Examples, Brand Proliferation as an Entry Deterrence Strategy, The Role of Brand Proliferation in Deterring New Entrants, Evaluation of Effectiveness and Challenges, Vertical Product Differentiation, Explanation of Vertical Product Differentiation and its Implications, Comparison with Horizontal Differentiation, Price Discrimination: First-, Second-, and Third-Degree Price Discrimination.	CO6

Text Books

1. “Modern Small Industry in India" -R. K. Vepa
2. “Problems of Accountability of Public Enterprises in India" -M. P. Srivastava
3. “Economic Development Perspectives, Vol. 3, Public Enterprises and Performance" -Binode Mohanty
4. “Public Enterprises in India - Principles and Performance" - V. K. L. Srivastava

Reference Books / Reading

1. “Industrial Economics - Issues and Perspectives"- Paul R. Ferguson and Glenys J. Ferguson
2. “The Economics of Industrial Organization" - William G. Shepherd
3. “Modern Small Industry for Developing Countries"- E. Staley and R. Morse
4. “Indian Growth and Stagnation - The Debate in India" - A. V. Desai

SANDIP FOUNDATION

SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S.Y. B. Tech(Electrical Engineering) (2023 Pattern)

SEM-IV

2311702: Methods and Types of Earthing

Skill Development Program

Teaching Scheme:	Credits:1	Examination Scheme	
Theory:	Th:	Theory	CIA: --
Practical: 2 hrs/week	Audit Course		End-Sem:--
		Pract:	--
		Oral:	--
		Termwork	25

Course Objectives: The student should be able to

1. Develop participants about the importance of earthing in electrical systems
2. Explain various earthing systems
3. Make use of relevant safety standards, codes, and regulations

Course Outcomes:

On completion of the course, learner will be able to–

CO1: Explain the Concept of Earthing

CO2: Classify and compare Earthing Methods

CO3: Measure Earth Resistance Measurement

CO4: Adapt with Safety Standards

CO5: Apply in Various Sectors

SANDIP FOUNDATION

SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S.Y. B. Tech(Electrical Engineering) (2023 Pattern)

SEM-IV

2311702: Methods and Types of Earthing

Skill Development Program

Module 1: Introduction to Earthing **7Hrs**	**CO**
Definition of earthing, Importance of earthing in electrical systems, Objectives and benefits of earthing	CO1 to CO4
Module 2 : Earthing Systems **7Hrs**	CO1 to CO5
TT (Separate Earth and Neutral) system,TN-S (Separate Neutral and Protective Earth) system, TN-C-S (Combined Neutral and Protective Earth) system	
Module 3 : Conductors and Electrodes used in Earthing **7Hrs**	CO1 to CO5
Earthing conductors (types and sizing), Electrodes (types and installation)	
Module 4 : Earth Resistance and Resistivity **7Hrs**	CO1 to CO5
Understanding earth resistance and its significance, Factors affecting earth resistance, Measurement of earth resistance, Soil resistivity and its measurement	
Module 5 :Types of Earthing **7Hrs**	CO1 to CO5
Plate Earthing, Rod Earthing, Pipe Earthing, Strip Earthing, Earthing with Water Mains	
Module 6 : Earthing for Different Systems **7Hrs**	CO1 to CO5
Earthing for domestic and industrial installations, Earthing in power substations and transmission systems, Earthing for electronic equipment and sensitive systems	

Text Books

1. "The Electrician's Guide to Earth Building" by John Whitfield
2. "Earthing: The Most Important Health Discovery Ever?" by Clinton Ober, Stephen T. Sinatra
3. "Practical Grounding, Bonding, Shielding, and Surge Protection" by G. Vijayaraghavan and Mark Brown
4. "IEEE Recommended Practice for Grounding of Industrial and Commercial Power Systems"

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SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S.Y. B. Tech (Electrical Engineering) ***(2023 Pattern)***

SEM-IV

2311802: Basics of AutoCAD

Employability Enhancement Course

Teaching Scheme:	**Credits**	**Examination Scheme**	
Theory: --	**Th:--**	**Theory**	**In Sem: ---**
Practical: --	**Audit Course---**		**End-Sem:---**
		Pract:	**--**
		Oral:	**--**
		Termwork	**--**

Course Objectives: The student should be able to

1. Design and drafting process for various Electrical industries, including, engineering, and manufacturing. It enables users to create accurate and detailed technical drawings for buildings, products, machinery, and more.
2. Improve efficiency and productivity in the design process. With a wide range of drawing and editing tools, Students can create complex designs quickly, reducing the time required for manual drafting.
3. Design and drafting, ensuring that drawings and models are compatible with other CAD software and can be used for manufacturing and construction purposes.

Course Outcomes:

On completion of the course, learner will be able to–

CO1: Create precise and detailed drawings, ensuring high-quality outputs for Electrical engineering diagrams, product designs, and more.

CO2: Create complex drawings in less time compared to traditional manual drafting methods in AutoCAD's tools and features.

CO3: Make use of snaps, grids, and precision tools, AutoCAD ensures drawings are accurate, reducing errors and the need for rework

SANDIP FOUNDATION

SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S.Y. B. Tech (Electrical Engineering) ***(2023 Pattern)***

SEM-IV

2311802: Basics of AutoCAD

Employability Enhancement Course

Module 1: Introduction **7Hrs**	**CO**
Getting Started with AutoCAD, Opening and Creating Drawings, Exploring the AutoCAD interface, Zooming and Panning	CO1 to CO3
Module 2: Basic Drawing & Editing Commands **7Hrs**	CO1 to CO3
Using the Mouse, Keyboard, and Enter Key to work quickly and efficiently in AutoCAD, Lines, Circles, Rectangles, Using Object Snap, Polar and Ortho Tracking, Entering Coordinates and Angles, Object Snaps and Tracking	
Module 3 : Making Changes in Your Drawing **7Hrs**	CO1 to CO3
Move, Copy, Rotate, Mirror, Scale, Text, The Multiline Text Tool, The Single Line Text Tool, Editing Text, The Multileader Tool.	
Module 4: Hatching and Adding Dimensions **7Hrs**	CO1 to CO3
The Hatch Command, The Hatch Editor Using Dimensioning Tools, Using Dimension Styles, Editing Dimensions	
Module 5 : Organizing Drawing with Layers and Advanced Object Types **7Hrs**	CO1 to CO3
Organizing Your Drawing with Layers, Properties by Layer, Layer Tools, Polylines, Arcs, Polygons, Ellipses	
Module 6 : Command Line Printing and Plotting **7Hrs**	CO1 to CO3
Inserting Blocks, The Insert Block Command, Inserting Blocks with Tool Palette, Migrating Blocks and other Elements between Drawings with Design Center, Command Line, Printing and Plotting	

Text Books

1. Get started with AutoCAD Electrical "James Richardson" publish by Musselburgh Press.
2. AutoCAD Electrical 2023 for Electrical Control Designers, 14th Edition by Prof. Sham Tickoo Purdue Univ. and CADCIM Technologies

SANDIP FOUNDATION

SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S.Y. B. Tech (Common) *(2023 Pattern)*

Sem-IV

2300207:Industrial Work Study

Teaching Scheme:	**Credits**	**Examination Scheme**	
Theory: 2hrs/week	**Th:02**	**Theory**	**CIA: 25**
Practical: --	**Practical: --**		**End-Sem:50**
Prerequisite : Nil		**Pract:**	**--**
		Oral:	**--**
		Termwork	**--**

Course Objectives:

1. To teach students about how to measure work, optimize methods and fix pay accordingly.

Course Outcomes:

On completion of the course, learner will be able to–

CO1: Explain different method study procedures and can implement them for optimizing work approaches.

CO2: Evaluate the work content and can fix standard time for performing work.

CO3: Analyze the data through work sampling.

CO4: Design the plans for fixing incentive and wages based on performance.

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SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S.Y. B. Tech (Common) *(2023 Pattern)*

Sem-IV

2300207:Industrial Work Study

Unit 1	**Method Study** **7 Hrs**	**CO**
Purpose of work study, its objectives, procedure and applications; method study definition and basic procedure, selection of job, various recording techniques like outline process charts, flow process charts, man machine charts, two handed process charts, string diagram, flow diagram, multiple activity chart, simo, cyclographs and chrono-cyclographs; critical examination, development, installation and maintenance of improved method; principles of motion economy and their application in work design; micro motion study, memo motion study and their use in methods study.		**CO1**
Unit 2	**Work Measurement** **7 Hrs**	**CO2**
Introduction & definition, objectives and basic procedure of work measurement; application of work measurement in industries; time study: basic procedure, equipment needed, methods of measuring time, selection of jobs, breaking a job into elements; numbers of cycles to be timed; rating and methods of rating, allowances, calculation of standard time.		
Unit 3	**Work Sampling** **7 Hrs**	**CO3**
Basic procedure, design of work sampling study, conducting work sampling study and establishment of standard-time.		
Unit 4	**Job Evaluation and Incentive Schemes** **7 Hrs**	**CO4**
Starlight line, Tailor, Merrick and Gantt incentive plans, Standard data system; elemental and non-elemental predetermined motion systems, work factors system; Methods, Time Measurement (MTM), MOST		

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SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S.Y. B. Tech (Common) *(2023 Pattern)*

Sem-IV

2300207:Industrial Work Study

Text Books

1. Barrnes RM; Motion and Time Study; Wiley Publications.
2. Currie RM; Work study; BIM publications.

Reference Books

1. Mynard; Hand book of Industrial Engineering.
2. Telsang, M.; Industrial Engineering and Production Management, S. Chand Publishers.
3. ILO; work-study; International Labour Organization.

SANDIP FOUNDATION

SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S.Y. B. Tech(Electrical Engineering) (2023 Pattern)

Sem- IV

VAC112: Introduction To Energy Audit

Value Added Course

Teaching Scheme:	**Credits: 1**	**Examination Scheme**	
Theory: --	**Th:**	**Theory**	**CIA: --**
Practical: 2 hrs/week	**Audit Course**		**End-Sem:--**
		Pract:	**--**
		Oral:	**--**
		Termwork	**25**

Course Objectives: The student should be able to

1. Define and compare Energy Systems
2. Explain the Energy Efficiency Concepts
3. Importance of Energy Audit Reporting

Course Outcomes:

On completion of the course, learner will be able to–

CO1: Demonstrate a comprehensive understanding of energy systems

CO2: Analyze energy consumption data

CO3: Apply appropriate methodologies and techniques for conducting energy audits

CO4: Evaluate lighting technologies, perform electrical load analysis

CO5: Explain energy management practices

SANDIP FOUNDATION

SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S.Y. B. Tech(Electrical Engineering) (2023 Pattern)

Sem- IV

VAC112: Introduction To Energy Audit

Value Added Course

Module 1: Gather Data and Information **7Hrs**	**CO**
Collect information about the building's layout, construction, and usage patterns, such as operating hours, occupancy levels, and special energy needs.	CO1 CO4
Module 2: Walkthrough Inspection **7Hrs**	CO1 CO5
Conduct a detailed walkthrough of the building or facility to observe energy-consuming systems and identify potential energy-saving areas. Note the type and condition of lighting, HVAC (Heating, Ventilation, and Air Conditioning) systems, insulation, windows, doors, and other energy-related components.	
Module 3: Data Logging and Monitoring **7Hrs**	CO1 CO4
Install data loggers or energy meters on key energy-consuming equipment to monitor their energy usage over a specific period. This data provides more detailed insights into energy patterns and helps identify outliers or inefficiencies	
Module 4 Energy Performance Analysis **7Hrs**	CO1 CO5
Analyze the gathered data to establish a baseline of energy consumption and identify peak demand periods. Compare the building's energy performance with industry benchmarks or similar facilities to assess its efficiency	
Module 5: Lighting System Assessment **7Hrs**	CO1 CO5
Assess the lighting system's efficiency, including the type of bulbs, fixtures, and controls in use. Recommend upgrades to more energy-efficient lighting technologies, such as LED.	
Module 6:Prepare the Energy Audit Report **7Hrs**	CO1 to CO5
Compile all the findings, analysis, and recommendations into a comprehensive energy audit report. Present the report to the building or facility owner/management with clear explanations and supporting data.	

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SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

S.Y. B. Tech(Electrical Engineering) (2023 Pattern)

Sem- IV

VAC112: Introduction To Energy Audit

Value Added Course

Text Books

1. "Energy Audit and Conservation - Energy Engineering and Management" by S. Rao and A. M. Maheshwari.
2. "Energy Audit of Building Systems: An Engineering Approach" by Moncef Krarti.
3. "Energy Audit and Management for Sustainable Development" by S. C. Bhatia
4. "Energy Management Handbook" by Wayne C. Turner and Steve Doty

SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

B. Tech (Common) ***(2023 Pattern)***

Sem-IV

Minor Project (Exit Course)

Teaching Scheme:	**Credits**	**Examination Scheme**	
Theory: --	Practical:02	**Theory**	**CIA: --**
Practical: --			**End-Sem:--**
		Pract:	**50**
		Oral:	--
		Termwork	--

Course Objectives: The student should be able to

1. Develop ability for the application of fundamental principles and elementary techniques which have been learnt, in developing solutions for real life engineering problems.

Course Outcomes:

On completion of the course, learner will be able to–

CO1: Identify an open ended problem in area of engineering.

CO2: Identify the methods and materials required for the project work.

CO3: Formulate and implement innovative ideas for social and environmental benefits.

CO4: Analyze the results to come out with concrete solutions.

CO5: Write technical report of the project apart from developing a presentation.

SANDIP FOUNDATION

SANDIP INSTITUTE OF TECHNOLOGY AND RESEARCH CENTRE

B. Tech (Common) *(2023 Pattern)*

Sem-IV

Minor Project (Exit Course)

PROCEDURE

This subject will be offered to the students who are will to exit second year engineering and opt for UG Diploma after the 4th semester.

Minor Project is an exit course requirement wherein under the guidance of a faculty member, a student is required to do an innovative work with application of knowledge earned while undergoing various courses and laboratories in the course of study.

Minor Project envisages that a student will acquire the ability to use a wide range of the skills learned during their course of study. A student is required to carry out the project work related to Engineering, under the guidance of a faculty member and/or the supervisor of the concerned industry/institute/organization.

The individual student has to undertake the project.

Duration: Minor Project to be completed within one month duration for the respective semester/Exit Course. It is to be assessed and evaluated at the end of 4th semester.