Shri Shamrao Patil (Yadravkar) Educational & Charitable Trust's

Sharad Institute of Technology College of Engineering

(An Autonomous Institute)

Yadrav (Ichalkaranji), Dist: Kolhapur, Maharashtra-416121

Department: Electrical Engineering **Rev:** Course Structure/00/NEP/2023-24

Class: S.Y. B. Tech. **Semester:** III

Course Code	Course Type	Course	Teaching Scheme				Examination Scheme					Credits
			L	T	P	Total Hrs.	CAI	CAII	MSE	ESE	Total	
23EE2301	PCC	Network Analysis	3	-	-	3	10	10	30	50	100	3
23EE2302	PCC	Measurement & Instrumentation	3	-	-	3	10	10	30	50	100	3
23EE2303	PCC	DC Machines & Transformers	3	-	-	3	10	10	30	50	100	3
23EE2304	EEM	Project Management	2	-	-	2	25	25	-	-	50	2
23EE2305	MC	Environmental Sciences	2	-	-	2	25	25	-	-	50	Audit
23EE2306	PCC	Network Analysis Laboratory	-	-	2	2	25	25	-	-	50	1
23EE2307	PCC	Measurement & Instrumentation Laboratory	-	-	2	2	15	15	-	20	50	1
23EE2308	PCC	DC Machines & Transformers Laboratory	-	-	2	2	15	15	-	20	50	1
23EE2309	CEP	Mini Project-II	-	-	2	2	25	25	-	-	50	1
23OEEE21	OEC	Open Elective – I	2	-	-	2	10	10	30	50	100	2
23EEMDXX	MDM	Multidisciplinary Minor- I	2	-	-	2	10	10	30	50	100	2
23HSSM01	VEC	Aptitude Skills-I	1	-	-	1	25	25	-	-	50	1
23HSSM02	VEC	Language Skills-I	-	-	2	2	25	25	-	-	50	1
Total			**18**	**-**	**10**	**28**	**230**	**230**	**150**	**290**	**900**	**21**

Multi-Disciplinary Minor Course-I

Electrical System Design **(Basket - A)**	Automation & IOT **(Basket - B)**	Renewable Energy Sources & Grid Integration **(Basket - C)**
Electrical System Planning & Design (23EEMDA1)	Introduction to PLC (23EEMDB1)	Energy Storage Systems (23EEMDC1)

*Open Elective course will be offered to students of other programs and will not be offered to students of the same program.

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Network Analysis

23EE2301	PCC	Network Analysis	3-0-0	3 Credits

Teaching Scheme	Examination Scheme
Lecture: 3 hrs/week Tutorial: -- Practical: --	Continuous Assessment-I: 10 Marks Continuous Assessment-II: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Basic Electrical Engineering, Fundamentals of Electrical Circuits.

Course Outcomes:

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

CO1	**Analyze** the performance of the network by determining the equivalent circuits using Thevenin's and Norton's theorems, maximizing power transfer using Maximum Power Transfer theorem, Reciprocity, Tellegen's and Millman's theorem for the electrical networks with DC excitation.
CO2	**Apply** the properties of Laplace Transform in circuit analysis to solve complex circuit problems.
CO3	**Apply** the Inverse Laplace Transform to solve numerical problems involving simple poles, repeated poles, and complex poles and analyse the properties of the Inverse Laplace Transform.
CO4	**Solve** initial and final conditions in RL, RC, and RLC circuits for both AC and DC excitations and analyse circuit elements under switching conditions.
CO5	**Apply** graph theory to analyse network topology and develop associated matrices, including incidence matrix, fundamental loop and cutset matrices.
CO6	**Solve** Z and Y parameters, ABCD and h parameters, of two-port networks.

Course Contents:

Unit 1: Network Theorems Thevenin's and Norton's theorems, Duality, Maximum Power transfer theorem, Millman's theorems, Reciprocity Theorem, and Tellegen's theorem.	[6]
Unit 2: Laplace Transform in Circuit Analysis: Laplace Transform, Properties of Laplace Transform, Circuit Analysis using Laplace Transform, Advantages, Disadvantages and Applications of Laplace Transform in Circuit Analysis, Simple Numerical Problems	[6]
Unit 3: Inverse Laplace Transforms The Inverse Laplace Transform: Simple Poles, Repeated Poles, Complex Poles; Inverse Laplace Transform Theorem: Linearity Theorem, Shifting Theorem, Convolution Theorem, Properties of Inverse Laplace Transform, Advantages, Disadvantages and Applications of	[6]

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Inverse Laplace Transform, Simple Numerical Problems	
Unit 4: Transient Analysis Behavior of circuit elements under switching condition and their Representation, Evaluation of initial and final conditions in RL, RC and RLC circuits for AC and DC excitations with Laplace transforms.	[6]
Unit 5: Network Topology Basic Terminology: Graph, Types of Graphs, Planar and Non-Planar Graph, Tree, Co-tree, Matrices Associated with Network Graphs: Incidence Matrix, Fundamental Loop Matrix, Fundamental Cutset Matrix with examples,	[6]
Unit-6: Two Port Network Parameters Concept of complex frequency, Transform impedance & transform admittance; Definition and classification of Two port network parameters: Z, Y, h and Transmission parameters, relationship between parameters sets, Interconnections of Two-Port Network, condition for symmetry and reciprocity, numerical problems.	[8]

Text Books:

1. M.E. Van Valkenberg, Network Analysis, Prentice Hall of India, 3rd Edition, 2000.
2. Charles K Alexander and Mathew N O Sadiku, Fundamentals of Electric Circuits, TMH, 3rd Edition, 2009.

Reference Books:

1. Hayt, Kemmerly and Durbin, Engineering Circuit Analysis, TMH, 7th Edition, 2010.
2. J. David Irwin and R. Mark Nelms, Basic Engineering Circuit Analysis, John Wiley, 8th Edition, 2006.
3. Roy Choudhury, Networks and Systems, 2nd Edition, New Age International Publications, 2006.
4. Joseph A. Edminister, Mahmood Maqvi, "Theory and Problems of Electric Circuits", Schaum's Outline Series.
5. Robert L Boylestad, "Introductory Circuit Analysis", Pearson Publications.

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Measurement & Instrumentation

23EE2302	PCC	Measurement & Instrumentation	3-0-0	3 Credits

Teaching Scheme	Examination Scheme
Lecture: 3 hrs/week Tutorial:- - Practical: -	Continuous Assessment -I:10 Marks Continuous Assessment -II: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Basic Electrical Engineering

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain the principles underlying measurement instruments, including characteristics, errors, classification, and standards used in electrical measurements.
CO2	Analyze the construction, working principles, advantages, and disadvantages of Permanent Magnet Moving Coil (PMMC), Moving Iron (MI), and Dynamometer type instruments.
CO3	Apply shunt and multiplier techniques to extend the range of Moving Iron (MI) instruments through practical problem-solving exercises.
CO4	Evaluate the construction, working principles, torque equations, and calibration methods of single-phase conventional energy meters used for the measurement of active and reactive power.
CO5	Design and implement measurement circuits using Wheatstone Bridge, Kelvin's Double Bridge, and other bridge circuits for the measurement of resistance, inductance, and capacitance.
CO6	Assess the selection, characteristics, and applications of various transducers, including resistive, capacitive, inductive, piezoelectric, Hall effect, optical, and digital transducers, and propose suitable transducers for specific measurement requirements.

Course Contents:

Unit 1: Characteristics of Measuring Instruments Characteristics of measuring instruments, Errors & its types, Classification of instruments, Standards, torque in measuring instruments, Construction & working principle advantages and disadvantages of Permanent Magnet Moving Coil (PMMC), Moving Iron (MI) and Dynamometer type instruments, shunt and multipliers for range extension of MI Instruments (Numerical)	[6]
Unit 2: Measurement of Power and Energy Measurement of active & reactive power in electrical circuit, Construction, working principle, torque equation of single phase conventional (induction type) energy meter, Calibration of energy meter, block diagram and operation of digital Energy Meter.	[6]

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Unit 3: Measurement of Resistance, Inductance and Capacitance Measurement of low, medium and high resistance, Wheatstone Bridge, Kelvin's Double Bridge, Ammeter-Voltmeter method, Megger, Earth tester for earth resistance measurement. Inductance measurement: Maxwell's inductance Bridge, Maxwell's inductance capacitance bridge, Hay's Bridge, Anderson's Bridge, Schering Bridge and Wien's Bridge.	[8]
Unit 4: Transducers Transducers: Classification of transducers, general characteristics, Selection of transducers, Resistive, Capacitive & Inductive Transducers, Piezoelectric, Hall effect, optical and digital transducers, Elements of data acquisition system , Smart Sensors-Thermal Imagers.	[6]
Unit 5: Digital Meters Digital instruments - pros and cons, working of digital voltmeters, Digital frequency meter, time interval measurement, digital LCR meter, digital multi-meters, Digital Tachometer, microprocessor-based instruments, Use of digital meters in Automization.	[6]
Unit 6: Storage & Display Devices DSO, CRO, Power Analyzer, Wave Analyzer & Harmonic Distortion, Spectrum Analyzer, Instrument Transformers: Construction, connection of CT & PT in the circuit, advantages of CT / PT, LED & LCD display.	[6]
Text Books: 1. R K Rajput, Electrical & Electronic Measurement s and Instrumentation, S Chand Publishing, 2015. 2. Sawhney, A. K., A Course in Electrical and Electronic Measurement and Instrumentation, Dhanpat Rai & Sons, New Delhi.	
Reference Books: 1. H.S Kalsi , Electronic Instrumentation, TMH, 2010 2. U. A. Bakshi, A.V. Bakshi, K. A. Bakshi, Electrical Measurements, Technical Publications	

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DC Machines & Transformers

23EE2303	PCC	DC Machines & Transformers	3-0-0	3 Credits

Teaching Scheme	Examination Scheme
Lecture: 3 hrs/week Tutorial: -- Practical: --	Continuous Assessment -I: 10 Marks Continuous Assessment -II: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Basic Electrical Engineering

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain the construction, types, and basic components of DC machines, special machines, and transformers.
CO2	Explain the working principles and characteristics of DC motors and transformers.
CO3	Determine emf in DC generators, torque and efficiency in DC motors, and voltage regulation in transformers.
CO4	Evaluate the performance, efficiency, and applications of DC machines, and transformers

Course Contents:

Unit 1: DC Generators Construction, Working, types, emf equation, armature reaction, Characteristics, Testing of DC Generators- O.C.C Test, Direct Load Test, applications, Numerical.	[6]
Unit 2: DC Motors Principles of working, Significance of back emf, Torque Equation, Types, Characteristics of DC Motors, Starting of DC Motors, Speed Control, Losses and Efficiency (Numerical), Braking of DC Motors, Testing of DC Motors- Brake Load, Swinburne's Test, Hopkinson's Test, Applications	[7]
Unit 3:Special Machines Construction, working principle, types & applications of stepper motors, Brushless DC motors, Permanent Magnet DC Motors, Servo motor.	[5]
Unit 4:Single Phase Transformer Transformer construction, Ideal and practical transformer, equivalent circuits, no load and on load operation, phasor diagrams, efficiency and voltage regulation (Numerical), parallel operation, excitation phenomenon in transformers, Testing of single-phase transformers, Applications.	[6]
Unit 5:Three Phase Transformers Constructional features of three phase transformers, cooling methodology, transformer connections, Phase conversion, Parallel operation of three phase transformers, tap changing of transformers, Testing of Three phase transformers, Applications.	[6]

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Unit 6:Special Transformers Auto transformers, Variable frequency transformer, voltage and current transformers, welding transformers, Pulse transformer, applications.	[6]

Text Books:

1. Bhattacharya S. K, Electrical Machines, Tata McGraw Hill Publications
2. Ashfaq Husain, Electrical Machines, Dhanpat Rai & sons New Delhi
3. Kothari Nagrath, Electrical Machines, Tata McGraw Hill Publications
4. M. N. Bandopadhyay, Electrical Machines, Tata McGraw Hill Publications

Reference Books:

1. Fitzerland, Electrical Machines, Tata McGraw Hill Publications
2. A.K.Sawhney, A Course in Electrical Machine Design, Dhanpat Rai & sons New Delhi
3. R. K. Agarwal, Principles of Electrical Machine Design, S. K. Kataria and sons.
4. J. B. Gupta, Electrical Machines, S.K. Kataria & Sons.

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Project Management

23EE2304	EEM	Project Management	2-0-0	2 Credits

Teaching Scheme	Examination Scheme
Lecture: 2 hrs/week Tutorial: -- Practical: --	Continuous Assessment -I: 25 Marks Continuous Assessment -II: 25 Marks End Semester Exam: --

Pre-Requisites: --

Course Outcomes: At the end of the course, students will be able to:

CO1	Define project management concepts and processes, including initiation, planning, execution, monitoring, controlling, and closure, using the PMBOK Guide.
CO2	Analyze project requirements and synthesize a comprehensive project scope statement and work breakdown structure (WBS) to ensure project deliverables align with stakeholder expectations.
CO3	Evaluate project schedules using Critical Path Method (CPM) and apply network diagramming techniques to identify critical paths and optimize project timelines.
CO4	Calculate project costs using various estimation techniques and interpret Earned Value Management (EVM) metrics to track project performance and forecast budget deviations.
CO5	Assess project risks through identification, analysis, and prioritization, and develop risk response plans to mitigate potential threats and capitalize on opportunities.
CO6	Appraise team dynamics and facilitate effective communication strategies, leadership techniques, and conflict resolution methods to foster collaboration and enhance project.

Course Contents:

Unit 1: Introduction to Project Management Overview of project management: definition, importance, and key concepts, Project life cycle: initiation, planning, execution, monitoring and controlling, closure, Project management processes and knowledge areas according to the PMBOK Guide.	[4]
Unit 2: Project Planning and Scope Management Project planning process: defining project objectives, scope, and deliverables, Work breakdown structure (WBS) development and decomposition techniques, Scope management: scope statement, scope verification, and scope control.	[4]
Unit 3: Project Scheduling Techniques for project scheduling: Gantt charts, network diagrams (PERT/CPM), Critical Path Method (CPM) and its applications in project scheduling,	[4]
Unit 4: Project Time & Cost Management Time management: estimating activity durations, scheduling constraints, and resource levelling, Cost estimation techniques: bottom-up estimation, analogous estimation, parametric estimation, Budgeting and cost control: budget development, cost monitoring, and cost performance analysis, Earned Value Management (EVM) and its use in project cost tracking and forecasting	[6]

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Unit 5: Project Risk Management Risk identification, analysis, and assessment techniques, Risk response planning: risk mitigation, avoidance, transfer, and acceptance strategies, Risk monitoring and control: tracking identified risks, implementing risk responses, and updating risk management plans.	[3]
Unit 6: Project Team Management and Communication Team formation and development: roles, responsibilities, and team dynamics, Effective communication strategies: communication planning, stakeholder engagement, and conflict resolution, Leadership and motivation: motivating team members, resolving conflicts, and fostering collaboration.	[3]

Text Books:

1. Harold Kerzner, Project Management: A Systems Approach to Planning, Scheduling, and Controlling
2. Clifford F. Gray and Erik W. Larson, Project Management: The Managerial Process
3. Project Management Institute (PMI), A Guide to the Project Management Body of Knowledge (PMBOK Guide)
4. John M. Nicholas and Herman Steyn, Project Management for Engineering, Business, and Technology
5. Robert K. Wysocki, Effective Project Management: Traditional, Agile, Extreme

Reference Books:

1. David I. Cleland and Lewis R. Ireland, Project Management: Strategic Design and Implementation
2. Eric Verzuh, The Fast Forward MBA in Project Management
3. Greg Horine, Project Management: Absolute Beginner's Guide
4. Harold Kerzner, Project Management Case Studies
5. Jeff Sutherland, Scrum: The Art of Doing Twice the Work in Half the Time

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Environmental Sciences

23EE2305	MC	Environmental Sciences	2-0-0	Audit

Teaching Scheme	Examination Scheme
Lecture: 2 hrs/week	Continuous Assessment -I: 25 Marks
Tutorial: --	Continuous Assessment -II: 25 Marks
Practical: --	End Semester Exam: --

Pre-Requisites: NA

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain various natural resources and associated Problems.
CO2	Summarize various ecosystems.
CO3	Explain the importance of conservation of biodiversity and its importance in balancing the earth.
CO4	Recognize various causes of environmental pollution along with various protection acts in India to limit the pollution.
CO5	Extract the information based of field study and prepare a report.

Course Contents:

Unit 1: Nature of Environmental Studies: Definition, scope and importance, Multidisciplinary nature of environmental studies. Need for public awareness.	**[2]**
Unit 2: Natural Resources and Associated Problems: a) Forest resources: Use and over-exploitation, deforestation, dams and their effects on forests and tribal people. b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dam's benefits and problems. c) Mineral resources: Usage and exploitation. Environmental effects of extracting and using mineral resources. d) Energy resources: Growing energy needs, renewable and non-renewable energy resources, use of alternate energy sources. Solar energy, Biomass energy, Nuclear energy. e) Land resources: Solar energy, Biomass energy, Nuclear energy, Land as a resource, land degradation, man induced landslides, soil erosion and desertification. f) Role of individuals in conservation of natural resources	[6]
Unit 3: Ecosystems: Concept of an eco-system. Structure and function of an ecosystem. Producers, consumers and de composers. Energy flow in the eco system. Ecological succession. Food chain etc. in concern with forest ecosystem, Producers, consumers and decomposers. Energy flow in the ecosystem. Ecological succession. Food chain etc. in concern with Grassland ecosystem, Producers, consumers and decomposers. Energy flow in the ecosystem. Ecological succession. Food chain etc. in concern with Desert ecosystem, Producers, consumers and decomposers. Energy flow in the ecosystem. Ecological succession. Food chain etc. in concern with various aquatic ecosystems	[4]

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Unit 4: Biodiversity: Introduction- Definition: genetic, species and ecosystem diversity. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Various approaches for the conservation of biodiversity.	[4]
Unit 5: Environmental Pollution and Environmental Protection: Definition: Causes, effects and control measures of various types of pollution. Solid waste Management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution, Concept of sustainable development: From Unsustainable to Sustainable development, Various environmental Protection Acts and their scope.	[4]
Unit 6: Field Work: The student should Visit to a local area to document environmental Assets-River/Forest/Grassland/Hill/Mountain. Or Visit to a local polluted site - Urban / Rural / Industrial /Agricultural. Or Study of common plants, insects, birds or Study of simple ecosystems - ponds, river, hill slopes, etc. **The student should expect to do this activity in a group size of 4-5 and prepare and submit a report on it.**	[4]
Text/Reference Books: 1. Agarwal, K.C., Environmental Biology, Nidi Pub. Ltd., Bikaner, 2001. 2. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., India, 3. Brunner R.C., Hazardous Waste Incineration, McGraw Hill Inc. 1989.	

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Network Analysis Laboratory

23EE2306	PCC	Network Analysis Laboratory	0-0-2	1 Credit

Teaching Scheme	Examination Scheme
Lecture: -- Tutorial: - Practical: 2 hrs/week	Continuous Assessment -I: 25 Marks Continuous Assessment -II: 25 Marks End Semester Exam: --

Pre-Requisites: Basic Electrical Engineering, Fundamentals of Electrical Circuits.

Course Outcomes: At the end of the course students will be able to

CO1	Solve the equivalent resistance between two points using both star-delta and delta-star conversion methods.
CO2	Solve complex electrical circuits by applying the fundamental theorems, leading to a deeper understanding of circuit behavior and verify by successfully applying the theorems with theoretical results.
CO3	Analyze RL circuits and RC circuits supplied by DC voltage sources with initial values, understanding transient responses
CO4	Solve the complete set of parameters (z, y, ABCD, h) for a given two-port networks, the tie-set and cut-set matrices for oriented graphs, and identify the total number of possible trees in the graph.
CO5	Solve for the total resistance, inductance, or capacitance of an R-L-C series circuit with AC excitation using circuit analysis principles.

List of Experiments:

Minimum 8 experiments should be performed from the following list.

1. Determination of equivalent resistance between two points using star-delta or delta-star conversion
2. Verification of Superposition theorem
3. Verification of Thevinin's Theorem
4. Verification of Reciprocity Theorem
5. Verification of Maximum Power Transfer Theorem
6. Transient analysis of RL circuit supplied by DC Voltage source (Initial values)
7. Transient analysis of RC circuit supplied by DC Voltage source (Initial values)
8. Determination of matrices (tieset and cutset matrices) and also number of possible trees for the oriented graph
9. Determination of z and y parameters of the two port networks
10. Determination of ABCD and h parameters of the two port networks
11. Determination of R or L or C of R-L-C series Circuits with AC excitation.

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Text Books:
1. M.E. Van Valkenberg, Network Analysis, Prentice Hall of India, 3rd Edition, 2000.
2. Charles K Alexander and Mathew N O Sadiku, Fundamentals of Electric Circuits, TMH, 3rd Edition, 2009.
3. Ravish R Singh, Electrical Networks, TMH, New Delhi, 2009.

Reference Books:
1. Hayt, Kemmerly and Durbin, Engineering Circuit Analysis, TMH, 7th Edition, 2010.
2. J. David Irwin and R. Mark Nelms, Basic Engineering Circuit Analysis, John Wiley, 8th Edition, 2006.
3. Roy Choudhury, Networks and Systems, 2nd Ed., New Age Int. Publications, 2006.
4. Joseph A. Edminister, Mahmood Maqvi, Theory and Problems of Electric Circuits, Schaum's Outline Series.
5. Robert L Boylestad, Introductory Circuit Analysis, Pearson Publications.

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Measurement & Instrumentation Laboratory

23EE2307	PCC	Measurement & Instrumentation Laboratory	0-0-2	1 Credit

Teaching Scheme	Examination Scheme
Lecture: -- Tutorial: - Practical: 2 hrs/week	Continuous Assessment -I: 15 Marks Continuous Assessment -II: 15 Marks End Semester Exam: 20 Marks

Pre-Requisites: Basic Electrical Engineering

Course Outcomes: At the end of the course students will be able to

CO1	Identify the different power measurement techniques used in electrical circuits, including the two-wattmeter method for active power measurement and appropriate methods for reactive power measurement.
CO2	Evaluate the precision measurement techniques for resistance, inductance, and capacitance
CO3	Analyze the calibration and maintenance procedures of single-phase energy meters, ensuring accuracy and adherence to industry standards.
CO4	Measure speed, displacement and strain.
CO5	Demonstrate use of digital meters and power analyser for measuring electrical parameters

List of Experiments:

Minimum 8 experiments should be performed from the following list.

1. Measurement of Active Power in three phase's circuit using two wattmeter methods.
2. Measurement of Reactive Power in three phase circuit.
3. Calibration single phase energy meter.
5. Measurement of low resistance using Kelvin double bridge and medium resistance using Wheatstone bridge.
7. Measurement of inductance by using AC bridges.
8. Measurement of capacitance by using Schering Bridge.
9. Measurement of Speed and displacement.
10. Measurement of Strain.
12. Electrical Parameters measurement using digital multimeters and LCR meter.
13. Measurement of Current, Voltage, p.f., Active power, Reactive power by using power analyzer.

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Text Books:

1. R K Rajput, Electrical & Electronic Measurement s and Instrumentation, S Chand Publishing, 2015.
2. Sawhney, A. K., A Course in Electrical and Electronic Measurement and Instrumentation, Dhanpat Rai & Sons, New Delhi.

Reference Books:

1. H.S Kalsi , Electronic Instrumentation, TMH, 2010
2. U. A. Bakshi, A.V. Bakshi, K. A. Bakshi, Electrical Measurements, Technical Publications

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DC Machines & Transformers Laboratory

23EE2308	PCC	DC Machines & Transformers Laboratory	0-0-2	1 Credit

Teaching Scheme	Examination Scheme
Lecture: -- Tutorial: - Practical: 2 hrs/week	Continuous Assessment -I: 15 Marks Continuous Assessment -II: 15 Marks End Semester Exam: 20 Marks

Pre-Requisites: Basic Electrical Engineering

Course Outcomes: At the end of the course, students will be able to:

CO1	Determine the efficiency of DC machines through various tests including Brake load test, Swinburne's Test, Hopkinson's Test and direct load test.
CO2	Analyze the results effectively by performing O.C.C. of DC Shunt Generator.
CO3	Test the voltage and current relations in Scott connection, open delta connection, and transformers.
CO4	Analyze their findings in a report based on an industrial visit to a Transformer manufacturing unit.

List of Experiments: Minimum 8 experiments should be performed from the following list.

1. To perform O.C.C. of DC Shunt Generator.
2. To determine efficiency by direct load test on DC Generator.
3. To determine efficiency by Brake load test on DC Shunt motor.
4. To determine the efficiency of DC Machine at any desired load by Swinburne's Test.
5. To determine the efficiency of the DC Machines by Hopkinson's Test.
6. To determine efficiency by direct load test on single phase transformer.
7. To determine efficiency by Sumpner's Test.
8. To Test voltage and or Current relation in i) Scott connection ii) open delta connection
9. To demonstrate the parallel operation of 3 phase transformer.
10. Report based on Industrial visit to a Transformer manufacturing unit.

Text Books:

1. Bhattacharya S. K, Electrical Machines, Tata McGraw Hill Publications
2. Kothari Nagrath, Electrical Machines, Tata McGraw Hill Publications
3. M. N. Bandopadhyay, Electrical Machines, Tata McGraw Hill Publications

Reference Books:

1. Fitzerland, Electrical Machines, Tata McGraw Hill Publications
2. A. K. Sawhney, A Course in Electrical Machine Design, Dhanpat Rai & sons New Delhi
3. K.L. Narang, A Text Book of Electrical Engineering Drawings, Satya Prakashan, New Delhi.
4. A Shanmugasundaram, G. Gangadharan, R. Palani, Electrical Machine Design Data Book, 3rd Edition, Wiely Eastern Ltd., New Delhi.

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SHARAD INSTITUTE OF TECHNOLOGY
COLLEGE OF ENGINEERING
Yadrav (Ichalkaranji) Dist.Kolhapur

Mini Project-II

23EE2309	CEP	Mini Project-II	0-0-2	1 Credit

Teaching Scheme	Examination Scheme
Practical: 2 hrs/week	Continuous Assessment-I: - 25 Marks Continuous Assessment-II: -25 Marks

Pre-Requisites: Mini Project

Course Objective: The project is a part of addressing societal and industrial needs. An ideathon is a brief, intense event where students can work on some of the most important problems that the world is facing today. Ideation's are brainstorming events where people with diverse knowledge backgrounds, skill sets and interests get together to predetermined problems, and come up with substantive, innovative and comprehensive solutions. An Ideathon's output might be ideas, a roadmap or an actionable plan. Teams leverage design thinking and cutting-edge techniques to brainstorm and collaborate on potential solutions within a given time frame.

Course Outcomes: At the end of the course, students will be able to:

CO1	Identify problems based on societal /research needs
CO2	Apply Knowledge and interpersonal skills to solve societal problems in a group.
CO3	Draw the proper inferences from available results through theoretical/ experimental/simulations.
CO4	Analyze the impact of solutions in societal and environmental context for sustainable development.
CO5	Demonstrate capabilities of self-learning in a group, which leads to lifelong learning.
CO6	Demonstrate project management principles during project work.

Course Contents:

Week 1: Higher Education and Case Study Pedagogy • Students shall form a group of 3 to 4 students, while forming a group shall not be allowed less than three or more than four students, as it is a group activity. • Allocation of mentor.	[2]
Week 2: Topic Selection • Briefly interact with students to provide hand-holding for topic selection. • Students should do survey and identify needs, which shall be converted into problem statement for mini project in consultation with faculty supervisor. • **Illustrative Examples : Any Industry or Societal Problem** • Finalization of Title.	[2]

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Week 3: Case Study Design/Ideathon: Part 1 • If needed, provide hand-holding to students for finalizing objectives. • Review the objectives of the case study groups. • Identify what can be quantified related to your topic and how. • Decide objectives for your case study. • Continue reading especially recent work specific to your topic.	[2]
Week 4: Case Study Design/Ideathon: Part 2 • Prepare a roadmap of your case study; identify what is to be measured on the field. • Ensure student groups have finalized the objectives.	[2]
Week 5: Survey Design • Prepare a questionnaire and try it out with your group members as mock. • Decide sampling strategy.	[2]
Week 6: Analysis Phase-1 • Students in a group shall understand problem effectively, propose multiple solution. • The students have to work on different approaches and search for the different methodology to solve the problem in consultation with the project guide.	[2]
Week 7 Analysis Phase-2 • The students have to finalize the best methodology to solve the problem in consultation with the project guide. • 25% Presentation has to be conducted by mentor/guide based on above activity.	[2]
Week 8: Analysis-3 • Identify appropriate data visualization tools for your case study. • Analyze the data	[2]
Week 9: Analysis-4 • Identify appropriate data visualization tools for your case study. • Analyze the data	[2]
Week 10: Report writing Part:1 • Prepare an outline of the report and start organizing the write-up for the first draft. • Prepare and submit the first draft of the report to the course coordinator.	[2]
Week 11: Report writing Part:2 • Make necessary corrections if any as per the suggestions of course coordinator. • Submit the final draft of the case study	[2]
Week 12: Final Presentation • 50% Presentation has to be conducted by mentor/guide based on above activity.	[2]

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Multi-Disciplinary Minor-I
Electrical System Planning & Design

23EEMDA1	MDM	Electrical System Planning & Design	2-0-0	2 Credits

Teaching Scheme	Examination Scheme
Lecture: 2 hrs/week Tutorial: -- Practical: --	Continuous Assessment -I: 10 Marks Continuous Assessment -II: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Basic Electrical Engineering

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain the fundamental principles and components of electrical systems, including generation, transmission, and distribution.
CO2	Analyze load characteristics and evaluate demand forecasting techniques to estimate electrical loads accurately.
CO3	Apply system analysis techniques to identify power flow, short-circuit, and stability issues, and synthesize optimization strategies for system design.
CO4	Design distribution systems, selecting components and construct operational strategies to ensure reliability and efficiency.
CO5	Evaluate protection systems, synthesize coordination schemes, and justify their application in ensuring system safety.
CO6	Assess sustainable design principles, integrate renewable energy solutions, and justify their implementation for environmentally conscious electrical systems.

Course Contents:

Unit 1: Introduction to Electrical System Planning Overview of electrical system planning and design, Components of electrical systems: generation, transmission, distribution, Factors influencing system planning –load growth, Technological advancements, environmental considerations.	[4]
Unit 2: Load Estimation and Demand Forecasting Load characteristics and classification: peak load, average load, diversity factor, Methods of load estimation: analytical methods, statistical methods, demand forecasting techniques.	[5]
Unit 3: System Analysis and Optimization Basic principles of system analysis: power flow analysis, short-circuit analysis, stability analysis, Optimization techniques in system design: economic dispatch, optimal power flow, reliability-centered maintenance.	[5]
Unit 4: Distribution System Design and Operation Components of distribution systems: substations, feeders, transformers, switchgear, Design considerations for distribution systems: voltage regulation, power factor correction, reliability.	[3]

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Unit 5: Protection and Coordination in Electrical Systems Fundamentals of protection systems: overcurrent protection, differential protection, distance protection, Coordination of protection devices: time-current coordination, zone-selective interlocking.	[3]
Unit 6: Sustainable Design Principles in Electrical Systems Principles of sustainable design: energy efficiency, renewable energy integration, environmental impact mitigation, Green building standards and certifications: LEED, BREEAM, Green Star.	[4]

Text Books:

1. Alexandra von Meier, Electric Power Systems: A Conceptual Introduction, Wiley, 2006
2. Turan Gonen, Electric Power Distribution System Engineering, Mc-Graw Hill Book Company, CRC Press, 2015
3. J. Duncan Glover, Thomas Overbye, and Mulukutla S. Sarma, Power System Analysis and Design, Cengage Learning, 2012.
4. Neil Sclater, John E. Traister, Handbook of Electrical Design Details, Tata Mc-Graw Hill Companies, 2003
5. Ned Mohan, Electric Power Systems: A First Course, John Wiley & Sons, 2012.
6. Badri Ram and D.N. Vishwakarma, Power System Protection and Switchgear, Tata McGraw Hill Education, 2011.

Reference Books:

1. Albert Thumann; Harry Franz, Efficient Electrical Systems Design Handbook, River Publishers,2009
2. B R Gupta, Power System Analysis And Design, S Chand Limited, 2008

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Multi-Disciplinary Minor-I
Introduction to PLC

23EEMDB1	MDM	Introduction to PLC	2-0-0	2 Credits

Teaching Scheme	Examination Scheme
Lecture: 2 hrs/week Tutorial: -- Practical: --	Continuous Assessment -I: 10 Marks Continuous Assessment -II: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: --

Course Outcomes: At the end of the course, students will be able to:

CO1	Define the components and architecture of PLC systems, including CPUs, I/O modules, power supplies, and communication modules.
CO2	Construct basic ladder logic programs using fundamental programming instructions such as contacts, coils, timers, and counters.
CO3	Interpret digital and analog I/O modules, and classify their applications in interfacing with sensors and actuators.
CO4	Execute advanced ladder logic instructions such as arithmetic, comparison, and data manipulation operations.
CO5	Develop human-machine interface (HMI) screens for process visualization and control using HMI software.
CO6	Identify common PLC hardware and software faults, and formulate strategies for fault finding and diagnostics.

Course Contents:

Unit-1: Basics of PLC Invention of PLC, Sustainability of PLC, Definition of PLC, Classifications of PLCs, Role of PLC in Process Automation, Features of a PLC,I/O Devices of PLC,PLC Programming Devices, PLC Selection Criteria, Major PLC Vendors and their Products, Top Five PLC Vendors	[3]
Unit-2: Design and Operation of PLC Architecture of PLC, Central Control Unit of PLC, Functional Modes of PLC,PLC Program Structure and Execution, Programming Devices for PLC, Selection of I/O Modules for PLC — Sourcing and Sinking	[3]
Unit-3: PLC Programming Tools Programming Languages, IEC 61131-3 Structuring Resources, Ladder Diagram, **Variables and Data Types, Register, Timer -** On Delay Timer, Off Delay Timer , Pulse Timer, **Counter -** Up Counter, Down Counter, Up-Down Counter, **Arithmetic Function** Addition (ADD), Subtraction (SUB), Division (DIV), Square Root (SQRT)	[6]

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Unit-4: Advanced PLC Functions Data Handling Functions, MOVE (MV),BLOCK TRANSFER (BT),TABLE AND REGISTER MOVE, Matrix Functions, Analog Signal Handling, PID Control with PLC, Digital Bit Function, Shift Register Function, Sequence Function, Function Chart to IEC 60848	[6]
Unit-5: PLC Communication Necessity for PLC Communication, Data Transmission Formats, Communication with Field Instruments, PLC Protocols **PLC Networking and Interfacing** Remote I/O Systems, Peer-to-Peer Networks, Host Computer Links, Access, Protocol, and Modulation, Functions of LANs, Network Transmission Interfaces.	[3]
Unit-6: Selection and Commissioning of PLC PLC Selection Criteria, Vendor Selection, PLC Commissioning, PLC Auxiliary Functions, Maintenance of PLC, Operational Safety of PLC. **Future of PLC** PLC-Based Automation, PLC and Programmable Automation Controller, Unified Human-Machine Interface, Plug and Play Solution, Wireless Link of PLC, Enterprise Resource Planning with PLC, Industrial Internet of Things and PLC.	[3]

Text / Reference Books:

1. Chanchal Dey, Sunit Kumar Sen, Industrial Automation Technologies, CRC Press, 2020
2. A.K. Gupta and S.K. Arora, Industrial Automation and Control: A Textbook, Laxmi Publications, 2013
3. Frank D. Petruzella, Programmable Logic Controllers, TMH
4. Frank Lamb, Industrial Automation: Hands-On, TMH Education, 2013
5. Stamatios Manesis, George Nikolakopoulos, Introduction to Industrial Automation, CRC Press, 2018

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Multi-Disciplinary Minor-I
Energy Storage Systems

23EEMDC1	MDM	Energy Storage Systems	2-0-0	2 Credits

Teaching Scheme	Examination Scheme
Lecture: 2 hrs/week Tutorial: - Practical: --	Continuous Assessment -I: 10 Marks Continuous Assessment -II: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Fundamentals of Electrical Engineering
Course Outcomes: At the end of the course, students will be able to:

CO1	Define the different types of energy storage technologies and their significance in modern energy management.
CO2	Analyze the characteristics and applications of various electrochemical energy storage technologies, such as batteries and fuel cells.
CO3	Design mechanical energy storage systems, including pumped hydro, compressed air energy storage (CAES), and flywheels, based on specific requirements and constraints..
CO4	Evaluate hydrogen production methods and storage technologies for their efficiency, reliability, and suitability in different applications.
CO5	Explain the principles and applications of thermal energy storage systems, including sensible, latent, and thermochemical storage.
CO6	Synthesize strategies for the integration of energy storage systems with renewable energy sources and grid networks to enhance reliability, stability, and sustainability.

Course Contents:

Unit 1: Introduction to Energy Storage Systems Overview of energy storage systems and their significance in energy management, Types of energy storage technologies: electrochemical, mechanical, chemical, and thermal storage, Comparison of energy storage systems based on capacity, efficiency, response time, and cost	[4]
Unit 2: Electrochemical Energy Storage Principles of electrochemical energy storage: batteries and fuel cells, Types of batteries: lead-acid, lithium-ion, flow batteries, and redox flow batteries, Characteristics, applications, and limitations of different battery technologies.	[4]
Unit 3: Mechanical Energy Storage Principles of chemical energy storage: hydrogen storage and conversion, Hydrogen production methods: electrolysis, steam reforming, and biomass gasification, Hydrogen storage technologies: compression, liquefaction, and solid-state storage.	[4]

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Unit 4: Chemical Energy Storage Advanced ladder logic instructions: arithmetic, comparison, data manipulation, Sequential function chart (SFC) programming for complex control sequences, Introduction to PLC networking and communication protocols (Ethernet/IP, Modbus), Case studies and practical applications of advanced programming techniques.	[4]
Unit 5: Thermal Energy Storage Principles of thermal energy storage: sensible, latent, and thermochemical storage, Types of thermal energy storage systems: water tanks, phase change materials (PCMs), and molten salt storage, Applications of thermal energy storage in solar thermal power plants and district heating systems.	[4]
Unit 6: Integration of Energy Storage Systems Challenges and opportunities in the integration of energy storage systems with renewable energy sources and grid networks, Grid-scale energy storage projects: case studies and real-world examples, Future trends and emerging technologies in energy storage systems.	[4]

Text/ Reference Books:

1. Robert Huggins, Energy Storage: Fundamentals, Materials and Applications, Springer, 2016
2. Michael Sterner, Ingo Stadler, Handbook of Energy Storage: Demand, Technologies, Integration, Springer, 2019
3. Kalaiselvam Sivakumar and Angelos A. Oikonomou, Thermal Energy Storage Technologies for Sustainability: Systems Design, Assessment, and Applications, Elsevier, 2014
4. Nihal Kularatna, Kosala Gunawardane, Energy Storage Devices for Renewable Energy-Based Systems: Rechargeable Batteries and Supercapacitors, Academic Press, 2021
5. Przemyslaw Komarnicki, Pio Lombardi , Zbigniew Styczynski, Electric Energy Storage Systems: Flexibility Options for Smart Grids, Springer, 2017.

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Aptitude Skills-I
(Verbal Ability)

23HSSM01	VEC	Aptitude Skills-I	1-0-0	1 Credit

Teaching Scheme	Examination Scheme
Lecture: 1 hrs/week Tutorial: -- Practical: --	Continuous Assessment -I: 25 Marks Continuous Assessment -II: 25 Marks

Pre-Requisites: Communication Skills

Course Outcomes: At the end of the course, students will be able to:

CO1	Apply sentence formation rules to spot the error.
CO2	Solve the questions based on the types of tenses.
CO3	Solve the questions based on Direct/Indirect Speech and Passive/active voice and Substitution and Elimination.
CO4	Make use of Proverbs, Idioms and phrases in sentence construction and the vocabulary.

Course Contents:

Unit 1: Speed Math Techniques Structure and Types of Sentences, Conditional Sentences	[3]
Unit 2: Number System Present tense, Past tense, Future tense, Use of Tenses in Sentence forming	[3]
Unit 3: Basic Aptitude Direct and Indirect Speech, Active and Passive Voice, Use of Modal verbs in Sentence Forming, Substitution and Elimination	[3]
Unit 4: Speed- Time- Distance Speed, Time, and Distance, Trains, Boats, Streams, Races	[3]
Text Books : 1. Raymond Murphy, Essential English Grammar with Answers, Murphy 2. R.S. Aggarwal , Objective General English, S Chand Publishing; Revised Edition	
Reference Books: 1. Rao and D,V,Prasada, Wren & Martin High School English Grammar and Composition 2. Murphy, Intermediate English Grammar with Answers, Cambridge University Press, Second Edition.	

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Language Skills- I

23HSSM02	VEC	Language Skills- I	0-0-2	1 Credit

Teaching Scheme	Examination Scheme
Lecture: -- Tutorial: -- Practical: 2 hrs/week	Continuous Assessment -I: 25 Marks Continuous Assessment -II: 25 Marks

Pre-Requisites: Basics of Programming

Course Outcomes: At the end of the course, students will be able to:

CO1	Develop flowchart and Algorithm to solve the given problem statements.
CO2	Develops programs using Data Types and Operators.
CO3	Make use of Decision Making and Looping Statements to develop conditional programs.
CO4	Make use of Arrays to develop programs in C language.

Course Contents:

Experiments

1. Explain basics of C such as Editing, Compiling, Error Checking, executing, testing and debugging of Programs and Deign Algorithms and Flowcharts.
2. Explain basics of Variable, Data types and operators and develop programs on arithmetic Operators.
3. Develop programs on Conditional, logical and Bitwise Operators.
4. Develop programs on Sizeof () and typecasting operator.
5. Develop programs on increment and decrement operator.
6. Develop programs on simple if and if-else statement.
7. Develop programs on simple if-else ladder and Nested if-else.
8. Develop programs on Switch case statement.
9. Develop programs on For-loop & Nested For-loop.
10. Develop programs on while and do-while loop.
11. Develop programs on one dimensional array.
12. Develop programs on two dimensional array.
13. Develop programs on string handling functions.

Text Books :

1. C Programming Absolute Beginner's Guide, Que Publishing; 3rd Edition
2. Ajay Mittal, Programming in C Practical Approach, Pearson Publication

Reference Books:

1. C: The Complete Reference, McGraw Hill Education; 4th Edition
2. C Programming in easy steps, In Easy Steps Limited, 5th Edition.

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