Mandsaur University

Subject Code: - EEE250
Subject Name: - Utilization of Electrical Energy
Semester:-IV

L	T	P	C
3	-	-	3

Course Objectives:
The objective of this course is to train students on characteristics of various drives, heating, welding methodologies, illumination methods and traction system.

Unit-I Illumination Engineering
Nature of Light, Units, Sensitivity of the Eye, Luminous Efficiency, Glares. Production of Light; Incandescent Lamps, Arc Lamps Gas Discharge Lamps- Fluorescent Lamps Polar Curves, Effect of Voltage Variation on Efficiency and Life of Lamps, Distribution and Control of Light, Lighting Calculations, Solid Angle, Inverse Square and Cosine Laws, Methods of Calculations, Factory Lighting, Flood Lighting and Street Lighting, Direct Diffused and Mixed Reflection & Transmission Factor, Refractors, Light Fittings.

Unit-II Heating, Welding and Electrolysis
Electrical Heating-Advantages, Methods and Applications, Resistance Heating, Design of Heating Elements, Efficiency and Losses Control. Induction Heating: Core Type Furnaces, Core Less Furnaces and High Frequency Eddy Current Heating, Dielectric Heating: Principle and Special Applications, Arc Furnaces: Direct Arc Furnaces, Indirect Arc Furnaces, Electrodes, Design of Heating Elements, Power Supply and Control. Different Methods of Electrical Welding, Resistance Welding, Arc Welding, Energy Storage Welding, Laser Welding, Electro Beam Welding, and Electrical Equipment for them. Arc Furnaces Transformer and Welding Transformers. Review of Electrolytic Principles, Laws of Electrolysis, Electroplating, Anodizing-Electro-Cleaning, Extraction of Refinery Metals, Power Supply for Electrolytic Process, Current and Energy Efficiency.

Unit-III Traction
Special Features of Traction Motors, Selection of Traction Motor, Different System of Electric Traction and Their Advantages and Disadvantages, Mechanics of Train Movement: Simplified Speed Time Curves for Different Services, Average and Schedule Speed, Tractive Effort, Specific Energy Consumption, Factors Affecting Specific Energy Consumption, Acceleration and Braking Retardation, Adhesive Weight and Coefficient of Adhesion.

Unit-IV Electric Drives
Individual and Collective Drives- Electrical Braking, Plugging, Rheostatic and Regenerative Braking Load Equalization Use of Fly Wheel Criteria for Selection of Motors for Various Industrial Drives, Calculation of Electrical Loads for Refrigeration and Air-Conditioning, Intermittent Loading and Temperature Rise Curve.

Unit-V Introduction to Electric and Hybrid Vehicles
Configuration and Performance of Electrical Vehicles, Traction Motor Characteristics, Tractive Effort, Transmission Requirement, Vehicle Performance and Energy Consumption.

Course Outcomes:

After completion of the course, the student will be able to

- Choose a right drive for a particular application.
- Understand various types of heating, welding and traction system.
- Student will be able to design illumination systems for various applications.

References

1. Open Shaw ,Taylor, .Utilization of Electrical Energy., Orient Longmans, 1962.
2. H. Pratap, Art and Science of Utilization of Electrical Energy.
3. Gupta, J.B., Utilization of Elect. Energy ,Katariya and sons, New Delhi.
4. Garg, G.C., Utilization of Elect. Power and Elect. Traction.
5. N V Suryanarayan, Utilization of Elect. Power Including Electric Drives and Elect. Traction, New Age International.
6. Hancok N N, Electric Power Utilisation, Wheeler Pub.
7. Mehrdad, Ehsani,Yimin Gao,Sabastien.E. Gay,Ali Emadi, "Modern Electric, Hybrid Electric and Fuel Cell Vehicles", CRC Press.

Mandsaur University

Subject Code: - EEE260
Subject Name: - Digital Electronics & Logic Design
Semester:-IV

L	T	P	C
3	-	-	3

Course Objectives:

- To study various number systems and to simplify the mathematical expressions using Boolean functions – simple problems.
- To introduce the fundamentals of digital circuits, combinational and sequential circuit.
- To study implementation of combinational circuits
- To study the design of various synchronous and asynchronous circuits.

Unit-I Number Systems, Boolean Algebra and Simplification of Boolean Functions
Digital Number Systems, Base Conversion, Binary, Decimal, Octal, Hexadecimal, Number System with Radix r, Gray Codes. ASCII code, EBCDIC Codes, Hollerith Code, Concept of Parity, Complement r's & (r-1)'s, Subtraction with Complements, Signed Binary Numbers, Digital Logic Gates. Basic Definition, Axiomatic Definition of Boolean Algebra, Basic Theorem and Properties of Boolean Algebra, Demorgon's Theorem. Negative Logic, Alternate logic Gate Representation (Concept of Bubbled Gates) Canonical and Standard Forms (Minterms & Maxterms), Sum of Minterms & Product of Maxterms, Conversion Between Canonical Forms. Simplification of Boolean Functions: Different Types Map Method, Product of Sum Simplification, NAND or NOR Implementation, Don't Care Condition, Tabulation Method.

Unit-II Design of Combinational Circuits, Programmable Logic Devices
Design of Adder, Subtractor, Comparators, Code Converters, Encoders, Decoders, Multiplexers and Demultiplexers. Introduction, Code Conversion, Universal Gate. Introduction, Binary Parallel Adder, Decimal Adder, Magnitude Comparator.

Unit-III Sequential Logic
Introduction of Sequential Circuits, Flip-Flops, Latches, S-R FF, J-K FF, D FF, T FF, Edge Triggered Flip Flop, J-K Flip Flop, T Flip Flop, Master Slave Flip Flop Triggering of Flip-Flops, Analysis of Clocked Sequential Circuits, State Reduction and Assignment, Flip-Flop Excitation Tables, Design Procedure, Design of Counters, Design with State Equations. Design with State Reduction, Applications of Flip flop.

Unit-IV Counters
Asynchronous and Synchronous Counter, Counters with MOD Numbers, Down Counter, UP/DOWN Counter, Propagation Delay in Ripple Counter, Programmable Counter, Pre-settable Counter, BCD Counter, Cascading, Counter Applications, Decoding in Counter, Decoding Glitches, Ring Counter, Johnson Counter, Rotate Left & Rotate Right Counter.

Unit V Registers and Memories
Registers – Buffer, Shift Left, Shift Right, Shift Left/Right Registers, Parallel in Parallel Out, Serial in Serial Out, Parallel in Serial Out, Serial in Parallel Out Registers.
Memories: ROM, PROM, EPROM, PLA, PLD.

Course Outcomes:

Various types of digital circuits are analyzed and studied knowledge in memory devices and minimization techniques for the development of digital circuits are achieved.

References:

1. M. Mano; Digital design; Pearson Education Asia
2. Thomas Blakeslee; Digital Design with standard MSI and LSI; Wiley Interscience
3. Jain RP; Modern Digital Electronics; TMH
4. M. Mano; Digital Logic & Computer Design; PHI
5. Tocci ; Digital Systems Principle & Applications; Pearson Education Asia
6. Gothmann; Digital Electronics; PHI
7. R. H. Gour; Digital Electronics and Micro Computer
8. Malvino, Leech; Digital Principles and Applications
9. Floyad; Digital Fundamentals (UBS)
10. Nripendra N. Biswas; Logic Design Theory (PHI)
11. D.C. Green; Digital Electronics (Pearson Education Asia)

Mandsaur University

Subject Code: - EEE270
Subject Name: - Electrical Machine-II
Semester:-IV

L	T	P	C
2	1	2	4

Course Objectives:

- To learn the conversion principle of electrical and mechanical energy.
- To know the construction and working principles of dc and synchronous machine and their types.
- To learn the methods of speed control and different tests of dc and synchronous machines to know its performance and characteristics.

Unit-I D.C. Machine-I
Working principle, construction of DC machines, armature windings, types of DC machines and method of excitation, lap and wave windings, e.m.f. and torque equations, armature reaction, effect of brush shift, compensating winding, commutation, causes of bad commutation, methods of improving commutation, basic performance of DC generators and their performance characteristics.

Unit-II D.C. Machine-II
Basic operation of dc motors, torque equation; operating characteristics of dc motors, 2-point, 3-point and 4-point starters of DC motors, speed control methods: field and armature control, braking: plugging, dynamic and regenerative braking, testing: Swinburne's test, Hopkinson's test, estimation of losses and efficiency.

Unit-III Synchronous Machine-I
Constructional features, excitation system including brushless excitation; polyphase distributive winding, synchronous generator- generated e.m.f., circuit model and phasor diagram, generation of harmonics and their elimination; armature reaction; synchronous reactance and impedance, equivalent circuit of alternator, relation between generated voltage and terminal voltage, voltage regulation of alternators using synchronous impedance, mmf and zpf method.

Unit-IV Synchronous Machine-II
Salient pole machine - two reaction theory, analysis of phasor diagram, power angle characteristics, determination of X_d and X_q., parallel operation of alternators - synchronization and load division, Synchroscopes and phase sequence indicator.

Unit-V Synchronous Machine-III
Synchronous motor - operating principle, circuit model, phasor diagram, effect of load. Operating characteristics of synchronous machines, V-curves and inverted V-curves, synchronous motors as power factor correcting device, super synchronous, hunting and damper winding efficiency and losses, starting methods of synchronous motors.
Single phase synchronous motors - hysteresis motor, reluctance motor, repulsion motor, stepper motor, switched reluctance motor.

Course Outcomes:

The students will be able to

- Understand the basics of energy conversion and identify the different features of dc and synchronous machines.
- Choose suitable dc and synchronous machine for specific applications.
- Understand the basics of dc and synchronous machines design, operation & control.

References:

1. M.G. Say, Performance & Design of AC Machines, CBS Publishers & Distributors, Delhi, 3rd Edition
2. A.E. Clayton & N.N. Nancock, the Performance & Design of DC Machines CBS Publications & Distributors, Delhi, 3rd Edition
3. P.S. Bhimbra, Electrical Machinery, Khanna Pub.
4. P.S. Bhimbra, Generalized Theory of Electrical Machines, Khanna publishers, Delhi
5. Ashfaq Husain, Electric Machines, Dhanpat Rai, New Delhi
6. I.J. Nagrath & D.P. Kothari, Electric Machines, Tata McGraw Hill, New Delhi

Suggested List of Experiment:

1. To study Constructional features of DC Motor.
2. To study the 2- Point, 3- Point and 4- Point starter of DC motor.
3. To perform speed control of D. C. Motor (armature and field control method).
4. To study the Commutator, commutation process and slip ring.
5. To perform No load and block rotor test on single phase Induction motor.
6. To perform No load and block rotor test on three phase Induction motor.
7. To study Constructional features of synchronous machine.
8. To perform V and Inverted V curve method on synchronous motor.
9. To study the synchroscopes of synchronous machine.
10. To perform voltage regulation of alternator using ZPF method.

Mandsaur University

Subject Code: - EEE280
Subject Name: - Power System-I
Semester:-IV

L	T	P	C
2	1	2	4

Course Objectives:

- To introduce the concepts and phenomenon of different sources of power generation.
- To give an idea about the fundamental concepts of electrical power distribution, both ac & dc.
- To familiarize the students with the tariff methods for electrical energy consumption in the prospect of optimum utilization of electrical energy.
- To impart the knowledge of different turbines used in the generating stations with the analytical methods.

Unit I

Generation System: - An Overview of Electrical Energy Generation General Background, Structure and Components of Power Network. Power Generation –Introduction to Conventional, Non-Conventional & Distributed Generation, Effect of Transmission Voltage on Power System Economy. Selection of Size of Feeder.

Power Plant Economics: – Load Curves, Base Load, Peak Load, Load Factor, Demand Factor, Diversity Factor, Capacity Factor, Utilization Factor, Cost of Electricity, Capital Cost, Fuel and Operation Cost.

Unit II

Transmission Line Components & Under Ground Cabling: - Inductance Resistance and Capacitance of Transmission Line, Calculation of Inductance for 1-Φ and 3-Φ, Single Circuit Line, Effect of Ground or Capacitance, Capacitance Calculation for Symmetrical and Asymmetrical 1-Phase and Three Phase, Single and Double Circuit Line, Charging Current, Transposition of Line, Composite Conductor, Skin and Proximity Effect, Bundle Conductor.
Comparison of Cables and Overhead Transmission lines, Classification of Cables, Phenomena of Dielectric Losses and Sheath Loss in Cables, Thermal Resistance of Cables.

UNIT-III

Transmission Systems: - Transmission Systems & Performance of Transmission Line Various Systems of Transmission, Effect of System Voltage. Short, Medium & Long Transmission Line and Their Representation, Nominal T, Nominal Л, Equivalent T and Equivalent Л Network Models, Mathematical Solution to Estimate Regulation & Efficiency of all Types of Lines. Surge Impedance Loading, Tuned Power Lines.

UNIT-IV

Mechanical Design: - Insulator & Mechanical Design Mechanical Design Types of Conductors Used in Overhead Transmission Line, Types of Line Supports and Towers, Spacing between Conductors, Length of Span and Sag, Tension Calculation for Transmission Line, Wind & Ice Loading, Support of Line at Two Different Levels, Vibration and Vibration Dampers. Insulator Materials Used for Transmission Line Insulation, Types of Insulator for Overhead Transmission Line Failure of Insulator, Voltage Distribution of Suspension Insulator, String Efficiency.

UNIT- V

Distribution System:- Voltage Control & Distribution System Ac Single Phase, 3 Phase, 3Wire & 4 Wire Distribution, Kelvin's Law for most Economical Size of Conductor Substation Layout Showing Substation Equipment, Bus Bar Single Bus Bar and Sensationalized Bus Bar, Main and Transfer for Bus Bar System, Sensationalized Double Bus Bar System, Ring Mains.

Course Outcomes:

- Articulate power system concepts required to engineering problems.
- Design power system components for a specified system and application
- Ability to discuss various power sources for generation of power merit/demerits.
- Formulate A.C and D.C distribution networks for necessary variable calculation.
- Ability to calculate usage of electrical power.
- Ability to plot the power /energy demand in the form of graph.
- Ability to discuss functions of Substation.

References:

1. William Stevenson, Elements of Power System Analysis, McGraw Hill.
2. C.L. Wadhwa, Electrical Power System Analysis, New Age International.
3. D.P. Kothari, I.J. Nagrath, Modern Power System Analysis TMH, III Ed. Reprint 2008.
4. D.P. Kothari, I.J. Nagrath, Power System Engineering TMH II Ed. Reprint 2009.
5. John Grainger and William Stevenson, Power system Analysis, McGraw Hill.
6. Ashfaq Husain, Electrical Power Systems, Vikas Publishing House.
7. T. Wildi, Electrical Machines, Drives and Power Systems, Pearson Education.
8. C.L. Wadhwa, Generation, Distribution and Utilization of Electrical Energy", New Age International.

Suggested List of Experiment:

1. To Study & Draw Different Types of Electrical & Electronics Symbols.
2. To Study the Hydro Power Station.
3. To Study the Nuclear Power Station.
4. To Study the Thermal Power Station.
5. To Study the Draw Different Types of Insulator.
6. To Study & Draw Towers Used in Transmission Line.
7. To Study the Different Types of Power Cable.
8. To Study & Design Electrical Power System.
9. To Study & Design Electrical Power Transmission Line.
10. Determination of Transmission Parameters of a transmission Line.

Mandsaur University

Subject Code: - EEE290
Subject Name: - Electrical Instrumentation
Semester:-IV

L	T	P	C
2	1	2	4

Course Objectives:
The primary objective of the course is to introduce operation principles of instruments, terminology related to measurements and to have an adequate knowledge in measurement techniques for voltage, current, power and energy.

Unit-I
Philosophy of Measurement- Methods of Measurement, Measurement System, Classification of instrument System, Characteristics of Instruments & Measurement System, Errors in Measurement & Its Analysis.

Unit-II
Analog Measurement of Electrical Quantities – Electro Dynamic, Thermocouple, Electrostatic & Rectifier Type Ammeters & Voltmeters, Electro dynamic Wattmeter, Three Phase Wattmeter, Power in Three Phase System, Errors & Remedies in Wattmeter.

Unit-III
Instrument Transformer: Theory and Construction of Current and Potential Transformers, Ratio and Phase Angle Errors and Their Minimization, Characteristics of Current Transformers (CT) & Potential Transformers (PT) and Their Testing.

Unit-IV
Magnetic Measurements: Flux Meter, B-H Curve, Hysteresis loop, AC Testing of Magnetic Materials, Separation of Iron losses, iron Loss Measurement by Wattmeter and Bridge Methods.

Unit-V
Measurement of Energy: Single Phase and Three Phase Energy Meter. Energy Meter – Construction & Operation – Energy Flow and Power Calculations, Errors. Power Factor Meter– Single Phase and Three Phase Electro-Dynamometer Type & Moving Iron Type Power Factor.

Course Outcomes:
After learning the course the students should be able to understand the technical terms of electrical measurements and detail principles, working and construction of the electrical measuring instruments and their application.

Reference Books:

1. A.K.Sawhney, A course in Elect. & Electronic Measurement and Instrumentation, Dhapat Rai & Co.
2. Golding & Widis, Electrical Measurement and Measurement instrument, Wheelar Books.
3. H.S. Kalsi, Electronic Instruments, Tata Mc-Graw hill.
4. Carr, Elements of Electronic Instrumentation and Measurement, Pearson Education.

5. D. Patranabis, Sensors & Transducers, PHI.
6. A.J. Bouwens, Digital Instrumentation, Tata Mc-Graw hill.
7. A.D. Heltric & W.C. Copper, Modern Electronic Instrumentation & Measuring Instruments, Wheeler Publication.

Suggested List of Experiment:

1. Measurement of Voltage, Current and Resistance Using Multimeter.
2. Measurement of Resistance Using Wheastone's Bridge and Kelvin Double Bridge.
3. Extension of Range of Wattmeter Using CT & PT .
4. Measurement of Current/ Voltage Using Hall Effect Transducer.
5. Measurement of Low Resistance by Kelvin‟s Double Bridge.
6. Measurement of Voltage, Current and Resistance Using dc Potentiometer.
7. Measurement of Insulation Resistance Using Megger
8. Measurement of Power in Three Phase Circuit by One, Two & Three Wattmeters.
9. Calibration of Single Phase Digital/ Electronic Type Energy Meter.
10. Measurement of Power in a Single Phase ac Circuit by 3 Voltmeter/ 3 Ammeter Method

Mandsaur University

Subject Code: - EEE300
Subject Name: - Electrical Simulation-II
Semester:-IV

L	T	P	C
2	-	4	4

Course Objectives:
The objective of simulation laboratory is to impart hands on experience in verification of circuit laws and theorems, measurement of circuit parameters, study of circuit characteristics using MATLAB. It also gives practical exposure to the usage of different circuits with different condition.

MATLAB Basics

Unit- I
Basic Electrical and Networks Applications
Analysis of Electrical Networks – Experiments Based on Solution of Series-Parallel Circuits, Solution of System with Linear Equations - Experiments Based on Mesh and Nodal Analysis, Experiments for Validation of Network Theorems, Solution of Network Problems, Solution of First Order Differential Equation – Experiments for the Study of Transients, Experiments for AC Signal Waveform Analysis, Study of Resonance in AC Circuit, Study of Frequency Response Waveform Analysis, Study of Resonance in AC Circuit, Study of Frequency Response.

Unit-II
System Modeling Using SIMULINK
Simulation Steps, Getting Simulink, Creating and Simulating a Simulink Model, Simulink Solution of Differential Equation, Assigning Variables, Observing Variables During Simulation, Storing/Saving Data, Linking M-file with Model File, Creating and Masking Sub-Systems, Solution Using Laplace Transform Approach, Solution Using Laplace Transform Approach, Study of Dynamic Response, Simulation of Non-Linear System, Examples Such as Simulink Model to Generate Sine, Cosine Waveform and Ramp Signal.

Course Outcomes:
At the successful completion of this course, the student is expected to gain the following skills:

- Become familiar with the basic circuit components and know how to connect them to make a real electrical circuit.
- Become familiar with basic electrical measurement instruments and know how to use them to make different types of measurements.
- Be able to verify the laws and principles of electrical circuits, understand the relationships and differences between theory and practice
- Be able to gain practical experience related to electrical circuits, stimulate more interest and motivation for further studies of electrical circuits and be able to carefully and thoroughly document and analyze experimental work.

References
1. M.E. Van Valkenburg, Network Analysis, Pearson

2. William H Hayt & Jack E. Kemmerly, Steven M Durbin; Engineering Circuit Analysis; McGrawHill
3. Richard C Dorf, James A Svoboda, Introduction to Electric Circuits, Wiley India, 2015
4. Charles K. Alexander & Matthew N.O. Sadiku: Electrical Circuits; McGrawHill
5. J David Irwin, Robert M Nelms, Engineering Circuit Analysis, Wiley India,2015
6. Robert L Boylestad, introductory circuit analysis, Pearson,2016
7. M S Sukhija, T K Nagsarkar; Circuits and Networks, Oxford University Press, 2015
8. Samarajit Ghosh, Network Theory Analysis and Synthesis

Suggested List of Experiment:

1. Analysis of Three Phase Circuit Representing Generator Transmission Line and Load
2. MATLAB Simulation of Ac Circuits
3. MATLAB Simulation of Transient And Parametric Analysis Of Series RLC Circuits Using Step and Pulse Input.
4. MATLAB Simulation of Transient And Parametric Analysis Of Series RLC Circuits Using Sine Input.
5. Series and Parallel Resonance Using MATLAB Simulation
6. Determination of Self, Mutual Inductances and Coefficient of Coupling.
7. MATAB Simulation for Calculation of Z, Y, Transmission and Hybrid Parameters.
8. Measurement of Active Power for Star and Delta Connected Balanced Loads
9. Measurement of Reactive Power for Star and Delta Connected Balanced Loads.
10. Measurement of 3-phase Power by Two Wattmeter Method for Unbalanced Loads.