ELECTRICAL ENGINEERING, UEC, UJJAIN.

Syllabus for Four Years Bachelor of Technology Degree Course as per NEP-2020

July-2024

SUBJECT		Exam Duration	Contact Hours per Week			Credits	Max. Marks	Min Pass Marks
Code	Title		L	T	P			
EE-4401	Electromagnetic Field & Materials	3 Hours	3	1	0	4	70	22

UNIT-I

Review of rectangular, cylindrical, spherical co-ordinate systems, conversion of vector from one system to another, concept of incremental length, area and volume. Expression for gradient, divergence, curl & Laplacian in generalised co-ordinate system too. Electrostatics - Coulomb's law & Gauss's law for various charge distributions, method of images. Poisson's & Laplace's equation, boundary conditions.

UNIT-II

Thermal, Mechanical and electrical properties of various types conductors, insulators and semiconductors. Equation of continuity. Dielectric material in electric field, polarization. Capacitance of different configuration energy stored in electrical field. Claussius Mossotti equation.

UNIT-III

Static field & material- Biot Savarts law (Analysis with different current flow configuration). Ampere's circuital law & its application, Lorentz force, magnetic dipole, magnetic boundary condition. Diamagnetic, Paramagnetic & Ferromagnetic materials and its B-H curve. Hysterises loss, eddy current loss.

UNIT-IV

Scalar magnetic potential & Vector magnetic potential, their properties & limitations with analysis of different simple configuration. Self & mutual inductance of various geometric configurations, Faraday's law, Maxwell's equation in various form.

UNIT-V

Wave equation in free space conducting medium. Uniform plane wave and its general solution. Wave equation in phasor form. Wave propagation and its characteristics in loss less medium, free space and conducting medium. Polarisation of wave. Wave's normal and oblique incidence on perfect conductor and dielectric. Poynting vector and flow of power. Complex pointing vector.

References-

1. S.P. Seth, Electromagnetic field
2. William H. Hayt, Engineering Electromagnetic
3. G.S.N. Raju, Electromagnetic field theory & transmission line.
4. P.V. Gupta, Electromagnetic Fields.
5. John D. Kraus, Electromagnetic.
6. K.A. Gangadhar, Field Theory,
7. Jon Allison-Electrical Engineering materials & Devices.
8. A.K. Dekkar-Electrical Engineering materials
9. Kortisky-Electrical Engineering materials & Devices
10. B.M. Tareev-Materials for Electrical Engineering.

Contd. ... 2

COURSE OUTCOMES: At the end of the course student will be able to

CO1	Apply basic concepts of different co-ordinate system in Electrical Engineering
CO2	Explain basic concept of Electrostatics and Electromagnetics
CO3	Illustrate Dielectric, Dielectric strength, its effects on capacitance.
CO4	Classify materials on the basis of electrical and magnetic properties.
CO5	Derive Maxwell Equations and electromagnetic wave transmission equations.

Mapping of Course outcomes (COs) with Program outcomes (POS)

Course	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
EE-4002.1	CO1	2	1	1	-	-	1	-	-	1	-	-	2
EE-4002.2	CO2	2	2	1	2	-	1	-	-	1	-	-	2
EE-4002.3	CO3	2	2	1	1	-	1	-	-	1	1	-	1
EE-4002.4	CO4	2	1	-	1	-	-	-	-	1	-	-	2
EE-4002.5	CO5	2	2	2	-	-	-	-	-	1	-	-	1
EE-4002 (Average)		2	1.6	1	0.8	0	0.6	0	0	1	0.2	0	1.6

*****

ELECTRICAL ENGINEERING, UEC, UJJAIN.

Syllabus for Four Years Bachelor of Technology Degree Course as per NEP-2020

July-2024

SUBJECT		Exam Duration	Contact Hours per Week			Credits	Max. Marks	Min Pass Marks
Code	Title		L	T	P			
EE-4402	Electrical Machine – I	3 Hours	3	1	2	5	70	22

UNIT-I

EME Conversion : Principal of virtual work, Singly excited systems, Energy, force and torque calculation for such a system, reluctance, permeance, self and mutual inductances, Derivation of torque equation for single phase reluctance motor, generalization of this concept for multiple excited systems Calculation of torque in electrical machine by (i) coupled circuit view-point and (ii) magnetic field view point. Relation between mechanical and electrical angle. Elementary ideas about motor and generator.
Introduction to the analysis of synchronous and induction machines based on principles of electro mechanical energy conversion, Self and mutual induction as functions of space angle. General equations of voltage and torque in different cases. Coupled circuit view point.

UNIT-II

DC Machines : Constructional details about essential features such as the field magnet, armature winding. commutator, brush gear etc. Simple armature windings, lap and wave armature winding as current sheet-interpretation of torque equations: Voltage generated in an electrical M/C voltage generated in a DC Machine. DC Machine magnetic fields-flux and mmf distribution. Position of brushes, armature Ampere turns-cross magnetizing and demagnetizing effect of armature reaction, effect of armature reaction on field form, brush shifting, reactance voltage, commutation, methods of improving commutation interpoles, High resistance brushes, compensating winding, analysis of DC machine from electric circuit and magnetic circuit view point. Characteristics of DC generators, effect of saturation magnetization characteristics, critical resistance, load and total characteristics of separately excited. series, shunt and compound machines, load sharing.

UNIT-III

The D.C. Motor : Principle of operation, back e.m.f, speed of D.C. motor, use of starter-3 point and 4 point, magnetic controller for D.C. motor, speed control of D.C. motor, characteristics of series, shunt and compound motors, losses in d.c. motors and efficiency, testing of d.c. machines-direct, indirect and regenerative test, separation of losses in d.c. machine, application of d.c. machine.

UNIT-IV

Transformers : Elementary Principle of transformer constructional detail, classification of transformers according to its magnetic circuit, electric circuit, uses cooling system etc. Magnetic coupled circuit, introduction to transformer, self and leakage reactance, voltage and current ratios, vector diagram as on no load, development of equivalent circuit concept, equivalent resistances reactances, referred quantities performance calculation, regulation-kapp's regulation diagram, per unit and percentage regulation, efficiency, maximum efficiency, effect of saturation on exciting current, In rush of magnetizing current, vector diagrams on load (lag and lead cases) Testing of transformers - O.C. and S.C. tests for calculation of equivalent circuit parameters of transformer. Auto transformer vector diagram, economy in copper incomparison to two winding transformer.

Contd. ... 2

UNIT-V

Polyphase Transformers : Three winding transformer equivalent circuit, star equivalent, regulation and vector diagram. Polyphase transformers-transformer connections - merits and demerits, three-phase, two phase and single phase conversion - Scott .V, and T. method of obtaining 6, 9 and 12 phase supply from three phase supply. Effect of harmonics in different connections of transformers. Transformer banks, parallel operation of transformers and load sharing.

References-

1. Attemading current machinery by Fitzarid and kingslay.
2. Altemating current machines-by Puchstein,Lioyed and Conord.
3. Performance and design of dc machine by Clayton.

COURSE OUTCOMES: At the end of the course student will be able to:

CO1	Understand energy conversion and development of torque in rotating machines
CO2	Analyze the construction, principle of operation, Characteristics and application of various types of DC generators.
CO3	Understand principle of operation, starting, testing, speed control and application of various types of DC motors.
CO4	Understand construction working principle, conduction of various test on single phase transformer.
CO5	Impart the knowledge on 3-phase connections effect of harmonics and conversion of 3-phase to multiphase transformer.

Mapping of Course outcomes (COs) with Program outcomes(POs):

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	-	-	-	3
CO2	2	-	-	-	-	-	-	-	-	-	-	2
CO3	3	-	-	2	2	-	-	-	-	-	-	3
CO4	2	-	-	-	-	-	-	-	-	-	-	3
CO5	3	-	2	-	-	-	-	-	-	-	-	3

List of Experiment

1. To perform open circuit and short circuit test on single phase transformers and evaluation of performance.
2. Perform Simpers test on 2 single phase transformers.
3. To perform the parallel of 2, single phase transformer and observe load sharing.
4. Swinburns test on DC motor and determine its efficiency.
5. To perform speed control of DC Motor by field control method.
6. To perform speed control of DC Motor by armature control method
7. To plot OCC on a separately excited DC generator.
8. Perform load test on DC generator.
9. Load test on single phase transformer and determination of voltage regulation and efficiency at different power factors.
10. Study of Scott connection of transformer.
11. Polarity test of transformer

*****

Electrical Engineering, UEC, Ujjain.

Syllabus for Four Years Bachelor of Technology Degree Course as per NEP-2020

July-2024

SUBJECT		Exam Duration	Contact Hours per Week			Credits	Max. Marks	Min Pass Marks
Code	Title		L	T	P			
EE-4403	Power System - I	3 Hours	3	1	2	5	70	22

Unit - I

General Introduction and Transmission Systems : Various system of transmission & their comparison. Types of Conductors, Line Parameters : calculation of inductance and capacitance of single and double circuit transmission lines, three phase line with standard and bundled conductors.

Unit - II

Performance of Transmission Lines : ABCD constants and equivalent circuits of short, medium & long lines. Line Performance:- regulation and efficiency of short, medium and long lines. Power flow along a transmission line and circle diagram.

Unit - III

Distribution Systems : Primary and secondary distribution systems, concentrated & uniformly distributed loads on distributors fed at one and both ends, ring distribution, sub mains and tapered mains, voltage drop and power loss calculations, voltage regulators, Feeders Kelvin's law and modified Kelvin's law for feeder conductor size and its limitations.

Unit - IV

Overhead Line Insulators and Cables : Overhead Line Insulators:- Types, potential distribution over a string of suspension insulator, string efficiency, methods to improve string efficiency.
Cables : Classification, Construction & characteristic of different types. Insulation resistance of cables, capacitance of single and three core cables, grading (capacitance and inter sheath), dielectric stress and sheath loss in cables.

Unit - V

Corona and Mechanical Design of Transmission Lines :
Corona : losses, critical disruptive voltage, disadvantages of corona. Mechanical Design of Transmission Lines:- Preventive maintenance, different types of towers, sag-tension calculations, sag-template, string charts, spacing of conductors and ground.

Text/Reference Books –

1. Grainger John, J. and Stevenson, Jr. W.D., "Power System Analysis", McGraw Hill, 1994.
2. Harder Edwin, I., "Fundamentals of Energy Production", John Wiley and Sons, 1982.
3. Deshpande, M.V., "Elements of Electric Power Station Design", A.H. Wheeler and Co. Allahabad, 1979.
4. Burke James, J., "Power Distribution Engineering; Fundamentals and Applications" Marcel Dekker 1996.
5. Wadhwa, CL., "Electric Power Systems", Second Edition, Wiley Eastern Limited, 1985.
6. Nagrath, I.J. and Kothari, D.P., "Power System Engineering", Tata McGraw Hill, 1995.
7. Ashfaq Hussain - Electrical Power System.
8. J.B. Gupta," A course in power systems", Kataria and sons.

*****

ELECTRICAL ENGINEERING, UEC, UJJAIN.

Syllabus for Four Years Bachelor of Technology Degree Course as per NEP-2020

July-2024

SUBJECT		Exam Duration	Contact Hours per Week			Credits	Max. Marks	Min Pass Marks
Code	Title		L	T	P			
EE-4404	Electrical Instrumentation	3 Hours	3	1	2	5	70	22

UNIT – I :

CRO : Introduction to CRO, Different parts of CRO, Its Block diagram, Electrostatic focusing, Electrostatic deflection, post deflection acceleration, Vertical and Horizontal deflection system, Time base circuit, deflection sensitivity of CRT, Lissajous patterns, Extension of frequency range, various types of Oscilloscope. Application of CROs.

UNIT – II :

Transducers : Transducers definition and classification, mechanical devices as primary detectors, Characteristic & choice of Transducers, Resistive, inductive and capacitive transducers, strain gauge and gauge factor, Thermistor, Thermo couples, LVDT, RVDT, Synchros, Piezo-Electric transducers, magnetostrictive transducers, Hall effect transducers, Opto-electronic transducers such as photo voltaic, Photo conductive, photo diode and photo conductive cells, Photo transistors.

UNIT – III :

Signal Generators : Fixed & variable frequency AF oscillators, Sine wave generators, Standard signal generator, AF Sine and Square wave generator Function generator, Square and pulse generator, Random noise generator, Sweep generator.

Wave analyzer : Basic wave analyzer, Frequency selective wave analyzer, Heterodyne wave analyzer, Harmonic distortion analyzer, spectrum analyzer, digital Fourier analyzer.

UNIT – IV :

Display Devices : Advantages of Digital instruments over analog instruments, resolution and sensitivity of Digital meters. Digital Voltmeter - Ramp type, Dual slope integration type, Integrating type, Successive approximation type, Continuous balance DVM or Servo balancing potentiometer type VM. , comparison of Electronic & Digital Voltmeter, Digital Multimeter, Digital frequency meter, Time period measurement, High frequency measurement.

UNIT – V :

Electronic Recording Devices : Recorders: Analog recorders, Graphic Recorder, Strip chart Recorder, Galvanometer Recorder, Null balance recorder, X-Y recorder, Circular chart recorder, , Oscillo-graphic recorder, Frequency modulation (FM) recording, PDM recording.

References :

1. Albert. D. Helfrick, W.D. Cooper, PHI - Modern Electronic Instrumentation and measurement techniques.
2. Kalsi H.S., TMH - Electronic Instrumentation.
3. A.K. Sawhney, Dhanpat Rai and Co - Electrical and Electronic measurements and Instrumentation.
4. E.W. Golding, Sir Isaac Pitman and Sons, Ltd. London 1940-Electrical Measurement and Measuring Instruments.
5. C.S. Rangan, G.R. Sarma, V.S.V. Mani, Tata McGraw-Hill Publishing Company Ltd. – Instrumentation Devices and Systems.

*****

ELECTRICAL ENGINEERING, UEC, UJJAIN.

Syllabus for Four Years Bachelor of Technology Degree Course as per NEP-2020

July-2024

SUBJECT		Exam Duration	Contact Hours per Week			Credits	Max. Marks	Min Pass Marks
Code	Title		L	T	P			
EE-4405	Digital Electronics & Logic Design	3 Hours	3	0	2	4	70	22

Unit-I

Number system and binary operations Codes, Boolean algebra & Logic gates : Introduction to number systems, Binary, Hex, Octal number system with mutual conversion and arithmetic operations. Codes and their conversion, Boolean algebra & Logic gates - AND, OR, NOT, NAND, NOR, Exclusive - OR and Exclusive - NOR gates, Implementations of Logic Functions using gates, NAND - NOR implementations, Boolean postulates and laws. De Morgan's Theorem, Principle of Duality, Boolean function, Canonical and standard forms. Minimization of Boolean functions, Minterm, Maxterm. Sum of Products (SOP), Product or Sums (POS), Karnaugh map Minimization, Quine - Mc Cluskey method of minimization.

Unit-II

Combinational Logic Circuits : Half adder - Full Adder, Half subtractor - Full subtractor, binary adder / binary Subtractor, Carry Look Ahead adder. BCD adder, Binary Multiplier - Binary Divider, Multiplexer/Demultiplexer. decoder encoder, parity checker/ parity generators, code converters, Magnitude Comparator.

Unit-III

Sequential Logic Circuits : Latches, Flip-flops–SR, JK, D, T, Characteristics table, excitation table, state diagram. State table, Edge triggering – Level Triggering, Realization of one flip flop using other flip flops.

Unit- IV

Registers and Counters : Registers - shift registers, serial and parallel data transfer, Universal shift registers. shift register counters–Ring counter, Johnson counter, Sequence generators. Asynchronous counter, Asynchronous Up/Down counter, Synchronous counters, Synchronous Up/Down counters, Design of Synchronous counters : state diagram, State table, Excitation table and maps, Circuit, Implementation, Modulo-n counter.

Unit- V

Logic Families : Introduction to different logic families and their characteristics, RTL, DTL, TTL, ECL, IIL, TTL inverter - circuit description and operation, CMOS inverter - circuit description and operation.
Memories - ROM - ROM organization - PROM - EPROM - EEPROM - EAPROM, RAM, RAM organization Static RAM, Dynamic RAM, Programmable Logic Array (PLA) - Programmable Array Logic (PAL).

References-

1. An introduction to digital computer design by V Rajaraman and T Radhakrishanan 3rd Edn. PHI.
2. Digital principles and application by A P Malvino and B P Leach, 4th Edn. McGraw Hill.
3. Digital computer fundamentals by T C Bratee, 6th Edn. McGraw Hill.
4. Pulse, digital and switching circuits – Millman.
5. Digital electronics by W H Gothmann, 2nd Edn. PHI

*****

ELECTRICAL ENGINEERING, UEC, UJJAIN.

Syllabus for Four Years Bachelor of Technology Degree Course as per NEP-2020

July-2024

SUBJECT		Exam Duration	Contact Hours per Week			Credits	Max. Marks	Min Pass Marks
Code	Title		L	T	P			
EE-4406	Electrical Engineering Drawing	Hours	0	0	2	1		

1. Drawing the individual parts of DC machines such as Yoke pole Armature Commutator and making an assembled drawing of DC machine & Armature winding.

2. Drawing of Constructional details of induction motor (slip ring type) and alternator.

3. Drawing of Constructional details of transformer including of core and winding along with different types of core and winding arrangements.

4. Sketching of principle diagrams of moving iron moving coil and induction type of instruments.

5. Drawing of different type of cables.

6. Sketching various types of insulators used, such as pin suspension and shackle type.

7. Wiring diagram of service mains.

8. Connections of pole mounted stations.

References-

1. Text book of Electrical Engineering Drawing - By K.L. Nung
2. An Introduction to Electrical Drawing - By Gibben.

*****