EVALUATION SCHEME – SEMESTER III – Electrical Engineering

Sr. No	Subject Code	Subject Name	Effective Teaching			Credits	Evaluation Scheme		
			L	T	P		Internal Assessment	External Assessment	Total Marks
			Hours/week						
THEORY									
1	MUPEE 301N	Fundamentals of Electrical Engineering	4	-	-	5	20	50	70
2	MUPEE 302N	Electrical and Electronics Engineering Materials	4	-	-	4	20	50	70
3	MUPEE 303N	Electronic Devices and Circuits	4	-	-	5	20	50	70
4	MUPEE 304N	Fundamentals of Mechanical and Civil Engineering	4	-	-	5	20	50	70
5	MUPEE 305N	Electrical Measurement and Measuring Instrument	4	-	-	5	20	50	70
PRACTICAL/PROJECT									
6	MUPEE 351N	Fundamentals of Electrical Engineering Lab	-	-	2	2	30	50	80
7	MUPEE 352N	Electrical and Electronics Engineering Materials Lab	-	-	2	1	30	50	80
8	MUPEE 353N	Electronic Devices and Circuits Lab	-	-	2	2	30	50	80
9	MUPEE 354N	Fundamentals of Mechanical and Civil Engineering Lab	-	-	2	2	30	50	80
10	MUPEE 355N	Electrical Measurement and Measuring Instrument Lab	-	-	2	2	30	50	80
11	MUPEE 356N	Electrical Workshop Practice Lab	-	-	4	3	80	120	200
12	MUPGP 351N	General Proficiency	-	-	1	1	25		25
13	MUPGP 352N	Industrial Exposure (Assessment at University Level)	-	-	1	1	25		25
		TOTAL	**20**		**16**	**38**	**380**	**620**	**1000**

MUPEE301N	Fundamentals of Electrical Engineering	4L:0T:2P	5 Credits

Course Objectives

The objectives of the course is:

- To give a brief overview on fundamentals of AC and DC Circuits.
- To make students understand the concept of magnetism and electricity and use it to solve numerical.

Course Outcomes

At the end of the Course, Student will be able:		Bloom's Level
CO1	To understand the applications and advantages of different forms of energy.	**K2**
CO2	To evaluate different DC Circuits and laws applicable to them.	**K3**
CO3	To understand the construction and working principal of different types of batteries	**K2**
CO4	To understand the fundamentals of alternating current and the concept of magnetism.	**K2**
CO5	To evaluate different AC Circuits and understand the poly phase system.	**K3**

K1 – Remember K2- Understand K3-Apply K4-Analyze K5 – Evaluate K6 – Create

Syllabus

UNIT 1.

Application and Advantages of Electrical Energy

- Different forms of energy
- Advantages of electrical energy
- Uses of electrical energy

Basic Electrical Quantities

- Basic concept of charge, current, voltage, resistance, power, energy and their units
- Conversion of units of work, power and energy from one form to another

UNIT 2. DC Circuits

Ohm's law, resistances in series and parallel , Kirchhoff's laws and their applications in solving electrical network problems Network theorems such as Thevenin's theorem, superposition theorem Maximum power and transfer theorem and Norton's theorem

UNIT 3. Batteries

Basic idea about primary and secondary cell, Working principle, construction and applications of Lead acid, Nickel Cadmium and Silver Oxide Cells . Capacity and efficiency of lead acid battery Charging methods used for lead acid accumulator. Care and maintenance of a lead acid battery. Grouping of cells in series and parallel (simple numerical problems) .Testing of lead Acid battery for fully charged conditions and their specifications .Application of lead acid battery Idea about batteries used in UPS .

UNIT 4. Magnetism and Electromagnetism:

Introduction to electromagnetism, Magnetic field around a straight current carrying conductor and a solenoid and methods to find its direction, force between two parallel current carrying conductors. Force on a conductor placed in the magnetic field Series magnetic circuits, simple problems Concept of hyteresis, loop and hysteresis loss.

UNIT 5. Electromagnetic Induction:

Faraday's Laws of electromagnetic induction , Lenz's law Fleming's Right and Left Hand Rule , Principle of self and mutual induction Principle of self and mutually induced e.m.f. and simple problems Inductances in series and parallel Energy stored in a magnetic field . Concept of eddy currents, eddy current loss

UNIT 6. AC Fundamentals

Concept of a.c. generation (single phase and three phase) Difference between a.c and d.c Concept of alternating current and voltage, equation of instantaneous values, average value, r.m.s value, form factor, power factor etc. Concept of phasor and phase difference. Representation of alternating sinusoidal quantities by vectors Phasor algebra (addition, subtraction, multiplication and division of complex quantities)

UNIT 7. AC Circuits

AC through pure resistance, inductance and capacitance .Alternating voltage applied to RL, RC and RLC series and parallel circuits (impedance triangle, phasor diagram and their solutions) . Concept of suceptance, conductance and admittance J-notation and its application in solving problems in ac circuits. Power in pure resistance, inductance, capacitance and series RL, RC, RLC circuits .Active and reactive components of current and their significance. Power factor and its practical significance

UNIT 8. Poly-Phase System

Advantages of 3 phase over single phase system, Star and delta connections (derive relationship between phase and line voltages, phase and line currents in star delta connections. Power in 3 phase circuits and measurement by two wattmeter method. Measurement of power and power factor of a 3-phase load by two wattmeter method using balanced/unbalanced load.

RECOMMENDED BOOKS:

- Fundamentals of Electrical Engineering by Sahdev, Uneek Publication, Jalandhar
- Basic Electrical Engineering by PS Dhogal, Tata McGraw Hill Education Pvt. Ltd., New Delhi
- Electrical Science by VK Mehta, S Chand and Co., New Delhi
- Electrical Engineering by DR Arora, Ishan Publications, Ambala
- Electrical Technology by JB Gupta, SK Kataria and Sons, New Delhi

MUPEE303N	Electronic Devices and Circuits	4L:0T:2P	5 Credits

Course Objectives

The objectives of the course is :
1. To understand the various power electronic devices like BJT, Diodes, FETs etc
2. To get acquainted with the applications of these semiconductor devices.

Course Outcomes

At the end of the Course, Student will be able:		Bloom's Level
CO1	To understand the atomic structure of various conducting, semi-conducting and insulating materials based on band theory.	**K2**
CO2	To understand the construction and working principal of various types of semi-conductor diodes.	**K1**
CO3	To understand the construction and working principal of Bipolar Junction Transistors along with its various configurations.	**K3**
CO4	To understand the working of Transistor as a single and multi-stage amplifier.	**K2**
CO5	To understand the construction and working principal of Field Effect Transistors along with its characteristics and applications.	**K2**

K1 – Remember K2- Understand K3-Apply K4-Analyze K5 – Evaluate K6 – Create

Syllabus

UNIT 1. Atomic structure

Introduction, Brief history of development of electronics, Active and passive components. Semi-conductor Theory, Atomic structure, crystalline structure, Energy band theory of crystals, energy band structure of insulator, semiconductor and conductor, generation and recombination of electron hole pairs. Energy band structure of Silicon and Germanium, Concept of Doping, intrinsic and extrinsic semiconductors, Effect of temperature on intrinsic and extrinsic semiconductors.

UNIT 2. Semiconductor Diodes

PN Junction, mechanism of current flow in PN junction, drift and diffusion currents, depletion layer, potential barrier, effect of forward and reverse biasing in a PN junction. Concept of junction capacitance in forward and reverse biased conditions, Ideal diode, and Semiconductor diode characteristics, static and dynamic resistance. Use of diode as half wave and full wave rectifiers (center tapped and bridge type), ripple factor, rectifier efficiency, Operation of filter circuits, Diode ratings/specifications , Various types of diodes such as zener diode, varactor diode, Schottky diode, light emitting diode, tunnel diode, photo diode; their working characteristics and applications, Use of zener diode for voltage stabilization

UNIT 3. Bi-polar Junction Transistors

Concept of junction transistor, PNP and NPN transistors, their symbols and mechanism of current,Transistor configurations: common base (CB), common emitter (CE) and common collector (CC), current relation and their input/output characteristics; comparison of the three configurations. Transistor biasing, its need, operating point, effect of temperature on the operating point of a transistor and need of stabilization of operating point, Different biasing circuits, limitations, Use of data book to know the parameters of a given transistor.

UNIT 4. Transistor as an amplifier

Single-Stage Transistor Amplifiers, CE configuration, function of each component, working of single stage transistor amplifier, physical and graphical explanation, phase reversal, Frequency response of a single stage transistor amplifier

Multi-Stage Transistor Amplifiers, Need of multi-stage transistor amplifiers – different types of couplings, their purpose and applications, RC coupled two-stage amplifiers, circuit details, working, frequency response, applications, Loading effect in multistage amplifiers, Elementary idea about direct coupled amplifier, its limitations and applications, Transformer coupled amplifiers, its frequency response

UNIT 5. Field Effect Transistor & OP Amps

FET - Construction, operation, characteristics and applications of a N channel JFET and P channel JFET, JFET as an amplifier, JFET applications, Types, construction, operation, characteristics and applications of a MOSFET, Comparison between BJT, JFET and MOSFET.

Operational Amplifiers-Characteristics of an ideal operational amplifier and its block diagram, Definition of differential voltage gain, CMRR, PSRR, slew rate and input offset current, Operational amplifier as an inverter, scale changer, voltage follower, adder, subtractor, differentiator, and integrator

RECOMMENDED BOOKS

1. Basic Electronics and Linear Circuit by NN Bhargava, Kulshreshta and SC Gupta, Tata McGraw Hill Education Pvt Ltd, New Delhi

2. Electronic Principles by SK Sahev, Dhanpat Rai & Co., New Delhi

3. Principles of Electrical and Electronics Engineering by VK Mehta; S Chand and Co., New Delhi

4. Electronic Components and Materials by SM Dhir, Tata McGraw Hill Publishing Company Pvt Ltd,New Delhi

MUPEE304N	Fundamentals of Mechanical and Civil Engineering	4L:0T:2P	5 Credits

Course Objectives

The objectives of the course is :
1. To get acquainted with the basics of Mechanical and Civil Engineering by understanding the measurement instruments and constructional features.
2. To understand the various types of measuring devices used in basic measurements related to mechanical and civil engineering.

Course Outcomes

At the end of the Course, Student will be able:		Bloom's Level
CO1	To understand the various mechanism of transmission of power through different mechanical systems.	**K2**
CO2	To understand the basic working principle of refrigeration and air conditioning.	**K2**
CO3	To comprehend ab out the different types of construction materials used in Civil works.	**K2**
CO4	To understand on the various types of foundation and bearing capacity of soil with its importance.	**K2**
CO5	To understand the basic ingredients of RCC and Concrete	**K2**

K1 – Remember K2- Understand K3-Apply K4-Analyze K5 – Evaluate K6 – Create

Syllabus

MECHANICAL ENGINEERING

Unit 1. Transmission of Power
Transmission of power through belt, rope drives and pulleys, gears and chains Different type of pulleys and their application. Chain drives and its comparison with belt drive Gear drives, types of gears, simple gear trains and velocity ratio

Unit 2. Air Conditioning System
Basic principle of refrigeration and air conditioning. Working of centralized air conditioner Concept of split air conditioner and its application. Pumps -Types and their uses

CIVIL ENGINEERING

Unit 4..Construction Materials:
Properties and uses of various construction materials such as stones, bricks, lime, cement and timber along with their properties, physical/ field testing and uses, elements of brick ,Masonry.

Unit 5.Foundations:

i) Bearing capacity of soil and its importance
ii) Types of various foundations and their salient features, suitability of various foundations for heavy, light and vibrating machines,
iii) Walls and there classification, load bearing, non-load bearing partition and cavity wall.

Unit 6.Concrete
Various ingredients of concrete, different grades of concrete, water cement ratio, workability, physical/ field testing of concrete, mixing of concrete

Unit 7. RCC
Basics of reinforced cement concrete and its use (elementary knowledge), introduction to various structural elements of a building

RECOMMENDED BOOKS

Mechanical Engineering

1. General Mechanical Engineering by M. Adithan; TTTI, Chandigarh
2. Basic Civil and Mechanical Engineering by Jayagopal; Vikas Publication, New Delhi
3. IC Engines and Automobile Engineering by Dr.MP Poonia, Standard Publishers, New Delhi

Civil Engineering

1. Textbook of Concrete Technology 2nd Edition by Kulkarni, PD Ghosh RK and Phull, YR; Age International (P) LTD.,Publishers ,New Delhi
2. Materials of Construction by Ghose; Tata McGraw Hill Publishing Co.,Ltd., New Delhi
3. Civil Engineering Materials by TTTI, Chandigarh; Tata McGraw Hill Publishing Co.Ltd.,New Delhi

MUPEE305N	**Electrical Measurements and Measuring Instruments**	**4L:0T:2P**	**5 Credits**

Course Objectives

The objectives of the course is :
3. To get acquainted with different types of measuring instruments
4. To understand the constructional features of different types of measuring instruments

Course Outcomes

At the end of the Course, Student will be able:		**Bloom's Level**
CO1	To understand the essentials of measurements and the types of measuring instruments.	**K2**
CO2	To understand the internal configuration of an ammeter and Voltmeter	**K2**
CO3	To understand the constructional feature of dynamometer type wattmeter.	**K2**
CO4	To comprehend the various miscellaneous Measuring instruments like Meggar, Frequency meter and synchroscope.	**K2**
CO5	To list down various electronic instruments like CRO, LCR Meter and Q-meter.	**K2**

K1 – Remember K2- Understand K3-Apply K4-Analyze K5 – Evaluate K6 – Create

Syllabus

UNIT 1.

1.1 Importance of measurement, Basic measuring systems, advantages and limitations of each measuring systems, generalized measurement system, Types of measuring instruments, Essentials of indicating instruments – deflecting, controlling and damping torque .

1.2 Transducers

Theory, types of transducers construction and use of various transducers like resistance, inductance, capacitance, electromagnetic, piezoelectric type.

UNIT 2.

Ammeters and Voltmeters (Moving coil and moving iron type)

Concept of ammeters and voltmeters and difference between them 2.2 Extension of range of voltmeters and ammeter 2.3 Construction and working principles of moving Iron and moving coil instruments 2.4 Merits and demerits, sources of error and application of these instruments

Wattmeters (Dynamometer Type)

Construction, working principle, merits and demerits of dynamometer type wattmeter, sources of error. Three phase power measurement by :

1. One wattmeter method
2. Two wattmeter method
3. Three wattmeter method

Energy meter (Induction type)

Construction, working principle, merits and demerits of single-phase and three-phase energy meters, Errors and their compensation, Simple numerical problems.

UNIT 3. Miscellaneous Measuring Instruments

Construction, working principle and application of Meggar, Earth tester, Analog Multimeter, Digital multi-meter, basic principle, constructional brief, display system, Frequency meter (dynamometer type) single phase power factor meter (Electrodynamometer type). Working principle of synchroscope and phase sequence indicator, tong tester (Clamp-on meter) Instrument Transformers: Construction, working and applications a) CT b) PT

UNIT 4. Electronic Instruments

Cathode Ray Oscilloscope: Block diagram, working principle of CRO. Applications of CRO. LCR meters and Q meter Study of LCR meter and its applications Digital LCR and Q meter.Signal conditioning and telemetry with small simple examples.

RECOMMENDED BOOKS

1.Electrical Measurement and Measuring Instruments by Golding and Widdis; Wheeler Publication House,New Delhi.

2.Electrical Measurements and Measuring Instruments by SK Sahdev, Unique Internationnal Publication,Jalandhar.

MUPEE302N	**Electrical and Electronics Engineering Materials**	**4L:0T:2P**	**4 Credits**

Course Objectives

The objectives of the course is :
1. To understand the different types of engineering materials used in the field of electrical and electronics engineering.
2. To understand the differences in the properties of various types of engineering materials based on their applications.

Course Outcomes

At the end of the Course, Student will be able:		**Bloom's Level**
CO1	To understand the classification of different types of material based on their atomic properties.	**K2**
CO2	To evaluate the various types of conducting materials and find out their applications in the field of electrical engineering.	**K3**
CO3	To understand the various types of semi-conducting based on their properties.	**K2**
CO4	To list down the various insulating materials based on their properties and based on the results define the applications of the insulating materials.	**K3**
CO5	To understand the different types of magnetic materials and terminologies associated with a magnetic system.	**K2**

K1 – Remember K2- Understand K3-Apply K4-Analyze K5 – Evaluate K6 – Create

Syllabus

UNIT 1. Classification
Classification of materials into conducting, semi conducting and insulating materials through a brief reference to their atomic structure and energy bands.

UNIT 2. Conducting Materials
Introduction, Resistance and factors affecting it such as alloying and temperature etc. Classification of conducting material as low resistivity and high resistivity materials, Low resistance materials
a. Copper- General properties as conductor: Resistivity, temperature coefficient, density, mechanical properties of hard-drawn and annealed copper, corrosion, contact resistance. Application in the field of electrical engineering
b. Aluminium - General properties as conductor: Resistivity, temperature coefficient, density, mechanical properties of hard and annealed aluminium, solderability, contact resistance. Applications of aluminium in the field of electrical engineering
c. Steel - General properties as conductor: Resistivity, corrosion, temperature coefficient, density, mechanical properties, solderability, Applications in the field of electrical engineering Introduction to bundle conductors and its applications Low resistivity copper alloys: Brass, Bronze (cadmium and Beryllium), and their practical applications with reasons for the same
Applications of special metals e.g. Silver, Gold, Platinum etc.
High resistivity materials and their applications e.g., manganin, constantin, nichrome, mercury, platinum, carbon and tungsten, Tantalum. Superconductors and their applications.

UNIT 3. Review of Semi-conducting Materials: Semi-Conducting material such as Germanium, Silicon, Carbon-their atomic structure/application/against, pure and impure semi-conductors and their use for making electronic devices. Material used for special purpose semiconductor, diode, contacts, power transistor, substrate, integrated circuits and power handling devices.

UNIT 4. Insulating materials; General Properties
Electrical Properties Volume resistivity, surface resistance, dielectric loss, dielectric strength (breakdown voltage) dielectric constant. Physical Properties Hygroscopicity, tensile and compressive strength, abrasive resistance, brittleness. Thermal Properties Heat resistance, classification according to permissible temperature rise. Effect of overloading on the life of an electrical appliance, increase in rating with the use of insulating materials having higher thermal stability, Thermal conductivity, Electro-thermal breakdown in solid dielectrics. Chemical Properties Solubility, chemical resistance, weather ability. Mechanical properties, mechanical structure, tensile structure

UNIT 5. Insulating Materials and their applications
5.1 Plastics a. Definition and classification b. Thermosetting materials: Phenol-formaldehyde resins (i.e. Bakelite) amino resins (urea formaldehyde and melamine - formaldehyde), epoxy resins - their important properties and applications c. Procedure of preparation of plastic (PVC) d. Thermo-plastic materials: Polyvinyl chloride (PVC), polyethelene, silicons, their important properties and applications.
5.2 Natural insulating materials, properties and their applications.
a. Mica and Mica products
b. Asbestos and asbestos products

c. Ceramic materials (porcelain and steatite)
d. Glass and glass products
e. Cotton
f. Silk
g. Paper (dry and impregnated)
h. Rubber, Bitumen
i. Mineral and insulating oil for transformers switchgear capacitors, high voltage insulated cables, insulating varnishes for coating and impregnation
j. Enamels for winding wires
k. Glass fibre sleeves
5.3 Gaseous materials; Air, Hydrogen, Nitrogen, SF6 their properties and applications

UNIT 6. Magnetic Materials

Introduction - ferromagnetic materials, permeability, B-H curve, magnetic saturation, hysteresis loop including coercive force and residual magnetism, concept of eddy current and hysteresis loss, curie temperature, magnetostriction effect, method of reduction of eddy current loss and hysteresis loss

Soft Magnetic Materials

a) Alloyed steels with silicon: High silicon, alloy steel for transformers, low silicon alloy steel for electric rotating machines
b) Cold rolled grain oriented steels for transformer, Non-oriented steels for rotating machine
c) Nickel-iron alloys
d) Soft Ferrites

Hard magnetic materials - Tungsten steel, chrome steel, hard ferrites and cobalt steel, their applications

Special Materials

Thermocouple, bimetals, leads soldering and fuses material, mention their applications.

Introduction of various engineering materials necessary for fabrication of electrical machines such as motors, generators, transformers etc

RECOMMENDED BOOKS

1. Electrical and Electronic Engineering Materials by SK Bhattacharya, Khanna Publishers, New Delhi

2 .Electronic Components and Materials by Grover and Jamwal, Dhanpat Rai and Co., New Delhi

3.Electrical Engineering Materials by Sahdev, Uneek International Publication Electronic Components and Materials by SM Dhir, Tata Mc Graw Hill, New Delhi

4. Electrical Engineering Materials by PL Kapoor