



**Subject Code:** - ELE080

**Subject Name:** - Communication Engineering

**Semester-IV**

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### **Course Objectives:**

The Primary Objective of the Course is to Introduce Communication Signals and how these Signals can be Converting, Transmit and Retrieve in Wireless/Wired Systems.

### **Unit-I**

Fourier series, Fourier Transform and Its Properties, Random Variables & Their Moments, Their Significance, Convolution, Mean, Variance & Standard Deviation, Central Limit Theorem, Voltage & Power Decibel Scales. Signal Processing: Types of Signal, Periodic & Non Periodic, Analog & Discrete, Energy & Power Signals.

### **Unit-II**

Need of Modulation in a Communication System, Block Schematic of a Typical Communication System. AM Modulation System, Modulation Index, Generation & Detection of AM Wave, Side Bands & Power Content in an AM Wave, DSB-SC, SSB, Their Methods of Generation & Detection, Vestigial Side Band Modulation, AM Transmitter Block Diagram, Comparison of Various AM System, Modulation & Demodulation Circuits. Relationship between Phase & Freq. Modulation, FM Wave & Its Spectrum, Phasor Diagram of a Narrow Band FM Signal, Wide Band FM, Methods of Generation & Detection of FM, FM Transmitters.

### **Unit-III**

TRF Receiver & its Limitations, Necessity of Heterodyning, Super Heterodyning Receivers, IF Amplifiers, Selection of Intermediate Frequency. RF Amplifiers, Detectors, AGC, AVC, FM Receivers, AFC.

### **Unit-IV**

Nyquist Sampling Theorem, TDM, Pulse Modulations & PCM, Quantization Error, Necessity of Non Linear Quantizer, A-law,  $\mu$ -law, FSK & PSK, QPSK, QAM. Source of Noise, Noise Figure, Noise Bandwidth, Effective Noise Temperature, Performance of AM, FM & Digital System in Presence of Noise.

### **Unit-V**

Satellite System Block Diagram, Satellite Freq. Bands, Satellite Multiple Access Format like TDMA, FDMA, Transponders, Earth Station & Satellite Eclipses, Link calculation.

### **Course Outcomes:**

After learning the course the students should be able to understand the technical terms of communication signals and their graphical representation viz. voltage, current and their conversion mechanism that needs in engineering field.

**References:**

1. B.P. Lathi, Modern Digital and Analog Communication System
2. Simon Haykins, Communication System
3. Wayne Tomasi, Advanced Electronic Communication System, PHI Learning
4. Singh & Sapre, Communication System, TMH
5. Martin S. Roden, Analog and Digital Communication
6. Frank R. Dungan, Electronic Communication System, Thomas/ Vikas
7. John G. Prokis, Masoud Salehi, Gerhard Bauch, Contemporary Communication Systems Using MATLAB, Cengage learning 2004.



**Subject Code:** - ELE090

**Subject Name:** - Electrical Machine-II

**Semester-IV**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>2</b>	<b>1</b>	<b>2</b>	<b>4</b>

## **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 their performance and characteristics.

## **Unit-I**

### **D.C. Machine-I**

Working principle, construction of DC machines, types of DC machines and method of excitation, Lap and Wave windings, e.m.f. and torque equations, armature reaction, 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: 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.

## **Unit-IV**

### **Synchronous Machine-II**

Salient pole machine- two reaction theory, analysis of phasor diagram, power angle characteristics, determination of  $X_d$  and  $X_q$ . (d) parallel operation of alternators-synchronization and load division, Synchrosopes and phase sequence indicator. Voltage regulation of alternators using synchronous impedance, mmf and zpf method.

## **Unit-V**

### **Synchronous Machine-III**

Synchronous motor - operating principle, circuit model, phasor diagram, operating characteristics, 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 and 3- Point of DC Motor.
3. To Study the 4- Point Starter of DC Motor.
4. To Perform Speed Control of D. C. Motor by Armature Resistance Method.
5. To Perform Speed Control of D. C. Motor by Field Flux Control Method.
6. To Perform Speed Control of D. C. Motor by Armature Voltage Control Method.
7. To Study Commutation Process and Slip Ring of DC Machine.
8. To Perform Hopkinson Test on a DC Generator and Motor Set.
9. To Perform Load Test on a DC Generator.
10. To Perform Magnetizing Characteristic Test on a Shunt DC Generator.
11. To Study Constructional Features of Synchronous Machine.
12. To Study the Starting Methods of Synchronous Motor.
13. To Perform V Curve Method on Synchronous Motor.
14. To Perform Inverted V Curve Method on Synchronous Motor.
15. To Study the Determination of  $X_d$  and  $X_q$  in Synchronous Machine.
16. To Study the Synchrosopes of Synchronous Machine.
17. To Perform Voltage Regulation of Alternators Using Synchronous Impedance Method.
18. To Perform Voltage Regulation of Alternators Using MMF Method.
19. To Perform Voltage Regulation of Alternators Using ZPF Method.



**Subject Code:** - ELE100

**Subject Name:** - Power Plant Engineering

**Semester-IV**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>2</b>	<b>1</b>	<b>2</b>	<b>4</b>

### **Course Objectives:**

Providing an overview of power plants and detailing the role of electrical engineers in their operation and maintenance.

### **Unit I Power From Renewable Energy**

Schematic Arrangement, Advantages and Disadvantages, Choice of Site Constituents of Hydro Power Plant, Hydro Turbine. Environmental Aspects for Selecting the Sites and Locations of Hydro Power Stations, Principle, Construction and Working of Wind, Tidal, Solar Photo Voltaic (SPV), Solar Thermal, Geo Thermal, Bio-Gas and Fuel Cell Power Systems.

### **Unit II Coal Based Thermal Power Plants**

Rankine Cycle – Improvisations, Layout of Modern Coal Power Plant, Super Critical Boilers, FBC Boilers, Turbines, Condensers, Steam & Heat rate, Subsystems of Thermal Power Plants – Fuel and Ash Handling, Draught System, Feed Water Treatment. Binary Cycles and Co-Generation Systems.

### **Unit III Diesel, Gas Turbine and Combined Cycle Power Plants**

Otto, Diesel, Dual & Brayton Cycle – Analysis & Optimization. Components of Diesel and Gas Turbine Power Plants. Combined Cycle Power Plants. Integrated Gasifiers Based Combined Cycle Systems.

### **Unit IV Nuclear Power Plants**

Basics of Nuclear Engineering, Layout and Subsystems of Nuclear Power Plants, Working of Nuclear Reactors: Boiling Water Reactor (BWR), Pressurized Water Reactor (PWR), Canada Deuterium-Uranium Reactor (CANDU), Breeder, Gas Cooled and Liquid Metal Cooled Reactors. Safety Measures for Nuclear Power Plants.

### **Unit V 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.

### **Course Outcomes:**

- Upon completion of this course, the students can able to understand different types of power plant, and its functions and their flow lines and issues related to them.
- Analysis and solve energy and economic related issues in power sectors.

### **References:**

1. Power Generation Technology- Dr.V.K.Sethi, Sudit Publication
2. Thermal Power Technology - Dr.V.K.Sethi, Sudit Publication

3. Generation, Distribution and Utilization of Electrical Energy by C.L. Wadhwa, New Age International.
4. Elements of Power System Analysis- William Stevenson Mc-Graw Hill
5. Modern Power System Analysis- I.S. Nagrah and D.P. Kothari, Tata Mc Graw Hill.
6. Power System Analysis- John Grainger and Willian Stevenson, Mc- Graw Hill.

**Suggested List of Experiment:**

1. To Study the renewable (Solar) energy source.
2. To Study the Hydro Power Station.
3. To Study the Nuclear Power Station.
4. To Study the Thermal Power Station.
5. To Study of Diesel Power Plant.
6. To Study the Bio-Gas Plant.
7. To Study the Wind Power Plant.
8. To Study the working of Impulse and Reaction steam turbines.
9. To study cooling tower and find its efficiency.
10. To study Low pressures Boiler and their mountings and accessories.
11. To study high pressure boilers and their accessories and mountings.
12. To Study the Super-heater, Air-preheater, Economizer, Condenser.



**Subject Code:** - ELE110

**Subject Name:-** Electrical and Electronics Measurement and Measuring Instruments

**Semester-IV**

L	T	P	C
2	1	2	4

### **Course Objectives:**

The primary objective of the course is to introduce transducer, principles of transducer, terminology related to measurements of transducers, OP-AMP and data acquisition system and to have an adequate knowledge in measurement of different transducers and display devices.

### **Unit-I**

**Measuring System:** Elements of a Measuring System, Block Diagram of System Configuration, Performance, Standards, Time Lag, Error, Distortion and Distortion Meters, Noise and Noise Factor.

### **Unit-II**

**Sensors & Transducers:** Definition and Classification, Mechanical Devices as Primary Detectors, Characteristic & Choice of Transducers, Electrical Transducers, Advantages of Electric Transducers, Active and Passive Transducers, Classification, Resistive, Inductive and Capacitive Transducers, Potentiometric, Metallic and Semiconductor Strain Gauges, Gauge Factor, Types, Material Used and Applications Thermistor, RTD, Inductive, LVDT Thermocouples, Piezo-Electric Transducers Opto- Electronic Transducers such as Photo Voltaic, Photo Conductive, and Photo Conductive Cells, Constructional Details, Characteristics and Applications.

### **Unit-III**

**Signal Conditioners:** Purpose of Signal Conditioning, Classification, Input Modifier, Operational Amplifiers Circuits used in Instrumentation, D.C. Amplifier, Chopper Amplifier. Instrumentation Amplifier, Characteristics, Three Amplifier Configuration. A/D and D/A Converters.

### **Unit-IV**

**Data Acquisition System:** Introduction data Acquisition System, Generalized DAS, Single and Multi Channel DAS, Data Loggers, Special Encoders.

### **Unit-V**

**Display Devices and Recorders:** Digital Display System and Indicators like CRT, Seven Segment LED, LED, LCD. Analog and Digital Recorders, Strip and Circular Chart Recorder and Magnetic Tape Recorder, X-Y Plotters Ultraviolet Recorders, Digital Tape Recorders.

### **Course Outcomes:**

After learning the course the students should be able to understand the technical terms of electrical & electronics transducers and detail principles, working and construction of the transducers and their applications in engineering field.

**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, Wheeler 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.
3. Measurement of Load/Weight Using Strain Gauge and Cantilever.
4. Measurement of Linear Displacement by LVDT and Draw its Characteristics.
5. Measurement of Temperature by Thermocouple.
6. Measurement of Temperature by Using Resistance Thermometer.
7. Measurement of Temperature by Using LM35
8. Measurement of Pressure Using LVDT and Diaphragm Gauge.
9. Study and Use of Data Conversion Using Analog to Digital Conversion.
10. Study and Use of Data Conversion Using Digital to Analog Conversion.
11. Measurement of pH Value Using pH Meter.
12. Measurement of Humidity by Hygrometer.
13. Study and Flow Measurement Using Electromagnetic Flow Meter.
14. Study of Time Division and Frequency Division Multiplexing.
15. Measurement of Liquid Level by Resistive/Capacitive Transducer.
16. To Study the V-I Characteristics of Photo Diodes.
17. Study of Different Display Devices like CRT, LED and LCD.
18. Implementing Inverting & Non Inverting Mode of Op-amp 741 IC.
19. Implementing Different Mathematical Operations Using Op-amp 741 IC.
20. Study of Instrumentation Amplifier.





**Subject Code:** - ELE120

**Subject Name:** - Electrical Engineering Drawing

**Semester-IV**

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**Course Objectives:** The students should be able to read and interpret electrical engineering drawings to communicate and correlate through sketches and drawing of actual machines. They should be able to prepare working drawing of electrical instruments, machines, panel etc.

### **UNIT I: Symbols & Notations**

Symbols of Practical Units, Types of Supplies, Single Phase, Three Phase Three Wire, Three Phase Four Wire, D.C. Supply etc. Accessories like Main Switches, Distribution Boards, Fans, Light Fixtures, Bell, Buzzer, Lighting Arrestor. All Types of Motor Starters, Instruments, Electronic Components etc.

### **UNIT II: Domestic Wiring**

All Types of Light Circuits: Staircase Wiring, Go Down Wiring, Fluorescent Tube Circuits, Intermediate Switch Circuits, Fan Circuits. Wiring of a Residential Building. Sodium Vapor Lamp, Mercury Vapor Lamp, Wiring Diagram of Electrical Bell Connection.

### **UNIT III: Instrument Circuits**

Connection of Meters in Circuits: Ammeter, Voltmeter, Wattmeter, Energy Meter, Power Factor Meter, Frequency Meter, Synchroscope etc. Extension of Range Using Shunt, Multiplier, Current Transformer, Potential Transformers etc.

### **UNIT IV: Power Wiring**

Wiring Diagrams of DC and AC Motor Starters like Three Point Shunt Motor Starter, Direct on Line (D.O.L.) Starter, Star- Delta Starter, Contactor Type and Auto Transformer Starter. Plate Earthing and Pipe Earthing as per ISS.

### **UNIT V: Electrical Machine Drawing**

Parts of D.C. Machines like, Magnetic Poles, Commutator, Armature etc. A.C. Machines Rotor, Slip Rings, etc. Various Cable Sections. Bushing of the Transformer. Assembly Diagrams of D.C. Machine, A.C. Machine, and Transformer.

### **Course Outcomes:**

- Analyze the general aspects of design of electrical equipment and machines.
- Design different types of symbols.
- Design different types of starter, field regulator, choke and control panel.
- Design and analyze different instruments circuits as ammeter, voltmeter, wattmeter, multiplier etc.

### **References:**

1. A Text Book of Electrical Drawing .by S.L. Uppal (Khanna pub.)
2. Electrical Drawing by K.L. Narang.

3. Electrical Drawing by C.R. bargain.
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**Suggested List of Experiment:**

1. To Draw Symbols & Notations of Types of Supplies, Instruments and Accessories.
2. To Draw Symbols & Notations of Types Indicating Instrument, Recording Instrument and Control Gears.
3. To Draw Symbols & Notations of Distribution Fuse Board, Outlets, Bells and Buzzers.
4. To Draw Symbols & Notations of Types of Motor Starters and Electronic Components.
5. To Draw Different Types of Wiring: (i) Staircase Wiring (ii) Corridor Wiring.
6. To Draw Different Types of Wiring: (i) Sodium Vapour Lamp (ii) Fluorescent Lamp Wiring.
7. To Study About the Trouble Shooting of Electrical Equipments like Fan, Iron box, Mixer-Grinder etc.
8. To Study about Earthing and their Types.
9. To Draw AC Motor Starters and DC Motor Starters.
10. To Measure the Electrical Quantities – Voltage, Current, Power and to Calculate Power Factor for RLC Circuit.
11. To Draw Connection of Instrument Circuit: Ammeter, Voltmeter, Wattmeter.
12. To Draw Connection of Instrument Circuit: Energy Meter, Power Factor Meter.
13. To Draw Connection of Instrument Circuit: Frequency Meter, Synchroscope.
14. To Draw and Calculate DC Machine Winding: Simplex Lap, Simplex Wave, Multiplex Lap, Multiplex Wave Winding.
15. To Draw and Calculate AC Machine Winding: Single Layer, Double Layer Winding.
16. To Draw Sketch of DC Machine Element: Poles, Commutator, Armature.
17. To Draw Sketch of AC Machine Element: Rotor, Slip Rings, Brush Gear, Couplings.
18. To Draw Free Hand Sketching of Machines Parts and Components: Stampings and Slots.
19. To Draw Free Hand Sketching of Machines parts and Components: Bearing and Bushing.
20. To Draw Free Hand Sketching of Machines Parts and Components: Tap Changer, Interpole and End Cover.



**Subject Code:** - ELE130

**Subject Name:** - Electrical Wiring & Winding

**Semester-IV**

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### **Course Objectives:**

- To learn about the electrical tools and electrical quantities.
- The students should be able to understand electrical house wiring connections.
- To know the construction and working principles of AC and DC machine.

### **Suggested List of Experiment:**

1. Introduction of Tools, Electrical Materials, Symbols and Devices etc.
2. To Study about the Trouble Shooting of Electrical Equipments like Fan, Iron Box, Mixer-Grinder etc.
3. To Measure the Electrical Quantities – Voltage, Current, Power and to Calculate Power Factor for RLC Circuit.
4. To Draw Connection of Instrument Circuit: Ammeter, Voltmeter, Wattmeter, Energy Meter.
5. To Implement Residential House Wiring Using Switches, Fuse, Indicator, Lamp and Energy Meter.
6. To Draw Different Types of Wiring: (i) Staircase Wiring (ii) Corridor Wiring.
7. To Draw Different Types of Wiring: (i) Sodium Vapour Lamp (ii) Fluorescent Lamp Wiring.
8. Assembly of Choke or Small Transformer.
9. To Study Various Electrical Gadgets of Induction Motor, Transformer, CFL, LED, PV Cell.
10. To Draw Connection of Instrument Circuit: Power Factor Meter, Frequency Meter, and Synchroscope.
11. To Implement Residential House Wiring Using Switches, Fuse, Indicator, Lamp and Energy Meter.
12. To Measure the Energy Consumed in a Single Phase Circuit and 3 Phase Circuit.
13. To Draw and Calculate DC Machine Winding: Simplex Lap, Simplex Wave, Multiplex Lap, Multiplex Wave Winding.
14. To Draw and Calculate AC Machine Winding: Single Layer, Double Layer Winding.
15. To Control One Lamp by Two 2-Way Switches.
16. To Design and Fabricate Single Phase Transformer.
17. To Control Lamps by Two Separate Switches (House Wiring).

### **Course Outcomes:**

Understand the basics of electrical equipments, electrical house wiring connection and its types and also learn how to measure the different quantities of electrical.