

# **COURSE STRUCTURE & SYLLABUS OF BACHELOR OF TECHNOLOGY (B.TECH)**

*In*

## **ELECTRICAL**

### **Course Structure**

#### **Fourth Year**

#### **VII Semester**

#### **Syllabus**

Paper Code	Name of the Subject
BEE1	Switchgear & Protection
BEE2	Utilization Of Electrical Power
BEE3	Communication Engineering
BEE4	Electronics Instrumentation
BEE5	Elective-I
BEE1P	Switchgear & Protection Practical
BEE4P	Electronics Instrumentation Practical

#### **BEE 1 : SWITCHGEAR & PROTECTION**

##### **1. INTRODUCTION**

Essential Qualities of Protection, Classification of Protective relays, Current Transformers for Protection, Potential transformer, summation transformer.

##### **2. OPERATING PRINCIPLES AND RELAY CONSTRUCTION**

Electromagnetic Relays, Thermal Relays, Static Relays, Microprocessor- based Protective Relays.

##### **3. OVERCURRENT PROTECTION**

Time – Current characteristics, current setting, time setting, overcurrent protective schemes, reverse power or directional relay, protection of parallel feeders, protection of ring mains, earth fault and phase fault protection, combined earth fault and phase fault protective scheme, phase fault protective scheme, directional earth fault relay, static overcurrent relays, microprocessor-based overcurrent relays.

##### **4. DISTANCE PROTECTION**

Impedance Relay, Reactance Relay, MHO (Admittance or Angle Admittance) Relay, Angle Impedance (OHM) Relay, Input Quantities for Various Types of Distance Relays, Sampling Comparator, effect of ARC resistance on the performance of Distance Relays, Effect of power surges( power swings) on the

performance of distance relays, effect of line length and source impedance on distance relays, selection of distance relays, MHO relay with Blinders, Quadrilateral relay, Elliptical Relay, Restricted MHO Relay, Restricted Impedance Relay, Restricted Impedance relay, restricted Directional Relay, Restricted Reactance Relay, some other Distance Relay characteristics, swiveling characteristics, choice of characteristics for Different Zones of Protection, Compensation for correct Distance Measurement, Reduction of Measuring Units, Switched Schemes, Auto reclosing.

## **5. PILOT RELAYING SCHEMES**

Wire pilot protection, carrier current protection

## **6. AC MACHINES AND BUS – ZONE PROTECTION**

Protection of Generators, Transformer Protection, Bus-Zone protection, Frame Leakage Protection.

## **7. MICROPROCESSOR BASED PROTECTIVE RELAYS**

Introduction, Overcurrent Relays, Impedance Relay, Directional Relay, Reactance Relay, Generalized Mathematical Expression for Distance Relays, Measurement of R and X, MHO and Offset MHO Relays.

## **BEE 2 : UTILIZATION OF ELECTRICAL POWER**

### **1. NON – CONVENTIONAL AND CONVENTIONAL SOURCES OF ENERGY**

Introduction, Tidal power, wind power, Geothermal power, wave power, magneto hydro dynamic (MHD) Generation, solar Energy, Hydro station, Steam power plant, Nuclear power plants, the gas turbine plant.

### **2. ECONOMICS OF GENERATION**

Introduction, Definitions, Load Duration curve, Number and size of generator units, Cost of electrical energy, Tariff or charge to consumer.

### **3. DISTRIBUTION**

Introduction, Types of Distribution system, Kelvin's law, Distributor, Substation, Cost comparison of distribution systems.

### **4. ELECTRIC DRIVES AND INDUSTRIAL APPLICATIONS**

Introduction, Factors affecting selection of motor, Types of loads, Steady state characteristics of drives, transient characteristics, size of motor, load equalization, Industrial applications, Modern approach to speed Control of D.C. Drives.

## **5.ELECTRIC HEATING AND WELDING**

Introduction, Classification of methods of electric heating, Requirements of a good heating material, Design of heating element, Temperature control of resistance furnace, Electric arc furnace, Induction heating, Dielectric heating, Resistance welding, Electric arc welding.

## **6. ELECTRIC TRACTION**

Introduction, requirements of an ideal traction system, supply system for electric traction, train movement, mechanism of train movement, the traction motors, Traction motor control, control of single phase series motors, speed control of 3-phase induction motors, multiple unit control, Braking of electric motors, electrolysis by currents through earth, current collection systems, Thyristors used in traction system.

## **BEE 3 : COMMUNICATION ENGINEERING**

### **1. ELECTRONIC COMMUNICATION SYSTEM**

Introduction, Contaminations, The Audio Spectrum, Signal Power Units, Volume Unit , Signal-To-Noise Ratio, Modulation, Fundamental Limitations In A Communication System, Number Systems

### **2. AMPLITUDE MODULATION**

Introduction, definition of am, generation of am wave, double-sideband suppressed-carrier modulation, single-sideband modulation (ssb), vestigial sideband modulation (vsb), demodulation of am.

### **3. EXPONENTIAL MODULATION1 FREQUENCY MODULATION**

Introduction, frequency spectrum of frequency modulation, comparison of fm and am, frequency modulation band widths, narrow band and wide band frequency modulation (nbfm and wbfm) , phase modulation, generation and detection principle, fm demodulation : am-based method.

### **4. SAMPLING AND ANALOG PULSE MODULATION**

Introduction, Sampling Theory, Sampling Analysis, Types Of Sampling, Practical Sampling: Major Problems, Types Of Analog Pulse Modulation, Pulse Amplitude Modulation, Pulse Position Modulation, Signal-To-Noise Ratios In Pulse Systems

### **5. DIGITAL DATA TRANSMISSION**

Introduction, representation of data signal, parallel and serial data transmission, 20ma loop and line drivers, modems, data signal: signal shaping and signaling speed, partial response (correlative) techniques, noise and error analysis, repeaters, digital-modulation systems, amplitude-shift keying (ask), frequency shift keying (fsk), four-phase or quaternary psk, interface standards

### **6. DIGITAL MODULATION : DM AND PCM**

Introduction, delta modulation, pulse code modulation, pcm bandwidth, pcm reception and noise, quantization noise analysis, aperture time, the  $S/N$  ratio and channel capacity of pcm, comparison of pcm with other systems, pulse rate, codecs, 24-channel pcm, the pcm channel bank, multiplex hierarchy, measurements of quantization noise, differential pcm

## **BEE 4 : ELECTRONICS INSTRUMENTATION**

### **1. ELECTRONIC INSTRUMENTS FOR MEASURING BASIC PARAMETERS**

Introduction, Amplified DC Meter, AC Voltmeter using Rectifiers, AC voltmeters Using Rectifiers, True RMS-Responding voltmeter, Electronic Multimeter, Considerations in choosing an Analog voltmeter, Digital Voltmeters, Components Measuring Instruments , Vector Impedance Meter, Vector Voltmeter, RF Power and voltage Measurement

## **2. OSCILLOSCOPES**

Introduction , Oscilloscope Block Diagram, Cathode Ray Tube , CRT Circuits , Vertical Deflection System, Delay Line, Multiple Trace Horizontal Deflection System , Oscilloscope Probes and Transducers , Oscilloscope Techniques, Special Oscilloscopes

## **3. SIGNAL GENERATION**

Introduction, The sine –wave generator, Frequency Divider generator, Signal generator modulation, Sweep-Frequency Generator , Pulse and square –wave generators, Function Generator, Audiofrequency Signal Generation.

## **4. SIGNAL ANALYSIS**

Introduction, Wave Analyzers, Harmonic Distortion Analyzers, Spectrum Analysis .

## **5. FREQUENCY COUNTERS AND TIME-INTERVAL MEASUREMENTS**

Simple Frequency Counter, Measurement Errors, Extending the frequency range of the counter, Automatic and computing counters,

## **6. TRANSDUCERS AS INPUT ELEMENTS TO INSTRUMENTATION SYSTEMS**

Classification of Transducers , Selecting a Transducer, Strain Gages, Displacement Transducers, Temperature Measurements, Photosensitive Devices.

## **7. ANALOG AND DIGITAL DATA ACQUISITION SYSTEMS**

Instrumentations Systems, Interfacing Transducers to Electronic Control & Measuring Systems, Multiplexing .

## **8. COMPUTER –CONTROLLED TEST SYSTEMS**

Introduction, Testing an Audio Amplifier, Testing a Radio Receiver, Instruments Used in computer-controlled instrumentation, IEEE 488 Electrical Interface, Digital Control Description, Example of Signal Timing in a Microprocessor-Based

## **9. FIBER OPTICS MEASUREMENTS**

Introduction, Sources and Detectors, Fiber Optic Power Measuring, Stabilized , calibrated Light Sources, End-to-End Measurement of Fiber System Loss, Optical Time – Domain Reflectometer.

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