

## **Subject : INSTRUMENTATION ENGINEERING**

- 1. Basic Electrical Engineering :**  
Network Theorems, D.C. networks, A.C. network fundamentals & phasor concepts, Series-Parallel A.C. networks, Energy & Power in electrical circuits. Magnetic circuits, Three-phase AC circuits.
- 2. Electrical Circuit Analysis/Signals & Systems:**  
Transients, Resonance, Transforms & properties: Laplace, Fourier, Z-transform, Discrete-time Fourier Transform, Discrete Fourier Transform, Fast Fourier Transform, Electrical Circuit Analysis using Laplace & Fourier Transforms, Properties of networks in terms of poles and zeros, Transfer function, Resonant circuits, Two-port networks.
- 3. Analog Electronics:**  
Characteristics of diode, BJT, JFET & MOSFET, Diode circuits. Transistors at low and high frequencies. Amplifiers, single and multi-stage. Feedback amplifiers. Operational amplifiers, characteristics and circuit configurations. Instrumentation amplifier. V to I & I to V converters. Op Amp based active filters. Oscillators and signal generators.
- 4. Digital electronics:**  
Combinational logic circuits, minimization of Boolean functions, IC families, TTL, MOS & CMOS. Arithmetic circuits, comparators, Schmitt trigger, Timer and multi vibrator. Sequential circuits, Flip-flops, Registers, Counters . Multiplexer, S/H circuit. ADC & DAC. Basic number system.  
Microprocessor applications,, Memory & Input- Output interfacing. Microcontrollers.
- 5. Signals, Systems and Communications:**  
Transients, Resonance, Transforms & properties: Laplace, Fourier, Z-transform, Discrete-time Fourier Transform, Discrete Fourier Transform, Fast Fourier Transform, Electrical Circuit Analysis using Laplace & Fourier Transforms, Properties of networks in terms of poles and zeros, Transfer function, Resonant circuits, Two-port networks.  
  
Time division and frequency division multiplexing, AM, FM, Pulse Modulation, Sampling & Quantization & Coding, Digital pass band methods, Digital Modulation: ASK, PSK, FSK, QPASK, Information Theory basics, Shannon's theorems, Entropy & Convolutional Coding, Noise.
- 6. Electrical & Electronic Measurements:**  
Bridges and potentiometers. Measurement of R, L , C, voltage , current, power , power factor and energy. Extension of instrument ranges. Digital voltmeters & multi-meters. Time , phase and frequency measurement. CRO.
- 7. Transducers, Mechanical measurement & Industrial Instrumentation:**  
Resistive, Inductive, Capacitive & Piezoelectric transducers and their signal conditioning. Measurement of displacement, velocity, acceleration, force, torque, vibration. Measurement of pressure, flow, temperature, liquid level and pH, conductivity, viscosity & humidity.
- 8. Control system & Process Control:**  
Feedback principles, Block diagram representation and reduction techniques. Time response, steady-state errors, Routh & Nyquist criteria, Bode plot, Root Loci. Time delay systems, Phase & gain margin. State space representation of systems. Mechanical , hydraulic & pneumatic system components, Synchro pair, Servo motor, Stepper Motor. P, P-I , P-I-D controllers

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**9. Analytical , Optical & Biomedical Instrumentation:**

Gas Chromatography, Mass Spectrometers. Optical sources and detectors. Basics of fiber optics. Fibre optic sensors. Biomedical instruments, EEG, ECG & EMG. Clinical measurements. Ultrasonic transducers & ultrasonography. Principles of Computer Assisted Tomography.

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