

**Syllabus for Lecturer Electronic Engineering Government
Polytechnic
Electronic Engineering Paper-Ist**

- 1. Electronic Devices:** Energy bands in semiconductor, band-gap in direct and indirect semiconductors, P-N junction, Zener diode, clipping, clamping and rectifiers. Small signal equivalent circuits of diodes, working of BJT, JFET, MOSFET devices.
- 2. Analog Circuits:** Diode circuits, amplifier models: Voltage amplifier, current amplifier, trans-conductance amplifier and trans-resistance amplifier. biasing schemes for BJT and FET amplifiers, bias stability, various configurations. High frequency transistor models, frequency response of single stage and multistage amplifiers. Oscillators: Review of the basic concept, Barkhausen criterion, RC oscillators (phase shift, Wien bridge etc.), LC oscillators (Hartley, Colpitt, Clapp etc.), non-sinusoidal oscillators. Op-Amp applications: Review of inverting and non-inverting amplifiers, integrator and differentiator, summing amplifier, precision rectifier, Schmitt trigger and its applications, active filters: Low pass, high pass, band pass and band stop, design guidelines.
- 3. Advanced Electronics:**
VLSI technology: Processing, lithography, interconnects, packaging, testing; VLSI design principles, MUX/ROM/PLA-based design, Moore & Mealy circuit design; Pipeline concepts & functions; Design for testability, examples.
- 4. Network Theory and Basic Machines:**
DC Circuits-Ohm's & Kirchoff's laws, mesh and nodal analysis, circuit theorems; Single phase AC circuits; Network graphs & matrices; Wye-Delta transformation; Linear constant coefficient differential equations-time domain analysis of RLC circuits; Solution of network equations using Laplace transforms- frequency domain analysis of RLC circuits; 2-port network parameters-driving point & transfer functions; State equations for networks; Steady state sinusoidal analysis.
Basics-DC machines, induction machines, and synchronous machines. Transformers and its efficiency.
- 5. Digital Electronics:**
Number representations: binary, integer and floating-point-numbers.
Combinatorial circuits, Boolean algebra, minimization of functions using identities and Karnaugh map, logic gates, arithmetic circuits, code converters, multiplexers, decoders. Sequential circuits: latches and flip-flops, counters, shift-registers. Data converters; sample and hold circuits, ADCs and DACs. Basics of multiplexers, counters/registers/memories/microprocessors, design & applications.
- 6. Control Systems:** Basic control system components; Feedback principle; Transfer function; Block diagram representation, Transforms & their applications; Signal flow graph; Frequency response; Routh-Hurwitz criteria, root loci, Nyquist/Bode plots;

Feedback systems-open & close loop types, stability analysis, steady state, transient and frequency response analysis; compensation; Lag, lead and lag-lead. State variable model and solution of state equations of LTI systems. Transient and steady-state analysis of LTI systems.

7. Instrumentation:

Principles of measurement, accuracy, precision and standards; Analog and Digital systems for measurement, measuring instruments for different applications; Static/dynamic characteristics of measurement systems, errors, statistical analysis and curve fitting.

8. Computer Organization and Architecture:

Basic architecture, CPU, I/O organisation, memory organisation, peripheral devices, trends; Hardware/software issues; Data representation & Programming; Operating systems-basics, processes, characteristics, applications. Microprocessors & microcontrollers, basics, interrupts, DMA, instruction sets, interfacing; Controllers & uses; Embedded systems.

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1. Electromagnetics:

Elements of vector calculus, Maxwell's equations-basic concepts-differential and integral forms and their interpretation; Gauss', Stokes' theorems; Poynting vector: Wave propagation through different media; Transmission lines: equations, characteristic impedance, impedance matching, impedance transformation, S-parameters, Smith chart. Waveguides-basics, rectangular types, modes, cut-off frequency, dispersion, dielectric types; Antennas-antenna types radiation pattern, gain and directivity, return loss, monopoles/dipoles, gain, antenna arrays.

2. Analog communication Systems:

AM, FM, transmitters/receivers, amplitude modulation and demodulation, angle modulation and demodulation, spectra of AM and FM, superheterodyne receivers.

3. Digital communication basics:

Sampling, quantizing, coding, PCM/ DPCM, multiplexing audio/video; Digital modulation: ASK, FSK, PSK; Multiple access: TDMA, FDMA, CDMA;

4. Digital Signal Processing :

Discrete time signals/systems, uses; Digital filters: FIR/IIR types, design, speech/audio/radar signal processing uses;

5. Communication networks:

Principles/practices/technologies/uses/OSI model/security; Basic packet multiplexed streams/scheduling; Cellular networks, types, analysis, protocols (TCP/TCP/IP).

6. Random signals and processes :

autocorrelation and power spectral density, properties of white noise, filtering of random signals.

7. Information theory :

entropy, mutual information and channel capacity theorem, Huffman coding algebraic and convolutional coding.

8. Microwave & satellite communication:

Terrestrial/space type LOS systems, block schematics link calculations, system design; Communication satellites, orbits, characteristics, systems, uses; Fibre-optics-Light propagation in optical fibre, fibre optic communication:fibre optics, theory, practice/standards, systems, block schematics, link calculations, system design.