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Syllabus for Lecturer Electronic Engineering Government Polytechnic

Electronic Engineering Paper-I[st]

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 diods,working of BJT, JEFT, 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; Date representation & Programming; Operating systems-basics, processes, characteristics, applications. Microprocessors & microcontrollers, basics, interrupts, DMA, instruction sets, interfacing; Controllers & uses; Embedded systems.

Syllabus for Lecturer Electronic Engineering Government Polytechnic
Electronic Engineering Paper-II[nd]

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, quanizing, coding, PCM/ DPCM, multiplexing audio/video; Digital modulation: ASK, FSK, PSK; Muliple 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 sreams/scheduling; Cellular networks, types, analysis, protocols (TCP/TCPIP).
6. **Random signals and processes :**
   autocorrelation and power spectral density, properties of white noise, filtering of randon 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.