

Syllabus for the Theoretical courses offered by ECE Department to other Departments

Basic Electronics: ECE-201 (Common to all branches) (L=3 T=1 P=0)

Introduction to electronics and its applications.

Semiconductors: Definition of solids (insulator, conductor, semiconductor) using band diagram, effect of temperature on semiconductor, effect of doping: intrinsic and extrinsic semiconductor, p-type, n-type. Expression for conductivity of a semiconductor.

Diodes: Construction, principle of operation (forward biasing, reverse biasing), characteristics, modeling (ideal model only), use in clipping circuits, clamping circuits. Rectifiers: half wave, full wave (centre tap and bridge type), capacitive filter. Zener diode: principle of operation, ideal mode, uses as voltage regulator. Power supply.

Bipolar Junction Transistor(BJT): Types npn and pnp, construction, principle of operation, use as amplifier, various amplifier configuration (Common base, common emitter and common collector), input/output characteristics, concept of cut-off, active and saturation regions, dc load line, operating point (Q-point).

Transistor Biasing: Need of biasing, method of biasing — base resistor method, collector feedback method, emitter feedback method, voltage divider method, stabilization of Q-point.

Single stage amplifier: Definition of h-parameters, h-parameter model of transistor, mid band analysis of amplifier using h-parameters(current gain, i/p impedance, voltage gain, o/p impedance), qualitative explanation of magnitude characteristics of frequency response, classification of amplifiers (Voltage amplifier, current amplifier, power amplifier).

Other Semiconductor devices and their uses (statements only): JFET, MOSFET, UJT, SCR. DIAC, TRIAC etc.

Operational Amplifier: Characteristics of ideal operational amplifier, analysis of simple operational amplifier circuits. Applications of operational amplifier — inverting amplifier, non-inverting amplifier, voltage follower, summing amplifier, differentiator, integrator and comparator.

Feedback amplifier: Types of feedback — positive, negative, effect of negative feedback on amplifiers, condition of oscillations, RC phase shift oscillator, Wien bridge Oscillator.

Logic Gates: Definition of NOT, OR, AND, NAND, Ex-OR, EX-NOR gates, simplification of logic function using Boolean algebra, circuit realisation using logic gates.

Linear Circuits: ECE-321 (for CSE) (L=3 T=1 P=0)

Characteristics and equivalent circuits of BJT and FET. Biasing of FET and BJT. BJT, JFET and MOSFET as amplifiers.

Multistage amplifier circuits and analysis. Feedback in amplifiers.

BJT and FET as oscillators of universal type. BJT Power amplifier and its application. Various types of amplifiers.

Operational amplifier, biasing, characteristics and applications.

Rectifiers, filters and voltage regulators.

Fabrication of BJT, FET and Integrated circuits.

Principles of Electronics Devices: ECE-323 for IT (L=3, T=1, P=0)

Fabrication, characteristics, equivalent circuits and biasing of BJT, JFET and MOSFET. BJT, JFET and MOSFET as amplifiers, their different characteristics and configurations.

Multistage amplifier analysis and their applications. Feedback in amplifiers and their applications. Power amplifiers, various types of amplifiers. Feedback oscillators and relaxation oscillators — analysis and applications.

D.C. Amplifier.

Rectifiers, filters and regulators. Operational amplifier biasing and applications.

Analog IC's.

Digital Signal Processing ECE-421 (for CSE) (L=3, T=0, P=0)

- Introduction: reasons behind digital processing of signals, brief historical development, organization of the course.
- Theory of discrete time linear system — sequences, linear time invariant systems, causality, stability, difference equations, frequency response, discrete Fourier series, relation between continuous and discrete systems.
- Z – transform — definition, properties of Z transform, system function, digital filter implementation from the system function, region of convergence in the Z plane, determining filter coefficients from the singularity locations, geometric evolution of Z transform in the Z plane, relationship between Fourier transform and Z transform, inverse Z transform.
- Digital filter structures: system describing equations, filter categories, direct form I and II structures, cascade and parallel communication of second order systems, linear phase FIR filter structures, frequency sampling structure for the FIR filter.
- IIR filter design techniques: Analog low pass filter design techniques, methods to convert analog filters into digital filters, frequency transformation for converting low pass filters into other types, all-pass filters for phase response compensation.

- FIR filter design techniques: Windowing method for designing FIR filters, DFT method for approximating the desired unit sample response, combining DFT and window method for designing FIR filter, frequency sampling method for designing FIR filter.
- Transform technique: Fourier transform, its properties, inverse Fourier transform, discrete Fourier transform, properties of DFT, circular convolution, computations for evaluating the DFT, decimation in time and decimation in frequency FFT algorithms, discrete Hilbert transform.
- Finite precision effects: Quantisation error in A to D conversion, expressing coefficients in finite precision, effects of finite precision arithmetic on digital filters.
- Realisation of digital signal processing to speech and radar.

Analog Electronics Circuits: ECE-422 (for EE) (L=3, T=0, P=0)

BJT, FET characteristics and biasing. BJT and FET equivalent circuit and parameters. BJT as single stage and multi stage amplifier — their characteristics and applications. Various types of amplifiers such as power amplifier, tuned amplifier. JFET and MOSFET as amplifier — their special features.

BJT and FET in various oscillator circuits such as R-C and L-C oscillators, crystal oscillator. Rectifier, filter and voltage regulators.

Operational amplifier biasing, characteristics and applications.

Fundamentals of fabrication of BJT, FET and integrated circuits.

Communication Engineering: ECE-521 (For CSE)(L=3, T=1, P=0)

- Introduction: General definition of an Electronic Communication System. Signals: Analog & Digital signals, various classification of signals.
- Fourier Series & Fourier Transform: Application of Fourier Series & Fourier Transform, properties of Fourier transform, Discrete & Continuous spectrum.
- Modulation: Classification of Modulation, definition of different types of modulation, Modulation benefits etc.
- Different types of continuous modulation system: AM, DSB, SSB, VSB, PM & FM systems.
- Sampling theorem & significance of sampling theorem. Various Pulse modulation systems: PAM, PWM & PPM systems.

- Noise parameters — noise equivalent temperature, noise equivalent bandwidth, noise figure and noise equivalent resistance. Noise parameters of a cascaded system.
- Effect of noise on different CW modulation system and signal to noise ratio.
- Multiplexing: Frequency division Multiplexing (FDM) & Time division Multiplexing. FDM & TDM Transmitter & Receiver.
- Digital Modulation Systems: General block diagram of Digital modulation systems. Basic principle of PCM, DM, ADM & DPCM systems. Basic principle of different digital carrier Modulation systems — coherent/noncoherent ASK, FSK and PSK system. Advantages of Digital Modulation systems. Probability of Error & “ Rate 1/M Code”.
- Signaling Methods: Various signaling Techniques.
- Basics of Information Theory: Definition of Information, Communication Entropy & Entropy rate. Redundancy, Channel capacity & Channel capacity theorem. Hartley Shannon law & Shannon bound.
- Coding Techniques: Huffman Coding, Shannon Fano Coding and linear block code.)
- Brief outline of Computer Networking — definition of a computer network, type of computer network, physical & logical topology. Transmission modes, transmission types & transmission media. Switching techniques — circuit switching, message switching and packet switching. Various network services. Radio paging systems.

Pulse & Digital Circuits: ECE-522 (for EE) (L=3, T=1, P=0)

- Introduction: Digital circuit, Definition of Analog & Digital information. Characteristics of Digital Circuits. Advantages of Digital systems.
- Boolean algebra, Demorgans theorem, simplification by Boolean algebra.
- Number system, range extension of number, overflow, arithmetic shifting rules of numbers.
- Minimization of logical function i) by Karnaugh Map method. ii) by Quine Mccluskey Method.
- Combinational Circuits: Realisation of different logic gates, Multiplexer, Demultiplexer, Decoder, Encoder, decoder driver, designing using these combinational circuits and their applications. Digital Arithmetic: Half Adder/Half Subtractor and Full adder/Full Subtractor Circuit. Realization of these circuits using logic gates or by using Multiplexers. Different methods of binary multiplication and Division, their Algorithm and realization of Multiplication and Division by hardware. BCD addition and subtraction by using 8421 code and excess-3 code and their hardware circuits.
- Sequential Circuits: Flip-flops, counters, registers, shift registers and sequence generator - their definition, construction, designing and applications.
- A/D & D/A Converter: Different types of D/A & A/D Converters.

- Multivibrator: Definition of different types of Multivibrator, their realization by logic gates, op-amp and transistors. 555 Timer IC and Schmitt Trigger circuit and their applications.
- Error Detection and Correction Codes — parity checking, block parity error detection/correction code, Hamming code, CRC etc.
- Different Codes: Gray code, ASCII code and Different BCD codes, their realization and applications.
- Display Devices: principle, realisation and applications of LED (Light Emitting Diode) & LCD (Liquid Crystal Display) Device.
- Memory Devices: Different types of Memory, Classification of Memory, Organization of Memory, R/W, ROM & EPROM Memory chips, Memory decoding. Bit & Byte organized Memory, Static and Dynamic Memory, Mos Ram etc.
- Logic Characteristics: Different Logic characteristics such as FAN OUT, FAN IN, PROPAGATION DELAY, POWER DISSIPATION, SPEED POWER PRODUCT, etc. Different logic families such as RTL, DCTL, DTL, HTL, TTL, ECL, MOS & CMOS logic family their importance and applications.
- Special Devices/IC's: Programming Logic Array (PLA), Charge Couple Device (CCD), Arithmetic and Logic Unit (ALU 74181 chip), 4 bit Digital Comparator (7485 chip), Eight bit Parity Generator and Checker Device (74180 chip).
- Linear wave Shaping: Study of RC LPF & HPF for different input signals.
- Non-Linear Wave Shaping: Different Clipping and Clamping Circuits.
- Time Base Waveform Generation: Different Methods of generating Time base waveform i.e. generation of sawtooth waveform.

Electronic Communication Engineering : ECE -621 (For EE)(L=3, T=0, P=0)

- Introduction : General definition of an Electronic Communication System.
- Signals: Analog & Digital signals, various classification of signals.
- Fourier Series & Fourier Transform: Application of Fourier Series & Fourier Transform, properties of Fourier transform, Discrete & Continuous spectrum.
- Modulation: Classification of Modulation, definition of different types of modulation, Modulation benefits etc. Different types of continuous modulation system: AM, DSB, SSB, VSB, PM & FM systems.
- Sampling theorem & significance of sampling theorem. Various Pulse modulation systems: PAM, PWM & PPM systems.
- Noise parameters — noise equivalent temperature, noise equivalent bandwidth, noise figure and noise equivalent resistance. Noise parameters of a cascaded system.

- Effect of noise on different CW modulation system and signal to noise ratio.
- Multiplexing: Frequency division Multiplexing (FDM) & Time division Multiplexing. FDM & TDM Transmitter & Receiver.
- Digital Modulation Systems: General block diagram of Digital modulation systems. Basic principle of PCM, DM, ADM & DPCM systems. Basic principle of different digital carrier Modulation systems — coherent/noncoherent ASK, FSK and PSK system. Advantages of Digital Modulation systems. Probability of Error & “ Rate 1/M Code”.
- Signaling Methods: Various signaling Techniques.
- Basics of Information Theory: Definition of Information, Communication Entropy & Entropy rate. Redundancy, Channel capacity & Channel capacity theorem. Hartley Shannon law & Shannon bound.
- Coding Techniques: Huffman Coding, Shannon Fano Coding and linear block code.
- Brief outline of Computer Networking — definition of a computer network, types of computer network, physical & logical topology. Transmission media. Switching techniques — circuit switching, message switching and packet switching. Various network services. Network protocols & Network operating systems. Internet & multimedia. Radio paging systems.