PH-8103

Electronics

L	T	P	C
4	1	0	5

Course Outcomes:

After successful completion of the course, the students should be able to

CO1: understand the basic knowledge about various devices of electronics.

CO2: use appropriate methods to analyze the electronic circuits.

CO3: use an operational amplifier for required application.

CO4: explain the overall function of an electronic circuit.

CO5: explain the basics of electromagnetic wave based communication systems.

CO/PO Mapping
S-strong, M-medium and W-weak indicate the strength of correlation

COs	Programme outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	W	W	W		W		M	S	S	S	S
CO2	S	S	S	M	S	W	M	W	M	W		M
CO3	S	W	M	W	W	S	S	S	S	M	S	S
CO4	S	S	W		W	M	M		M	S	W	W
CO5	M	W	S	W	S		S	M			M	W

PH-8103

L	T	P	C
4	1	0	5

Electronics

UNIT-I

Semiconductor Devices: Introduction, Drift and diffusion of carriers, Generation and recombination of charges, continuity equation, Direct and indirect semiconductors. PN junction, diode equation, barrier width and Capacitance of PN junctions, Varactor, switching diode, Metal-semiconductor junctions; Photodiodes, Light emitting diodes, Semiconductor laser. FET as switch and amplifier, MOSFET, Enhancement and depletion mode, UJT, UJT as relaxation oscillator, IMPATT diode, four layer pnpn devices - diode, SCR, SCS, PUT, diac, triac, Tunnel diode. **15Hrs**

Circuit Analysis-I: Introduction, Network, classification of two terminal circuit elements- Lumped and distributed, linear & nonlinear, bilateral & non-bilateral, passive & active, time invariant & time variant elements, energy sources- dependent and independent; Revisiting the elementary properties of resistance, capacitor and inductor and their frequency response; basics of complex number system, complex impedance, phasor diagram ; Super-position, Thevenin's, Norton and maximum power transfer theorems for dc as well as for steady state ac; Mesh and Node analysis both for dc and steady state ac circuits containing resistor/inductor/capacitor and independent voltage/current sources; Admittance, impedance and hybrid matrices for two port networks and their cascade and parallel combinations. **15Hrs**

UNIT-II

Circuit analysis-II: Introduction, Basics of Laplace transform- step, ramp, impulse, sinusoidal, exponential, elementary operational transform, inverse transform, initial and final value theorem, convolution integral; behavior of resistance, inductor, capacitor in s-domain analysis, concept of complex frequency, s-domain analysis of circuit containing resistor, capacitor/inductor and independent current/voltage sources, response with step, impulse, pulse and sinusoidal functions, logarithms, decibels, Bode plot, Transfer function, Location of poles and zeros of response functions of passive systems, Frequency response. Stability in S-domain and Routh-Hurwitz stability criteria. **15Hrs**

Operational amplifiers: Introduction, basics of an amplifier, op-amp block diagram, characteristics of an ideal and practical op-amp, equivalent circuit, voltage transfer curve, slew rate, inverting, non-inverting, open loop and close loop gain, differential amplifiers, common mode rejection ratio, transfer characteristics, Comparator characteristics, Zero crossing and non-zero crossing detector, integrator and differentiator, Peak detector, summing amplifier, Logarithmic and antilogarithmic amplifiers, inverting and non-inverting Schmitt triggers, mono-stable and a-stable multi-vibrators. Principle of an oscillator–Phase shift oscillator, Wien bridge oscillator, Principle of phase locking, voltage controlled oscillator.

First order piecewise linear circuit, op-amp negative resistance converter, Dynamic route, jump phenomenon and relaxation oscillator, triggering of bi-stable circuits. **10Hrs**

Filters: Introduction to passive filters- classification, first order RC low-pass filter, RC high pass filter, RLC series band-pass and band reject filters.

Introduction to active filters, First order low and high pass filters. Second order Sallen and Key configurations for low and high pass filters. **5Hrs**

Total:60Hrs

Books:

1. Semiconductor Devices Physics and Technology by S.M. Sze(Wiley).
2. Applications of Laplace Transforms by Leonard R. Geis (Prentice Hall, New Jersey).
3. Linear and Nonlinear Circuits by Chua, Desoer and Kuh(Tata Mc Graw).
4. Integrated Electronics by Millman and Halkias(Tata Mc Graw Hill).
5. Electronic devices and Circuit theory by Boylestad and Nashelsky(Preutice Hill).
6. OPAMPS and Linear Integrateed circuits by Ramakant A Gayakwad(Preutice Hill).
7. Electronic Principles by A.P. Malvino(Tata Mc Graw Hill, New Delhi).

C/BOS

7/2/21

Head
Department of Physics
Sant Longowal Inst. of Engg. & Tech.
LONGOWAL (Sangrur)