Common Pool of Generic Electives (GE) Courses
Offered by Department of Electronic Sciences

Category-IV

GENERIC ELECTIVES (GE-1): Fundamentals of Electronics

Credit distribution, Eligibility and Pre-requisites of the Course

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course
		Lecture	Tutorial	Practical/ Practice		
Fundamentals of Electronics ELGE-1A	**4**	**3**	**0**	**1**	**None**	**None**

Learning Objectives

The Learning Objectives of this course are as follows:

- The paper equips the learners about basic circuit knowledge to analyze electric circuits using network theorems.
- Understand diode and it's applications in clipping and clamping circuits, Rectifiers and design regulated power supply using Zener diodes.
- To be able to plot the current voltage characteristics of Diode, Transistors and its different biasing conditions
- Usage of semiconductor devices in designing the circuits.

Learning outcomes

The Learning Outcomes of this course are as follows:

CO1 Study basic circuit concepts in a systematic manner suitable for analysis and design and further analyze the electric circuit using network theorems.
CO2 To understand the different types of semiconductor devices and their characteristics
CO3 Illustrate about working of transistors, transistor-based amplifiers and its biasing.
CO4 Explain the concepts of feedback and oscillations and construct feedback amplifiers

SYLLABUS OF GE-1

UNIT – I Basic Resistive Circuit (12 Hours)

Ohm's Law, resistors in series and parallel combinations. DC voltage sources: ideal and non-ideal cases; DC current sources: ideal and non-ideal cases; Introduction to Kirchhoff's current law, Kirchhoff's voltage law, voltage divider circuit, current divider circuit; source

transformations– voltage source to current source and current source to voltage source, basic problems. Resistive circuits: Thevenin's theorem, Norton theorem, Superposition theorem, Maximum power transfer theorem.

UNIT – II PN-junction diode and its applications (12 Hours)

PN junction, Unbiased PN junction, Forward and Reversed biased condition, IV-characteristics of PN junction diode, types of diodes – Zener diode, photo diode, LED.

Diode circuits and power supplies. Half and full wave rectifiers, Bridge rectifier (qualitative comparison), Regulated power supply using Zener diode, Basic Clipper and Clamper circuits using diodes.

UNIT – III Bipolar Junction Transistors (BJT) and Biasing (12 Hours)

NPN Transistor and basic transistor action, Definition of α, β and γ and their interrelations, leakage currents, Modes of operation, Input and output characteristics of CB, CE and CC Configurations. Transistor biasing, thermal runaway, stability and stability factor, Fixed bias without and with R_E, collector to base bias, voltage divider bias and emitter bias ($+V_{CC}$ and $-V_{EE}$ bias), circuit diagrams and their working.

UNIT – IV BJT Applications (12 Hours)

BJT amplifier (CE), dc and ac load line analysis, Operating point, Concept of feedback, negative and positive feedback, advantages and disadvantages of negative feedback, voltage (series and shunt), current (series and shunt) feedback amplifiers, gain, input and output impedances. Positive feedback and Barkhausen criteria for oscillations.

Practical component (if any) - Fundamentals of Electronic Lab (30 Hours)
(Hardware and Circuit Simulation Software)

Learning outcomes

CO1 Verify the network theorems and operation of typical electrical circuits.
CO2 Study various stages of a zener diode based regulated power supply.
CO3 Understand various biasing concepts, BJT based amplifiers.

1. Study and operation of digital multi-meter, function generator, regulated power supply, CRO, etc.
2. Verification of KVL and KCL.
3. Verification of Superposition theorem.
4. Verification of Thevenin's, Norton's Theorem
5. Verification of Maximum power transfer theorem.
6. To plot the IV-characteristics of a ordinary and Zener diode and LED
7. Study of Half wave and Full Wave Rectifiers
8. Study of Fixed Bias, Voltage divider bias Feedback configuration for transistors.
9. Study of transistor amplifier circuit.

Note: Students shall sincerely work towards completing all the above listed practicals for this course. In any circumstance, the completed number of practicals shall not be less than seven.