Bharatiya Vidya Bhavan

BHAVAN'S VIVEKANANDA COLLEGE
of Science, Humanities and Commerce, Sainikpuri
Autonomous College | Affiliated to Osmania University
Reaccredited with 'A' Grade by NAAC

Syllabus - B Sc I Year Electronics
(w.e.f academic year: 2025-26)
Semester I

Course Name: Semiconductor Devices **Course Code: EL124**(60 Hours)
Hours/Week: 4 **Credits: 4**

Course Objectives: This course aims to -
COB1: familiarize students with the fundamentals of Semiconductor Physics
COB2: make them understand the operation of various semiconductor devices
COB3: train them to apply the devices for common applications.
COB4: provide an understanding of the capabilities and limitations of various semiconductor devices

Unit- I **(15Hrs)**

PN Junction: Basics of semiconductor physics, formation of PN junction, depletion region, junction capacitance, VI characteristics of a PN junction diode, diode equation (no derivation), effect of temperature on reverse saturation current.

Working and characteristics of i) Zener diode, Application of Zener diode as voltage regulator ii) Tunnel diode and iii) Varactor diode.

Unit-II **(15Hrs)**

Bipolar Junction Transistor (BJT): PNP and NPN transistors, current components in BJT, BJT static characteristics (input and output), Early effect, CB, CE, CC configurations of transistor, transistor as an amplifier.

BJT in CE configuration has two port networks, h – parameter model and its hybrid equivalent circuit. Determination of h-parameters from the characteristics; load line analysis (DC and AC), transistor biasing - Fixed, and self-bias, stability factor.

Unit- III **(15Hrs)**

Field Effect Transistor (FET): Construction and working of JFET, drain and transfer characteristics of FET, determination of FET parameters. Application of FET as Voltage Variable Resistor (VVR), advantages of FET over BJT;

MOSFET - Construction and working of enhancement and depletion mode MOSFET, output and transfer characteristics; Application of MOSFET as a switch.

Uni Junction Transistor (UJT): Construction and working of UJT and its characteristics. Application of UJT as relaxation oscillator.

Unit- IV **(15Hrs)**

Silicon Controlled Rectifier (SCR): Construction and working of SCR. Two transistor representation, characteristics of SCR. Application of SCR as power controller.

Photo electronic Devices: Construction and Characteristics of Light Dependent Resistor (LDR), Photovoltaic Cell, Photo diode, Photo transistor and Light Emitting Diode (LED).

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Course Outcomes: By the end of the course, the students will be able to -

CO1: Study and analyze the behavior of diodes and transistors.
CO2: Design applications of diodes and transistors.
CO3: Use FET and UJT in simple applications.
CO4: Study the applications of SCR and photonic devices.

Books Recommended:

1. B Sc First Year ELECTRONICS - Telugu Akademi
2. Electronic Devices and Circuits - Jacob Millman and Christos C Halkias (TMH)
3. Basic Electronics and Linear Circuits - Bharghava, Kulsreshta, Gupta (TMH)
4. Principles of Electronics - V.K.Mehta & Rohit Mehta
5. Electronic Devices and Circuits - Allen Mottershed (PHI)
6. Electrical Technology Vol. I and II, B L Theraja, A K Theraja, S. Chand

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Semester I

Course Name: Semiconductor Devices Lab **Course Code: EL124P**

Hours/Week: 2 **Credits: 1**

Course Objectives: This course aims to –
COB1: understand operation of semiconductor devices.
COB2: verify the theoretical concepts through laboratory and simulation experiments.

List of experiments:

1. V-I characteristics of a Junction diode and determination of cut-in voltage, forward and reverse resistances.
2. Zener diode a) VI Characteristics – Determination of Zener breakdown voltage.
   b) Voltage regulator (line and load) using Zener diode.
3. BJT-input and output characteristics (CE configuration) and determination of 'h' parameters.
4. Drain and transfer characteristics of FET-determination of FET parameters.
5. UJT characteristics-determination of intrinsic stand-off ratio 'η'.
6. UJT as relaxation oscillator.
7. V-I Characteristics of LDR/Photo diode/Photo transistor/Solar cell.
8. Simulation: i. Diode (PN junction diode and zener diode) characteristics
   ii. Study of transistor I/P characteristics.
   iii. Study of transistor O/P characteristics.
   iv. FET-Characteristics

Note: Student has to perform minimum of SIX experiments.

Course Outcomes: Upon successful completion of this course student will be able to -
CO1: Understand the current voltage characteristics of semiconductor devices.
CO2: Design applications using diodes and transistors.

Reference Books:

1. Lab manual for Electronic Devices and Circuits - 4th Edition by David A Bell - PHI
2. Experiments in Electronics by S V Subramaniyam - Mac Millan India Limited
3. Basic Electronics - A Text lab manual by Zbar, Malvino, Miller.

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Semester II

Course Name: Circuit Analysis **Course Code: EL224**(60 Hours)
Hours/Week: 4 **Credits: 4**

Course Objectives: *This course aims to,*
COB1: develop an understanding of the basic circuit laws and elements of electric circuits
COB2: introduce the basic concepts of DC and AC circuit behavior
COB3: make the students proficient in analyzing any given electrical network by applying basic circuit laws and network theorems.
COB4: become familiar with the working principle of CRO and its operation

Unit - I **(15Hrs)**

AC Fundamentals: Periodic waveforms, sine wave – average and RMS values; the j-operator, polar and rectangular forms of complex numbers, phasor diagram; complex impedance and admittance.

Kirchhoff's Current and Voltage Laws: Concept of voltage and current sources - KVL and KCL- application to simple circuits consisting of resistors and sources – Node voltage analysis and Mesh analysis.

Unit-II **(15Hrs)**

Network Theorems: Statement and explanation of theorems - superposition theorem, Thevenin's theorem, Norton's theorem, maximum power transfer theorem - application to simple networks (DC and AC).

Reciprocity Theorem, Millman's Theorem, application to simple networks. T and π networks, conversions between them.

Unit-III **(15Hrs)**

RC and RL Circuits:

Transient response of RC and RL circuits with step input, time constant.

Frequency response of RC and RL circuits, types of filters – low pass filter and high pass filter, differentiating and integrating circuits.

Unit-IV **(15Hrs)**

Resonance: RLC circuit - series and parallel resonance – resonant frequency – Q Factor-Bandwidth - Selectivity.

Cathode Ray Oscilloscope: CRO block diagram, Cathode Ray Tube (CRT) and its working, Electron gun focusing, deflection sensitivity, fluorescent screen, measurement of amplitude, time period, frequency and phase(Qualitative only).

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Course Outcomes:

By the end of the course, students will be able to-

CO1: Apply the knowledge of basic circuit laws and simplify the network using reduction techniques.

CO2: Analyze the circuits using Kirchhoff's laws and Network theorems.

CO3: Analyze the transient and frequency response of circuits containing RC, RL and RLC.

CO4: Understand the working of the most commonly used equipment CRO and use it for measurement of electrical quantities.

Recommended Books:

1. B Sc I Year Electronics – Telugu Akademi.
2. Grob's Basic Electronics – Mitchel E Schultz, Tata McGraw Hill.
3. Electric Circuits – Mahmood Nahvi and Joseph Edminister, Schaum's outlines 5th Ed. McGraw Hill Education (India) Pvt. Limited.
4. Engineering Circuit Analysis - William H. Hayt, Jack E. Kemmerly, Steven M. Durbin.
5. Applied Electronics - R S Sedha - S. Chand Publications.
6. Circuit Analysis - P. Gnanasivam - Pearson Education.
7. Circuit and Networks - A. Sudhakar & S. Pillai - TMH

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Semester II

Course Name: Circuit Analysis Lab **Course Code: EL224P**

Hours/Week: 2 **Credits: 1**

Course Objectives: This course aims to-

COB 1: Introduce the fundamental concepts of ac and dc signals

COB 2: Learn different theorems for simplification of basic linear electronic circuits

List of experiments:

1. Familiarization of CRO - measurement of amplitude, time period, frequency and phase angle.
2. Verification of KCL and KVL.
3. Verification of Thevenin's and Norton's theorems.
4. Verification of maximum power transfer theorem.
5. RC circuits – Frequency response (Low pass and High pass filters).
6. RC circuits – differentiation and integration – tracing of waveforms.
7. LCR – Series resonance circuit – frequency response – Determination of f_o, Q and bandwidth.
8. Simulation:
   i) Verification of KVL and KCL.
   ii) Transient response of RC and RL circuits
   iii) Frequency response of RC and RL circuits
   iv) Frequency response of RLC circuits (series and parallel).

Note: Student must perform minimum of SIX experiments. Experiment no. 8 is compulsory.

Course Outcomes: Upon successful completion of this course, the students will be able to -

CO1: *Understand proportional relationship between a signal and a voltage or current that represents the signal.*

CO2: *Apply concepts of electric network topology, nodes, branches, loops to solve circuit problems including the use of computer simulation.*

Reference Books:

1. Basic Electronics – A Text Lab Manual - Zbar, Malvino, Miller.
2. Lab manual for Electronic Devices and Circuits, 4th Edition - David A Bell – PHI

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