



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: 2026-27)

Semester I

Course Name: Semiconductor Devices

Course Code: EL124(60 Hours)

Hours/Week: 4

Credits: 4

Course Objectives: This course aims to -

- 1: Familiarize students with the fundamentals of Semiconductor Physics
- 2: Make them understand the operation of various semiconductor devices
- 3: Train them to apply the devices for common applications
- 4: Provide an understanding of the capabilities and limitations of various semiconductor devices
- 5: Develop the ability to analyze characteristics of semiconductor devices
- 6: Provide exposure to modern trends and advancements in 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; two-port network representation, h-parameter model and its hybrid equivalent circuit; determination of h-parameters from characteristics; load line analysis (DC and AC); transistor biasing—fixed bias 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;

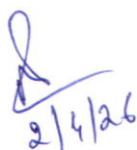
MOSFET: Construction, working, and characteristics (output and transfer) of enhancement-mode and depletion-mode MOSFETs; basic concept of CMOS; application of MOSFET as a switch.

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, working, and V-I characteristics; two-transistor representation; applications of SCR as a power controller.


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Photoelectronic Devices: Construction and characteristics of Light Dependent Resistor (LDR), Photodiode, Phototransistor, Photovoltaic Cell, and Light Emitting Diode (LED).

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

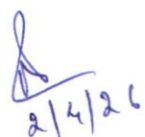
- EL124.CO1: Explain the fundamentals of semiconductor physics*
EL124.CO2: Describe the operation of semiconductor devices
EL124.CO3: Apply semiconductor devices in basic electronic circuits
EL124.CO4: Analyze the performance and limitations of semiconductor devices
EL124.CO5: Evaluate device characteristics using graphical and numerical methods
EL124.CO6: Identify modern semiconductor devices and their applications

Books Recommended:

1. B Sc First Year ELECTRONICS - Telugu Akademi
2. Electronic Devices and Circuits - Jacob Millman and Christos C Halkias - TMH
3. Electronic Devices and Circuit Theory - Robert L. Boylestad, Louis Nashelsky - Pearson
4. Electronic Devices and Circuits - Allen Mottershed - PHI
5. Grob's Basic Electronics – Mitchel E Schultz - Tata McGraw Hill.
6. Electrical Technology Vol. I and II - B L Theraja, A K Theraja - S. Chand.
7. Basic Electronics and Linear Circuits - Bharghava, Kulsreshta, Gupta - TMH.
8. Principles of Electronics - V. K. Mehta, Rohit Mehta - S. Chand.

CO - PO Mapping Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	1	2	1					
CO2	3	3	2	2	2				1	1
CO3	3	3	2	3	2				1	1
CO4	3	2	2	2	2				1	
CO5	3	2	2	2	2	1	1			
CO6	3	3	3	3	2	1	1	1	2	2
Score	3.0	2.5	2.0	2.3	1.8	1.0	1.0	1.0	1.3	1.3


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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 –

- 1: *understand the operation of semiconductor devices.*
- 2: *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: Students have to perform a minimum of SIX experiments.

Course Outcomes: Upon successful completion of this course student will be able to -

EL124P.CO1: Understand the current voltage characteristics of semiconductor devices.

EL124P.CO2: Design applications using diodes and transistors.

Reference Books:

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

CO - PO Mapping Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3		2	1	1	1	1
CO2	3	3	3	3	1	2	1	1	1	1
SCORE	3	3	3	3	1	2	1	1	1	1


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Semester II

Course Name: Circuit Analysis
Hours/Week: 4

Course Code: EL224(60 Hours)
Credits: 4

Course Objectives: This course aims to -

- 1: Develop an understanding of the basic circuit laws and elements of electric circuits
- 2: Introduce the basic concepts of DC and AC circuit behavior
- 3: Make the students proficient in analyzing any given electrical network by applying basic circuit laws and network theorems
- 4: Become familiar with the working principle of CRO and its operation
- 5: Develop the ability to analyze transient and steady-state response of electrical circuits
- 6: Develop problem-solving skills in electrical circuit analysis

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 and Frequency Response of RC and RL Circuits: Analysis of transient response for step input and time constant; frequency and phase response of RC and RL circuits; low-pass and high-pass filters; differentiating and integrating circuits.

Unit-IV

(15Hrs)

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


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Oscilloscope: Block diagram of CRO; Cathode Ray Tube (CRT)—construction and working, including electron gun, focusing, deflection sensitivity (qualitative only), and fluorescent screen; measurement of amplitude, time period, frequency, and phase ; working of Digital Storage Oscilloscope (DSO).

Course Outcomes:

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

EL224.CO1: Apply the knowledge of basic circuit laws and simplify the network using reduction techniques

EL224.CO2: Analyze the circuits using Kirchhoff's laws and network theorems

EL224.CO3: Analyze the transient and frequency response of circuits containing RC, RL and RLC

EL224.CO4: Understand the working of the most commonly used equipment CRO and use it for measurement of electrical quantities

EL224.CO5: Evaluate circuit performance under different operating conditions

EL224.CO6: Develop solutions for electrical circuits using appropriate techniques

Recommended Books:

1. B Sc I Year Electronics – Telugu Akademi.
2. Engineering Circuit Analysis - William H. Hayt, Jack E. Kemmerly, Steven M. Durbin.
3. Electric Circuits – Mahmood Nahvi and Joseph Edminister, Schaum's outlines 5th Ed. McGraw Hill Education (India) Pvt. Limited.
4. Grob's Basic Electronics – Mitchel E Schultz, Tata McGraw Hill.
5. Network Analysis by M. E. Van Valkenburg - Prentice-Hall, 2nd Edition
6. Applied Electronics - R S Sedha - S. Chand Publications.
7. Circuit Analysis - P. Gnanasivam - Pearson Education.
8. Electrical Circuit Theory and Network Analysis - Nilkanta Datta - Books and Allied (P) Ltd.
9. Circuit and Networks - A. Sudhakar & S. Pillai - TMH
10. Electrical Technology - B. L. Theraja and A. K. Theraja - S. Chand Publishing.

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CO3	3	3	2	2	2	2	1	1	1	2
CO4	3	3	2	2	2	2	1	1	1	2
CO5	3	3	2	2	2	2	1	1	1	2
CO6	2	2	1	3	3	1	1	1	2	3
Score	2.8	2.7	1.7	2.0	2.2	1.5	1.0	1.0	1.2	2.2


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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-

- 1: Introduce the fundamental concepts of ac and dc signals
- 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: Students must perform a minimum of SIX experiments. Experiment no. 8 is compulsory.

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

EL224P.CO1: Understand proportional relationship between a signal and a voltage or current that represents the signal.

EL224P.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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CO2	3	3	3	3	2	3	3	2	3	2
SCORE	3.0	3.0	3.0	3.0	2.0	3.0	3.0	2.0	3.0	2.0


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