



## Department of Electrical and Electronics Engineering

### Scheme of Examination and Syllabus for Under Graduate Programme

Under Multiple Entry and Exit, Internship and  
CBCS-LOCF as per NEP-2020  
w.e.f. session 2024-25 (in phased manner)

### Subject: Electronics



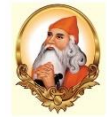
**Guru Jambheshwar University of Science & Technology Hisar-  
125001, Haryana**

**(A+ NAAC Accredited State Govt. University)**



# Guru Jambheshwar University of Science and Technology

Hisar-125001, Haryana



(‘A+’ NAAC Accredited State Govt. University)

Scheme of Examination and Syllabus for Under Graduate Programme w.e.f. session 2024-25  
For affiliated Degree Colleges according to National Education Policy-2020

## Subject: Electronics

### FIRST YEAR

SEMESTER-I								
	Course Code	Nomenclature of Paper/Course	Credits	Contact Hours	Internal Marks	External Marks	Total Marks	Duration of Exam (Hrs)
Discipline Specific Course	C24ELE101T	Network Analysis	3	3	20	50	70	2.5
	C24ELE101P	Network Analysis Lab	1	2	10	20	30	2
Minor Course/ Vocational Course	C24MIC132T	Electronic Components	2	2	15	35	50	2
Multidisciplinary Course	C24MDC111T	Electronics in Daily Life	3	3	25	50	75	2.5
Skill Enhancement Course	C24SEC132T	Linear Integrated Circuit Applications	3	3	25	50	75	2.5

### SEMESTER-II

Type of Course	Course Code	Nomenclature of Paper/Course	Credits	Contact Hours	Internal Marks	External Marks	Total Marks	Duration of Exam (Hrs)
Discipline Specific Course	C24ELE201T	Electronic Devices and Basic Digital Electronics	3	3	20	50	70	2.5
	C24ELE201P	Electronic Devices and Basic Digital Electronics Lab	1	2	10	20	30	2
Minor Course/ Vocational Course	C24MIC232T	Understanding of Computer Systems	2	2	15	35	50	2
Multidisciplinary Course	C24MDC211T	Basic Analog Electronics	3	3	25	50	75	2.5
Skill Enhancement Course	C24SEC232T	PCB Fundamentals	3	3	25	50	75	2.5

## **Programme Outcomes**

- PO1** To demonstrate, solve and have an understanding of major fundamentals concepts in the discipline of electronic science.
- PO2** To solve the problems by thinking methodically, strategically, independently and draw a logical conclusion
- PO3** To use of modern experimental techniques and scientific equipment's.
- PO4** To perform job in different fields like education, research, industries, civil service, survey, banking, business, public service etc.
- PO5** To build a foundation of various fields in science and technology. The course comprises of the study of major discipline specific courses, minor courses, skill enhancement courses and value added courses.

**Electronics**  
**Network Analysis (Semester-I)**  
**Discipline Specific Course (DSC)**

**Paper Code: C24ELE101T**  
**45 Hrs (3 Hrs /Week)**  
**Credits: 3**  
**Exam. Time: 2.5 Hrs**

**External Marks : 50**  
**Internal Marks : 20**  
**Total Marks: 70**

**Note:** The maximum time duration for attempting the paper will be of 2.5 hours. The examiner is required to set seven questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 2.5 marks each. In addition to that six more questions will be set, two questions from each unit. The students shall be required to attempt four questions in all selecting one question from each unit in addition to compulsory Question No. 1. All questions shall carry equal marks i.e. 12.5 marks.

**Unit-I**

**Network Theorems-I:-** Kirchhoff's Voltage law, Kirchhoff's current law, Mesh Analysis, Nodal Analysis, Star-Delta transformation, Superposition theorem

**Unit-II**

**Network Theorems-II:-** Thevenin's Theorem, Norton's Theorem, Reciprocity Theorem, Maximum Power Transfer Theorem.

**Unit-III**

**Two-port Network-I:-** Open Circuit Impedance(Z) Parameters, Short Circuit Admittance (Y) Parameters, Transmission (ABCD) Parameters, Inverse Transmission (A'B'C'D') Parameters

**Two-port Network-II:-** Conversion of Parameters, Dependent sources, Inter Connection of Two – Port Networks, T and  $\pi$  Representation, Terminated Two-Port Networks, Lattice Networks

**Network Analysis Lab**

**Paper Code: C24ELE101P**  
**30 Hrs (2 Hrs /Week)**  
**Credits: 1**  
**Exam. Time: 2 Hrs**

**External Marks: 20**  
**Internal Marks: 10**  
**Total Marks: 30**

**Note:** A candidate is required to perform minimum 6 experiments out of the list provided during course of study in this semester.

1. To verify maximum power transfer theorem for DC network.
2. To study the application of Superposition theorem.
3. To study the application of Thevenin theorem.
4. To study the application of Norton theorem.
5. To calculate 'Z' parameters of two-port network.
6. To determine 'Y' parameters of two-port network.
7. To calculate 'ABCD' parameters of two-port network.
8. To determine the A'B'C'D' parameters of the cascade connection of two-port network.
9. To determine the equivalent parameters of series connection of two port network.
10. To determine the equivalent parameters of parallel connection of two port network.

**Recommended Books/e-resources/LMS:**

1. Circuits and Networks by A. Sudhakar, Shyammohan
2. Network Analysis, Publication Khanna by G.K. Mithal
3. Network Analysis, Publication Pearson India by M.E. Van Valkenburg

**Course Outcomes**

After completing this course, the learner will be able to:

1. Define & describe the terminology and fundamental principles related to electric networks, their representation and synthesis.
2. Understand & explain various theorems and methods/techniques for analysis and synthesis of electric networks.
3. Apply Network Theorems to solve and synthesize various electric networks.
4. Design basic electric networks for a given / desirable set of network parameters.

**Mapping of COs with POs:**

Outcomes	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	S	M
CO2	S	S	M	S	M
CO3	S	M	M	M	S
CO4	S	S	M	M	S

S=Strong, M=Medium, W=Weak

**Electronics**  
**Electronic Components (Semester-I)**  
**Minor Course (MIC)**

**Paper Code: C24MIC132T**  
**30 Hrs (2 Hrs /Week)**  
**Credits: 2**  
**Exam. Time: 2 Hrs**

**External Marks : 35**  
**Internal Marks : 15**  
**Total Marks: 50**

**Note:** The examiner is required to set five questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 3 marks each. In addition to this, four more questions (each question may be of 2-3 parts) will be set consisting of two questions from each unit. The student/candidate is required to attempt three questions in all selecting one from each unit in consisting of 10 marks in addition to the compulsory Question No.1.

**Unit-I**

**Passive Components:** Resistors, Capacitors, Inductors, Transformers, Fuses (their types & applications).

**Junction Diodes:** Rectifying diode, Forward and reverse bias characteristics, Varactor Diode, Light Emitting Diode, Photo diode and Photo transistors (qualitative only).

**Rectifiers:** Half wave, Full wave, Bridge, Clipping and Clamping circuits.

**Zener diode:** Zener diode as voltage regulator.

**Unit-II**

**Bipolar Junction Transistor:** Basic working principle, Input and Output Characteristics of CB & CE configurations. Transistor as an amplifier, Transistor as a switch.

**Sinusoidal Circuit Analysis:** Resonance in Series and Parallel RLC Circuits, Frequency Response of Series and Parallel RLC Circuits, Quality (Q) Factor and Bandwidth.

**Recommended Books/e-resources/LMS:**

1. Integrated Electronics by Millman and Halkias.
2. Basic Electronics and Linear Circuits by NN Bhargava, DC Kulshreshtha (TTTI)
3. Electronics Devices and Circuit by Allen Mottershead
4. Basic Electronics SOLID STATE by B L Theraja

**Course Outcomes**

After completing this course, the learner will be able to:

1. Learn about active, Passive components and junction diode's
2. Understand the applications of junction diode and Zener diode
3. Understand the Concept of Bipolar Junction Transistor
4. Understand various R, L and C circuits

**Mapping of COs with POs:**

Outcomes	PO1	PO2	PO3	PO4	PO5
CO1	S	M	M	S	M
CO2	S	M	M	S	M
CO3	S	S	M	M	M
CO4	S	S	S	M	M

S=Strong, M=Medium, W=Weak

**Electronics**  
**Electronics in Daily Life (Semester I)**  
**Multi-Disciplinary Course (MDC)**

**Course Code: C24MDC111T**  
**45 Hrs. (3Hrs./Week)**  
**Credit : 3**  
**Exam Time: 2.5 Hrs.**

**External Marks :50**  
**Internal Marks :25**  
**Total Marks: 75**

**Note:** The maximum time duration for attempting the paper will be of 2.5 hours. The examiner is required to set seven questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 2.5 marks each. In addition to that six more questions will be set, two questions from each unit. The students shall be required to attempt four questions in all selecting one question from each unit in addition to compulsory Question No. 1. All questions shall carry equal marks i.e. 12.5 marks.

**Unit-I**

**Introduction to basic Electronics components and Devices:** Resistor, Color code, Inductor, Capacitor, basic Potentiometer circuit, Multiple range Potentiometer  
Classification of Instruments, Digital Mode of operations, Basics of CRO, Multimeter

**Unit-II**

AC - DC Voltage, Domestic Electric supply, Transformer, Power consumption, wire, electric tester, clamp meter, Fuse, circuit breaker, Electric consumption meter reading, Soldering techniques, LED.

**Unit-III**

Home Appliances: Inverters and UPS, Switch Mode Power Supply, washing Machine , Electric Iron, Microwave Oven, Measurement of Earth Resistance: Necessity of Earth Electrode, Necessity of measurement of Earth Electrode, Methods of measuring Earth Resistance

**Recommended Books/e-resources/LMS:**

1. A course in Electrical and Electronic Measurements and Instrumentation by A K Sawhney.
2. Electronics Instrumentation and Measurement Techniques by W D Cooper
3. Handbook of Repair and Maintenance of Domestic Electronics Appliances, Shashi Bhushan Sinha, BPB Publications
4. Getting Down to Earth: A practical guide to earth resistance testing, Megger

**Course Outcomes:** After completing this course, the learner will be able to:

1. Understand about various electronic components
2. Learn about the use of AC and DC voltages and transformers etc
3. Understand the concept of various home appliances.
4. Learn the concept and importance of earthing

**Mapping of COs with POs:**

Outcomes	PO1	PO2	PO3	PO4	PO5
CO1	S	M	M	M	S
CO2	S	M	S	M	S
CO3	M	M	S	S	S
CO4	M	S	S	S	S

S=Strong, M=Medium, W=Weak

**Electronics**  
**Linear Integrated Circuit Applications (Semester I)**  
**Skill Enhancement Course (SEC)**

**Course Code: C24SEC132T**  
**45 Hrs. (3 Hrs./Week)**  
**Credit : 3**  
**Exam Time: 2.5Hrs.**

**External Marks :50**  
**Internal Marks :25**  
**Total Marks: 75**

**Note:** The maximum time duration for attempting the paper will be of 2.5 hours. The examiner is required to set seven questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 2.5 marks each. In addition to that six more questions will be set, two questions from each unit. The students shall be required to attempt four questions in all selecting one question from each unit in addition to compulsory Question No. 1. All questions shall carry equal marks i.e. 12.5 marks.

**Unit-I**

**Operational Amplifier- I:** Differential Amplifier, differential gain, Common mode gain, CMRR, Ideal Operational amplifier, Voltage follower, Op-amp as Inverting Amplifier, Non-inverting amplifier.

**Unit-II**

**Operational Amplifier- II:** Practical Op-Amp: Input Offset Voltages, input bias Current, input offset current, thermal drift, summing amplifier, subtractor, Integrator, Differentiator circuit

**Unit-III**

**Op-amp filter circuits:** Low-pass, high-pass and band-pass Butterworth filters.

**Applications of Operational Amplifiers:** Scale Changer, Voltage Follower, V-to-I and I-to-V converters, Instrumentation amplifier, Comparators, Schmitt trigger, peak detector, clipper and clamper

**Recommended Books/e-resources/LMS:**

1. Basic Electronics Solid state by B.L. Theraja.
2. Opamp and linear circuits by Ramakant A Gayakward.
3. Electronics for Scientist & Engineers by Vishvanathan & Mehta.

**Course Outcomes**

After completing this course, the learner will be able to:

1. Understand the concept and working of operational amplifier.
2. Understand the op-amp parameters and its applications
3. Learn about various filter circuits
4. Understand the concept of comparators and Schmitt triggers

**Mapping of COs with POs:**

Outcomes	PO1	PO2	PO3	PO4	PO5
CO1	M	S	M	S	M
CO2	M	S	M	S	M
CO3	S	M	M	S	M
CO4	S	M	S	M	M

S=Strong, M=Medium, W=Weak



**Electronics**  
**Electronic Devices and Basic Digital Electronics (Semester-II)**  
**Discipline Specific Course (DSC)**

**Paper Code: C24ELE201T**

**45 Hrs (3 Hrs /Week)**

**Credits: 3**

**Exam. Time: 2.5 Hrs**

**External Marks : 50**

**Internal Marks : 20**

**Total Marks: 70**

**Note:** The maximum time duration for attempting the paper will be of 2.5 hours. The examiner is required to set seven questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 2.5 marks each. In addition to that six more questions will be set, two questions from each unit. The students shall be required to attempt four questions in all selecting one question from each unit in addition to compulsory Question No. 1. All questions shall carry equal marks i.e. 12.5 marks.

**Unit-I**

**Transistor Biasing Techniques:-** Why Bias a Transistor, Selection of Operating Point, need for Bias Stabilization, Requirement of a Biasing Circuit, Different Biasing Circuits: Bias Circuit with Emitter Resistor, Voltage Divider Biasing Circuit, Gain of a multi-stage amplifier.

**Unit-II**

**Field Effect Transistor:** - Junctions Field Effect Transistor, Qualitative Description of JFET, Drain and transfer characteristics of JFET, FET small signal low frequency model, MOSFET -Depletion and enhancement and their drain & transfer characteristics, CMOS (Basic idea).

**Unit-III**

**Number Systems:** - Binary, Octal, Hexadecimal number system and base conversions, Binary Arithmetic operations, 1's and 2's complement representation, Binary codes-BCD, Gray, Error detecting and correcting codes, BCD addition, Boolean Algebra, Duality Principle, De Morgan's Law, Simplification of Boolean Identities, Standard SOP & POS Forms, Simplification using K-map (upto 3 variables), don't care condition

**Logic Gates:** Positive and Negative logic level, Logic Gates: AND, OR, NOT, XOR, XNOR, NOR, NAND (Definition, Symbols & Truth table).

**Logic families:** Unipolar & Bipolar Logic families, characteristics of Digital IC's (fan in, fan out, propagation delay. Noise Margin), RTL, DTL, TTL, CMOS Logic gate

**Electronic Devices and Basic Digital Electronics Lab**

**Paper Code: C24ELE201P**

**30 Hrs (2 Hrs /Week)**

**Credits: 1**

**Exam. Time: 2 Hrs**

**External Marks: 20**

**Internal Marks: 10**

**Total Marks: 30**

**Note:** A candidate is required to perform minimum 6 experiments out of the list provided during course of study in this semester.

1. Study of fixed bias arrangement for transistors.
2. Study of voltage divider biasing arrangement for transistors.
3. Study of two stage R-C coupled transistor amplifier.
4. Study of JFET characteristics.
5. Study of different type of digital IC's :( functions, pin diagram, block diagram of various Digital ICs etc.).
6. Design of basic logic gates using discrete components.
7. Study of DTL NAND gate.

8. Study of TTL NAND gate.
9. Digital trainer using AND, OR & NOT gates.
10. Digital trainer using NAND gates.

**Recommended Books/e-resources/LMS:**

1. Basic Electronics and Linear Circuits by NN Bhargava, D C Kulshreshtha
2. Integrated Electronics by Millman and Halkias
3. Electronics Devices and Circuit by Allen Mottershead
4. Digital Electronics by R.P. Jain
5. Digital Computer Electronics by Albert Paul Malvino

**Course Outcomes**

After completing this course, the learner will be able to:

1. To describe the basic Biasing Techniques.
2. To understand the basics of Field effect transistors
3. To learn about the number systems, conversions and K-map's
4. To understand the basics of Logic gates and Families

**Mapping of COs with POs:**

Outcomes	PO1	PO2	PO3	PO4	PO5
CO1	S	M	M	M	M
CO2	M	S	M	S	M
CO3	M	S	M	S	S
CO4	M	M	S	S	S

S=Strong, M=Medium, W=Weak

**Electronics**  
**Understanding of Computer Systems (Semester-II)**  
**Minor Course (MIC)**

**Paper Code: C24MIC232T**  
**30 Hrs (2 Hrs /Week)**  
**Credits: 2**  
**Exam. Time: 2 Hrs**

**External Marks : 35**  
**Internal Marks : 15**  
**Total Marks: 50**

**Note:** The examiner is required to set five questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 3 marks each. In addition to this, four more questions (each question may be of 2-3 parts) will be set consisting of two questions from each unit. The student/candidate is required to attempt three questions in all selecting one from each unit in consisting of 10 marks in addition to the compulsory Question No.1.

**Unit-I**

Identification of various parts of Computer/ Laptop, Understanding the computer configuration/Laptop configuration, Power Backup: Inverter, UPS, Dry Battery  
Various Interfacing Cables, connectors and converters for computer, Laptop

**Unit-II**

Printer Scanner Configuration, Projector: Types of Projectors and their Installation, Setting up of Internet Connection: Wired & Wi-fi, Setting Up of a complete ICT solution using Computer/laptop

**Recommended Books/e-resources/LMS:**

1. Computer Fundamentals by Pradeep K. Sinha BPB Publications
2. IBM PC & Clones: Hardware Trouble Shooting and Maintenance by B.Govindarajalu, TataMcGraw Hill
3. PC Upgrade & Repair Bible , Wiley India.
4. PC Systems, Installation and Maintenance, Second Edition by R. P. Beales,
5. PC Upgrade & Repair Black Book by Ron Gilster.
6. Computer Installation and Servicing by D Balasubramanian

**Course Outcomes:** After completing this course, the learner will be able to:

1. Identify the different parts of Computer or Laptop systems.
2. Know about various backup systems and cable connections
3. Learn about different printers
4. Understand the Setting of Internet Connection with computer/Laptop systems

**Mapping of COs with POs:**

<b>Outcomes</b>	PO1	PO2	PO3	PO4	PO5
CO1	S	M	M	S	S
CO2	M	M	M	M	S
CO3	M	M	M	M	M
CO4	M	M	M	M	M

S=Strong, M=Medium, W=Weak

**Electronics**  
**Basic Analog Electronics (Semester II)**  
**Multi-Disciplinary Course (MDC)**

**Course Code: C24MDC211T**  
**45 Hrs. (3Hrs./Week)**  
**Credit : 3**  
**Exam Time: 2.5 Hrs.**

**External Marks :50**  
**Internal Marks :25**  
**Total Marks: 75**

**Note:** The maximum time duration for attempting the paper will be of 2.5 hours. The examiner is required to set seven questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 2.5 marks each. In addition to that six more questions will be set, two questions from each unit. The students shall be required to attempt four questions in all selecting one question from each unit in addition to compulsory Question No. 1. All questions shall carry equal marks i.e. 12.5 marks.

**Unit-I**

**Introduction to Semiconductors:-** Intrinsic and Extrinsic Semiconductors, Energy Band diagram, Drift and Diffusion currents in semiconductors(Basic idea only), Junction diode and its characteristics, Zener diode, Voltage regulation using Zener Diode, Clipping circuit, Clamping Circuit.

**Unit-II**

**Rectifiers:-** HWR, FWR, Bridge FWR, Filter circuits: L,C,LC (Calculation of ripple factor for capacitor filter only), Voltage Multiplier Circuit.

**Unit-III**

**Bipolar Junction Transistor:-** Potential Curves in unbiased and biased transistor, Transistor current components, Static characteristics of CB and CE configuration, active, cutoff and saturation regions, Transistor current gains.

**Transistor Model:-** Transistor as an Amplifier, Ebers-Moll model of transistor, Emitter follower, comparison of transistor amplifier configuration.

**Recommended Books/e-resources/LMS:**

1. Basic Electronics and Linear Circuits by NN Bhargava, D C Kulshreshtha
2. Integrated Electronics by Millman and Halkias
3. Electronics Devices and Circuit by Allen Mottershead

**Course Outcomes:** After completing this course, the learner will be able to:

1. Explain the Physics behind working of Diode and BJT and various applications of Diodes.
2. Understand the concept and working of filter circuits.
3. Understand various transistor configurations.
4. Concept of Ebers-Moll model of transistor.

**Mapping of COs with POs:**

Outcomes	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	M	S
CO2	M	S	M	M	M
CO3	M	M	S	M	M
CO4	S	M	S	M	M

S=Strong, M=Medium, W=Weak

**Electronics**  
**PCB Fundamentals (Semester II)**  
**Skill Enhancement Course (SEC)**

**Course Code: C24SEC232T**  
**45 Hrs. (3 Hrs./Week)**  
**Credit : 3**  
**Exam Time: 2.5Hrs.**

**External Marks :50**  
**Internal Marks :25**  
**Total Marks: 75**

**Note:** The maximum time duration for attempting the paper will be of 2.5 hours. The examiner is required to set seven questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 2.5 marks each. In addition to that six more questions will be set, two questions from each unit. The students shall be required to attempt four questions in all selecting one question from each unit in addition to compulsory Question No. 1. All questions shall carry equal marks i.e. 12.5 marks.

**Unit-I**

**PCB Fundamentals:-** PCB Advantages, components of PCB, Electronic components, IC's, Surface mounted devices (SMD), Classification of PCB - single, double, multilayer and flexible boards, Manufacturing of PCB.

**Unit-II**

**Schematic and layout Design:-** Schematic diagram, Mechanical and Electrical design considerations, Placing and mounting of components, Conductor spacing, heat sinks and package density, Net-list, Tracks, Pads.

**Unit-III**

**Technology of PCB:-** Copper clad laminates, Image transfer, Photo printing, Screen printing, Plating techniques, etching techniques, Lead cutting and soldering techniques.

**PCB Technology:-** Trends, Environmental concepts in PCB industry.

**Recommended Books/e-resources/LMS:**

1. R.S. Khandpur, Printed Circuit Board: Design, Fabrication, Assembly and Testing, Tata McGraw Hill.
2. Walter Boshart, Printed Circuit Boards: Design and Technology, Tata McGraw Hill.

**Course Outcomes**

After completing this course, the learner will be able to:

1. Understand the concept of manufacturing of PCB.
2. Learn the plating & soldering techniques.
3. Understand the Mechanical and Electrical design considerations.

**Mapping of COs with POs:**

Outcomes	PO1	PO2	PO3	PO4	PO5
CO1	M	M	M	M	S
CO2	M	M	S	M	S
CO3	S	M	M	M	S

S=Strong, M=Medium, W=Weak