CBCS Syllabus as per NEP 2020 for F. Y. B.Sc. Electronics (SEM II) (2024 Pattern)

Name of the Programme : B.Sc. Electronics

Programme Code : USEL

Class : F. Y. B. Sc.

Semester : II

Course Type : Skill Enhancement Course (SEC)

Course Code : ELE -154-SEC

Course Title : Circuit Simulator-II

No. of Credits : 02

No. of Teaching Hours : 60

Course Objectives:

1. To develop hands-on skills of students
2. To promote entrepreneurship among the students
3. To enhance technical knowledge
4. To increase employment opportunities of students
5. To develop hands on working experience with reference to Solve, Simulate and Analyses Electrical & Electronics Circuits using TINA.TI. Software.
6. To develop in various Hardware Description Languages, VHDL, Verilog, Verilog A, Verilog AMS and System C and for designing their PCB layouts.
7. TINA Standard includes circuit simulation TINA Design Suite also includes the advanced PCB designer

Course Outcomes:

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

CO1.Create, design and develop problem solving ability
CO2. Understand state of the art, technology and development
CO3. Develop soft skills needed.
CO4. Get knowledge of self-employability.
CO5. Identify Electronic components and understand simulating tool.
CO6. Design Suite also includes the advanced PCB designer.
CO7. TINA Design Suite is a powerful yet affordable software package for analyzing, designing and real time testing of circuits with analog, digital & microcontroller components

List of Practical

- The practical course consists of **15** experiments.
- Any two of the following activities with proper documentation will be considered as equivalent of 4 experiments weightage in term work.

1. Study of TINA Environment
2. Analyzing an RLC Circuit
3. Study of Logic Gates (Verification of Truth tables)
4. De Morgan's Theorem

5. Full Wave Rectifier
6. Half Wave Rectifier
7. Transistor Amplifier
8. Forward Characteristics of Diode
9. Study of Bipolar Junction Transistor as a Switch.
10. PCB Design Using TINA
11. Study of Decimal to BCD/ (Binary) Converter.
12. Study of Half Adder and Full Adder using Logic Gates.
13. Study of BCD to Seven Segment Display using IC 7447.
14. Study of Multiplexer 4:1
15. Study of Demultiplexer 1:4
16. Study of RS, JK and D flip flops using NAND gates

Activity:

- Industrial Visit
- Study Tour
- Field visit
- Designing
- Internet Browsing
- Seminar/Group Discussion

Reference Books:

1. Texa tool and software
2. Tina_V12_Lab_Manual
3. Printed circuit Board – Design & Technology by Walter C. Bosshart, TMH.
4. Printed Circuit Board –Design, Fabrication, Assembly & Testing, R.S. Khandpur, TMH,3rd Edition,2017.
5. Electronic Devices and circuit theory, Robert Boylstead and Louis Nashelsky, PHI, 10th Edition, 2009 Mapping of Program Outcomes with Course Outcomes Weightage: 1=Weak or low relation, 2=Moderate or partial relation, 3=Strong or direct relation

Mapping Table

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
CO1	3					3			3				3
CO2				2		2	2		3	2			
CO3				3			1				2		
CO4			3					2			3		2
CO5			2					3		3			
CO6		2			1							2	
CO7	2	3			2							1	

Justification

PO1: Comprehensive Knowledge and Understanding:

CO1: Developing problem-solving skills involves understanding foundational theories and methodologies, which are essential for comprehensive knowledge in the field.

CO7: Proficiency in using TINA Design Suite for circuit analysis and design demonstrates a thorough understanding of foundational theories and principles in the field.

PO2: Practical, Professional, and Procedural Knowledge:

CO6: Proficiency in using advanced PCB design tools involves applying industry standards and best practices, essential for professional work.

CO7: Using TINA Design Suite for circuit analysis and design demonstrates practical application of professional knowledge and adherence to industry standards.

PO3: Entrepreneurial Mindset and Knowledge:

CO4: Knowledge of self-employability directly contributes to understanding business principles and developing an entrepreneurial mindset.

CO5: Identifying electronic components and using simulation tools can support innovation but is less directly related to business principles and market dynamics.

PO4: Specialized Skills and Competencies:

CO2: Keeping up with the latest technology is essential for maintaining technical proficiency and adapting to new developments.

CO3: Soft skills are crucial for effective communication and leadership, which are essential competencies in any professional field.

PO5: Capacity for Application, Problem-Solving, and Analytical Reasoning:

CO6: Proficiency in using advanced PCB design tools requires analytical reasoning and the ability to apply learned concepts to design solutions.

CO7: Using TINA Design Suite effectively demonstrates the application of analytical reasoning and problem-solving skills in practical, real-world settings.

PO6: Communication Skills and Collaboration:

CO1: While problem-solving is essential, its direct impact on communication and collaboration is secondary. Effective problem-solving can contribute to clearer communication of solutions.

CO2: Understanding current technology aids in communicating technical information clearly, but its primary focus is not on communication or collaboration

PO7: Research-related Skills:

CO2: Keeping up with current technology and developments is crucial for conducting cutting-edge research and understanding the context of research questions.

CO3: Soft skills are important for effective communication of research findings and collaboration in research projects, but they are secondary to technical and inquiry skills.
PO8: Learning How to Learn Skills:

CO4: Knowledge of self-employability can enhance self-directed learning and goal-setting, but it is not the primary focus.

CO5: Learning to identify electronic components and use simulation tools requires self-directed learning and the ability to adapt to new tools and methods.
PO9: Digital and Technological Skills:

CO1: While problem-solving is crucial, its direct link to ICT proficiency and data analysis using software is somewhat indirect.

CO2: Understanding technology and developments directly supports proficiency in using ICT and analyzing data with appropriate software.
PO10: Multicultural Competence, Inclusive Spirit, and Empathy:

CO2: Understanding technology is important but does not directly contribute to multicultural competence or empathy.

CO5: While technical skills are valuable, they do not directly contribute to multicultural competence or empathy.
PO11: Value Inculcation and Environmental Awareness:

CO3: Developing soft skills such as communication, teamwork, and empathy directly supports engagement in multicultural settings and leading diverse teams.

CO4: Knowledge of self-employability is less directly related to multicultural competence and empathy.
PO11: Autonomy, Responsibility, and Accountability:

CO6: Using advanced design tools contributes to project management and independent application of skills.

CO7: Proficiency in TINA Design Suite supports independent analysis and testing of circuits, contributing to project management and accountability.
PO12: Community Engagement and Service:

CO1: Problem-solving skills can be applied in community-engaged services, contributing to societal well-being.

- **CO4:** Knowledge of self-employability is less directly related to community engagement and service.

CBCS Syllabus as per NEP 2020 for F. Y. B.Sc. Electronics (SEM I) (2024 Pattern)

Name of the Programme : B.Sc. Electronics

Programme Code : USEL

Class : F. Y. B.Sc.

Semester : I

Course Type : DSC-I (General) (Theory)

Course Code : ELE -101-GEN

Course Title : Fundamentals of Electronics

No. of Credits : 02

No. of Teaching Hours : 30

Course Objectives:

1. To get familiar with basic electronics components.
2. To understand DC circuit theorems and their use in circuit analysis.
3. To know the AC circuits and related terminologies.
4. To study elementary electronic circuits and applications.
5. To know about different number systems and codes.
6. To understand logic gates and truth tables.
7. To understand Boolean Laws and k map techniques.
8. To understand different arithmetic circuits.

Course Outcomes:

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

CO1. To identify different components and understand the working principles of the electronic devices and their applications.

CO2. Aptitude to apply Logic thinking and Basic Science knowledge for problem solving in various fields of electronics both in industries and research.

CO3. Capacity to identify and implementation of formulate to solve the electronic related issues and analyze the problems in various sub disciplines of electronics.

CO4. To solve problems based on inter-conversion of number systems.

CO5. To reduce expressions using k-map in SOP and POS forms.

CO6. Capacity to identify and implementation of the formulate to solve the arithmetic circuits and analyze the problems in digital electronics

CO7. Capability to understand the working principles of the logical devices and their applications.

Topics and Learning Points

Unit 1: Basics of Analog Electronics : (10L)

Electronics components: Resistors, capacitors, Inductors, Transformer, Switches, Relays, Fuses, Batteries, Cables, Connectors, Color coding of resistors, series and parallel combinations of resistors, capacitors & Inductors, Charging and discharging of a capacitor, Concept of Ideal & Real AC & DC voltage and current source, RC Filters (First order low pass & high pass only)

Unit 2: Network Theorems (5 L)

Ohms law, voltage and current dividers, Kirchhoff's Laws (KCL, KVL), Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Superposition theorem

Unit 3: Number Systems and Digital Electronics: (10 L)

Number Systems, Inter conversions – Decimal to Binary, Octal, Hexadecimal; Binary to Decimal, Octal, Hexadecimal, Octal to Binary, Decimal, Hexadecimal; Hexadecimal to Binary, Octal, Decimal, BCD, Excess-3 and Gray code, Interconversion- Binary to Gray and Gray to Binary, Decimal to BCD, Decimal to Excess-3, Concept of Logic Gates with Pinout diagrams, Boolean Laws, De-Morgan's Theorems, Introduction to k-map, Minimization Techniques using K-map (2, 3 and 4 Variables),

Unit 4: Arithmetical Operations and Arithmetical Circuits: (5 L)

Basic Binary Rules for addition and subtraction, 1's and 2's complement of binary numbers, Half adder, Full adder, Half Subtractor, Parallel Adder, Universal Adder/Subtractor

Reference Books:

1. Basic Electronics: Bernard Grob, McGraw Hill Publication, 8th Revised Edition,2010
2. Circuits and Networks Analysis and Synthesis: Sudhkar and S. P. Shyammohan, Tata McGraw-Hill Publishing Company Limited, 3rd Edition, (2006).
3. Basic Electronics and Linear Circuits: Bhargava N.N., Kulshreshtha D.C., Gupta S.C., Tata McGraw Hill.
4. Digital Electronics : Principles, Devices and Applications - Anil K. Maini (Wiley)
5. Digital Fundamentals - Floyd T.N. and Jain R.P. (Pearson Educations)
6. Digital system Design – M. Morris Mano(Pearson Education)
7. Digital Principles and Applications –Leach, Malvino, Saha (TMH)

Mapping of Program Outcomes with Course Outcomes

Weightage: 1=Weak or low relation, 2=Moderate or partial relation, 3=Strong or direct relation

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
CO1	1	1	2	1	1	3	2	1	-	-	2	3	1
CO2	1	-	1	1	-	2	1	-	2	2	2	1	-
CO3	2	1	3	-	-	-	3	2	2	2	-	-	2
CO4	-	2	-	2	-	-	-	3	-	-	3	-	-
CO5	2	-	-	2	3	-	2	-	1	3	-	-	-
CO6	-	3	3	-	-	2	-	-	1	-	-	3	2

CO7	1	-	1	1	2	-	2	-	-	-	2	-	3

Mapping justification:

PO1: Comprehensive Knowledge and Understanding:
CO1: Students can recognize and comprehend the foundational elements of electronic systems.
CO2: Applying logic thinking and basic science knowledge students have logically approach and solve problems in diverse electronic applications.
CO3: Identifying and implementing formulations for electronic problem-solving makes student able to tackle issues across different sub-disciplines of electronics through systematic analysis and application of solutions.
CO5: Reducing expressions using K-map in SOP and POS forms enhances students skills in simplifying Boolean expressions, essential for optimizing digital circuits and enhancing their efficiency.
CO7: Students having understanding the working principles of logical devices this ensuring comprehension of how logical components operate and their applications in various electronic systems.

PO2: Practical, Professional, and Procedural Knowledge:
CO1: Students gain hands-on experience in identifying electronic components and understanding their function through laboratory work and practical sessions. Students having understanding the working principles of electronic devices prepares students for professional roles where they apply this knowledge in designing and troubleshooting electronic systems. Students learn procedures for identifying components, testing them, and integrating them into electronic circuits, which is essential for practical implementation.
CO3: Students implementing formulas involves practical applications in designing electronic circuits and systems, and troubleshooting issues that arise. Students having understanding for formulating solutions to electronic issues requires in-depth knowledge of electronic theory and its practical application in various sub-disciplines. Students can developing procedures for problem-solving involves systematic approaches to analyze and solve electronic problems, ensuring effective resolution.
CO4: Practical exercises involve converting number systems in digital circuits, ensuring students can implement these conversions in real-world applications.Understanding number system conversions is fundamental in digital electronics and is applied in designing and debugging digital systems.
CO6: Students can implement practically designing and testing arithmetic circuits such as adders, multipliers, and dividers in digital systems. Understanding arithmetic circuits and their implementation requires knowledge of digital logic and circuit design principles.

PO3: Entrepreneurial Mindset and Knowledge:
CO1: Students having understanding of electronic components and their applications which is essential for entrepreneurs who may need to innovate or create new products based on existing technologies.
CO2: Students having logical thinking and basic science knowledge are critical for entrepreneurs in electronics. It enables them to innovate solutions, identify market

opportunities, and solve technical challenges efficiently.
CO3: Students having ability to identify and formulate solutions to electronic issues is important for entrepreneurs in developing new products or optimizing existing technologies.
CO6: Students are able to understand and implement arithmetic circuits in digital electronics which are valuable skills for entrepreneurs developing digital products or systems.
CO7: Students are capable to understand logical devices and their applications is crucial for entrepreneurs in electronics.

PO4: Specialized Skills and Competencies:
CO1: Students are able to identify and understand electronic components and their applications. Students having ability to identify components and understand their working principles.
CO2: Students having ability to apply logical thinking and basic science knowledge for problem-solving in electronics which focuses on applying logic thinking and basic science knowledge to solve problems in electronics.
CO4: Students having ability to solve problems related to number system conversions.
CO5: Students focuses on reducing expressions using K-maps in both SOP (Sum of Products) and POS (Product of Sums) forms.
CO7: Students having ability to understand the working principles of logical devices and their applications. Students having understanding the principles and applications of logical devices.

PO5: Capacity for Application, Problem-Solving, and Analytical Reasoning:
CO1: Students able to apply their understanding of electronic components and their working principles in practical applications, which helps in capacity for application and problem-solving in electronics.
CO5: Students having focus on the practical application of Karnaugh maps (K-maps) to simplify logical expressions in both SOP and POS forms. This enhances students' capacity for application and problem-solving in digital electronics, which is a core aspect of the program.
CO7: Students having understanding of the principles and applications of logical devices, which is crucial for enhancing students' capacity to apply logical reasoning and problem-solving skills in electronics.

PO6: Communication Skills and Collaboration:
CO1: Students focuses on technical knowledge acquisition, which contributes to foundational understanding rather than direct communication or collaboration skills.
CO2: Students able to apply logic thinking and basic science knowledge to solve problems, which often requires clear communication of ideas and collaboration with others to explore various solutions or research directions.
CO6: Students having technical skills in implementing formulas for problem-solving in digital electronics, which support communication through explaining solutions or collaborating on projects.

PO7: Research-related Skills:

CO1: Students can primarily focuses on foundational understanding and application of electronic components and principles.
CO2: Students applying logic thinking and basic science knowledge to solve problems, which is crucial for research in electronics. This includes the ability to formulate hypotheses, design experiments, and analyze data, all essential research-related skills.
CO3: Students having technical skills related to formula identification and implementation for problem-solving. While these skills are foundational for research.
CO5: Students focuses on technical skills in logical expression simplification, which are essential in electronics.
CO7: Students having understanding principles and applications of logical devices, which are foundational for electronics but do not directly emphasize research-specific skills.

PO8: Learning How to Learn Skills:
CO1: Understanding various electronic components and their functions encourages continuous learning and adaptation to new technologies.
CO3: The ability to identify and implement solutions to diverse electronic problems necessitates continuous learning and adaptability to evolving challenges and technologies.
CO4: Mastery of number system inter-conversions supports foundational knowledge that underpins further learning in digital electronics and computing.

PO9: Digital and Technological Skills:
CO2: Students applying logical thinking and science knowledge directly enhances digital and technological problem-solving skills, which are crucial in various electronics fields.
CO3: Students having ability to solve and analyze problems in electronics requires strong digital and technological skills, as it involves understanding and applying complex concepts and techniques.
CO5: Students known about Karnaugh Maps which are essential for simplifying logical expressions, which is a crucial skill in digital circuit design and technology.
CO6: Students can solve arithmetic circuits and related problems is central to digital electronics, requiring a high level of digital and technological proficiency.

PO10: Multicultural Competence, Inclusive Spirit, and Empathy:
CO2: Logical thinking and problem-solving skills can be applied in collaborative and diverse team settings, fostering a spirit of inclusivity and empathy through shared goals and challenges.
CO3: Solving complex problems often requires teamwork and collaboration in diverse groups, promoting multicultural competence and empathy through mutual support and understanding.
CO5: Simplifying logical expressions using K-maps is a technical skill that does not directly contribute to multicultural competence, inclusivity, or empathy.
PO11: Value Inculcation and Environmental Awareness:

CO1: Students having understanding the working principles of electronic devices can foster awareness about energy-efficient designs and sustainable technology applications.
CO2: Students have logical thinking and problem-solving in electronics can lead to innovative solutions that contribute to environmental sustainability and inculcate values related to scientific integrity and ethics.
CO4: Students having understanding of number systems is crucial for digital electronics, its direct impact on environmental awareness and value inculcation is minimal.
CO7: Students having deep understanding about logical devices can contribute to the development of efficient, sustainable technologies and foster values related to innovation and responsibility.

PO12: Autonomy, Responsibility, and Accountability:
CO1: Students having understanding of electronic components and their applications requires a degree of autonomy in learning and responsibility in ensuring accurate comprehension.
CO2: Students can have problem-solving skills in various fields of electronics necessitates a high level of autonomy and accountability, as well as the responsibility to apply scientific knowledge accurately.
CO6: Students can solve arithmetic circuits and analyzing digital electronics problems require a moderate level of responsibility and accountability to ensure accurate and efficient solutions.

PO13: Community Engagement and Service:
CO1: Understanding electronic components and their applications can contribute to community projects involving technology and service.
CO3: Solving electronic-related issues can support community projects and services, particularly those that require technical support and expertise.
CO6: Solving problems in digital electronics can be beneficial to community projects that require technical solutions and support.
CO7: Understanding logical devices and their applications can aid community projects that involve technological solutions and improvements.

CBCS Syllabus as per NEP 2020 for F. Y. B.Sc. Electronics (SEM I) (2024 Pattern)

Name of the Programme : B.Sc. Electronics

Programme Code : USEL

Class : F. Y. B.Sc.

Semester : I

Course Type : DSC-I (General) (Practical)

Course Code : ELE-102-GEN

Course Title : Electronics Practical-I

No. of Credits : 02

No. of Teaching Hours : 60

Course Objectives:

1. To provide hands-on experience and support theoretical knowledge in the field of electronics and digital circuits.
2. To understand Electronic Components
3. Proficiency in Use of Electronic Instruments
4. To measure and Analyse of Signal Parameters
5. To Verify and Application of Network Theorems
6. To Design and Test Electronic Circuits
7. To Understanding Digital Logic and Boolean Algebra
8. Application-Oriented Learning
9. To Enhanced Laboratory Skills

Course Outcomes:

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

CO1. Students will gain practical skills in using electronic components and instruments.
CO2. They will develop proficiency in circuit design, analysis, and testing.
CO3. They will be able to apply network theorems and principles of circuit theory to solve practical problems.
CO4. Students will gain insights into digital logic design, including logic gates, combinational circuits, and sequential circuits.
CO5. They will understand the operation of basic electronic systems such as filters, oscillators, and amplifiers.
CO6. Practical sessions will enhance their ability to troubleshoot and debug electronic circuits.
CO7. Develop hobby projects.

List of Practicals

- The practical course consists of **15** experiments.
- Any two of the following activities with proper documentation will be considered as equivalent of 4 experiments weightage in term work.

1. Study of electronic components (Resistor, Capacitor, inductor, Transformer, Switches, Fuses, Connectors, Cables, Diodes, Transistors, IC's)
2. Use of measuring electronic instruments (Multimeter, Signal Generators, Power supply)
3. Measurement of signal parameters (amplitude, period, frequency, peak voltage, peak to peak voltage, RMS value)
4. Verification of network theorems: KVL.
5. Verification of network theorems: KCL.
6. Verification of Superposition Theorem/Thevenin/ Norton/ Maximum Power Transfer theorem.
7. Build and test Clipper / Clamper circuit.
8. Study of filters (First order passive Low pass & High pass filter)
9. LCR series resonance
10. Verification of logic gates using IC's (7400, 7402, 7408, 7404, 7432, 7486)
11. Realization of basic gates using universal gates (NAND, NOR)
12. Study of Half & Full adder using gates.
13. Verification of DE Morgan's theorem
14. Code converter : Binary to Gray and Gray to Binary
15. Design of Parity checker/ Generator using XOR gates.
16. Verification of DE Morgan's theorem
17. To study Universal adder & Subtractor

Activity: Any One Activity (Equivalent to two Practical)

1.Software simulation.

2. Internet Browsing

3. Industrial /field Visit

4. Hands on training workshop

5. Do it Yourself Open ended Project

Mapping of Program Outcomes with Course Outcomes

Weightage: 1=Weak or low relation, 2=Moderate or partial relation, 3=Strong or direct relation

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
CO1	3	3	-	-	-	1	-	-	3	1	-	-	-
CO2	3	3	2	-	-	2	-	-	2	-	2	-	-
CO3	3	3	1	-	1	-	-	1	3	2	-	-	3
CO4	2	2	1	-	-	1	-	-	2	-	1	-	-
CO5	3	2	-	-	-	3	-	-	3	2	-	-	-
CO6	3	3	-	-	-	2	-	-	3	-	-	3	-
CO7	3	2	-	-	-	2	-	-	1	-	-	-	3

Justification of Mapping

PO1: Comprehensive Knowledge and Understanding

- **CO1 (Practical skills in using electronic components and instruments): 3**
  - Understanding electronic components and instruments requires comprehensive knowledge of their principles and applications.
- **CO2 (Proficiency in circuit design, analysis, and testing): 3**
  - Circuit design and analysis necessitate a deep understanding of electronic principles and theories.
- **CO3 (Applying network theorems and circuit theory): 3**
  - Application of network theorems requires a thorough understanding of circuit theory.
- **CO4 (Insights into digital logic design): 2**
  - Digital logic design involves understanding theoretical concepts and practical applications.

PO2: Practical, Professional, and Procedural Knowledge

- **CO1 (Practical skills in using electronic components and instruments): 3**
  - Developing practical skills involves acquiring professional knowledge in handling electronic components.

- **CO2 (Proficiency in circuit design, analysis, and testing): 3**
  - Proficiency in circuit design requires procedural knowledge in analyzing and testing circuits.
- **CO3 (Applying network theorems and circuit theory): 3**
  - Applying network theorems involves procedural knowledge in solving practical circuit problems.
- **CO4 (Insights into digital logic design): 2**
  - Understanding digital logic design includes procedural knowledge in designing logical circuits.
- **CO5 (Understanding basic electronic systems): 2**
  - Understanding electronic systems involves practical knowledge in their operation.

PO3: Entrepreneurial Mindset and Knowledge

- **CO2 (Proficiency in circuit design, analysis, and testing): 2**
  - Proficiency in circuit design can foster an entrepreneurial mindset through innovative solutions.
- **CO4 (Insights into digital logic design): 1**
  - Digital logic design insights can inspire entrepreneurial ventures.

PO5: Capacity for Application, Problem-Solving, and Analytical Reasoning

- **CO3 (Applying network theorems and circuit theory): 1**
  - Applying network theorems requires analytical reasoning and problem-solving skills.
- **CO5 (Understanding basic electronic systems): 2**
  - Understanding electronic systems involves applying knowledge to solve practical problems.

PO6: Communication Skills and Collaboration

- **CO1 (Practical skills in using electronic components and instruments): 1**
  - Practical sessions often require communication and collaboration among students.
- **CO2 (Proficiency in circuit design, analysis, and testing): 2**
  - Circuit design and testing often involve teamwork and communication.

PO9: Digital and Technological Skills

- **CO1 (Practical skills in using electronic components and instruments): 3**
  - Practical skills directly enhance digital and technological competencies.
- **CO2 (Proficiency in circuit design, analysis, and testing): 2**
  - Circuit design and analysis contribute to digital and technological skills.

PO10: Multicultural Competence, Inclusive Spirit, and Empathy

- **CO1 (Practical skills in using electronic components and instruments): 1**
  - Practical sessions can foster multicultural competence through teamwork.
- **CO2 (Proficiency in circuit design, analysis, and testing): -**
  - No direct correlation evident in the provided matrix.

PO11: Value Inculcation and Environmental Awareness

- **CO4 (Insights into digital logic design): 1**
  - Understanding digital logic design includes considering environmental impacts.

PO12: Autonomy, Responsibility, and Accountability

- **CO6 (Troubleshooting and debugging electronic circuits): 3**
  - Developing troubleshooting skills enhances autonomy and accountability.

PO13: Community Engagement and Service

- **CO7 (Develop hobby projects): 3**

Engaging in hobby projects can contribute to community engagement and service.

CBCS Syllabus as per NEP 2020 for F. Y. B.Sc. Electronics (SEM I) (2024 Pattern)

Name of the Programme : B.Sc. Electronics

Programme Code : USEL

Class : F. Y. B.Sc.

Semester : I

Course Type : Open Elective (OE) (Theory)

Course Code : ELE-103-OE

Course Title : Principles of Electronic Devices

No. of Credits : 02

No. of Teaching Hours : 30

Course Objectives:

1. To get familiar with passive components and understand the working principle.
2. To get familiar with basic semiconductor devices.
3. To understand the working principle of semiconductor diodes and BJT.
4. To study characteristic features of semiconductor diodes and its applications.
5. To know about different number systems and codes.
6. To study the interconversions using number systems and codes.
7. To understand basic logic gates and truth tables and DeMorgan's Theorems.

Course Outcomes:

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

CO1: Understand the fundamental knowledge of passive devices.
CO2: Know the concept of semiconductor devices.
CO3: Explore constructional features and I-V characteristics of Semiconductor Diodes and BJT.
CO4: Understand Binary arithmetic, different number systems, interconversions and codes.
CO5: Solve problems based on inter conversion of number systems and codes.
CO6: Understand concepts of Logic Gates, universal gates and their applications.
CO7: Reduce expressions using DeMorgan's Theorems.

Topics and Learning Points

Unit 1: Passive Components (15L)

Study of passive components: Resistor, Capacitor, Inductor, Transformer, Cables, Switches, Fuses, Batteries (working principle, circuit symbols, types, specifications and applications).

Study of semiconductor active components: P-N junction diode, zener diode, LED, BJT (symbol, working principle, I-V characteristics, applications)

Unit 2: Number Systems and Logic Gates(15L)

Number Systems - Introduction to decimal, Octal, Binary and hexadecimal number systems, Inter conversions of number systems. Addition, subtraction (using 1's and 2's complement) of binary numbers, BCDcode , Excess-3 code and Gray code. Interconversion- Binary to Gray and Gray to Binary, Decimal to BCD, Decimal toExcess-3,
Concept of Logic Gates (NOT, OR, AND),Universal Gates(NOR, NAND) and Derived gates(EX-OR, EX-NOR) – Statement, Circuit Symbol,Expression, Truth table. De Morgan's Theorems.

Reference Books:

1. Electronic Principles : Albert Malvino, David J Bates, McGraw Hill 7th Edition. 2012
2. Principles of Electronics: V.K. Mehta, S.Chand and Co.
3. Basic Electronics and Linear Circuits: Bhargava N.N., Kulshreshtha D.C., Gupta S.C., Tata McGraw Hill.
4. Digital Fundamentals: Floyd T.N. and Jain R.P. (Pearson Educations)
5. Digital system Design: M. Morris Mano(Pearson Education)
6. Digital Principles and Applications: Leach, Malvino, Saha (TMH)

Course Outcome	Program Outcome												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
CO1	3	3	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-	-
CO3	3	3	-	-	3	2	1	2	1	-	-	1	-
CO4	3	3	-	-	-	-	-	-	2	-	-	-	-
CO5	3	3	-	-	3	2	1	2	2	2	-	1	-
CO6	3	-	-	-	-	-	-	-	2	2	-	-	-
CO7	3	3	-	-	2	2	-	-	2	2	-	1	-

Justification:

PO1: Comprehensive Knowledge and Understanding
CO1: Develop a comprehensive knowledge and understanding of the basic principles and characteristics of passive electronic components, such as resistors, capacitors, and inductors, enabling students to analyze and design simple electronic circuits.
CO2: Understanding of semiconductor devices, including diodes and transistors, their behavior, and applications, empowering students to comprehend and analyze electronic circuits involving semiconductor components.

CO3: Gain a profound knowledge of the constructional features and current-voltage characteristics of basic semiconductor diodes (e.g., PN diodes) and bipolar junction transistors (BJTs), enabling students to interpret and analyze the behavior of these devices in electronic circuits.
CO4: Understanding of binary arithmetic, different number systems (such as binary, decimal, and hexadecimal), conversions between these systems, and coding techniques, enabling students to perform accurate calculations and conversions in digital systems.
CO5: Apply the knowledge of number system conversions and coding techniques to solve problems related to digital systems, ensuring students' proficiency in performing accurate conversions and understanding the impact of different codes on system design.
CO6: Gain a comprehensive understanding of logic gates, including universal gates, and their application in digital circuits, allowing students to analyze, design, and troubleshoot digital logic circuits effectively.
CO7: Acquire the ability to simplify logical expressions using De Morgan's theorems, enhancing students' logical reasoning skills and enabling them to optimize digital logic circuits in terms of simplicity and efficiency.

PO2: Practical, Professional, and Procedural Knowledge
CO1: Develop practical knowledge of selecting and using appropriate passive electronic components in various circuits, allowing students to apply their understanding to real-world engineering scenarios.
CO2: Acquire professional knowledge of semiconductor devices and their applications, enabling students to effectively choose and integrate these components into electronic systems.
CO3: Gain procedural knowledge of constructing and analyzing basic semiconductor diodes and bipolar junction transistors (BJTs), equipping students with practical skills to evaluate and troubleshoot these devices.
CO4: Develop professional knowledge of binary arithmetic, number system conversions, and coding techniques, allowing students to apply these skills in practical scenarios such as digital data representation and circuit design.
CO5: Apply procedural knowledge of number system conversions and codes to solve practical problems encountered in digital systems design and implementation.
CO7: Acquire procedural knowledge of using De Morgan's theorems to simplify logic expressions, equipping students with practical skills to optimize digital circuits for efficiency and ease of implementation.

PO5: Capacity for Application, Problem-Solving, and Analytical Reasoning
CO3: Evaluate and interpret the constructional features and current-voltage characteristics of semiconductor diodes and bipolar junction transistors (BJTs), enabling practical application in circuit analysis and design.
CO5: Solving numerical problems and code conversions, showcasing the ability to analyze and solve problems related to interconversion of number systems and codes.
CO7: Demonstrate analytical reasoning and problem-solving skills in reducing logical expressions using De Morgan's Theorems, showcasing the capacity to apply acquired knowledge to optimize logic expressions and simplify digital circuits.

PO6: Communication Skills and Collaboration

CO3: To analyze and discuss the constructional features and current-voltage characteristics of semiconductor diodes and bipolar junction transistors (BJTs), fostering effective communication and collaborative problem-solving.
CO5: Demonstrate effective communication skills by explaining and presenting solutions to problems related to interconversion of number systems and codes, fostering collaboration and promoting effective knowledge sharing.
CO7: Reduce expressions using De Morgan's Theorems.
PO6: Demonstrate effective communication skills by explaining the process of reducing logical expressions using De Morgan's Theorems to peers and professionals, promoting collaborative problem-solving and effective knowledge sharing.

PO7: Research-related Skills
CO3: To investigate and analyze technical literature, research papers, and experimental data to understand the constructional features and current-voltage characteristics of semiconductor diodes and bipolar junction transistors (BJTs) in greater detail.
CO5: To investigate and analyze various research papers, algorithms, and problem-solving approaches related to the interconversion of number systems and codes, enhancing problem-solving skills and widening the knowledge base.

PO8: Learning How to Learn Skills
CO3: By engaging in self-directed learning, conducting experiments, and analyzing empirical data to explore and understand the constructional features and current-voltage characteristics of semiconductor diodes and bipolar junction transistors (BJTs).
CO5: By practicing problem-solving techniques, engaging in critical thinking, and seeking out additional resources to effectively solve problems related to the interconversion of number systems and codes.

PO9: Digital and Technological Skills
CO3: Utilizing online resources, virtual labs, and circuit simulation software to explore the constructional features and current-voltage characteristics of semiconductor diodes and bipolar junction transistors (BJTs) in a digital environment.
CO4: Cultivate digital and technological skills through the use of online tools, binary arithmetic calculators, and interactive learning platforms to understand the concepts of binary arithmetic, different number systems, inter conversions, and various codes used in digital systems.
CO5: To solve problems related to number system conversions and code conversions using digital tools, online calculators, and programming languages, effectively transitioning between different digital representations.
CO6: Develop digital and technological skills by utilizing digital resources, virtual circuit simulators, and logic gate applications to understand the concepts of logic gates, universal gates, and their applications in digital systems.
CO7: Enhance digital and technological skills by utilizing digital tools, logic circuit simulators, and programming languages to apply De Morgan's theorems and reduce logical expressions, fostering a deeper understanding of digital logic and circuit design.

PO10: Community Engagement and Service
CO5: Community members in solving problems related to number system conversions and codes, offering support and guidance, and promoting community engagement and service through problem-solving assistance.

CO6: Engage in community projects or initiatives involving the application of logic gates, universal gates, and their real-world applications, contributing to community engagement and service through practical demonstrations and knowledge-sharing.
CO7: Providing guidance and support to individuals seeking to understand and apply De Morgan's theorems to reduce logical expressions, actively participating in community engagement and service.

PO12: Autonomy, Responsibility, and Accountability
CO3: Students to independently investigate and analyze the constructional features and current-voltage (I-V) characteristics of semiconductor diodes and bipolar junction transistors (BJTs), promoting self-reliance in their learning.
CO5: Students to autonomously solve problems related to number system conversions and codes, encouraging them to take responsibility for their learning and problem-solving abilities.
CO7: Students to autonomously apply De Morgan's theorems to reduce logical expressions, fostering independent thinking and accountability for their problem-solving approach.

CBCS Syllabus as per NEP 2020 for F. Y. B.Sc. Electronics (SEM I) (2024 Pattern)

Name of the Programme : B.Sc. Electronics

Programme Code : USEL

Class : F. Y. B.Sc.

Semester : I

Course Type : Skill Enhancement Course (SEC)

Course Code : ELE-104-SEC

Course Title : Circuit Simulator-I

No. of Credits : 02

No. of Teaching Hours : 60

Course Objectives:

1. To solve unknown current and voltages in any circuit.
2. To develop hands-on skills of students
3. To promote entrepreneurship among the students
4. To enhance technical knowledge.
5. To increase employment opportunities of students.
6. To analyse Electrical and Electronic Circuits using PSPICE simulator.
7. To develop hands on working experience with reference to Solve, Simulate and Analyse Electrical & Electronics Circuits using PSPICE environments.

Course Outcomes:

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

CO1. Create, design and develop problem solving ability

CO2. Understand state of the art, technology and development

CO3. Develop soft skills needed.

CO4. Get knowledge of self-employability.

CO5. Identify Electronic components and understand simulating tool

CO6. Explain PSPICE EDA tools

CO7. Analyse any Electrical and Electronic Circuit with Simulation in PSPICE.

List of Practicals

1. Study of PSPICE environment.
2. Study of Simulation and Circuit Schematic using PSPICE
3. Pspice simulation of resistive circuit
4. Pspice simulation of capacitive circuit
5. Pspice simulation of diode clipper
6. Pspice simulation of nodal analysis for dc circuits
7. Pspice simulation of transient and parametric analysis of series RLC circuits using step and pulse input
8. Pspice simulation of transient and parametric analysis of series RLC circuits using sine input
9. Analysis of three phase circuit representing generator transmission line and load
10. Pspice simulation of D.C. Circuit for determining Thevenin's equivalent
11. Pspice simulation of maximum power transfer theorem for dc circuits
12. Pspice simulation of superposition theorem for dc circuits
13. Pspice simulation of ac circuits
14. Pspice simulation of transformer circuit
15. Pspice simulation of ac sweep of filter with ideal op-amp (filter circuit)
16. Pspice simulation of rectifier circuit (peak detector).
17. Pspice simulation of Half adder & Full adder,
18. Pspice simulation of Half Subtractor & Full Subtractor
19. Pspice simulation of AM modulated signal.

Reference Books:

1. Essential Electronic Design Automation (EDA), Mark. D. Birnbaum, Prentice Hall, 2004
2. Introduction To PSpice Using OrCAD for Circuits and Electronics, Muhammad H. Rashid, Paperback – Import,3rd Edition, 2003.
3. Printed circuit Board – Design & Technology by Walter C. Bosshart, TMH.
4. Printed Circuit Board –Design, Fabrication, Assembly & Testing, R.S. Khandpur, TMH,3rd Edition,2017.
5. Electronic Devices and circuit theory, Robert Boylstead and Louis Nashelsky, PHI, 10th Edition, 2009.

Mapping Table

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
CO1	3	3			2				3		3	1	2
CO2	2	2		2					2			2	3
CO3			2	3						2			
CO4			2		3						2		
CO5						2							
CO6		3				3	3	1					
CO7							2	3		1			

Justification for Mapping Table

PO1: Comprehensive Knowledge and Understanding:
CO1: Enhances graduates' profound understanding by applying foundational theories and methodologies to solve complex problems effectively.
CO2: Provides a deep understanding of current advancements in technology within the field, enriching their comprehensive knowledge and understanding.
PO2: Practical, Professional, and Procedural Knowledge:

CO1: Enhances practical skills by applying theoretical knowledge to solve real-world problems effectively.
CO2: Provides knowledge of current advancements and industry standards, ensuring graduates stay updated with technological developments.
CO6: Familiarizes graduates with PSPICE tools, enabling them to apply industry best practices in simulating and analyzing circuits.

PO3: Entrepreneurial Mindset and Knowledge:
CO3: Enhances graduates' communication and collaboration skills, crucial for networking, pitching ideas, and managing business relationships, with potential for further development.
CO4: Introduces graduates to entrepreneurial skills and self-management, contributing to their ability to identify business opportunities and manage risks, with room for enhancement.

PO4: Specialized Skills and Competencies:
CO2: Provides knowledge of current advancements in technology and development, crucial for adapting and innovating in response to changing circumstances.
CO3: Augments effective communication and leadership skills, essential for collaborating effectively and adapting to dynamic environments, with potential for further development.

PO5: Capacity for Application, Problem-Solving, and Analytical Reasoning:
CO1: Enhances graduates' capacity to apply theoretical knowledge effectively in practical settings and solve complex problems with critical thinking and creativity.
CO4: Introduces entrepreneurial skills and risk management strategies, contributing to graduates' readiness to take calculated risks and innovate in their field, with room for enhancement.

PO6: Communication Skills and Collaboration:
CO5: Deepens technical proficiency in electronic components and simulation tools, supporting effective communication and collaboration in technical projects.
CO6: Familiarizes graduates with PSPICE tools, enhancing their ability to communicate technical analysis and collaborate effectively in the context of circuit simulation.

PO7: Research-related Skills:
CO6: This CO moderately supports PO1 by fostering the understanding of specific research tools used in the data collection and analysis of electronic circuits.
CO7: This CO strongly maps to PO1 as it involves the practical application of simulation tools for analyzing circuits, directly tying into observational skills, methodologies, and reporting findings.

PO8: Learning How to Learn Skills:
CO6: Understanding and explaining PSPICE EDA tools requires self-learning and adapting to new software.
CO7: Analyzing and simulating circuits using PSPICE necessitates self-directed learning and adapting to complex demands.

PO9: Digital and Technological Skills:
CO1: Developing problem-solving ability involves using various digital tools and technologies, but it's not the primary focus.
CO2: Understanding the latest technology trends and developments requires proficiency in accessing information sources and using ICT tools.

PO10: Multicultural Competence, Inclusive Spirit, and Empathy:
CO3: Developing soft skills is crucial for effective communication, empathy, and working in diverse teams.
CO7: Analyzing circuits using simulation tools is a technical skill, with minimal relevance to multicultural engagement or empathy
PO11: Value Inculcation and Environmental Awareness:
CO1: Problem-solving often involves considering ethical implications and sustainable solutions, thus contributing to environmental awareness.
CO4: Knowledge of self-employability focuses on individual career growth, with limited direct impact on ethical values or environmental awareness.
PO12: Autonomy, Responsibility, and Accountability:
CO1: This CO strongly maps to PO1 as it emphasizes developing problem-solving skills, which are essential for formulating research questions and utilizing methodologies for data collection and analysis.
CO2: This CO moderately maps to PO1 by providing an understanding of current technologies and developments, aiding in the formulation of relevant and contemporary research questions.
PO13: Community Engagement and Service:
CO1: Problem-solving skills can be applied to community challenges, promoting societal well-being through innovative solutions.
CO2: Justification: Understanding the latest technology can help address community issues and contribute to societal advancement

CBCS Syllabus as per NEP 2020 for F. Y. B.Sc. Electronics (SEM II) (2024 Pattern)

Name of the Programme : B.Sc. Electronics
Programme Code : USEL
Class : F. Y. B.Sc.
Semester : II
Course Type : DSC-I (General) (Theory)
Course Code : ELE-151-GEN
Course Title : Analog and Digital Electronics
No. of Credits : 02
No. of Teaching Hours : 30

Course Objectives:

1. To study characteristic features of semiconductor devices like diode, BJT, FET.
2. To study elementary electronic circuits and applications.
3. To study applications of semiconductor devices.
4. To get familiar with combinational and sequential circuits.
5. To study multiplexer and Demultiplexer.
6. To study flip flops and shift registers.
7. To know the difference between combinational and Sequential circuits.

Course Outcomes:

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

CO1 Getting the fundamental knowledge of electronics components & circuits.
CO2 Knowing actual Application of semiconductor devices
CO3 Apply the knowledge of semiconductors to illustrate the functioning of basic electronic devices.
CO4 Classify and analyze the various circuit configurations of Transistor and MOSFETs.
CO5 Realizing logic circuit for Multiplexer and Demultiplexer
CO6 Recognizing different types of flip flops like RS, JK, DFF, TFF, and MSJKFF.
CO7 Preparing the logic circuits and analysing functionality of counters and shift registers.

Topics and Learning Points

Unit 1: Semiconductor Devices and Circuits (10L)

Introduction to semiconductor materials, Energy level diagram, P-N junction diode, Zener diode, Light Emitting Diode (LED), Photo diode, rectifier, Bipolar Junction Transistor, CE, CB, CC configurations, transistor as a switch and Amplifier circuits.

Unit-2: Field Effect Transistor (6L)

Junction Field Effect Transitor (JFET), JFET as voltage variable resistor, Metal Oxide Semiconductor Field Effect Transistor (MOSFET)-DMOSFET, EMOSFET

Unit 3: Combinational Circuits (7 L)

Multiplexers (8:1), Demultiplexer (1:8), Encoders-Decimal to binary, Decimal to BCD, Priority encoder, Decoders- BCD to seven segment.

Unit 4: Sequential Circuits **(7 L)**

Flip flops :RS, JK, Master slave JK, D and T.

Counters: Asynchronous counter, Synchronous counter, up/ down counter, Decade counter(IC 7490)

Shift registers: SISO, SIPO, PISO, PIPO , Ring counter and Applications.

Reference Books:

1. Basic Electronics: Bernard Grob, McGraw Hill Publication, 8th Revised Edition,2010
2. Electronic Principles: Albert Malvino, David J Bates, McGraw Hill 7th Edition. 2012
3. Basic Electronics and Linear Circuits: Bhargava N.N., Kulshreshtha D.C., Gupta S.C., Tata McGraw Hill.
4. Digital Principles and Applications: Malvino Leach, Tata McGraw-Hill.
5. Digital Fundamentals: Floyd T.M., Jain R.P., Pearson Education
6. Digital Electronics : Principles, Devices and Applications - Anil K. Maini (Wiley)

CO with PO mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
CO1	1	1	2	1	1	-	2	1	-	3	2	2	-
CO2	2	-	1	1	-	2	1	-	1	-	1	1	3
CO3	2	2	1	-	1	-	3	2	2	2	-	-	2
CO4	-	1	2	2	-	-	-	1	-	-	3	-	-
CO5	2	-	-	2	3	-	2	1	1	-	-	-	-
CO6	-	3	-	-	2	3	-	-	1	2	-	3	-
CO7	3	-	2	1	-	2	2	-	-	2	2	1	3

Mapping justification:

PO1: Comprehensive Knowledge and Understanding:

CO1: Students having fundamental knowledge which forms the basis for comprehensive understanding in electronics.

CO2: Students having knowledge about practical applications of semiconductor devices which are important for a deep understanding of electronics.

CO3: Students can apply semiconductor knowledge to device functionality which is key to comprehensive understanding.

CO5: Students having understanding and designing logic circuits for multiplexers and demultiplexers contribute to comprehensive digital electronics knowledge.

CO7: Students having knowledge about designing and analysing counters and shift registers is important for understanding more complex digital circuits.

PO2: Practical, Professional, and Procedural Knowledge:

CO1: Students having fundamental knowledge of components and circuits which is essential for practical and professional skills in electronics.
CO3: Students applying semiconductor knowledge to demonstrate device functionality is key for practical and procedural expertise.
CO4: Students able to analyse transistor and MOSFET configurations involves deep procedural knowledge and practical skills.
CO6: Students having knowledge of flip-flops which is important for practical digital electronics work, contributing to procedural understanding.

PO3: Entrepreneurial Mindset and Knowledge:

CO1: Students having fundamental knowledge which is essential for entrepreneurs to understand the basics and innovate effectively in the electronics field.
CO2: Students having understanding the applications of semiconductor devices which is crucial for identifying business opportunities and developing marketable products.
CO3: Students able to apply semiconductor knowledge helps in designing new devices and solutions, which is key for entrepreneurship.
CO4: Students able to analyse circuit configurations which can lead to innovative solutions, though it is more technical and less directly linked to entrepreneurial mindset than applications.
CO7: Students can design and analyse more complex digital circuits this can lead to innovative product development, supporting entrepreneurial goals.

PO4: Specialized Skills and Competencies:

CO1: Students having fundamental knowledge of components and circuits is essential for developing specialized skills and competencies in electronics.
CO2: Students can understand the applications of semiconductor devices which is crucial for advanced technical proficiency and specialized knowledge.
CO4: Analysing different configurations of transistors and MOSFETs requires and enhances specialized competencies in circuit design and analysis.
CO5: Designing logic circuits for multiplexers and demultiplexers involves specialized skills in digital electronics, though less fundamental than semiconductor devices and transistors.
CO7: Designing and analyzing counters and shift registers involves advanced digital design skills and competencies in creating complex digital systems.

PO5: Capacity for Application, Problem-Solving, and Analytical Reasoning:

CO1: Students having fundamental knowledge which is essential for applying concepts, solving problems, and developing analytical reasoning in electronics.
CO3: Students can apply semiconductor knowledge to illustrate device functionality is key for problem-solving and analytical reasoning.
CO5: Designing logic circuits for multiplexers and demultiplexers involves application and problem-solving, but may be less critical than fundamental and semiconductor knowledge.
CO6: Students having deep knowledge of various flip-flops is important for problem-solving in digital electronics, though more specialized compared to basic components and circuits.

PO6: Communication Skills and Collaboration:

CO2: Students having understanding the applications of semiconductor devices is crucial for communicating technical information and collaborating on practical projects.

CO6: While important for technical knowledge, understanding flip-flops has less direct impact on communication skills and collaboration compared to other COs.
CO7: Designing and analysing counters and shift registers requires clear communication and teamwork in digital systems projects.
PO7: Research-related Skills:
CO1: Students having fundamental knowledge which is important for understanding the basics, which are crucial for conducting research in electronics.
CO2: Students having deep understanding of the applications of semiconductor devices is essential for conducting applied research and developing new technologies.
CO3: Students are able to apply semiconductor knowledge to illustrate device functionality which is crucial for experimental research and validating theoretical models.
CO5: Designing logic circuits involves applying research skills to develop and test new digital systems, though it is more specialized.
CO7: Designing and analyzing counters and shift registers involves significant research skills in developing and testing complex digital systems.
PO8: Learning How to Learn Skills:
CO1: Students having understanding of the fundamentals forms the basis for continuous learning and adapting to new technologies in electronics.
CO3: Students applying theoretical knowledge to practical devices encourages continuous learning and adaptation.
CO4: Students can analyse and classify circuits require ongoing learning about new configurations and technologies.
CO5: Designing logic circuits necessitates continuous learning and application of new methods and technologies.
PO9: Digital and Technological Skills:
CO2: Understanding the applications of semiconductor devices directly relates to digital and technological skills, as these devices are foundational to modern electronics and technology.
CO3: Applying semiconductor knowledge to real devices enhances digital and technological proficiency by bridging theory and practical application.
CO5: Designing and understanding logic circuits like multiplexers and demultiplexers are core digital skills essential for creating complex electronic systems.
CO6: Knowledge of various flip-flops is fundamental for digital design and technology, as flip-flops are essential components in memory and logic circuits.
PO10: Multicultural Competence, Inclusive Spirit, and Empathy:
CO1: Students having fundamental knowledge of electronics is primarily technical and does not directly address multicultural competence, inclusive spirit, or empathy.
CO3: Students can apply knowledge can involve collaboration and teamwork in diverse groups, promoting multicultural competence and inclusive practices.
CO6: Students having understanding and discussing various flip-flops can occur in diverse team settings, fostering an inclusive spirit and empathy through collaborative work.
CO7: Students Working on logic circuits and analysing their functionality often involves teamwork in multicultural settings, encouraging inclusive practices and empathy.
PO11: Value Inculcation and Environmental Awareness:

CO1: Students able to understand the fundamentals of electronics can include learning about the environmental impact of electronic components and the importance of sustainable practices in manufacturing and disposal.
CO2: Students are knowing the applications of semiconductor devices often involves understanding their environmental impact, such as energy efficiency and the role of semiconductors in renewable energy technologies.
CO4: Analyzing circuit configurations can include considerations of energy consumption and efficiency, promoting environmental awareness in circuit design.
CO7: Developing and analyzing logic circuits can include considerations of energy efficiency and sustainable design, fostering environmental awareness.

PO12: Autonomy, Responsibility, and Accountability:

CO1: Students having fundamental knowledge which is essential for building a base of autonomy in learning and problem-solving, but responsibility and accountability are less directly addressed.
CO2: Students can apply knowledge of semiconductor devices requires a high degree of responsibility and accountability to ensure proper and ethical use, as well as autonomy in applying this knowledge in various contexts.
CO6: Students having understanding of various flip-flops involves some responsibility in ensuring accurate knowledge and application, promoting autonomy in the learning process.
CO7: Students can develop and analyse these circuits involves significant responsibility for accurate design and functionality, fostering a high degree of accountability and autonomy in the engineering process.

PO13: Community Engagement and Service:

CO2: Students having understanding of the applications of semiconductor devices can lead to community-focused projects, such as developing energy-efficient solutions for community use, thereby contributing to community engagement and service.
CO3: Students applying knowledge to practical devices can include projects that benefit the community, such as creating affordable electronic solutions for local needs, thereby promoting engagement and service.
CO7: Students developing and analyzing logic circuits can be used in community projects, such as creating educational tools or affordable technology solutions for community use, promoting engagement and service.

CBCS Syllabus as per NEP 2020 for F. Y. B.Sc. Electronics (SEM II) (2024 Pattern)

Name of the Programme : B.Sc. Electronics
Programme Code : USEL
Class : F. Y. B.Sc.
Semester : II
Course Type : DSC-I (General) (Practical)
Course Code : ELE-152-GEN
Course Title : Electronics Practical-II
No. of Credits : 02
No. of Teaching Hours : 60

Course Objectives:

1. To teach students how to draw symbols, timing diagrams, circuit diagrams.
2. To develop skill of Circuit Connections.
3. To train them to design and analyze circuits for specific purpose.
4. To motivate them to work on different mini projects.
5. To teach students how to know, identify, draw different symbols, logic diagrams and circuit diagrams.
6. To develop skill of circuit connections.
7. To train them to design and analyse circuits for specific purpose.
8. To motivate them to work on different mini projects.

Course Outcomes:

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

CO1. To identify different devices, ICs and their types
CO2. To know working of different instruments used in the laboratory.
CO3. To connect circuit and do required performance analysis.
CO4. To understand basic parameters in electronics
CO5. Capability to develop experimental skills, analyzing the results and interpret data
CO6. Practical sessions will enhance their ability to troubleshoot and debug electronic circuits.
CO7. Develop hobby projects.

List of Practicals

- The practical course consists of **15** experiments.
- Any two of the following activities with proper documentation will be considered as equivalent of 4 experiments weightage in term work.

1. Study of forward and Reverse biased characteristics of PN Junction Diode
2. Study of breakdown characteristics and voltage regulation action of Zener diode.
3. Study of output characteristics of Bipolar Junction Transistor in CE mode.

4. Study of output and transfer characteristics of JFET/MOSFET
5. Study of I-V characteristics of UJT and Demonstration of UJT based relaxation oscillator.
6. Study of low voltage Half-wave, Full-wave and Bridge rectifier circuits.
7. Study of amplification action of BJT.
8. Diode matrix ROM.
9. Logic gate using diode and transistor.
10. Thumbwheel Interface
11. Build and Test 8:1 Multiplexer using gates.
12. Build and Test 1:8 Demultiplexer using gates.
13. Build and Test 3X4 matrix Keyboard Encoder
14. Study of RS, JK, T and D flip flops using NAND gates
15. Study of Up/Down Counter
16. Study of decade counter IC 7490
17. Study of 4 bit Shift Register.
18. Study of Decoders
19. Study of Encoders

Activities

i. Hobby projects
ii. Internet browsing
iii. Market Survey of Electronic Systems.
v. Study Tour and its report writing

Mapping of Program Outcomes with Course Outcomes

Weightage: 1=Weak or low relation, 2=Moderate or partial relation, 3=Strong or direct relation

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
CO1	3	-	3	-	3	-	-	-	-	1	-	2	-
CO2	1	3	-	-	2	-	-	-	-	-	2	-	-
CO3	-	3	-	-	1	-	-	2	3	2	-	-	3
CO4	2	-	-	-	2	2	-	-	1	-	1	-	-
CO5	-	2	-	-	-	3	-	-	-	2	-	1	-
CO6	-	-	-	-	-	-	-	-	-	-	-	3	-
CO7	3	-	3	-	3	-	-	-	-	-	-	-	3

Justification of Mapping

PO1: Comprehensive Knowledge and Understanding

- **CO1 (To identify different devices, ICs and their types): 3**
  - Identifying devices and ICs requires comprehensive knowledge of their types and functionalities.
- **CO4 (To understand basic parameters in electronics): 2**
  - Understanding basic parameters involves acquiring foundational knowledge in electronics.

PO2: Practical, Professional, and Procedural Knowledge

- **CO2 (To know working of different instruments used in the laboratory): 3**
  - Knowing the workings of instruments involves practical and procedural knowledge in using laboratory equipment.
- **CO7 (Develop hobby projects): 3**
  - Engaging in hobby projects develops practical and professional skills in electronics.

PO3: Entrepreneurial Mindset and Knowledge

- **CO1 (To identify different devices, ICs and their types): 3**
  - Understanding different devices and ICs can stimulate an entrepreneurial mindset through innovative applications.

PO4: Specialized Skills and Competencies

- **CO5 (Capability to develop experimental skills, analyzing the results and interpret data): 2**
  - Developing experimental skills and analyzing data enhances specialized competencies in electronics.
- **CO6 (Practical sessions will enhance their ability to troubleshoot and debug electronic circuits): 3**
  - Troubleshooting and debugging circuits builds specialized skills in electronics.

PO5: Capacity for Application, Problem-Solving, and Analytical Reasoning

- **CO1 (To identify different devices, ICs and their types): 3**
  - Identifying devices and ICs requires analytical reasoning and problem-solving skills.
- **CO2 (To know working of different instruments used in the laboratory): 2**
  - Understanding instrument operations involves applying knowledge to solve practical problems.
- **CO4 (To understand basic parameters in electronics): 2**
  - Understanding parameters involves applying knowledge to analyze and solve electronic circuit issues.
- **CO5 (Capability to develop experimental skills, analyzing the results and interpret data): 2**
  - Developing experimental skills includes the capacity to analyze results and interpret data.

PO6: Communication Skills and Collaboration

- **CO7 (Develop hobby projects): 3**

    - Collaborating on hobby projects enhances communication and collaboration skills.

PO9: Digital and Technological Skills

- **CO2 (To know working of different instruments used in the laboratory): 2**
    - Knowing instrument operations enhances digital and technological skills.
- **CO5 (Capability to develop experimental skills, analyzing the results and interpret data): 2**
    - Developing experimental skills contributes to digital and technological competencies.

PO10: Multicultural Competence, Inclusive Spirit, and Empathy

- **CO1 (To identify different devices, ICs and their types): 1**
    - Collaborating on identifying devices can foster multicultural competence and empathy.
- **CO4 (To understand basic parameters in electronics): 1**
    - Understanding basic parameters can promote inclusive spirit and empathy through understanding diverse perspectives.

PO11: Value Inculcation and Environmental Awareness

- **CO1 (To identify different devices, ICs and their types): 2**
    - Understanding device types may include considerations of environmental impact.

PO12: Autonomy, Responsibility, and Accountability

- **CO7 (Develop hobby projects): 3**
    - Taking responsibility for hobby projects promotes autonomy and accountability.

PO13: Community Engagement and Service

- **CO7 (Develop hobby projects): 3**
    - Engaging in hobby projects can contribute to community engagement and service.

CBCS Syllabus as per NEP 2020 for F. Y. B.Sc. Electronics (SEM II) (2024 Pattern)

Name of the Programme : B.Sc. Electronics

Programme Code : USEL

Class : F. Y. B.Sc.

Semester : II

Course Type : Open Elective (OE) (Practical)

Course Code : ELE -153-OE

Course Title : Electronics Practical

No. of Credits : 02

No. of Teaching Hours : 60

Course Objectives:

1. To teach students how to know, identify, draw different symbols, logic diagrams andcircuit diagrams.

2. To develop skill of circuit connections.

3. To train them to design and analyse circuits for specific purpose.

4. To know about different number systems and codes.

5. To learn number systems and their representation.

6. To study the interconversions using number systems.

7. To understand basic logic gates and truth tables.

Course Outcomes:

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

CO1. identify different components, devices, IC's, as well as their types.

CO2. understand basic parameters.

CO3. know operation of different instruments used in the laboratory

CO4. Practical Application

CO5: Understand Interconversion codes

CO6: Understand Concept of digital Electronics.

CO7: Understand concepts of Logic Gates.

List of Practical's: (Any 15)

1. Study of Passive and Active Components.

2. Study of different resistors and its color coding.

3. Study of Basic Electronic Devices - Multimeters

4.Study of Basic Electronic Devices - Signal Generators

5.Study of Basic Electronic Devices - CRO

6.Study of relay and Switches.

7. Diode characteristics.

8. Study of Inter conversion System.

9. Study of digital system vs Analog System.

10. Study of basic Logic Gate

11. Study of Half adder

12. Study of Full adder

13. Code converter: Binary to Gray

14. Study of Universal logic Gate.

15. Gray to Binary Converter

16. Study of 1's Compliment.

17. Study of Digital online payment system.

18. Study of Seven segment Display.

19.Market Survey.

20. Activity.

Mapping of Program Outcomes with Course Outcomes

Weightage: 1=Weak or low relation, 2=Moderate or partial relation, 3=Strong or direct relation

Course Outcome					Program Outcomes								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
CO1	3	-	-	-	-	-	-	-	-	-	-	3	1
CO2	-	2	-	-	-	-	-	-	-	-	2	-	-
CO3	-	-	2	-	-	-	3	3	-	-	-	-	-
CO4	-	-	-	-	3	-	-	-	-	-	-	-	-
CO5	-	-	-	3	-	2	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	2	-	-	-	-
CO7	-	-	-	-	-	-	-	-	1	2	-	-	3

Justification

PO1:- Comprehensive Knowledge and Understanding

CO1: focuses on the fundamental knowledge of various electronic components, devices, and integrated circuits (ICs). This foundational knowledge is crucial for understanding and solving more complex engineering problems.

PO2: Practical, Professional, and Procedural Knowledge

CO2: it involves understanding the fundamental parameters that govern electronic circuits, which is essential for identifying and analyzing complex electronics problems

PO3: Entrepreneurial Mindset and Knowledge

CO3: It focuses on the practical skills required to operate laboratory instruments, which is essential for both the technical and entrepreneurial aspects of electronics science practice.

PO4: Specialized Skills and Competencies:

CO5: It involves understanding and applying various interconversion codes, which is essential for developing specialized skills in electronic systems and programming.

PO5: Capacity for Application, Problem-Solving, and Analytical Reasoning

CO4: It involves the practical application of simulation tools to model and analyze electronic circuits, which directly aligns with the capacity for application, problem-solving, and analytical reasoning

PO6: Communication Skills and Collaboration

CO5: focuses on understanding interconversion codes and their applications, which can significantly enhance communication and collaboration in technical contexts

PO7: Research-related Skills

CO3: involves understanding the operation of various laboratory instruments, which is crucial for developing research-related skills**.**

PO8: Learning How to Learn Skills

CO3: focuses on understanding and operating various laboratory instruments, which fosters skills necessary for independent and lifelong learning.

PO9: Digital and Technological Skills

CO6: involves understanding the concepts of digital electronics, which directly contributes to developing digital and technological skills essential for modern electronics practice**.**

CO7: focuses on understanding logic gates, which is foundational knowledge in digital electronics and directly contributes to developing digital and technological skills required for electronics practice

PO10: Multicultural Competence, Inclusive Spirit, and Empathy

CO7: involves understanding logic gates, can contribute to developing multicultural competence, an inclusive spirit, and empathy within electronics practice

P011: Value Inculcation and Environmental Awareness

CO3: involves understanding fundamental electrical parameters and their roles in electronic circuits. This knowledge contributes directly to the ethical and sustainable aspects of electronics practice

PO12: Autonomy, Responsibility, and Accountability:

CO1: involves identifying various electronic components, devices, and integrated circuits (ICs), which directly contributes to developing autonomy, responsibility, and accountability.

PO13: Community Engagement and Service:

CO1 and CO7 collectively contribute to preparing engineers who can effectively engage in community service activities using their technical knowledge