Syllabus for F. Y. B.Sc. (Computer Science) Electronics (SEM-I) (2024 Pattern)

Name of the Programme : B.Sc. (Computer Science) Electronics

Programme Code : USCS

Class : F. Y. B.Sc.

Semester : I

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

Course Code : COSEL-101-GEN

Course Title : Basics 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 I: Basics of Analog Electronics : (15L)

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, Resonance, LCR series resonance circuits, concept of impedance, quality factor, bandwidth RC Filters (First order low pass & high pass only)

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

Unit II: Number Systems and Digital Electronics: (15L)

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), 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, Study of IC 7483, IC 4008

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

Syllabus for F. Y. B.Sc. (Computer Science) Electronics (SEM-I) (2024 Pattern)

Name of the Programme : B.Sc. (Computer Science) Electronics

Programme Code : USCS

Class : F. Y. B.Sc.

Semester : I

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

Course Code : COSEL-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.

Syllabus for F. Y. B.Sc. (Computer Science) Electronics (SEM-II) (2024 Pattern)

Name of the Programme : B.Sc. (Computer Science) Electronics
Programme Code : USCS
Class : F. Y. B.Sc.
Semester : II
Course Type : DSC-I (General) (Theory)
Course Code : COSEL-151-GEN
Course Title : Analog and Digital Circuits
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, 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)**

RS flip flop, JK flip flop, Master slave JK flip flop, D flip flop and T flip flop, Asynchronous and 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.

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Name of the Programme : B.Sc. (Computer Science) Electronics
Programme Code : USCS
Class : F. Y. B.Sc.
Semester : II
Course Type : DSC-I (General) (Practical)
Course Code : COSEL-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.