Anekant Education Society's
Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati

Autonomous

Course Structure For F. Y. B. Sc. Computer Science
Electronic Science (Sem I)

Semester	Paper Code	Title of Paper	No. of Credits
I	UCSEL 111	Basic Electronics and Network Theorems	2
	UCSEL 112	Fundamentals of Digital Electronics	2
	UCSEL 113	Electronics Practical's	2

SYLLABUS (CBCS) FOR F. Y. B. Sc (Computer Science)(w.e.f. June, 2022)

Class : F.Y. B. Sc (Computer Science)
Semester I
Paper Code : UCSEL 111
Paper : I
Title of Paper : Basic Electronics and Network Theorems
Credit : 2 No. of lectures : 36

- **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 get familiar with various applications of different components.
  6. To give knowledge of filters.
  7. This course provide the students with the fundamental skills to understand basics of electronics.

- **Course Outcomes:**

  At the end of this course, students should be able to:

  CO1: Identify active and passive components and understand basic circuit theory

  CO2: Evaluate mesh and nodal analysis of ac and dc circuit.

  CO3: Solve & minimize complex electronic circuits.

  CO4: To understand various applications of electronic device.

  CO5: This course gives student deep knowledge about electronics.

  C06: To make student able to analyze complex network and skill to solve it.

  C07: To give students basic knowledge of network theorems.

Unit 1: Basic Elements: (12L)

Electronics components: Resistors, capacitors, Inductors, Transformer, Switches, Relays, Fuses, Batteries, Cables, Connectors (with reference to circuit symbol, working principle, types, specifications and applications).Color coding of resistors, series and parallel combinations of resistors, capacitor & Inductor,Charging and discharging of a capacitor

Unit 2: Basic Electric Circuits (12L)

Concept of Ideal & Real voltage and current source, internal resistance,

DC source, AC source (amplitude, wavelength, period, frequency, peak value, peak to peak values, RMSvalues), Resonance, LCR series resonance circuits, concept of impedance, quality factor, bandwidth

RC Filters (First order low pass & high pass only)

Unit 3: Network Theorems **(12L)**

Network terminology (Active & passive elements, Node, Branch, loop, mesh), Ohms law, voltage and currentdividers, Kirchhoff's Laws (KCL, KVL), Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Superposition theorem, numerical problems related to all theorems.

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**
5. **Circuits and Networks Analysis and Synthesis: Sudhkar and S. P. Shyammohan, Tata McGraw-HillPublishing Company Limited, 3rd Edition, (2006).**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	-	-	-	-	-	2	-
CO2	1	1	2	-	-	-	1
CO3	2	2	2	-	-	3	2
CO4	1	1	1	-	-	-	-
CO5	-	-	-	-	-	-	3
CO6	1	2	2	-	-	2	3
CO7	1	2	2	-	-	1	2

PO Justification:

PO1: Computer Knowledge:

CO2: Mesh and nodal analysis skills are essential for computer engineers involved in designing power supplies, understanding signal processing, and analyzing electronic circuits integrated into computer systems.

CO3: Computer engineers often deal with complex electronic circuits in designing various components of computer systems. The ability to solve and minimize these circuits is valuable for optimizing the performance of electronic devices within computers.

CO4: Understanding the applications of electronic devices is crucial for computer engineers as it enables them to select and integrate appropriate components into computer systems, ensuring compatibility and optimal performance.

CO6: Analyzing complex networks is relevant for computer engineers dealing with computer networks, ensuring efficient communication and connectivity. The problem-solving skills developed in this course are transferable to addressing complex issues in computer networks.

CO7: Basic knowledge of network theorems is essential for computer engineers involved in designing and troubleshooting computer networks, ensuring a solid understanding of the principles that govern data transmission and communication.

PO2: Design/ development of a solution:

CO2: The ability to evaluate mesh and nodal analysis is essential for designing circuits that meet specific requirements in a solution. This skill is particularly valuable when dealing with AC and DC circuits in the development of electronic solutions.

CO3: The capability to solve and minimize complex electronic circuits is directly applicable to the development of solutions. This skill is crucial for optimizing electronic circuits within a larger system to ensure efficiency and performance.

CO4: Understanding the applications of electronic devices is essential in the design phase of a solution. It allows engineers to select and integrate the appropriate electronic devices to meet the specific requirements of the solution being developed.

CO6: The ability to analyze complex networks is valuable in the development of solutions that involve interconnected electronic systems. This skill is critical for ensuring seamless communication and functionality within the larger solution.
CO7: Basic knowledge of network theorems is essential for designing electronic solutions that involve networked components. It provides a foundational understanding of the principles governing data transmission and communication within the developed solution.

PO3: Modern tool usage:
CO2: Tools like simulation software are commonly used for mesh and nodal analysis. Students utilizing these tools gain proficiency in employing modern technologies for circuit analysis, contributing to their competence in modern tool usage.
CO3: Advanced tools for circuit analysis and optimization are essential in solving and minimizing complex electronic circuits. Utilizing modern software enables students to handle complex problems efficiently, aligning with the use of modern tools in electronic circuit design and optimization.
CO4: Simulation tools can aid in understanding the various applications of electronic devices by allowing students to simulate and analyze the performance of these devices in different scenarios. This aligns with the use of modern tools for exploring electronic device applications.
CO6: Analyzing complex networks often involves the use of simulation and analysis tools. Proficiency in these tools equips students with the skills to analyze and solve complex network problems efficiently, aligning with the modern tool usage outcome.
CO7: Modern tools play a role in illustrating and applying network theorems. Utilizing simulation software for network analysis helps students grasp and apply theoretical concepts, contributing to their understanding of network theorems through practical tool usage.
PO6: Individual and teamwork:
CO1: Working in teams can involve collaboration on identifying and understanding components in circuits. Additionally, individual efforts may be required when studying and applying basic circuit theory. This emphasizes both individual and teamwork skills.
CO3: The process of solving and minimizing complex circuits can involve individual problem-solving as well as collaboration within a team.
CO6: Analyzing complex networks can be a collaborative effort, requiring teamwork to tackle intricate problems.
CO7: Acquiring basic knowledge of network theorems may involve individual study as well as collaborative efforts in group discussions and problem-solving.
PO7: Innovation, Employability and Entrepreneurial skill:
CO2: Students have analytical and problem-solving skills, which are crucial for innovation. The ability to analyze circuits using mesh and nodal analysis prepares students for innovative solutions to complex electronic problems, enhancing employability in roles that require circuit analysis skills.
CO3: Students have ability to solve and minimize complex circuits is essential in various electronic applications, fostering innovation and enhancing entrepreneurial skills for creating efficient electronic designs.
CO5: Students have deep knowledge in electronics is a key factor in fostering innovation. It enhances employability by making students experts in their field and provides a strong foundation for entrepreneurship, where in-depth knowledge is crucial for developing new electronic products or solutions.
CO6: Students have ability to analyze complex networks is a valuable skill contributing to innovation. This analytical skill enhances employability in roles requiring network analysis, and it is essential for entrepreneurial ventures involving the development of complex electronic systems.
CO7: Students have basic knowledge of network theorems contributes to the employability of students in various electronic industries. Understanding network theorems is fundamental for innovation in circuit design and troubleshooting, aligning with the entrepreneurial skill of creating efficient electronic solutions.

SYLLABUS (CBCS) FOR F. Y. B. Sc (Computer Science)(w.e.f. June, 2022)

Class : F.Y. B. Sc. (Computer Science)
Semester I
Paper Code : UCSEL 112
Paper : II
Title of Paper : Fundamentals of Digital Electronics
Credit : 2 No. of lectures : 36

- **Course Objectives:**

1. To know about different number systems and codes.
2. To understand logic gates and truth tables.
3. To understand Boolean Laws and k map techniques.
4. To understand different arithmetic circuits.
5. To understand basic Boolean laws and try to implement them.
6. To know the concept of combinational circuits.
7. To know about the various logic family ICs.

- **Course Outcomes:**

CO1: To solve problems based on interconversion of number systems.
CO2: To reduce expressions using Boolean Laws.
CO3: To reduce expressions using k-map in SOP and POS forms.
CO4: To familiarize with the applications of arithmetic circuits.
CO5: To develop the understandings of number systems and its application in digital electronics.
CO6: To develop and analyze of K-map to solve the Boolean functions and implement.
CO7: Apply the fundamental knowledge of analog and digital electronics to get different types of analog to digital signal.

Unit I: Number Systems and Digital Codes (8L)

Number Systems - Introduction to decimal, Octal, Binary and hexadecimal numbersystems, Inter conversions – Decimal to Binary, Octal, Hexadecimal; Binary to Decimal, Octal, Hexadecimal; Octal to Binary, Decimal, Hexadecimal; Hexadecimal to Binary, Octal, Decimal

Codes - BCD, Excess-3 and Gray

Interconversion- Binary to Gray and Gray to Binary, Decimal to BCD, Decimal toExcess-3, Alphanumeric representation using ASCII code.

Unit II: Logic Gates (8L)

Positive and Negative logic, Concept of Logic Gates – Statement, Symbol,Expression, Truth table of basic gates, Derived Gates.

Derived Logic Gates- Statement, symbol, Expression, Truth Table of derived gatesEX OR, and EXNOR.Parity checker using EX OR gates.

Pinout diagrams - IC 7400, IC 7402, IC 7432, IC 7408, IC 7486 (Top/Bottom Views)

Unit III: Boolean algebra and Karnaugh Map (12L)

Boolean Laws – Insertion, union, Tautology,Complement, Double Negation, Commutation, Association, Distribution, Absorption.

Boolean Expressions in SOP and POS Form, Conversion of SOP and POS into their standard form, Minimization of Complex Boolean Expression using Boolean Algebraic Techniques.

DeMorgan's Theorems, Introduction to k-map, Minimization Techniques using K-map (2 , 3 and 4 Variables).

Unit IV: Arithmetical Operations and Arithmetical Circuits (8L)

Basic Binary Rules for addition and subtraction, 1's and 2's complement of binary numbers, Subtraction of binary numbers using 1's and 2's complement, Half adder, Full adder, Half Subtractor, Parallel Adder, Universal Adder/Subtractor. Study of IC 7483, IC4008.

Reference Books:

1. **Digital Electronics : Principles, Devices and Applications - Anil K. Maini (Wiley)**
2. **Digital Fundamentals - Floyd T.N. and Jain R.P. (Pearson Educations)**
3. **Digital system Design – M. Morris Mano(Pearson Education)**
4. **Digital Principles and Applications –Leach, Malvino, Saha (TMH)**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	-	-	-	-	2	-
CO2	1	1	1	-	-	-	1
CO3	2	2	2	-	-	3	2
CO4	1	1	1	-	-	-	-
CO5	3	-	-	-	-	-	3
CO6	1	2	2	-	-	2	3
CO7	1	2	1	-	-	1	2

PO Justification:

PO1: Computer Knowledge:

CO1: Solving problems related to interconversion of number systems often requires the use of computer tools and resources. Recognizing the need for ongoing learning includes acquiring and utilizing computer knowledge for problem-solving.

CO2: The reduction of expressions using Boolean Laws often involves the use of software tools or programming, emphasizing the need for computer skills in engineering practice.

CO3: Utilizing K-maps involves the use of graphical tools and often software for optimization.

CO4: Students are familiar with the applications of arithmetic circuits implies the use of modern engineering tools, including computer simulations and modeling.

CO5: Understanding number systems and their applications in digital electronics involves continuous learning and staying updated, often through the use of online resources and computer-based learning materials.

CO6: Developing and analyzing K-maps often requires the use of computer tools for efficient implementation and analysis, aligning with the use of modern engineering tools.

CO7: Applying fundamental knowledge to obtain analog to digital signals may involve the use of computer-based simulations, modeling, or programming tools.

PO2: Design/ Development of a solution:

CO2: Reducing expressions using Boolean Laws requires the design of logical transformations and experiments to validate the effectiveness of these laws in simplifying expressions.

CO3: Utilizing K-maps involves the design and experimentation of graphical methods for reducing

Boolean expressions, aligning with the design and conduct of experiments.
CO4: Familiarizing with the applications of arithmetic circuits involves designing solutions, conducting experiments to understand circuit behavior, and analyzing data to ensure proper functionality.
CO6: Developing and analyzing K-maps involves designing solutions for Boolean function optimization, conducting experiments to test different configurations, and analyzing data to select the most efficient solutions.
CO7: Applying fundamental knowledge to obtain different types of analog to digital signals requires designing solutions, conducting experiments, and analyzing data to ensure the accuracy and effectiveness of the conversion process.

PO3: Modern tool usage:
CO2: Reducing expressions using Boolean Laws can be efficiently done using modern tools like computer software or programming environments.
CO3: Utilizing K-maps often involves the use of graphical tools or software for optimization, aligning with the need for modern engineering tools.
CO4: Familiarizing with the applications of arithmetic circuits may involve simulation tools or software applications for circuit design and analysis.
CO6: Developing and analyzing K-maps often involves using modern tools, such as graphical software or digital design tools, for efficient implementation and analysis.
CO7: Applying fundamental knowledge to obtain different types of analog to digital signals may involve the use of modern tools like simulation software, oscilloscopes, or digital signal processing tools.

PO6: Individual and teamwork:

CO1: Demonstrates proficiency in mathematical and logical concepts related to number systems, showcasing individual problem-solving skills.

CO3: Demonstrates the ability to use Karnaugh maps for expression reduction, showcasing individual analytical skills in solving complex problems.

CO6: Demonstrates an understanding of the broader implications of number systems in the context of digital electronics, showcasing individual knowledge application.

CO7: Applies fundamental knowledge of analog and digital electronics to obtain various types of analog-to-digital signals, showcasing individual application skills.

PO7: Innovation, Employability and Entrepreneurial skill:
CO2: Applies Boolean Laws innovatively to reduce logical expressions, highlighting adaptability and employability in solving complex problems.
CO3: Utilizes Karnaugh maps innovatively for expression reduction, showcasing adaptability and employability in tackling intricate problems.
CO5: Applies knowledge of number systems innovatively in the context of digital electronics, showcasing adaptability and employability in diverse scenarios.
CO6: Innovatively develops and analyzes Karnaugh maps for solving Boolean functions, highlighting adaptability and employability in implementing solutions.
CO7: Applies fundamental knowledge innovatively to obtain various types of analog-to-digital signals, showcasing adaptability and employability in diverse applications.

SYLLABUS (CBCS) FOR F. Y. B. Sc. (Computer Science)(w.e.f. June, 2022)

Class : F.Y. B. Sc. (Computer Science)
Semester I
Paper Code : UCSEL 113
Paper III
Title of Paper : Electronics
Practical'sCredit 2

- **Course Objectives:**
  1. To teach students how to draw different symbols, logic diagrams and 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 learn the basic technique for the design of digital circuits and fundamental concept used in the design of digital system.
  6. To implement simple logical operations using combinational logic circuits.
  7. To impart to student the concept of sequential circuits.

- **Course Outcomes:**

  At the end of this course, students should be able to:
  CO1: To identify different components, devices, IC's, as well as their types.
  CO2: To understand basic parameters.
  CO3: To know operation of different instruments used in the laboratory.
  CO4: To connect circuit and do required performance analysis.
  CO5: To develop skill to built and trouble shoot digital circuits.
  CO6: This course will help in design and analysis of the digital circuits and systems.
  CO7: Student will able to measure AC and DC parameters.

Group A : Demonstration (Any Two)
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, CRO, DSO, Power supply)
3. Demonstration of various IC's
4. Hand's on training- soldering /desoldring techniques

Group B : Analog Electronics (Any Four)
1. Measurement of signal parameters (amplitude, period, frequency, peak voltage, peak to peak voltage, RMS value)
2. Verification of Kirchhoff's Current Law (KCL)
3. Verification of Kirchhoff's Voltage Law (KVL)
4. Verification of Thevenin theorem.
5. Verification of Maximum power transfer theorem
6. Study of filters (First order passive Low pass & High pass filter)
7. LCR series resonance

Group C : Digital Electronics (Any Four)

1. Verification of logic gates using IC's (7400, 7402, 7408, 7404, 7432)
2. Realization of basic gates using universal gates (NAND, NOR)
3. Study of Half & Full adder using gates.
4. Code converter : Binary to Gray and Gray to Binary
5. Design of Parity checker/ Generator using XOR gates.
6. Verification of DE Morgan's theorem
7. To study Universal adder & Subtractor

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	3	-	-	-	2	2
CO2	3	1	2	-	-	-	2
CO3	-	2	2	-	-	3	3
CO4	-	3	3	-	-	3	-
CO5	3	-	-	-	-	-	3
CO6	1	1	2	-	-	2	2
CO7	-	-	3	-	-	3	2

PO Justification:

PO1: Computer knowledge:

CO1: Computer knowledge is essential for identifying various components, devices, and ICs, as computer-aided tools and databases are often used for component identification and classification.
CO2: Computer knowledge is crucial for understanding and analyzing basic parameters, as simulations and computational tools are often employed to explore the behavior of electronic components and circuits.
CO5: Computer knowledge supports the development of skills in building and troubleshooting digital circuits through the use of simulation tools and software-based diagnostic techniques.
CO6: Computer knowledge is integral to the design and analysis of digital circuits and systems, involving the use of computer-aided design (CAD) tools and software for simulation and verification.

PO2: Design/ development of a solution:

CO1: Identifying components is crucial in the design phase, as designers need to choose appropriate components for a given problem to create effective solutions.
CO2: Understanding basic parameters is fundamental to the design process, guiding designers in selecting and specifying parameters for creating solutions.
CO3: Knowing how instruments operate is essential for designing experiments and selecting appropriate tools for the development of solutions.
CO4: Connecting circuits and analyzing performance are integral parts of the design process, contributing to the development of effective solutions.
CO6: Designing and analyzing digital circuits and systems directly align with the design and development of solutions, where understanding the system is crucial for effective design.

PO3: Modern tool usage:

CO2: Utilizing modern tools for simulations and modeling enhances the understanding of basic parameters, allowing students to analyze and visualize electronic characteristics efficiently.
CO3: Learning the operation of laboratory instruments often involves the use of modern tools for virtual simulations, remote control, or data logging, enhancing familiarity with advanced technology.
CO4: Connecting circuits and performing analysis is often facilitated through modern simulation tools and software, which provide a more efficient and accurate means of analyzing circuit performance.
CO6: Designing and analyzing digital circuits is significantly supported by modern tools like Computer-Aided Design (CAD) software, enabling more complex and precise designs.
CO7: Modern tools for data acquisition and analysis are crucial in measuring AC and DC parameters

accurately, ensuring students are proficient in utilizing advanced technology.

PO6: Individual and teamwork:
CO1: Developing the ability to identify components individually, demonstrating personal proficiency in understanding electronic elements.
CO3: Understanding the operation of instruments individually, demonstrating personal competency in laboratory procedures.
CO4: Connecting circuits and performing analysis individually, showcasing personal analytical skills and competence in circuit performance evaluation.
CO6: Engaging in the design and analysis of digital circuits individually, showcasing personal capability in understanding and working with complex digital systems.
CO7: Collaborating with team members on laboratory work, circuit connections, troubleshooting, and possibly on larger design and analysis projects, showcasing teamwork skills.

PO7: Innovation, Employability and Entrepreneurial skill:
CO1: The ability to identify and understand different components showcases employability skills, as this knowledge is fundamental for various roles in the electronics industry.
CO2: Understanding basic parameters is crucial for innovation in electronics and is a key employability skill, especially in roles requiring problem-solving and creative thinking.
CO3: Knowing the operation of instruments demonstrates employability skills, as it is essential for adapting to different work environments and utilizing a variety of tools in innovative ways.
CO5: Developing skills to build and troubleshoot digital circuits is crucial for employability, particularly in roles where hands-on practical skills are required.
CO6: Designing and analyzing digital circuits contributes to innovation and employability, as it involves applying theoretical knowledge to practical solutions.
CO7: The entire course, by enhancing innovation and employability skills, indirectly contributes to entrepreneurial skills. Entrepreneurs often need a combination of innovative thinking and practical skills to succeed.