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

Autonomous

Course Structure For F. Y. B. Sc. Computer Science

Semester	Paper Code	Title of Paper	No. of Credits
II	CSEL1201	Semiconductor Devices and Memories	2
	CSEL1202	Sequential Circuits Design	2
	CSEL1203	Practical	2

SYLLABUS (CBCS) FOR F. Y. B. Sc. Computer Science
(w.e. from June, 2019)

Academic Year 2019-2020

Class : F.Y. B. Sc.(Comp. Sci.) (Semester- II)
Paper Code: CSEL1201
Paper : I Title of Paper : **Semiconductor Devices and Memories**
Credit : 2 No. of lectures: 36

Course Objectives:

1. To study characteristic features of semiconductor devices
2. To study elementary electronic circuits and applications
3. To understand basics of basics of Memories.
4. This course aims to provide general understanding of semiconductor devices.
5. This course addresses on electronic devices on a fundamental level.
6. To study, analyze and design circuits using semiconductor devices.
7. To make student understand construction, characteristics and operation of the major semiconductorDevices.

Course Outcomes:

CO1: Analysis the different types of memories designs.
CO2: Identification of new developments in semiconductor memory design.
CO3: Analysis of different memory testing and design for testability.
CO4: Analysis of characteristics of semiconductor devices.
CO5: Demonstrate the switching and amplification application of the semiconductor devices.
C06 : To have knowledge about the physics of semiconductor devices.
CO7: Analysis circuit using semiconductor devices.

Unit 1: Diodes **(10L)**

Study of semiconductor devices with reference to symbol, working principle, I-V characteristics, parameters, specifications: diode, zener diode, light emitting diode, photo diode, Optocoupler, solar cell, Rectifiers (half and full wave), Block diagram of power supply**.**

Unit-2: Transistor and its types: **(12L)**

BJT: symbol, types, construction, working principle, I-V characteristics, parameters, specifications, concept of amplifier, configurations of transistors (CC,CE& CB) Brief study of : Uni-Junction Transistor (UJT), Junction Field Effect Transistor (JFET), Metal Oxide Semiconductor FET (MOSFET) , Applications of transistors.

Unit 3: Memories **(14L)**

Data storage principle, Types of memories: Random Access memory(RAM), Read only Memory(ROM), Static RAM(SRAM), Dynamic RAM(DRAM), Programmable ROM(PROM), Erasable PROM(EPROM), Electrical EPROM(EEPROM), compare DRAM & SRAM , RAM & ROM ,Roll of memories in PLD(Programmable Logic Devices), Need of PLD, Simple PLD(SPLD),Complex PLD(CPLD) , Field Programmable Gate Array (FPGA)

Text/ 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. Modern Digital Electronics: R.P. Jain, Mcgraw Hill
4. A text book of electrical technology: B.L.Theraja, S.Chand and Co.

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

PO Justification:

PO1: Computer knowledge:

CO2: Identifying new developments in semiconductor memory design contributes to staying updated with advancements in computer technology. This skill enhances computer knowledge by keeping individuals informed about the latest trends and innovations in semiconductor memory design.

CO4: Analyzing the characteristics of semiconductor devices is fundamental to understanding their role in computer systems. This analysis enhances computer knowledge by providing a foundational understanding of the behavior and performance of semiconductor devices.

CO7: Analyzing circuits using semiconductor devices is a practical application of computer knowledge. This skill allows individuals to understand and troubleshoot circuits, contributing to a comprehensive understanding of computer systems.

PO2: Design/ Development of a solution:

CO2: Identifying new developments in semiconductor memory design is crucial for staying current with technological advancements. This skill enables individuals to incorporate the latest innovations into their solutions, enhancing the design and development process.

CO3: Analysis of memory testing and design for testability contributes to the creation of robust and reliable solutions. Understanding how to test and design for testability is essential in developing solutions that can be effectively evaluated and maintained.

CO7: Analysis of circuits using semiconductor devices is directly relevant to the design and development of solutions involving electronic circuits. This competency enhances the ability to create effective solutions in the realm of semiconductor-based circuits.

PO3: Modern tool usage:

CO3: The analysis of memory testing and design for testability often involves the use of modern tools and software for simulation, testing, and verification. Mastery of such tools is essential for efficient and effective analysis in this context, aligning with the need for modern tool usage.

CO4: Analyzing the characteristics of semiconductor devices often involves the use of simulation tools and software for modeling and understanding their behavior. Proficiency in modern tools is critical for accurate analysis and design in semiconductor device characterization.

CO7: The analysis of circuits using semiconductor devices is greatly aided by modern tools for circuit simulation, analysis, and design. The use of simulation software and other tools is essential for efficient and accurate analysis of circuits, making it a key aspect of modern tool usage.

PO4: Ethics:

CO7: In the analysis of a circuit using semiconductor devices, ethical considerations play a significant role. Ethical practices in this context may involve ensuring the proper and legal use of semiconductor devices, respecting intellectual property rights, and adhering to safety standards.

PO5: Environmental Sustainability:

CO3: The analysis of different memory testing and design for testability involves considering the environmental impact of memory systems and testing processes. Sustainable practices in testing and design contribute to reduced energy consumption, efficient use of resources, and the overall environmental friendliness of electronic systems.

CO5: Demonstrating the switching and amplification applications of semiconductor devices includes considering the energy efficiency and sustainability of these applications. Knowledge of sustainable practices in the use of semiconductor devices can lead to the development of energy-efficient electronic systems, aligning with environmental sustainability goals.

CO6: Understanding the physics of semiconductor devices allows for the development of energy-efficient devices and systems. Knowledge in this area contributes to the design and implementation of electronics that consume less power, which is environmentally sustainable.

PO6: Individual and teamwork:

CO1: The analysis of different types of memory designs may involve both individual research and collaborative efforts within a team.

CO6: Understanding the physics of semiconductor devices may involve individual study of theoretical principles. However, practical applications and projects related to semiconductor devices often require teamwork.

PO7: Innovation, Employability and Entrepreneurial skill:

CO1: Analyzing different types of memory designs requires innovative thinking to understand the strengths, weaknesses, and potential applications of each design. This skill contributes to employability by fostering problem-solving abilities and entrepreneurial skills by promoting creative thinking in the field of memory design.

CO2: Identifying new developments in semiconductor memory design reflects an ability to stay updated with industry trends and innovations. This competency enhances employability by ensuring individuals are well-versed in the latest technologies and contributes to entrepreneurial skills by encouraging individuals to explore and apply cutting-edge solutions.

CO3: Analyzing memory testing and design for testability involves finding innovative solutions to ensure the reliability and quality of memory systems. This skill enhances employability by preparing individuals for roles that require a deep understanding of testing methodologies and contributes to entrepreneurial skills by fostering the ability to develop novel testing strategies.

CO6: Having knowledge about the physics of semiconductor devices provides a foundation for innovative thinking in the design and application of these devices. This knowledge enhances employability by making individuals well-equipped to contribute to the development of cutting-edge technologies and contributes to entrepreneurial skills by fostering the ability to explore novel approaches based on a deep understanding of device physics.

CO7: Analyzing circuits using semiconductor devices involves both innovative problem-solving and practical application. This competency enhances employability by providing practical circuit analysis skills and contributes to entrepreneurial skills by fostering the ability to design and optimize circuits for various applications

SYLLABUS (CBCS) FOR F. Y. B. Sc. Computer Science
(w.e. from June, 2019)
Academic Year 2019-2020

Class : F.Y. B. Sc.(Comp. Sci.) (Semester- II)
Paper Code: CSEL1202
Paper : II Title of Paper: **Sequential Circuits Design**
Credit : 2 No. of lectures: 36

Course Objectives:

1. To study the basic number system, binary codes.
2. To study the theory of K-map and Boolean algebra.
3. To study representation of functions using Boolean expressions and their minimization techniques.
4. To study the combinational logic design of various logic gates.
5. To study some of the programmable logic devices.
6. To study their use in realization of switching functions and gates.
7. To study the sequential logic circuit design both in synchronous and asynchronous modes for variouscomplex logic gates.

Course Outcomes:

CO1: Student will be aware of theory of Boolean algebra and K-maps.
CO2: To understand the underlining features of various number systems.
CO3: Students will be able to use the concept of Boolean algebra for the analysis.
CO4: To understand the design of various combinational and sequential logic circuits.
CO5: Students will be able to design various logic gates starting from simple ordinary gates to complex programmable logic device.
C06 : Be able to design and analyze sequential logic circuits.
CO7: To understand the basic design and implementation of digital cicuits and systems.

Unit I : Flip Flops (12L)

Introduction to sequential circuits, Flip flops – Introduction, Block diagram, Truth table, Logic diagrams for RSFF , latch, clocked RSFF, JKFF, Master slave JKFF, D flip-flop and T-flip-flop. Excitation table for SR, JK, T and D flip flops, Advantages and disadvantages of flip-flop, application of flip-flops.

UNIT II : Counters (14L)

Introduction to Counters, Ripple counter, 3 bit Asynchronous up and down counter (Logic diagram, timing diagram, truth table), Design of 3-bit Synchronous up and down Counter using JKFF (Excitation table, Truth table, K-map, Logic Diagram, timing diagram), Concept of modulus counter and mod n counters using Decade counter(7490) , Applications of Counter.

Unit III : Shift registers (10L)

Introduction, SISO, SIPO, PISO, PIPO shift registers with truth table and timing diagrams, ring counter, universal 4-bit shift register, Applications of Shift Registers.

Text/ Reference Books:

1. Digital Electronics: Jain R.P., Tata McGraw Hill
2. Digital Principles and Applications : Malvino Leach, Tata McGraw-Hill.
3. Digital Fundamentals: Floyd T.M., Jain R.P., Pearson Education

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

PO Justification:

PO1: Computer knowledge:

CO2: Understanding various number systems is crucial for computer knowledge, as different systems are used in computer architecture, programming, and digital systems. Familiarity with number systems contributes to a comprehensive understanding of computer representation and computation.

CO4: Understanding the design of combinational and sequential logic circuits is crucial for computer knowledge. This knowledge is directly applicable to the development of digital systems and forms the basis for more complex computer architecture and programming concepts.

CO7: Understanding the basic design and implementation of digital circuits and systems is a fundamental aspect of computer knowledge. This knowledge forms the basis for the development of various digital applications and systems.

PO2: Design/ Development of a solution:

CO2: Understanding the features of various number systems is foundational for designing and developing solutions in computer systems. Different number systems are used in programming, data representation, and computer architecture. The knowledge of these systems contributes to the effective design and development of solutions in the field of computing.

CO3: The application of Boolean algebra for analysis is a practical skill that contributes to the design and development of solutions in digital systems. Boolean algebra forms the basis for designing logical circuits, and the ability to use it enhances the capability to design effective solutions for digital applications.

CO4: Understanding the design of combinational and sequential logic circuits is essential for designing solutions in digital systems. This knowledge is directly applicable to the development of computer systems, memory units, and other digital applications. Proficiency in designing these circuits is crucial for creating effective and efficient solutions.

CO7: Understanding the basic design and implementation of digital circuits and systems is directly aligned with the ability to design and develop solutions. This knowledge is fundamental for creating solutions in the digital domain, ranging from simple logic gates to complex digital systems.

PO3: Modern tool usage:

CO3: Using Boolean algebra for analysis often involves the use of modern tools and software for simulation, modeling, and analysis of digital circuits. Modern tools aid in visualizing and validating complex Boolean expressions, facilitating efficient and accurate analysis.

CO4: Understanding the design of combinational and sequential logic circuits is complemented by the use of modern tools for simulation, synthesis, and verification. Modern tools enhance the design process, allowing for more efficient and error-free development of digital circuits.

CO7: The basic design and implementation of digital circuits and systems often involve the use of modern tools for schematic capture, simulation, and layout. Incorporating modern tools into the learning process ensures that students are familiar with industry-standard tools used in digital design.

PO4: Ethics:

CO7: Understanding the basic design and implementation of digital circuits and systems involves ethical considerations.

PO5: Environmental sustainability:

CO3: The application of Boolean algebra for analysis, when approached responsibly, can contribute to environmental sustainability. Efficient logical analysis can lead to optimized digital circuits, which may result in reduced power consumption and energy efficiency. Using Boolean algebra principles effectively can lead to the design of circuits that consume less energy, aligning with environmental sustainability goals.

CO5: The design of various logic gates and programmable logic devices presents opportunities for environmentally sustainable practices. Efficient design strategies can contribute to the development of electronic systems with lower power requirements and reduced environmental impact. By emphasizing energy-efficient designs, students can contribute to the overall goal of environmental

sustainability.
CO6: Responsible design and analysis of sequential logic circuits can contribute to environmental sustainability. Optimizing the functionality and power consumption of sequential logic circuits can lead to more energy-efficient systems, aligning with environmental goals.

PO6: Individual and teamwork:
CO1: While understanding the theory of Boolean algebra and K-maps is an individual skill, the application of these concepts in real-world scenarios often involves teamwork. Collaborative efforts may be required to solve complex problems, discuss different approaches to applying Boolean algebra, and collectively create efficient K-maps.
CO6: Designing and analyzing sequential logic circuits can be approached as both an individual and a team effort. Individuals may contribute by understanding the theoretical concepts and applying them to specific design problems, while teamwork may be necessary to address challenges, share insights, and collectively ensure the robustness of sequential logic circuit designs.
CO7: Understanding the basic design and implementation of digital circuits and systems is a foundational skill that can be enhanced through both individual learning and teamwork. While individuals may grasp the theoretical concepts, teamwork becomes crucial when applying these concepts to solve practical design problems and implementing complex digital systems.

PO7: Innovation, Employability and Entrepreneurial skill:
CO1: Awareness of Boolean algebra and K-maps is foundational for innovative problem-solving in digital design. This knowledge enhances employability by providing individuals with the skills to creatively approach logical analysis and contributes to entrepreneurial skills by fostering the ability to innovate in digital circuit design.
CO2: Understanding various number systems is crucial for innovation in various fields, from computer programming to digital design. Proficiency in number systems enhances employability by ensuring individuals can work across diverse domains, and it contributes to entrepreneurial skills by fostering adaptability to different numerical representations in innovative solutions.
CO3: Using Boolean algebra for analysis requires creative problem-solving skills. The ability to apply Boolean algebra innovatively contributes to employability by preparing individuals for roles that require logical analysis, and it fosters entrepreneurial skills by encouraging creative approaches to digital circuit design.
CO6: Designing and analyzing sequential logic circuits requires creative thinking. Proficiency in this area enhances employability by providing skills in developing complex digital systems, and it contributes to entrepreneurial skills by fostering the ability to create innovative solutions that involve sequential logic.
CO7: Understanding the basic design and implementation of digital circuits and systems is essential for innovation in digital technology. This knowledge enhances employability by providing a foundational understanding of digital systems, and it contributes to entrepreneurial skills by fostering the ability to identify opportunities for innovation in digital circuit design.

SYLLABUS (CBCS) FOR F. Y. B. Sc. Computer Science
(w.e. from June, 2019)

Academic Year 2019-2020

Class : F.Y. B. Sc.(Comp. Sci.) (Semester- II)
Paper Code: CSEL1203
Paper : III Title of Paper: Practical Course (Annual)

Course Objectives:

1. To introduce the operation of semiconductor devices.
2. To provide the knowledge about number system, arithmetic operation and sequential code of digitalelectronic cicutits.
3. To introduce the fundamental concept and working principle of types of BJTs.
4. To provide the understanding of basic gates and their truth tables.
5. To understand the knowledge of K-map, SOP and POS methods.
6. To design the logic circuits and different class of digital circuit like unipolar and bipolar logic families.
7. To analyze the network theorems and laws.

Course Outcomes:

CO1: To give the knowledge of basic electronic components and circuits.
CO2: To understand working of some IC based circuits.
CO3: To introduce basic of Diode and Transistor circuits.
CO4: To analyze basic AC and DC circuit for voltage and current by using KVL, KCL and network theorems.
CO5: Explain behavior of FET at low frequency.
C06 : Design and analyze transformers.
CO7: Understand and identify various manufacturing techniques

Preparatory experiments (**2 Compulsory**)

1. Study of Components.
2. Study of Basic Electronic Devices (Multimeters, Signal Generators, CRO)
3. Study of AC and DC sources

All the students are required to complete **16** experiments from the following list :

Group A (Any Four)

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 JFET/MOSFET
5. Study of I-V characteristics of UJT and Demonstration of UJT based relaxation oscillator.
6. Study of solar cell.

Group B (Any four)

1. Verification of network theorems: KCL / KVL, Thevenin, Norton.

2. Verification of network theorems: Maximum Power Transfer, Superposition theorem.
3. Study of low voltage Half-wave, Full-wave and Bridge rectifier circuits.
4. Study of amplification action of BJT.
5. Build and test Inverting and non inverting amplifier using OPAMP.
6. Build and test adder and subtractor circuits using OPAMP.

Group C (Any Four)

1. Basic Logic gates using Diodes and transistors
2. Inter conversions and realizations of logic expressions using ICs
3. Study of RS, JK and D flip flops using NAND gates
4. Study of Up/Down Counter
5. Study of decade counter IC circuit configurations
6. Study of 4-bit Shift register IC

Group D (Any Four)

1. Build and Test 4 bit parity checker/ generator using X-OR gate IC
2. Build and Test Half Adder, Full Adder and Subtractor using basic gate
3. Build and Test 2:1 Multiplexer and 1:2 Demultiplexer using gates
4. Build and Test a Denounce switch using NAND or NOR gate IC
5. Build and Test Diode matrix ROM
6. Study of Four bit Universal Adder/Subtractor / ALU

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

PO Justification:

PO1: Computer knowledge:

CO2: Integrated circuits (ICs) are widely used in computer systems. Understanding IC-based circuits requires knowledge of digital and analog electronics, which in turn, involves computer-based simulation and design tools.

CO4: Computer-based tools are essential for solving complex circuit analysis problems involving AC and DC circuits. Students can use software for solving equations, performing simulations, and visualizing circuit responses.

CO5: Computer knowledge is vital for simulating and analyzing the behavior of Field-Effect Transistors (FETs) at different frequencies. Software tools can assist in understanding and visualizing FET characteristics.

CO7: Computer knowledge is relevant for understanding automated manufacturing processes and quality control. Concepts like Computer-Aided Manufacturing (CAM) can be introduced to illustrate the role of computers in the manufacturing industry.

PO2: Design/ development of a solution:

CO2: Understanding IC-based circuits is essential for designing electronic solutions that incorporate integrated circuits. The ability to comprehend and work with ICs contributes to the development of electronic solutions.

CO3: Knowledge of diode and transistor circuits is foundational for designing electronic solutions. These basic building blocks are often used in various electronic systems, and understanding their principles is crucial for effective design.
CO4: Analyzing circuits using Kirchhoff's laws and network theorems is a critical skill for designing and developing electronic solutions. This knowledge aids in creating efficient and optimized circuit designs.
CO7: Knowledge of manufacturing techniques is essential for designing electronic solutions that are not only functional but also manufacturable. Understanding how products are manufactured helps in developing practical and feasible solutions.

PO3: Modern tool usage:

CO3: Modern tools are often used in the design and analysis of diode and transistor circuits. Students, while learning about these components, should also be exposed to and familiar with contemporary tools for circuit simulation, modeling, and analysis.
CO4: The analysis of AC and DC circuits involves the use of modern tools for simulation and computation. Students should be adept at using these tools to apply Kirchhoff's laws (KVL and KCL) and network theorems for circuit analysis.

PO4: Ethics:

CO7: The understanding and identification of various manufacturing techniques may involve ethical considerations such as ensuring the well-being of workers, minimizing environmental impact, and maintaining transparency in business practices.

PO6: Individual and teamwork:

CO1: Understanding basic electronic components and circuits is foundational knowledge for any engineering discipline, and the application of this knowledge often involves both individual work and collaboration within a team. Individual understanding contributes to teamwork when combining efforts to solve complex problems.
CO6: Designing and analyzing transformers can be both an individual and team effort. While individual skills are needed for specific tasks, such as detailed analysis, teamwork is often required for comprehensive design projects that involve multiple aspects of transformer design, testing, and optimization.

PO7: Innovation, Employability and Entrepreneurial skill:

CO1: Understanding basic electronic components and circuits is foundational for innovation. The knowledge gained in this area is essential for creating new ideas, designs, and solutions in the field of electronics.
CO2: Understanding the working of IC-based circuits contributes to the development of innovative solutions. Integrated circuits are fundamental components in modern electronics, and a deep understanding of their functioning enhances employability and entrepreneurial potential.
CO3: Introducing the basics of diode and transistor circuits provides students with the foundation to innovate in electronic design. Employability in the electronics industry often requires a solid understanding of these fundamental components.