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

Course Structure & Credit Distribution for
S. Y. B. Sc. (Electronics) (Sem. III) (2022 Pattern)
(w.e.f. June, 2023)

Semester	Paper Code	Title of Paper	No. of Credits
III	USEL231	Linear Integrated Circuits and Applications	3
	USEL232	Digital Circuit Design	3
	USEL233	Electronic Practical's	3

SYLLABUS (CBCS) FOR S. Y. B. Sc. (Electronics)

(w.e.f. June, 2023)

Class: S.Y. B. Sc. (Sem III) (2022 Pattern)

Paper Code : USEL231

Title of Paper: Linear Integrated Circuits and Applications

Paper : I

Credit : 3 **No. of lectures: 48**

Course Objectives:

1. To study basic principles of amplifiers and oscillators.
2. To understand the working of various analog circuits.
3. To develop analog circuit design skills.
4. To apply the knowledge of analog circuits in different applications.
5. To understand the basic concepts of operational amplifier and its various applications.
6. To understand the basics of Op-Amp and its practical applications
7. To know about Oscillator and its Application.

Course Outcomes:

After completing the course student will able to

1. Understand basics of amplifiers, op-amp and oscillators.
2. Explain the concepts of oscillators, filters.
3. Design the circuits of different filters and oscillators.
4. Design and analyse the various non-linear application of op-amp
5. Design and analyse filter circuits using op-amp
6. Design and analyse oscillators circuits using op-amp.
7. Design the Characteristics of Op-Amp.

UNIT- 1: Amplifiers (12)

General classification of amplifiers with respect to signal amplitude, frequency and configuration: Small signal amplifier

Types of coupling (quantitative analysis): RC coupled, transformer coupled and direct coupled. Multi-stage RC coupled CE amplifier: effect of coupling capacitor and bypass capacitor on frequency response (qualitative approach).

Concept of small signal and large signal amplifiers. Comparison with respect to gain, efficiency, distortion. Concept of thermal run away and use and types of heat sinks.

UNIT 2: Oscillators (12)

Concept of negative and positive feedback and Barkhausen criterion. Types of feedback circuits: current shunt, current series, voltage shunt and voltage series, comparison and applications. Effect of negative feedback: on gain ,Bandwidth, input and output impedance, stability of an amplifier.

Positive feedback: RC oscillators -Wien bridge , Phase Shift. LC oscillators- Hartley ,Colpitts. Crystal oscillator. Design of oscillators for given feedback factor and frequency of oscillations.

UNIT 3: Operational amplifier **(12)**

Differential Amplifier, Block diagram of an operational amplifier, Op-Amp characteristics(Ideal and practical) input offset voltage, output offset voltage,input offset current, input bias current, common mode rejection ratio, slew rate, supply voltage rejection ratio.Open loop frequency response. Gain bandwidth product. Concept of virtual Ground, offset null.
Inverting and non-inverting amplifiers.Adder and subtractors.Voltage follower, Integrator, Differentiator.

UNIT 4: Applications of Op-amp **(12)**

Comparators, Schmitt Trigger,Voltage to current converter, Current to voltage converter, Bridge amplifier, Instrumentation amplifiers with three op-amp.
Active and passive filters, First order low pass, high pass, band pass and band reject filters. Designing of filters.

Recommended Books:

1. Electronic Principles by Malvino A.P TMH
2. Operational amplifiers and linear Integrated Circuits by Gaykawad R. PHP
3. Operational amplifier by Clayton G.B. ELBS
4. Electronic devices and circuits by Millman, HalkiasMcGrawHill
5. Electronic devices and circuits by Boylestead PHP
6. Principles of Electronics by Meheta V.K. S.Chand and Company
7. Principles of Electronics by B.L.ThorejaS.Chand and Company
8. Basic Electronic Devices and Circuits: R.Y. Borse 1st Edition 2012 Adhayan Publishers and distributors, New Delhi.

Mapping of Program Outcomes with Course Outcomes

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

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

Justification For The Mapping:

PO1:Disciplinary Knowledge:

CO1:Students will acquire a foundational understanding of electronic circuits, focusing on amplifiers, operational amplifiers (op-amps), and oscillators.

PO2: Critical Thinking and Problem solving:

CO2: Students will develop practical skills in designing circuits for various filters and oscillators.

CO3**:** Students we designing these circuits requires critical thinking, problem-solving skills, and the ability to apply theoretical knowledge to real-world situations.

CO7: Students will focus on understanding and designing the characteristics of op-amps.

PO3: Social competence:

CO5: Students will learn to design filter circuits using op-amps, expanding their knowledge of practical applications.

CO6: Students will apply their knowledge to design and analyze oscillator circuits utilizing op-amps.

PO4: Research-related skills and Scientific temper:

CO2: Students will engage in a comprehensive study of oscillator circuits, delving into the underlying principles, mathematical models, and practical applications.

CO4: studying existing oscillator designs, and understanding the historical development of oscillator technology.

PO9: Self-directed and Life-long learning:

CO1: To understand amplifiers, op-amps, and oscillators, students must be resourceful.

CO6: Designing Oscillator circuits involves critical analysis and problem-solving to achieve desired filter characteristics.

SYLLABUS (CBCS) FOR S. Y. B. Sc. (Electronics)

(w.e.f. June, 2023)

Class: S.Y. B. Sc. (Sem III) (2022 Pattern)
Paper Code : USEL232
Title of Paper: Digital Circuit Design
Paper : II
Credit : 3 **No. of lectures: 48**

- **Course Objectives:**

1. To utilize k-maps in the design of combinational circuits.
2. To understand the design principles of sequential circuits.
3. To study the design and working of various data converters
4. To configure the digital circuits in system interfacing.
5. To be familiar with different logic families.
6. To Understand the basic software tools for the design and implementation of digital circuits and system.
7. To understand the Analyze the operation of counters .

- **Course outcomes:**

Student should able to:

1. Design combinational circuits using logic gates.
2. Design various counters and determining outputs.
3. Work with different types of counters and design its applications.
4. Understand digital system interfacing and logic families.
5. Understand the fundamental concepts and techniques used in digital electronics.
6. To prepare students to perform the analysis and design of various digital electronic circuits.
7. To facilitate students in designing a logic circuit.

UNIT -1: Combinational Logic Circuit Design: (**12)**

Revision of K maps, Design of code converters: BCD to Seven segments, Binary to Gray, Gray to binary, Half adder, Full adder, Priority Encoder, Error Detection Technique: Hamming Code

UNIT -2: Sequential Circuits: (12)

State table, State diagram, excitation table and transition table, Design of counters using state machines: Asynchronous, modulus and up-down counter, Sequence generator. Applications of counters: - Totalizer, Digital clock.

UNIT -3: Data Converters: (12)

Digital to analog converters: Weighted resistive network, R-2R ladder network.
DAC parameters: accuracy and resolution.
Analog to Digital converters: Simultaneous conversion, Counter type, Successive approximation method, Single slope, Dual slope, Delta Sigma ADC, Study of ADC IC 0808, ADC parameters.

UNIT -4: Digital System interfacing and Logic families: (12)

Digital system interfacing of LED's, Single and multi-digit 7 segment display/driver. Introduction and comparative study of TTL, NMOS, CMOS, ECL logic families with reference to their performance parameters

Recommended Books:

1. Digital Fundamentals by Floyd Thomas (Pearson)
2. Digital Circuit design by Morris Mano (PHP)
3. Digital Principles and applications by Malvino Leach (TMH)
4. Modern digital Electronics by R.P.Jain (TMH)

Mapping of Program Outcomes with Course Outcomes

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CO1	2	-	-	-	-	-	-	-	3
CO2	-	3	1	2	-	-	-	-	-
CO3	-	2	-	-	-	-	-	-	-
CO4	-	-	-	1	-	-	-	-	-
CO5	2	-	3	-	-	-1	-	-	-
CO6	-	-	2	-	-	-	-	-	1
CO7	-	1	-	-	-	-	-	-	-

Justification For The Mapping:

PO1:Disciplinary Knowledge:

CO1: Students will get K-maps help to minimize the number of gates and inputs in a circuit, improving its efficiency and reducing costs.

CO5: Digital electronics involves abstract concepts such as conversion ,and counters.

PO2: Critical Thinking and Problem solving:

CO2: Students to Evaluate various counter designs, including digital, analog, and sensor-based options.

CO3: Students to understanding analog to digital system interfacing and logic families involve critical thinking skills.

CO7: Students need to evaluate the problem, consider various solutions, and make informed decisions during the design process.

PO3: Social competence:

CO2: students learn to navigate the dynamics of team-based projects, fostering communication skills and the ability to work harmoniously towards common objectives.

CO5: Students Understanding fundamental concepts in digital electronics allows students to engage in meaningful discussions with peers and professionals in the field.

CO6: Collaborative analysis and design of digital electronic circuits require effective teamwork.

PO4: Research-related skills and Scientific temper:
CO2: : Students will Promotes the exploration of different counter designs, studying the literature on counter types, and integrating new advancements into the design process.

CO4: students to develop into research literature on digital system interfacing and logic families, staying updated on emerging technologies.

PO6: Personal and professional competence:

CO5: Providing students with a strong foundation in the basic concepts and techniques used in digital electronics, forming the basis for further specialization.

PO9: Self-directed and Life-long learning:
CO1: Students to Designing combinational circuits requires students to engage in self-directed learning.

CO6: Students we need to be self-directed in acquiring new analytical and design skills in electronics .

SYLLABUS (CBCS) FOR S. Y. B. Sc. (Electronics)

(w.e.f. June, 2023)

Class: S.Y. B. Sc. (Sem III) (2022 Pattern)
Paper Code : USEL233
Title of Paper: Electronic Practical's
Paper : III
Credit : 3 **No. of lectures: 48**

Objectives:

1. To make use different basic concepts for building different applications
2. To understand design procedures of different electronic circuit as per requirement
3. To build experimental setup and test the circuits.
4. To develop skills of analyzing test results of given experiments.
5. To Design and test combinational circuits.
6. This course gives students deep knowledge in digital communication systems
7. To Understand Basic knowledge of Digital electronics.

Course Outcomes:

After achieving the above objectives, students should be able to

1. Design any operational amp. Based application circuit and test it.
2. Design any instrumentation based application circuit and test it.
3. Understand basic parameters in electronics.
4. Know operation of different instruments used in the laboratory.
5. Connect circuit and do required performance analysis.
6. The course will help in design and analysis of the digital circuit and system.
7. At the end of the course, the students will be able to.

Group A : Activities: Any One

1. To study CRO/DSO.
2. To learn Pinnacle Software
3. To learn LABVIEW Software
4. Internet survey on recent technologies in Electronics
5. Study tour and its report writing

Group B : (Linear Integrated Circuits and Applications): Any Four

1. Designing Wein bridge oscillator/Phase shift oscillator.
2. Designing and build two stage amplifier using transistor.
3. Designing and build V to I converter using opamp.
4. Designing a first order Low Pass Filter and High Pass Filter using OPAMP IC-741.
5. Study of op-amp adder, subtractor.
6. Designing of an inverting and non-inverting amplifier for given gain.
7. Designing of an integrator and differentiator using op-amp for a given specification and study its frequency response.

Group C : (Digital Electronics): Any Four

1. Code conversion using logic gates – binary to gray, gray to binary.
2. Hamming Code generation and error detection.
3. 3-bit synchronous counter using flip flops.
4. DAC using R-2R ladder network.
5. ADC using IC 0808.
6. Study of Single digit 7 segment display / driver.

Mapping of Program Outcomes with Course Outcomes

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Course Outcome	Program Outcomes								
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CO2	-	3	-	2	-	-	-	-	-
CO3	-	2	-	-	-	-	-	-	-
CO4	-	-	-	1	2	-	-	-	-
CO5	-	-	3	-	-	-	1	-	-
CO6	2	-	3	-	-	-	-	-	1
CO7	1	1	-	-	-	-	-	-	-

Justification For The Mapping:

PO1:Disciplinary Knowledge:

CO1: Students Designing operational amplifier-based circuits requires a deep understanding of electronic principles, specifically in the area of operational amplifier applications.

CO6: Students must understand how different components interact to create effective instrumentation circuits.

CO7: Students we will include analog and digital circuits, instrumentation, and basic parameters in electronics.

PO2: Critical Thinking and Problem solving:

CO2: Designing instrumentation-based circuits requires critical thinking to select the right components and configurations.

CO3: Students must analyze how changes in one parameter affect the overall behavior of electronic circuits.
CO7: students develop critical thinking and problem-solving skills. Throughout the course, students engage in various activities such as circuit design, analysis, and testing,etc.

PO3: Social competence:

CO5: Students working together in labs can share insights, collectively analyze circuit behavior, and collaboratively address challenges.
CO6: Students may work in teams to tackle complex digital projects, share expertise, and collectively solve problems.

PO4: Research-related skills and Scientific temper:
CO2: Designing and testing instrumentation-based circuits involves research-related skills.
CO4: Students may need to explore manuals, research articles, or documentation to understand the underlying principles of different instruments.
PO5:Tran- Disciplinary Knowledge:

CO5: Students need to integrate knowledge from these different disciplines to analyze and interpret the performance of a circuit accurately.

PO7:Effective Citizenship and Ethics:

CO5: Students must ensure the integrity of their analysis and consider the societal impact of their findings.
PO9: Self-directed and Life-long learning:
CO6: Designing and analyzing digital circuits and systems involve staying current with digital technologies and design methodologies.