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

Autonomous

Course Structure For F. Y. B. Sc.
(2022-23)

Electronic Science (Sem I)

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

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

Class : F.Y. B. Sc. (Electronic Science)
Semester I
Paper Code : USEL 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 circuit elements and passive components.
2. To understand DC circuit theorems and their use in circuit analysis.
3. To study characteristic features of semiconductor components.
4. To study elementary electronic circuits and application.
5. To study the various type of Filter circuits.

Course Outcome:
At the end of this course, students should be able to:
1. To identify different parameters, specifications of passive components used in electronics.
2. Capability to understand the working principles of their electronic devices and their application.
3. To develop an understandings of the fundamental law and elements of electronic circuits.
4. Compare DC, AC signals & circuit application.
5. To understand the working principles of the electronics devices and their applications.
6. To solve problem based on 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, capacitors & Inductors.

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, RMS values), Charging and discharging of a capacitor, 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 current dividers, 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
4. Circuits and Networks Analysis and Synthesis: Sudhkar and S. P. Shyammohan, Tata McGraw-Hill Publishing Company Limited, 3rd Edition, (2006).

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
CO1	3	2	-	-	-	1	-	-	3
CO2	3	2	2	-	-	2	-	-	2
CO3	3	3	1	-	1	-	-	1	3
CO4	2	2	1	-	-	1	-	-	2

CO5	3	2	-	-	-	1	-	-	3
CO6	3	3	-	-	-	-	-	-	3
CO7	-	-	-	-	-	-	-	-	-

Justification of Mapping

PO1-Disciplinary Knowledge:

CO1- Identification of different parameters and specifications of passive components in electronics aligns closely with the comprehensive knowledge of disciplines in a graduate program. This involves a strong theoretical understanding of electronic components.
CO2 - The capability to understand the working principles of electronic devices and their applications requires a comprehensive knowledge of the relevant disciplines within the graduate program. This links theoretical understanding with practical application.
CO3 - Developing an understanding of the fundamental laws and elements of electronic circuits is integral to the broader knowledge base expected from a graduate program. This demonstrates a strong theoretical foundation.
CO4- Comparing DC and AC signals and their circuit applications involves a combination of theoretical and practical knowledge, moderately related to the comprehensive understanding of the disciplines within the graduate program.
CO5- Understanding the working principles of electronic devices and their applications is directly aligned with the comprehensive knowledge expected from a graduate program. This involves both theoretical and practical aspects.
CO6- Solving problems based on network theorems is moderately related to the comprehensive knowledge of the disciplines within the graduate program. It involves applying theoretical knowledge to real-world problem solving.

PO2-Critical Thinking and Problem solving:

CO1-Identification of different parameters and specifications of passive components in electronics aligns closely with the comprehensive knowledge of disciplines in a graduate program. This involves a strong theoretical understanding of electronic components.
CO2- The capability to understand the working principles of electronic devices and their applications requires a comprehensive knowledge of the relevant disciplines within the graduate program. This links theoretical understanding with practical application.
CO3- Developing an understanding of the fundamental laws and elements of electronic circuits is integral to the broader knowledge base expected from a graduate program. This demonstrates a strong theoretical foundation.
CO4- Comparing DC and AC signals and their circuit applications involves a combination of theoretical and practical knowledge, moderately related to the comprehensive understanding of the disciplines within the graduate program.
CO5- Understanding the working principles of electronic devices and their applications is directly aligned with the comprehensive knowledge expected from a graduate program. This involves both theoretical and practical aspects.
CO6- Solving problems based on network theorems are moderately related to the comprehensive knowledge of the disciplines within the graduate program. It involves applying theoretical knowledge to real-world problem solving.

PO3-Social competence:

CO2- Understanding the working principles of electronic devices and their applications requires strong analytical skills and problem-solving abilities, aligning well with the emphasis on critical thinking.
CO3- Developing an understanding of the fundamental laws and elements of electronic circuits involves a mix of theoretical knowledge and analytical skills, making it moderately related to critical thinking and problem-solving in PO2.
CO4- Comparing DC and AC signals and their circuit applications requires some level of analysis, linking it moderately to critical thinking and problem-solving skills emphasized.

PO5-Trans-disciplinary knowledge:

CO3- Developing an understanding of the fundamental laws and elements of electronic circuits is primarily focused on the electronics discipline, but it can be integrated into broader perspectives to a certain extent.

PO6-Personal and professional competence:

CO1-Identifying parameters and specifications of passive components in electronics involves technical knowledge, and to some extent, collaboration in a team setting, resulting in a moderate relationship with personal and professional competence.

CO2- Understanding the working principles of electronic devices requires technical skills, which can contribute to both independent work and collaborative efforts within a team, resulting in a moderate relationship with personal and professional competence.

CO4- Comparing DC and AC signals and their circuit applications may involve collaborative discussions and teamwork, contributing to a moderate relationship with personal and professional competence.

CO5- Understanding the working principles of electronic devices and their applications can contribute to both independent work and collaborative efforts within a team, resulting in a moderate relationship with personal and professional competence.

PO8-Environment and Sustainability:

CO3- Developing an understanding of the fundamental laws and elements of electronic circuits is more focused on technical knowledge within the electronics discipline, resulting in a partial relationship with the impact on societal and environmental contexts.

PO9- Self-directed and Life-long learning:

CO1- Identifying parameters and specifications of passive components in electronics requires technical knowledge and the ability to engage in independent learning, resulting in a moderate relationship with self-directed and life-long learning.

CO2- Understanding the working principles of electronic devices involves technical knowledge, and the ability to engage in independent learning contributes to a moderate relationship with self-directed and life-long learning.

CO3- Developing an understanding of the fundamental laws and elements of electronic circuits involves independent learning and is moderately related to the self-directed and life-long learning emphasized.

CO4- Comparing DC and AC signals and their circuit applications requires technical knowledge and the potential for independent learning, resulting in a moderate relationship with self-directed and life-long learning.

CO5- Understanding the working principles of electronic devices and their applications involves technical knowledge, and the ability to engage in independent learning contributes to a moderate relationship with self-directed and life-long learning.

CO6- Solving problems based on network theorems requires independent learning and problem-solving skills, strongly related to the self-directed and life-long learning emphasized.

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

Class : F.Y. B. Sc. (Electronic Science)
Semester I
Paper Code : USEL 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 develop skill to build digital circuits.
6. To learn basics techniques to design digital circuits.
7. To learn fundamental concepts used in design of digital system.

Course Outcome:

1. To solve problems based on interconversion of number systems.
2. To reduce expressions using Boolean Laws.
3. To reduce expressions using k-map in SOP and POS forms.
4. To familiarize with the applications of arithmetic circuits.
5. To develop skill to build digital circuits.
6. To learn basic techniques to design digital circuits and fundamental concepts using in design of digital system.

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)**

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

Justification Of Mapping

PO1-Disciplinary Knowledge:

CO1- It involves problem-solving using the interconversion of number systems, which contributes to a comprehensive knowledge of the disciplines in a graduate program, but the connection may not be as strong.

CO2- It involves reducing expressions using Boolean Laws, which demonstrates a strong theoretical understanding generated from the specific graduate program in the area of work.

CO3- It involves reducing expressions using k-map in SOP and POS forms, contributing to both theoretical and practical understanding within the graduate program.

CO4- It involves familiarizing with the applications of arithmetic circuits, contributing to a practical understanding of the disciplines in the graduate program.

CO5- It involves developing skills to build digital circuits, which contributes to practical understanding within the graduate program.
CO6- It involves learning basic techniques to design digital circuits and fundamental concepts used in the design of digital systems, demonstrating a strong theoretical understanding within the specific graduate program.

PO2-Critical Thinking and Problem solving:

CO1-Student will able to as solving problems based on the interconversion of number systems requires some level of critical thinking and problem-solving skills.
CO2- As reducing expressions using Boolean Laws involves analysis, inference, and problem-solving, aligning well with the skills of critical thinking.
CO3- As reducing expressions using k-map in SOP and POS forms requires a systematic approach, analysis, and problem-solving skills, demonstrating critical thinking abilities.
CO4- Familiarizing with the applications of arithmetic circuits involves some level of problem-solving and critical thinking.
CO5- To developing skills to build digital circuits requires problem-solving abilities and critical thinking to ensure the circuits function correctly.
CO6- As learning basic techniques to design digital circuits and fundamental concepts in the design of digital systems involves critical thinking and problem-solving skills.

PO3- Social competence:

CO2- Students will apply their knowledge as reducing expressions using Boolean Laws is more focused on technical skills, but the ability to explain solutions effectively may involve social competence.
CO3-Reducing expressions using k-map in SOP and POS forms requires effective communication of solutions, demonstrating social competence.
CO4- Student will be familiarizing with the applications of arithmetic circuits is more technical, but discussing these applications may require some level of social competence.

PO5- Trans-disciplinary knowledge:

CO3- Students will apply their knowledge as reducing expressions using k-map in SOP and POS forms may require integration of different disciplines to address complex problems.

PO6- Personal and professional competence:

CO1- Students will apply their knowledge solving problems based on interconversion of number systems may involve both independent work and collaboration within a team to meet defined objectives.
CO2- As reducing expressions using Boolean Laws may require collaboration and teamwork for solving complex problems.
CO4-Familiarizing with the applications of arithmetic circuits may require both independent work and collaboration across interdisciplinary fields.
CO5- Student will developing skills to build digital circuits often involves collaborative work, demonstrating interpersonal relationships and teamwork.

PO8- Environment and Sustainability:

CO3- As reducing expressions using k-map in SOP and POS forms is primarily a technical skill, and its connection to environmental and sustainability aspects may be indirect.

PO9- Self-directed and Life-long learning:

CO1- Students will apply their knowledge solving problems based on interconversion of number systems may contribute to the development of problem-solving skills, a key aspect of self-directed and life-long learning.
CO2- Reducing expressions using Boolean Laws involves logical reasoning and problem-solving skills, which are relevant to self-directed learning.
CO3- As reducing expressions using k-map in SOP and POS forms requires analytical skills that can contribute to independent learning.
CO4- Student will familiarizing with the applications of arithmetic circuits is more focused on practical knowledge, but it may contribute to a foundation for self-directed learning.
CO5- Student will developing skills to build digital circuits is a hands-on activity that encourages self-directed learning and skill development.
CO6- As learning basic techniques to design digital circuits and fundamental concepts involves understanding foundational principles, which can contribute to self-directed learning.

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

Class : F.Y. B. Sc. (Electronic Science)

Semester I

Paper Code : USEL 113

Paper III

Title of Paper : Electronics Practical's

Credit 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 analyses circuits for specific purpose.
4. To motivate them to work on different mini projects.
5. To get familiar with concepts of analog electronics.
6. To get familiar with concepts of digital electronics.
7. To develop skill to build analog circuits.

Course Outcome:

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

1. To identify different components, devices, IC's, as well as their types.
2. To understand basic parameters.
3. To know operation of different instruments used in the laboratory.
4. To connect circuit and do required performance analysis
5. Capability to develop experimental skills, analyzing the results.
6. Understand concepts of analog electronics.
7. Understand concepts of digital electronics.

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

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

Justification of Mapping

PO1-Disciplinary Knowledge:

CO1- Identifying different components and devices aligns with comprehensive knowledge in the graduate program, demonstrating theoretical and practical understanding.

CO2- Understanding basic parameters associated with each device contributes to strong theoretical knowledge in the graduate program.

CO3- Knowing the operation of different instruments used in the laboratory supports practical understanding within the graduate program.

CO4- Connecting circuits and performing required performance analysis demonstrates a strong blend of theoretical and practical skills in the graduate program.

CO5- Comparing simulated and actual results of experiments aligns with the practical application of theoretical knowledge in the graduate program.

CO6- Developing experimental skills, analyzing results, and interpreting data showcase a comprehensive understanding of both theoretical and practical aspects in the graduate program.

CO7- Developing hobby projects involves practical application and demonstrates a degree of theoretical understanding, contributing to the overall knowledge in the graduate program.

PO2- Critical Thinking and Problem solving:

CO1- Identifying different components and devices requires critical analysis and observation, contributing to critical thinking and problem-solving skills.

CO2- Understanding basic parameters associated with each device involves analysis and inference, fostering critical thinking in problem-solving scenarios.

CO3- Knowing the operation of different instruments used in the laboratory requires problem-solving skills and interpretation of data, aligning with critical thinking.

CO4- Connecting circuits and performing required performance analysis involves problem-solving and critical analysis of circuit behavior.
CO5- Comparing simulated and actual results of experiments necessitates critical analysis and problem-solving to reconcile differences and draw meaningful conclusions.
CO6- Developing experimental skills, analyzing results, and interpreting data require critical thinking and problem-solving capabilities.
CO7- Developing hobby projects involves critical thinking and problem-solving in the design and implementation of projects.

PO3-Social competence:

CO1- Identifying different components and devices may involve collaboration, enhancing social competence in group work.
CO2- Understanding basic parameters associated with each device may require effective communication of ideas, contributing to social competence.
CO3- Knowing the operation of different instruments used in the laboratory involves collaboration and effective communication, fostering social competence in group settings.
CO4- Connecting circuits and performing required performance analysis may involve teamwork, enhancing social competence in collaborative environments.
CO7- Developing hobby projects involves effective communication of thoughts and ideas, contributing to social competence.

PO5-Trans-disciplinary knowledge:

CO1- Identifying different components and devices involves integrating knowledge from various disciplines, contributing to a trans-disciplinary approach.
CO2- Understanding basic parameters associated with each device requires the integration of knowledge from different disciplines, supporting a trans-disciplinary perspective.
CO3- Knowing the operation of different instruments used in the laboratory involves integrating knowledge from various disciplines, fostering a trans-disciplinary understanding.
CO4- Connecting circuits and performing required performance analysis integrates knowledge from electronics and other disciplines, supporting a trans-disciplinary approach.
CO5- Comparing simulated and actual results of experiments involves integrating knowledge from simulations and practical experimentation, contributing to a trans-disciplinary understanding.
CO6- Developing experimental skills, analyzing results, and interpreting data requires the integration of knowledge from various disciplines, supporting a trans-disciplinary approach.
CO7- Developing hobby projects involves integrating knowledge from different domains, contributing to a trans-disciplinary perspective.

PO6-Personal and professional competence:

CO1- Identifying different components and devices involves teamwork, contributing to personal and professional competence.
CO2- Understanding basic parameters associated with each device requires self-motivation and adaptability, enhancing personal and professional competence.
CO3- Knowing the operation of different instruments used in the laboratory involves collaboration and teamwork, fostering personal and professional competence.
CO4- Connecting circuits and performing required performance analysis requires interpersonal relationships and collaboration, contributing to personal and professional competence.
CO5- Comparing simulated and actual results of experiments involves teamwork and collaboration, enhancing personal and professional competence.
CO6- Developing experimental skills, analyzing results, and interpreting data requires self-motivation and adaptability, contributing to personal and professional competence.
CO7- Developing hobby projects involves collaboration and interpersonal relationships, fostering personal and professional competence.

PO8-Environment and Sustainability:

CO3- Knowing the operation of different instruments used in the laboratory may have limited direct ties to environmental sustainability but could indirectly contribute through efficient laboratory practices.

PO9- Self-directed and Life-long learning:

CO1- Identifying different components and devices encourages self-directed learning and staying

updated on technological changes.
CO2- Understanding basic parameters associated with each device promotes continuous learning and adaptability in response to technological changes.
CO3- Knowing the operation of different instruments used in the laboratory fosters a self-directed approach to learning and staying abreast of technological advancements.
CO4- Connecting circuits and performing required performance analysis requires ongoing learning to adapt to changes in technology, supporting a self-directed and lifelong learning attitude.
CO5- Comparing simulated and actual results of experiments necessitates continuous learning and adaptability to evolving technologies.
CO6- Developing experimental skills, analyzing results, and interpreting data involve ongoing learning and adaptability, fostering a self-directed and lifelong learning approach.
CO7- Developing hobby projects encourages continuous learning and self-motivation, aligning with the goal of lifelong learning.