Anekant Education Society's

Tuljaram Chaturchand College of Arts, Science & Commerce, Baramati

(Empowered Autonomous)

Four Year B. Sc. Degree Program in Electronics

(Faculty of Science & Technology)

CBCS Syllabus

S.Y.B. Sc. (Electronics) Semester – IV

For Department of Electronics

Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati

Choice Based Credit System Syllabus

As Per NEP 2.0 (2024 Pattern)

<u>To be implemented from Academic Year 2025-2026</u>

Title of the Programme: S.Y.B. Sc. (Electronics)

Preamble

AES's Tuljaram Chaturchand College has decided to change the syllabus of various faculties from June, 2023 by taking into consideration the guidelines and provisions given in the National Education Policy (NEP), 2020. The NEP envisions making education more holistic and effective and to lay emphasis on the integration of general (academic) education, vocational education and experiential learning. The NEP introduces holistic and multidisciplinary education that would help to develop intellectual, scientific, social, physical, emotional, ethical and moral capacities of the students. The NEP 2020 envisages flexible curricular structures and learning based outcomes for the development of the students. The credit structure and the courses framework provided in the NEP are nationally accepted and internationally comparable.

The rapid changes in science and technology and new approaches in different areas of Electronics and related subjects, Board of Studies in Electronics of Tuljaram Chaturchand College, Baramati - Pune has prepared the syllabus of S. Y. B. Sc .Electronics Semester – III & IV under the Choice Based Credit System (CBCS) by following the guidelines of NEP 2020, NCrF, NHEQF, Prof. R.D. Kulkarni's Report, GR of Gov. of Maharashtra dated 20th April, 16th May 2023 and 13th March, 2024 and Circular of SPPU, Pune dated 31st May 2023 and 2nd May, 2024.

B.Sc. Electronics is a program, develops a specialized skill set among the graduates to cater the need of industries. The curriculum of B.Sc. Electronics is designed to help the learners to understand, appreciate, analyse and engage with learning of the subject and alsoprovide best learning experience to the graduates. The curriculum is aimed to equip the graduates with competencies like problem solving and analytical reasoning which provide them high professional competence apart from imparting disciplinary knowledge. The Electronics Department is encourage its faculty to make suitable pedagogical innovations, in addition to teaching/learning processes suggested in the model curriculum, so that the Course/Programme learning outcomes can be achieved.

Significance

In recent years, Electronics has made unprecedented growth in terms of new technologies, new ideas and principles. The research organizations and industries that work in this frontier area are in need of highly skilled and scientifically oriented manpower. This manpower can be available only with flexible, adaptive and progressive training programs and a cohesive interaction among the institutions, universities, and industries. The key areas of study within subject area of Electronics comprise of Semiconductor Devices, VLSI design, Microprocessors & Microcontroller Systems, Computer Coding/ Programming etc. and also modern applied fields such as Embedded Systems, IoT, Data Communication, Robotics, Control Systems, Artificial Intelligence, Nano Electronics and Nano Electronic Devices etc.

Overall, revising the Electronics syllabus in accordance with the NEP 2020 ensures that students receive an education that is relevant, comprehensive, and prepares them to navigate the dynamic and interconnected world of today. It equips them with the knowledge, skills, and competencies needed to contribute meaningfully to society and pursue their academic and professional goals in a rapidly changing global landscape.

Programme Specific Outcomes (PSOs)

PSO1:AcquiretheknowledgeinElectronicDevicesandCircuits,Analog&Digitalcommunication, Embeddedsystems, AI, WSN ,MEMSandothercoreareasof Electronics.

PSO2:UnderstandtheprinciplesandworkingofbothhardwareandsoftwareaspectsofElectronicsys tems.

PSO3: Gaintheoretical andpractical knowledgeindevelopingareasofElectronics.

PSO4:Toanalyze,designandimplementanaloganddigitalelectronicsystems,informationandcom municationsystems

PSO5**:** Assesstheimpact ofnewtechnologiesandsolvecomplex problems.

PSO6:Developresearchorientedskillsandtoinculcatelaboratoryskillsinstudentssothattheycanta keupindependent projects

PSO7: Aptitude to apply Logic thinking and Basic Science knowledge for problem solving in various fields of electronics both in industries and research.

PSO8: To acquire experimental skills, analysing the results and interpret data.

PSO9: Ability to design / develop/manage/ operation and maintenance of sophisticated electronic gadgets / systems / processes that conforms to a given specification within ethical and economic constraints.

PSO10: Capacity to identify and implementation of formulate to solve the electronic related issues and analyse the problems in various sub disciplines of electronics.

PSO11: Capability to use the Modern Tools/Techniques.

Anekant Education Society's

Tuljaram Chaturchand College

of Arts, Science and Commerce Baramati, Dist-Pune, MS, India.

(Empowered Autonomous)

Board of Studies in Electronics

(Academic Year 2025-26 to 2027-28)

Sr. No.	Name	Designation
1.	Dr. Deshpande J.D.	Chairperson
2.	Dr. Mrs. Pawar A. M.	Member
3.	Dr. Patil S. N.,	Member
4.	Dr. Mrs.Rupnawar P. D.,	Member
5.	Dr. Kothawale A. S,	Member
6.	Dr. Mrs. Gawade S. A.,	Member
7.	Mrs. Patil S. S.	Member
8.	Mrs. Shinde P. K.	Member
9.	Mrs. Walekar S. S.	Member
10.	Miss. Pawar S. S.	Member
11.	Prof. Dr. Tilekar S. K	Expert from other University
12.	Dr. Lande Pankaj	Expert from other University
13.	Dr. Arun Patil	Expert from University
14.	Mr. Patil Sharad. V.	Industry Expert
15.	Mr. Sutar Ganesh	Meritorious Alumni
16.	Mr. Gaikwad Shubham R.	Student Representative
17.	Miss. Chavan Gauri M.	Student Representative

Course and Credit Distribution Structure for B.Sc. (Electronics) 2024 pattern as per NEP-2020

Level/Difficulty	**Sem**	**Subject DSC-1**				**Subject DSC-2**	**Subject DSC-3**	**GE/OE**	**SEC**	**IKS**	**AEC**	**VEC**	**CC**	**Total**
4.5/100	I	2(T)+2(P)				2(T)+2(P)	2(T)+2(P)	2(T)	2(T/P)	2(T) (Generic)	2(T)	2(T)	--	**22**
	II	2(T)+2(P)				2(T)+2(P)	2(T)+2(P)	2(P)	2(T/P)	--	2(T)	2(T)	2(T	**22**
Exitoption:AwardofUGCertificateinMajorwith44creditsandanadditional4creditscoreNSQFcourse/InternshipORContinuewithMajorandMinor **Continueoption**:Studentwillselectonesubjectamongthe(subject1,subject2andsubject3)asmajorandotherasminorandthirdsubjectwillbedropped.														
Level/Difficulty	**Sem**	**CreditsRelatedtoMajor**				**Minor**	--	**GE/OE**	**SEC**	**IKS**	**AEC**	**VEC**	**CC**	**Total**
		MajorCore	**MajorElective**	**VSC**	**FP/OJT/CEP/RP**									
5.0/200	III	4(T)+2(P)	--	2(T/P)	2(FP)	2(T)+2(P)	--	2(T)	--	2(T)	2(T)	--	2(T)	**22**
	IV	4(T)+2(P)	--	2(T/P)	2(CEP)	2(T)+2(P)	--	2(P)	2(T/P)	--	2(T)	--	2(T)	**22**
Exitoption:AwardofUGDiplomainMajorandMinorwith88creditsandanadditional4creditscoreNSQFcourse/InternshipORContinuewithMajorandMinor														
5.5/300	V	8(T)+4(P)	2(T)+2(P)	2(T/P)	2(FP/CEP)	2(T)	--	--	--	--	--	--	--	**22**
	VI	8(T)+4(P)	2(T)+2(P)	2(T/P)	4(OJT)	--	--	--	--	--	--	--	--	**22**
Total3Years		**44**	**8**	**8**	**10**	**18**	**8**	**8**	**6**	**4**	**8**	**4**	**6**	**132**
Exitoption:Awardof**UGDegreeinMajor**with132creditsORContinuewithMajorandMinor														
6.0/400	VII	6(T)+4(P)	2(T)+2(T/P)	--	4(RP)	4(RM)(T)	--	--	--	--	--	--	--	**22**
	VIII	6(T)+4(P)	2(T)+2(T/P)	--	6(RP)	--	--	--	--	--	--	--	--	**22**
Total4Years		**64**	**16**	**8**	**22**	**22**	**8**	8	**6**	**4**	**8**	**4**	**6**	**176**
FourYear**UGHonourswithResearchDegree**inMajorandMinorwith176credits														
6.0/400	VII	10(T)+4(P)	2(T)+2(T/P)	--	--	4(RM)(T)	--	--	--	--	--	--	--	**22**
	VIII	10(T)+4(P)	2(T)+2(T/P)	--	4(OJT)	--	--	--	--	--	--	--	--	**22**
Total4Years		**72**	**16**	**8**	**14**	**22**	**8**	8	**6**	**4**	**8**	**4**	**6**	**176**
FourYear**UGHonoursDegree**inMajorandMinorwith176credits														

T=Theory**P**=Practical **DSC=**DisciplineSpecificCourse **OE=**Open Elective **SEC=**SkillEnhancement Course

IKS=IndianKnowledge System **AEC=**AbilityEnhancementCourse **VEC=**ValueEducation Course**CC=** Co-curricularCourse **VSC**=VocationalSkillCourse

OJT=OnJobTraining **CEP**=CommunityEngagementProject **FP**=Field Project **RP**=ResearchProject

Course Structure for S.Y.B.Sc.Electronics (2024 Pattern)

Sem	Course Type	Course Code	Course Title	Theory/ Practical	Credits
III (5.0)	Major Mandatory	ELE-201-MRM	Integrated Circuits and Applications	Theory	02
	Major Mandatory	ELE -202-MRM	Digital Circuit Design	Theory	02
	Major Mandatory	ELE -203-MRM	Ele Pract. 2	Practical	02
	Vocational Skill Course (VSC)	ELE -204-VSC	Practicals on Circuit Building and Testing	Practical	02
	Field Project(FP)	ELE -205-FP	Field Project	Practical	02
	Minor	ELE -206-MN	Electronic Communication	Theory	02
	Minor	ELE -207-MN	Communication Practicals	Practical	02
	Open Elective (OE)	ELE -208-OE	Basics of Computer Hardware	Theory	02
	Subject Specific Indian Knowledge System (IKS)	ELE -209-IKS	Electronics IKS	Theory	02
	Ability Enhancement Course (AEC)	MAR-210-AEC/ HIN-210-AEC/ SAN-210-AEC		Theory (Any One)	02
	Co-curricular Course (CC)	YOG/PES/CUL/NSS /NCC-211-CC	To be continued from the Semester - II		02
	Total Credits Semester - III				**22**
IV (5.0)	Major Mandatory	ELE -251- MRM	C- Language	Theory	02
	Major Mandatory	ELE -252- MRM	Communication Systems	Theory	02
	Major Mandatory	ELE -253- MRM	Electronics Practical 3	Practical	02
	Vocational Skill Course (VSC)	ELE -254-VSC	Signal Conditioning of Electronic Circuits	Theory	02
	Community Engagement Project (CEP)	ELE -255-CEP	Community Engagement Project	Practical	02
	Minor	ELE -256-MN	Electronic Instrumentation	Theory	02
	Minor	ELE -257-MN	Instrumentation Practicals	Practical	02
	Open Elective (OE)	ELE -258-OE	Basics of Computer Hardware Lab.	Practical	02
	Skill Enhancement Course (SEC)	ELE -259-SEC	Circuit Simulator III	Practical	02
	Ability Enhancement Course (AEC)	MAR-260-AEC/ HIN-260-AEC/ SAN-260-AEC		Theory (Any One)	02
	Co-curricular Course (CC)	YOG/PES/CUL/NSS /NCC-261-CC	To be continued from the Semester - III		02
	Total Credits Semester - IV				**22**
	Total Credits Semester – III + IV				**44**

CBCS Syllabus as per NEP 2020 for S. Y. B.Sc. Electronics (SEM IV) (2024 Pattern)

Name of the Programme : B.Sc. Electronics
Programme Code : USEL
Class : S. Y. B.Sc.
Semester : IV
Course Type : Major Mandatory (Theory)
Course Code : ELE -251-MRM
Course Title : C- Language
No. of Credits : 02
No. of Teaching Hours : 30

Course Objectives

1. To introduce students to fundamentals of C programming language.
2. To develop problem-solving skills.
3. Learn how to write and execute C programs.
4. Understand the basic syntax and structure of C
5. Master the use of functions and modular programming
6. To learn to function and pointers.
7. Gain proficiency in working with arrays and strings

Course Outcomes

By the end of the course, students will be able to:

CO1. Understand the basics of C programming language.
CO1- CO2- Develop problem-solving skills
CO3-Gain proficiency in C programming syntax and semantics
CO4- Gain a foundation for advanced programming concepts.
CO5- Apply C programming concepts to real-world problems.
CO6- Improve code efficiency and optimization.
CO7- Develop debugging and error handling skills

Topics and Learning Points

Unit 1: Fundamentals in C **[10 L]**

Algorithms & flowcharts, Programming Languages, Programming tools, Structure of a C program, C program development cycle

C Tokens: Keywords, Identifiers, Variables, Constants–character, integer, float, string, escape sequences, Data types–built-in and user defined, Operators and Expressions, Operator Precedence.

Unit 2: Control structures and functions **[12 L]**

Decision making structures- if, if-else, switch-case, Loop Control structures-While, do-while, for, Jumping Statements- break, continue and go to statement, Nested control structures

Functions in C- What is a function, Advantages of Functions, Standard library functions, User defined functions: Declaration, definition, function call, parameter passing (by value), return keyword, Scope of variables, storage classes, Recursion, programs.

Unit 3: Arrays **[8 L]**

Array Concept, Types – one, two and multidimensional, Array Operations – declaration, Initialization, accessing array elements, Passing arrays to functions, Array Applications, programs.

Reference Books:

1. Yashavant Kanetkar: Let Us C 7thEdition,PBPPublications
2. E Balaguruswamy: Programming in ANSI C 7th Edition, Tata Mc-Graw Hill Publishing Co.Ltd. -NewDelhi
3. Madhusudan Mothe C for Beginner
4. Byron. S. Gottfried Schaum's Outline of Programming with C TMH
5. Brian W. Kernighanand DennisM. Ritchie:TheCProgrammingLanguage2nd Edition, Prentice Hall Publication
6. Herbert Schildt, The Complete Reference to C
7. Harrow, Problem Solving with C

Mapping of Program Outcomes with Course Outcomes

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

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
CO1	3	2	1	2	2	1	1	2	2	1	1	2	1
CO2	3	3	2	2	3	2	1	3	2	1	1	3	1
CO3	3	3	1	3	3	2	1	2	3	1	1	2	1
CO4	3	2	1	3	3	1	2	3	3	1	1	2	1
CO5	3	3	2	3	3	2	2	3	3	2	2	3	2
CO6	3	3	2	3	3	2	1	3	3	1	1	3	1
CO7	3	3	1	3	3	2	1	3	3	1	1	3	1

Mapping Justification:

PO1: Comprehensive Knowledge and Understanding

CO1 – CO7:

Students gain a strong foundation in the fundamental concepts of the C programming language including data types, control structures, functions, arrays, and pointers. They develop conceptual clarity about syntax, semantics, and logical structuring of programs. This comprehensive understanding allows them to interpret how programs execute at both high and low levels, forming a base for further learning in data structures, operating systems, and embedded programming.

PO2: Practical, Professional, and Procedural Knowledge

CO2, CO3, CO5, CO7:

Students acquire hands-on experience by writing, compiling, and debugging programs in real-time environments. Through practical lab sessions, they learn professional coding procedures, structured programming, modular design, and documentation standards. They also follow procedural steps to test, validate, and refine programs — aligning their work with real-world software development processes.

PO3: Entrepreneurial Mindset and Knowledge

CO2, CO5, CO6:
By learning to design efficient solutions for logical and real-life problems, students develop an entrepreneurial outlook towards problem-solving. Programming projects encourage innovative thinking, automation, and idea generation for potential software or tool development. The ability to create optimized, reliable, and scalable programs nurtures creativity and innovation aligned with entrepreneurship in the tech field.

PO4: Specialized Skills and Competencies
CO3, CO4, CO6:
Students gain specialized competencies in computational thinking, algorithm design, and structured programming. They acquire the ability to use C as a foundation for advanced subjects like embedded systems, AI, and data analytics. Skill development in topics such as recursion, dynamic memory, and file handling further enhances their technical proficiency, making them industry-ready.

PO5: Capacity for Application, Problem-Solving, and Analytical Reasoning
CO2, CO5, CO6, CO7:
This PO is at the core of the course. Students learn to analyze problems, design logic using flowcharts or pseudocode, and apply C programming concepts to solve practical and mathematical problems. They enhance their analytical reasoning by debugging, optimizing, and evaluating program performance. Logical decomposition and algorithmic design skills are cultivated through extensive programming exercises.

PO6: Communication Skills and Collaboration
CO2, CO5, CO7:
Students collaborate in group coding activities and discuss different programming approaches, thereby enhancing teamwork and peer learning. Documenting programs, writing comments, and presenting output reports help improve their technical communication skills. These practices strengthen their ability to express complex programming logic clearly and concisely.

PO7: Research-related Skills
CO4, CO6, CO7:
Students develop a research-oriented mindset through the exploration of algorithm optimization techniques and code efficiency analysis. They learn to identify performance bottlenecks and study different methods to improve execution speed and memory utilization. Experimenting with new libraries and programming paradigms also fosters an early appreciation for applied research in computer science.

PO8: Learning How to Learn Skills
CO1 – CO7:
Learning programming instills self-learning habits. Students use online compilers, reference manuals, and digital forums to enhance their coding knowledge beyond the classroom. They gain confidence in adapting to new programming languages and tools — a critical life-long learning skill in the ever-evolving field of technology.

PO9: Digital and Technological Skills
CO3, CO5, CO6:
Programming in C naturally develops essential digital competencies. Students learn to work on integrated development environments (IDEs), manage files, and understand system-level

interactions between hardware and software. This exposure enhances their technical literacy and prepares them for advanced courses in software development and system programming.

PO10: Multicultural Competence, Inclusive Spirit, and Empathy
CO5, CO6:
Group activities and peer learning environments promote inclusivity and respect for diverse perspectives. Students learn to collaborate with peers from different backgrounds while solving coding challenges. Exposure to global open-source communities fosters teamwork, empathy, and cultural adaptability.

PO11: Value Inculcation and Environmental Awareness
CO5, CO7:
Although indirectly related, the course promotes responsible use of technology and ethical coding practices. Students understand the importance of developing efficient software that minimizes resource use, thereby contributing to environmental sustainability in digital systems.

PO12: Autonomy, Responsibility, and Accountability
CO2, CO5, CO6, CO7:
Programming tasks require students to work independently on assignments, manage their time effectively, and take ownership of debugging and improving their code. They learn to be accountable for results, documentation, and code quality, which strengthens personal responsibility and discipline.

PO13: Community Engagement and Service
CO5, CO6:
Students can apply programming knowledge to community-oriented projects such as developing small applications, automating educational tasks, or contributing to open-source projects. This helps them understand the social relevance of computing and its potential in community development and service.

CBCS Syllabus as per NEP 2020 for S. Y. B.Sc.Electronics (SEM III) (2024 Pattern)

Name of the Programme : B.Sc.Electronics
Programme Code : USEL
Class : S. Y. B.Sc.
Semester : IV
Course Type : Major Mandatory (Theory)
Course Code : ELE-252-MRM
Course Title : Communication Systems
No. of Credits : 02
No. of Teaching Hours : 30

Course Objectives

1. To study basics of communication systems.
2. To study different characteristics of communication systems.
3. To understand Amplitude Modulation techniques
4. To understand Amplitude demodulation techniques
5. To learn the different AM receivers.
6. To learn the Digital communication system.
7. To study the concepts of different modulations.

Course Outcomes

After completing the course student will able to

CO1: Understand and identify the fundamental concepts and various components of communication systems.

CO2: Explain signal to noise ratio, noise figure and noise temperature for single and cascaded stages in a communication system

CO3: Develop the ability to compare and contrast the strengths and weaknesses of various communication systems

CO4: Define the need of modulation for communication systems

CO5: Explain the behavior of the communication systems in the presence of noise.

CO6: Compare the different analog and digital modulation schemes for transmission of information.

CO7: To know the function of Digital communication system.

Topics and Points

UNIT- 1: Basics of communication and telephone systems (10)

Block diagram of communication system, Types of communication system: simplex, duplex, analog and digital communication, Electromagnetic spectrum ,base band and broad band communication, Noise concept and types, Signal to noise ratio, Noise figure, Noise temperature.

UNIT- 2: Amplitude Modulation and AM Receiver (10)

Need of modulation, Concept of modulation, AM waveform, mathematical expression of AM, Concept of sideband, Definition of modulation index, power distribution.
AM using diode/transistor, Demodulation, Demodulator circuit using diode.
AM Receiver: TRF and super-heterodyne receiver

UNIT- 3: Pulse Digital Communication Systems (10)

Block diagram of digital communication system, Study of bit rate, baud rate and bandwidth.
Serial and parallel communication,
Concept of ASK, PSK, FSK, PAM, PWM, PPM, PCM, FDM and TDM.

Recommended Books:

1. Communication Electronics : Principles and applications by Louis E Frenzel 3rd edition TMH Publications.
2. Electronics Communication Systems : Keneddy
3. Telecommunication Switching Systems and Network : Vishwanathan Thiagarajan, PHI publication.
4. Electronics Communication Systems by Denis Roddy, John Coolen, PHI publication.

Mapping of Program Outcomes with Course Outcomes

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
CO1	3	-	-	-	-	3		-	-	-	-	-	-
CO2	1	-	-	2	3	-	3	-	-	-	-	-	-
CO3	2	3	-	-	-	-	-	-	-	-	-	2	-
CO4	-	2	3	-	-	-	2	-	-	-	-	-	-
CO5	2	1	-	-	2	2	-	3	-	-	-	-	-
CO6	-	-	-	3	-	2	-	-	-	-	-	-	-
CO7	2	-	-	-	-	-	2	-	3	-	-	-	-

Mapping Justification:

PO1:Comprehensive Knowledge and Understanding

Selected CO directly addresses the need for foundational knowledge in communication systems, crucial for further learning.

PO2:Practical, Professional, and Procedural Knowledge

CO3, 4 and 5 fosters practical skills in evaluating systems, preparing students for professional roles where decision-making is key.

PO3:Entrepreneurial Mindset and Knowledge

CO4 Understanding modulation can lead to innovative solutions in communications, fostering an entrepreneurial mindset.

PO4:Specialized Skills and Competencies

CO2 and CO6 Focuses on specialized knowledge, enhancing students' competencies in modulation techniques.

PO5:Capacity for Application, Problem-Solving, and Analytical Reasoning

CO2 and CO5 Requires analytical reasoning and application skills to address noise in communication systems.

PO6:Communication Skills and Collaboration

The CO1, 5 and 6 supports the development of communication skills essential for collaboration.

PO7:Research-related Skills

CO2, CO4 and CO7 Encourages research-related skills by requiring comprehension of quantitative measures in communication systems.

PO8:Learning How to Learn Skills

Understanding noise effects promotes independent learning and critical thinking about system behavior.

PO9:Digital and Technological Skills

Directly enhances digital skills, crucial for navigating modern communication technologies.

PO10:Multicultural Competence, Inclusive Spirit, and Empathy

While not explicitly addressed, knowledge of communication systems can lead to greater awareness of diverse perspectives.

PO11:Value Inculcation and Environmental Awareness

May need integration into coursework, but understanding communication can promote awareness of societal issues. No direct alignment.

PO12:Autonomy, Responsibility, and Accountability

Fosters critical thinking and independent evaluation, promoting responsibility in decision-making.

PO13:Community Engagement and Service

While this PO isn't directly addressed, projects applying communication concepts could enhance community engagement.

CBCS Syllabus as per NEP 2020 for S. Y. B.Sc. Electronics (SEM IV) (2024 Pattern)

Name of the Programme : B.Sc.Electronics
Programme Code : USEL
Class : S. Y. B.Sc.
Semester : IV
Course Type : Major Mandatory (Practical)
Course Code : ELE-253-MRM
Course Title : Electronics Practical-3
No. of Credits : 02
No. of Teaching Hours : 60

Course Objectives

1. To develop fundamental skills in writing and executing C programs.
2. To understand and implement basic programming constructs such as loops, conditionals, arrays, and functions.
3. To apply problem-solving techniques through coding for various computational tasks (e.g., number operations, matrix operations).
4. To introduce students to fundamental concepts of communication systems and analog/digital modulation techniques.
5. To provide hands-on experience in building and testing basic communication circuits (e.g., TDM, FSK, PAM, PWM).
6. To understand error detection and correction techniques such as Hamming Code and PN sequence generation.
7. To encourage practical learning through real-world applications like PCB making, field visits, or DIY projects.

Course Outcomes

By the end of the course, students will be able to:

CO1: Write and execute basic C programs involving variables, operators, arrays, and control structures.
CO2: Analyze and solve simple real-world problems using structured programming in C.
CO3: Demonstrate understanding of basic modulation techniques including PAM, PWM, and PPM.
CO4: Design and implement simple communication circuits such as amplitude modulators/demodulators and delta modulators.
CO5: Generate and verify error detection/correction codes like Hamming code using digital circuits.
CO6: Integrate theoretical concepts with practical knowledge through hands-on activities and simulations.
CO7: Display improved technical skills and engineering practices via participation in workshops, field visits, or open-ended projects.

List of Practicals

Total 15 practical's are compulsory including activities.

List of Practicals (C-Language):

1. C Program to Print Your Own Name by taking it as input
2. Basic programs using different operators.
3. To swap value of two variables.

4. To find the maximum number out of the three numbers.
5. To check given number is Armstrong number or not.
6. To reverse digits of the given number.
7. To calculate average of all elements of an array.
8. To add two square matrices.

List of Practicals (Communication Systems):

1. Time Division multiplexing circuit.
2. Frequency Shift Keying (FSK) using XR 2206
3. Hamming Code generation and error detection.
4. Study of PAM, PPM and PWM
5. PN sequence generator
6. Design, Build and test Amplitude Modulator and Demodulator.
7. Delta Modulation circuit using opamp

Activity

Any one of the following activities will be considered as equivalent to 2 experiments

1. PCB Making using simulator
2. Internet browsing
3. Industrial /field Visit
4. Hands on training workshop
5. Do it Yourself Open ended Project

Mapping of Program Outcomes with Course Outcomes

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

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
CO1	3	3	1	2	3	2	1	3	3	1	1	2	1
CO2	3	3	2	3	3	2	1	3	3	1	1	3	2
CO3	3	2	1	3	2	2	2	3	3	1	1	2	1
CO4	3	3	2	3	3	2	2	3	3	1	1	3	2
CO5	3	3	2	3	3	2	2	3	3	1	1	3	2
CO6	3	3	2	3	3	3	2	3	3	1	1	3	2
CO7	3	3	3	3	3	3	2	3	3	2	2	3	3

Mapping Justification:

PO1: Comprehensive Knowledge and Understanding

- CO1 & CO2: Students learn fundamental programming concepts and structured problem-solving in C.
- CO3–CO5: They understand digital communication principles such as modulation techniques and error detection.
- CO6–CO7: Integration of theory and practice ensures deep understanding of core engineering concepts.

PO2: Practical, Professional, and Procedural Knowledge

- CO1–CO2: Writing and debugging programs develops practical skills and follows procedural programming methodology.

- CO4–CO6: Hands-on lab activities and simulations provide experience with circuits, modulators, and digital systems.
- CO7: Workshops and field visits expose students to professional engineering practices.

PO3: Entrepreneurial Mindset and Knowledge

- CO2, CO4–CO7: Encourages innovation and problem-solving in communication system design, coding, and circuit projects.
- CO7: Open-ended projects develop ideas that could be converted into products or services.

PO4: Specialized Skills and Competencies

- CO3–CO6: Students gain competency in modulation/demodulation circuits, error coding, and simulations.
- CO1–CO2: Programming skills enhance computational problem-solving.

PO5: Capacity for Application, Problem-Solving, and Analytical Reasoning

- CO2, CO4–CO6: Students analyze real-world problems, design solutions, and verify outcomes using digital and communication systems.
- CO1: Programming logic strengthens analytical thinking.

PO6: Communication Skills and Collaboration

- CO1–CO7: Lab work, team projects, and report writing improve collaboration and technical communication.

PO7: Research-related Skills

- CO3–CO6: Exploring simulation tools, coding optimizations, and modulation techniques fosters research aptitude.
- CO7: Workshops encourage investigation and innovative solutions.

PO8: Learning How to Learn Skills

- CO1–CO7: Students self-learn programming, simulations, and circuit design, building the habit of continuous learning.

PO9: Digital and Technological Skills

- CO1–CO7: All COs involve programming, circuit simulation, and digital concepts, enhancing technological literacy.

PO10: Multicultural Competence, Inclusive Spirit, and Empathy

- CO7: Collaborative projects promote inclusivity and respect in teamwork.

PO11: Value Inculcation and Environmental Awareness

- CO5–CO7: Students develop ethical practices in coding, circuit usage, and energy-efficient designs.

PO12: Autonomy, Responsibility, and Accountability

- CO1–CO7: Independent coding assignments, lab experiments, and project submissions cultivate responsibility and accountability.

PO13: Community Engagement and Service

- CO6–CO7: Open-ended projects and applied engineering solutions can serve community needs (e.g., small communication tools, digital solutions).

CBCS Syllabus as per NEP 2020 for S.Y.B.Sc

(2024 Pattern)

Name of the Programme : B. Sc. Electronics
Programme Code : USEL
Class : S. Y. B. Sc.
Semester : IV
Course Type : Vocational Skill Course (VSC) (Theory)
Course Code : ELE-254-VSC
Course Title : Signal Conditioning of Electronic Circuits
No. of Credits : 02
No. of Teaching Hours : 30

Course Objectives:

1. To know the concept of signal conditioning in electronic circuits.
2. To understand the role of bridges in measuring parameters.
3. To study the PLL and its various applications.
4. To study designing of various signal conditioning circuits.
5. To study different types of data converters.
6. To design multiple filters, ADCs , DACs according to the need.
7. To make proficiency of problem solving of signal conditioning circuits.

Course Outcomes:

By the end of the course, students will be able to:

CO1- Identify the signal conditioning circuits.

CO2 - Know the role of bridge circuits.

CO3 - Measure the unknown quantity in the circuits using bridges.

CO4 - Get knowledge about the PLL.

CO5 - Design number of signal conditioning circuits.

CO6 - Solve the problems on signal conditioning circuits.

CO7 - Know the various applications of signal conditioning circuits.

Topics and Learning Points

Unit 1: Sensors and Signal conditioning circuits (10)

Definition & need of sensor, characteristics of sensors, classification of sensors, Introduction to signal conditioning, Block diagram of signal conditioning system, signal conditioning for sensors- resistive sensors, temperature, electromagnetic, optical and digital sensors, Block diagram of PLL, PLL applications (frequency multiplier, frequency synthesizer and FM), Grounding, Shielding and Isolation Techniques. Data Acquisition System.

Unit 2: Bridge Circuits (08)

Wheatstone bridge (Measurement of Resistance), Sensitivity of a Wheatstone Bridge, Unbalance Wheatstone Bridge, Applications, Limitations, Wein Bridge, Precautions to be taken while using a Bridge.

Unit 3: Data Converters (12)

ADC & DAC Introduction, Specifications of ADC and DAC, Digital to Analog Converters: the R-2R ladder DAC, the Weighted Resistor type DAC, Analog to Digital Conversion: Flash ADC, Dual Slope ADC, Successive Approximation ADC, and Voltage to Frequency converter.

Reference Books:-

1. Electronic Instrumentation by Kalsi (Tata McGraw Hill)
2. Fundamentals of Digital Electronics by Anand Kumar
3. Instrumentation Measurement and Analysis by Nakra and Chaudhri (Tata McGraw Hill)
4. Electronic instrumentation and measurement techniques by Helfric and Copper (Eastern EconomyEdition)
5. Op-Amps and Linear circuits - Ramakant Gaikwad (PHI)

Table of Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
CO1	3				3			3	3				2
CO2	3	3							3				2
CO3		3		3		3		2			2		
CO4				2			2						

CO 5			3		3		3			3			
CO 6			3			3	3					3	
CO 7											2	2	

Justification of Mapping

PO1: Comprehensive Knowledge and Understanding:

CO1: Identifying signal conditioning circuits directly builds foundational theoretical knowledge in instrumentation.
CO2: Understanding bridge circuits strengthens core concepts in measurement systems.

PO2: Practical, Professional, and Procedural Knowledge:

CO2: Understanding bridge circuits is crucial for applying professional knowledge in measurement systems.
CO3: Measuring unknown quantities using bridges demonstrates direct application

PO3: Entrepreneurial Mindset and Knowledge:

CO5: Designing signal conditioning circuits directly strengthens entrepreneurial skills through creating new solutions or prototypes.
CO6: Solving practical problems in circuits enhances analytical reasoning and opportunity-driven decision-making.

PO4: Specialized Skills and Competencies

CO3: Measuring unknown quantities using bridges strengthens application of technical knowledge and analytical reasoning.
CO4: Learning about PLLs supports technical understanding and analytical thinking in circuit design.

PO5:Capacity for Application, Problem-Solving, and Analytical Reasoning

CO1: Identifying signal conditioning circuits develops practical application and analytical understanding of instrumentation systems.
CO5: Designing signal conditioning circuits requires high-level application and problem-solving skills.

PO6: Communication Skills and Collaboration

CO3: Measuring unknown quantities in circuits often involves teamwork and communicating findings effectively.
CO6: Solving problems collaboratively enhances communication of analytical reasoning and technical solutions.

PO7: Research-related Skills

CO4: Knowledge about PLL enhances understanding of system behavior, moderately supporting research methodology.
CO5: Designing signal conditioning circuits fosters experimentation, problem-solving, and analytical application.
CO6: Solving problems on signal conditioning circuits strengthens critical thinking and practical research skills.

PO8: Learning How to Learn Skills

CO1: Identifying signal conditioning circuits fosters independent exploration and understanding of electronic systems.
CO3: Measuring unknown quantities develops hands-on problem-solving and independent learning skills.

PO9: Digital and Technological Skills

CO1: Identifying signal conditioning circuits requires strong technical knowledge and hands-on ICT skills.
CO2: Understanding bridge circuits supports technological proficiency and analytical problem-solving.

PO10:Multicultural Competence, Inclusive Spirit, and Empathy

CO5: Designing signal conditioning circuits encourages teamwork, exchanging ideas, and incorporating diverse perspectives.

PO11:Value Inculcation and Environmental Awareness

CO3: Measuring unknown quantities responsibly aligns with accurate and conscientious engineering practice.
CO7: Knowing applications fosters awareness of proper and responsible use of circuits in real-world systems.

PO12: Autonomy, Responsibility, and Accountability

CO6: Solving problems on signal conditioning circuits enhances autonomous problem-solving and accountable reasoning.
CO7: Knowing applications supports responsible application of knowledge, though less directly linked to autonomy.

PO13: Community Engagement and Service

CO1: Identifying signal conditioning circuits enables sharing practical technical knowledge with community members.
CO2: Understanding bridge circuits supports demonstration and educational outreach on circuit applications.

CBCS Syllabus as per NEP 2020 for S. Y. B. Sc. Electronics (SEM IV) (2024 Pattern)

Name of the Programme: B.Sc. Electronics
Programme Code: USEL
Class: S. Y. B. Sc.
Semester: IV
Course Type: Minor (Theory)
Course Code: ELE-256-MN
Course Title: **Electronic Instrumentation**
No. of Credits: 02
No. of Teaching Hours: 30

Course Objectives:

1. To study the block diagram of electronic instrument.
2. To understand the working principles of popular instruments.
3. To know important technical specifications of instruments.
4. To learn the operating procedure of instruments.
5. To understand basic concepts and definitions in measurement.
6. Elaborate discussion about the importance of signal generators and analyzers in Measurement.
7. To study the instrumentation systems and perform its applications.

Course Outcomes:

After completing this course, students will be able to:

CO1: To understand performance characteristics of the instruments and fundamentals of measurement.

CO2: To learn construction, working principles of electrical/ analog instruments, digital instruments.

CO3: To know the calibration procedure of electrical instruments.

CO4: Apply fundamental knowledge of measurement in monitoring various electrical instruments.

CO5: Extend the ranges of analog instruments.

CO6: Use the knowledge of performance characteristics for selection and use of Instruments.

CO7: Understand construction, working principle and types of oscilloscopes.

Unit 1: Basics of Measurement and Measuring Instruments (12)

Basics of Measurement - Definitions: Accuracy, precision, resolution, sensitivity, linearity, Types of errors: Gross, Systematic, Random, Static and dynamic characteristics of instruments, Calibration and standards. Measuring Instruments: Ammeter, Voltmeter, Multimeter, Wattmeter, Function generator, Oscilloscope (CRO), DSO (Block/ functional diagram, working principle, specifications and applications).

Unit 2: Instrumentation Systems (10)

Block diagram of an instrumentation system, Performance Characteristics, Introduction to Sensors, Transducers and Actuators, Classification of sensors and actuators, Wheatstone bridge, Temperature sensors: Thermocouples, RTD, Thermistors, displacement and pressure

Sensors: LVDT, strain gauges, Piezo electric sensors, optical sensors and ultrasonic sensors.

Unit 3: Signal Conditioning and Data Acquisition Systems (8)

Concept of signal conditioning, Amplifiers (instrumentation amplifier), Filters, ADC, DAC and Display systems: Digital display (7-segment, LCD), Basic block diagram of data acquisition system.

Text / Reference Books:

1. Electronic Instrumentation by H. S. Kalsi, 4th Edition McGraw Hill 2019.
2. Electrical and Electronic Measurements and Instrumentation, A K Sawhney, Dhanpat Rai and Co.,2023.
3. Introduction to Instrumentation and Measurements, R. B. Northrop, 3rd Edition, 2014.
4. Measurement Systems: Application and Design, E.O. Doebelin, 4th Edition, 1989.
5. Instrumentation for Engineers and Scientists, John Turner, Martyn Hill, Oxford University Press, 1st Edition, 1999.

Table of Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
CO1	3							2					
CO2	2	2					3		3				
CO3		3		3			2						
CO4		3			3			2				2	
CO5			2	3									
CO6				2	2	3							
CO7	2								3				

Justification of Mapping

PO1: Comprehensive Knowledge and Understanding
CO1: Understanding performance characteristics and fundamentals directly contributes to comprehensive knowledge.
CO2: Learning the construction and working principles enhances understanding of various instruments.
CO7: Understanding the construction and types of oscilloscopes aligns with comprehensive knowledge.
PO2: Practical, Professional, and Procedural Knowledge
CO2: Learning about the construction and working principles of instruments reflects practical and procedural knowledge.
CO3: Knowing the calibration procedure demonstrates professional knowledge necessary in the field.
CO4: Applying measurement knowledge to monitor instruments shows practical application of skills.
PO3: Entrepreneurial Mindset and Knowledge
CO5: Extending the ranges of analog instruments could foster innovative thinking, aligning with an entrepreneurial mindset.
PO4: Specialized Skills and Competencies
CO3: Calibration procedures represent a specialized skill essential for instrumentation.
CO5: Extending ranges of instruments showcases the application of specialized competencies.
CO6: Using performance characteristics for instrument selection reflects specialized skills in decision-making.
PO5: Capacity for Application, Problem-Solving, and Analytical Reasoning
CO4: Applying knowledge of measurement in monitoring instruments involves problem-solving and analytical skills.
CO6: Selecting instruments based on performance characteristics also requires analytical reasoning.
PO6: Communication Skills and Collaboration
CO6: Using knowledge for the selection and use of instruments often requires teamwork and effective communication.
PO7: Research-related Skills
CO2 & CO3: Learning about instrument construction and calibration procedures can involve research into best practices and methodologies.
PO8: Learning How to Learn Skills
CO1 & CO4: Understanding performance characteristics and applying knowledge in monitoring instruments encourage self-directed learning.
PO9: Digital and Technological Skills
CO2 & CO7: Learning about digital instruments and oscilloscopes involves developing technological skills relevant in modern instrumentation.
PO10: Multicultural Competence, Inclusive Spirit, and Empathy
None of the COs directly addresses multicultural competence, though teamwork in selection and application (CO6) can be enhanced by such skills.
PO11: Value Inculcation and Environmental Awareness
None of the COs directly relate to value inculcation or environmental awareness, although ethical considerations in instrument use can be an underlying theme.

PO12: Autonomy, Responsibility, and Accountability
CO4: Applying fundamental knowledge in monitoring instruments reflects a sense of responsibility and accountability in practice.
PO13: Community Engagement and Service
None of the COs directly addresses community engagement, although practical applications of instrumentation can have community benefits.

CBCS Syllabus as per NEP 2020 for S. Y. B. Sc. Electronics (SEM IV) (2024 Pattern)

Name of the Programme: B.Sc. Electronics
Programme Code: USEL
Class: S. Y. B. Sc.
Semester: IV
Course Type: Minor (Practical)
Course Code: ELE-257-MN
Course Title: **Instrumentation Practicals**
No. of Credits: 02
No. of Teaching Hours: 60

Course Objectives:

1. To study basic instrumentation system.
2. To study working of instrumentation system.
3. To identify and study different sensors.
4. To understand the signal processing techniques.
5. To get knowledge about the instruments in the laboratory.
6. To learn the construction of measurement system using sensors.
7. To learn designing and test the simple measurement systems.

Course Outcomes:

After completing this course, students will be able to:

1. Explain the working of basic instrumentation systems.
2. Identify and use appropriate sensors for measuring physical quantities.
3. Understand signal processing techniques used in instrumentation.
4. Operate lab instruments independently.
5. Make use of sensors to construct a measurement system.
6. Design simple measurement systems.
7. Test the designed measurement system.

List of Experiments:

1. Study of Multi-range voltmeter.
2. Study of Function generator.
3. Study of CRO/ DSO.
4. Study of different types of power supply.
5. Use of Ammeter, Voltmeter and Wattmeter.
6. Use of LCR meter.
7. Measurement of Light Intensity using LDR.
8. Measurement of temperature using Thermistor.
9. Measurement of temperature using RTD.
10. Study of Thermocouple Characteristics.
11. Displacement Measurement using LVDT.
12. Study of Flash ADC
13. Study of 3-bit/4-bit DAC
14. Study of Low Pass Filter
15. Study of High Pass Filter
16. Digital display interfacing with sensor (LM35)

Activities:

1. Virtual Lab
2. Study tour
3. Assignment experiment
4. Internet survey of recent technologies in Electronics

Table of Mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PO1 3**
CO 1	3	2			3			3					
CO 2	3		2			2			3			2	
CO 3					3		3						
CO 4			2	3				3					
CO 5				3		3					3		3

CO 6		3	3						2	2	3		3
CO 7		3					3			2		2	

Justification of Mapping

PO1: Comprehensive Knowledge and Understanding:

CO1: Explaining basic instrumentation systems directly reflects comprehensive theoretical understanding.

CO2: Identifying and selecting sensors requires strong conceptual knowledge of measurement principles.

PO2: Practical, Professional, and Procedural Knowledge:

CO1: Understanding system working provides foundational knowledge for practical implementation.

CO6: Designing systems integrates procedural knowledge with professional application.

CO7: Testing systems requires practical knowledge of instrumentation procedures and standards.

PO3: Entrepreneurial Mindset and Knowledge:

CO2: Selecting appropriate sensors supports innovative product ideas and application-oriented thinking.

CO4: Operating instruments independently fosters self-reliance, a key entrepreneurial trait.

CO6: Designing systems cultivates innovation, problem- solving, and product development mindset. |

PO4: Specialized Skills and Competencies:

CO4: Independent operation of instruments reflects high technical proficiency and confidence.

CO5: Constructing a measurement system showcases applied technical and design skills.

PO5: Capacity for Application, Problem-Solving, and Analytical Reasoning:

CO1: Understanding system working helps in analyzing and solving basic instrumentation-related problems.

CO3:| Applying signal processing techniques involves analysis and problem-solving in data interpretation. |

PO6: Communication Skills and Collaboration:

CO2: Identifying and discussing appropriate sensors requires teamwork and information exchange.

CO5: Constructing a measurement system promotes teamwork and collaborative problem-solving.

PO7: Research-related Skills:

CO3: Knowledge of signal processing is crucial for analyzing and interpreting experimental data. CO7: Testing systems involves data analysis, interpretation, and validation—core research skills.

PO8: Learning How to Learn Skills:

CO1: Learning to explain instrumentation systems encourages independent understanding through continuous study. |

CO4: Operating instruments independently builds confidence and self-directed practical learning.

PO9: Digital and Technological Skills:

CO1: Understanding instrumentation systems provides the foundation for using digital measuring tools. |

CO2: Selecting and using appropriate sensors involves strong technological and practical proficiency.

CO6: Designing measurement systems requires applying digital and technological concepts innovatively.

PO10: Multicultural Competence, Inclusive Spirit, and Empathy:

CO6: Designing systems in a team setting promotes inclusive decision-making and shared responsibility.

CO7: Testing systems collaboratively encourages communication, cooperation, and mutual respect among team members.

PO11: Value Inculcation and Environmental Awareness:

CO5: Constructing measurement systems using sensors can emphasize energy-efficient and sustainable designs.

CO6: Designing systems allows students to incorporate ethical practices and environmental considerations.

PO12: Autonomy, Responsibility, and Accountability:

CO2: Selecting and using sensors independently requires responsibility and accountability in experimental setups.

CO7: Testing designed systems shows ownership and accountability in ensuring performance and accuracy.

PO13: Community Engagement and Service:

CO5: Constructing measurement systems can directly benefit community projects, e.g., water quality monitoring.

CO6: Designing simple measurement systems allows creation of useful devices for societal well-being.

CBCS Syllabus as per NEP 2020 for S.Y.OE

(2024 Pattern)

Name of the Programme : **B.Sc**. Electronics

Programme Code : USEL

Class : **S. Y. O. E.**

Semester : IV

Course Type : **Open Elective [Practical]**

Course Code : **ELE-258-OE**

Course Title : **Basics of Computer Hardware Lab**

No. of Credits : **02**

No. of Teaching Hours : **60**

Topics and Learning Points

Course Outcomes: After completion of the course, the students will be able to

1. Identify computer hardware parts and connect peripherals
2. Describe function of input and output peripheral devices.
3. Understand the use of different types of storage devices.
4. Able to troubleshoot the computer hardware problems.
5. Understand the computers system and its operation.
6. Understand the use of system software and application software.
7. Understand the role of power supply.

List of Experiments

1. Study of read and write action of RAM (using IC 2112/4 or equivalent).
2. Study of diode matrix ROM.
3. Study of computer hardware system.
4. Study of ALU using IC 74181.
5. Study of Motherboard and CPU.
6. Study of keyboard and mouse.

7. Study of types of printers and scanners.

8. Study of display devices.

9. Study semiconductor storage devices. (RAM/SSD/Pen Drive/Memory Card)

10. Study optical storage devices.

11. Study magnetic storage devices.

12. Study of SMPS.

13. Study of UPS.

14. Assembling and Disassembling of Computer.

15. Study of different cables and connectors for interfacing various peripheral devices.

Activity List: (Any one Activity equivalent to two experiments)

1. Industrial Visit.
2. Study Tour
3. Internet Survey on different Simulators in Electronics
4. Any one extra practical done by student from the above list but, excluding regular laboratory practical

References:

1. Digital electronics - G. K. Kharate, Oxford University Press.

2. Fundamentals of Digital Circuits - Anand Kumar.

3. Digital Principles and Applications - Malvino and Leach, TMG Hill Edition.

4. Digital Electronics: Jain R.P., Tata McGraw Hill

5. Digital Fundamentals: Floyd T.M., Pearson Education

Table of Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PO13
CO 1	3	3	2	-	-	2	-	-	3	-	-	3	-
CO 2	3	3	2	3	-	-	2	3	2	3	2	-	2
CO 3	-	2	-	1	-	-	-	-	3	-	-	1	-
CO 4	2	3	3	3	3	3	4	3	-	-	-	-	2

CO 5	-	-	-	-	3	-	-	-	-	-	-	2	-
CO 6	3	3	2	2	-	-	1	2	-	2	-	-	-
CO 7	-	2	-	-	1	1	-	-	2	-	1	-	2

Justification of Mapping

PO1: Comprehensive Knowledge and Understanding:

CO1: Understanding and identifying computer hardware parts requires strong foundational knowledge of system components.

CO2: Describing input/output device functions reflects a clear grasp of fundamental computer operation principles.

CO4: Troubleshooting hardware involves applying conceptual knowledge to practical issues.

CO6: Knowing system and application software is essential to understanding overall computing principles.

PO2: Practical, Professional, and Procedural Knowledge:

CO1: Identifying hardware parts and connecting peripherals reflects strong practical and procedural computer assembly skills.

CO2: Describing input/output devices demonstrates professional understanding of how hardware interfaces are used in practice.

CO3: Understanding storage devices supports practical system configuration and maintenance, moderately related to professional application.

CO4: Troubleshooting computer hardware issues shows direct application of professional and procedural knowledge.

CO6: Using system and application software reflects strong procedural and professional computer operation skills.

CO7: Understanding power supply functions supports safe and reliable

PO3: Entrepreneurial Mindset and Knowledge:

CO1: Knowledge of hardware components can help identify business opportunities in computer servicing or assembly.

CO2: Understanding peripheral devices supports innovative product or service ideas in hardware sales or repair.

CO4: Understanding peripheral devices supports innovative product or service ideas in hardware sales or repair.

CO6: Familiarity with software applications helps identify market needs for digital or service-based business ventures.

PO4: Specialized Skills and Competencies

CO2: Understanding I/O devices enhances specialized knowledge and communication of system functionality.

CO3: Knowing storage device types supports problem-solving in data management and system optimization.

CO4: Troubleshooting develops analytical and diagnostic skills essential for professional technical competence.

CO6: Knowledge of software supports analytical thinking and communication in multidisciplinary environments.

PO5: Capacity for Application, Problem-Solving, and Analytical Reasoning

CO4: Troubleshooting develops strong application and problem-solving skills through hands-on fault diagnosis.

CO5: Understanding system operations fosters analytical reasoning and the ability to apply knowledge in practical contexts.

CO7: Knowing the role of power supply contributes partially to analytical understanding of system functioning.

PO6: Communication Skills and Collaboration

CO1: Identifying hardware parts requires explaining components clearly during lab or group discussions.

CO4: Troubleshooting hardware problems often requires collaborative problem-solving and clear communication within teams.

CO4: knowing the role of power supply only partially contributes to communication or teamwork skills.

PO7: Research-related Skills

CO2: Studying input/output peripherals involves investigation of device characteristics and performance.

CO4: Troubleshooting hardware problems requires systematic observation, hypothesis formation, and testing — key research skills.

CO6: Learning about software provides some exposure to data handling but less to formal research methodology.

PO8: Learning How to Learn Skills

CO2: Understanding and interfacing peripherals enhances independent exploration and self-directed practice.

CO4: Troubleshooting hardware problems develops self-learning, analytical, and adaptive problem-solving abilities.

CO5: Mastery of system and application software supports independent learning through experimentation and practice.

PO9: Digital and Technological Skills

CO1: Understanding computer hardware builds a foundation for digital literacy and technological proficiency.

CO2: Knowledge of input/output peripherals directly supports digital device handling and operation.:

CO3: Using system and application software strengthens digital competency and software-handling proficiency.

CO7: Knowing the role of power supply contributes to the reliable operation of digital systems.

PO10: Multicultural Competence, Inclusive Spirit, and Empathy

CO2: Learning about various input/output devices promotes adaptability to different user needs and environments.

CO6: Using diverse system and application software enhances understanding of global technological diversity.

PO11: Value Inculcation and Environmental Awareness

CO2: Knowledge of peripherals encourages efficient device use, reducing electronic waste.

CO7: Awareness of power supply system's fosters energy-conscious computing practices.

PO12: Autonomy, Responsibility, and Accountability

CO1: Identifying hardware parts independently demonstrates responsibility and technical autonomy.

CO3: Knowledge of storage devices supports responsible decision-making in data management.

CO5: Understanding system operations encourages independent management of computer systems.

PO13: Community Engagement and Service

CO2: Understanding I/O devices supports demonstrations or training sessions for community technology literacy.

CO4: Troubleshooting hardware problems helps provide practical support and technical service to the community.

CO7: Knowledge of power supply contributes partially to safe and responsible community technology use.

CBCS Syllabus as per NEP 2020 for S.Y.B. Sc.

(2024 Pattern)

Name of the Programme : B.Sc. Electronics

Programme Code : USEL

Class : S. Y. B.Sc.

Semester : IV

Course Type : Skill Enhancement Course (SEC) (Practical)

Course Code : ELE-259-SEC

Course Title : Circuit Simulator III

No. of Credits : 02

No. of Teaching Hours : 60

Topics and Learning Points

Course Objectives:

1. To develop hands on skills for different circuits using PSpice simulator.
2. To get knowledge about entering a design simulation and build a solid foundation in the overall use of software.
3. To enhance technical knowledge about the DC bias simulations, transient analysis simulations, sweep simulation by sweeping component values, operating frequencies or global parameters.
4. To increase employment opportunities of students to simulate several types of analog circuits, transformers, digital circuits.
5. To develop hands on working for simulation of several types of mixed analog and digital circuits and stress analysis.
6. To develop hands on working experience with reference to Solve, Simulate and analyze Electrical & Electronics Circuits using PSPICE environments.
7. To configure and run smoke analysis.

Course Outcomes:

CO1: Create, design and develop problem solving ability.

CO2: To edit a stimulus and run a parametric analysis.

CO3: Understand state of the art, technology and development

CO4: Develop soft skills needed.

CO5: Get knowledge of self-employability.

CO6: Explain PSPICE EDA tools

CO7:To get acquainted with PSpice software and its various features.

List of Practicals (Any 15)

1. Simulation of Wein Bridge Oscillator/ Phase shift oscillator using PSpice simulator.
2. Design and simulate low pass filter using PSpice simulator.
3. Design and simulate high pass filter using PSpice simulator.
4. Design and simulate an amplifier using PSpice simulator.
5. Design and simulate operational amplifier using PSpice simulator.
6. Study and simulate concept of filter using PSpice simulator.
7. Design and simulate integrator using op.amp. By PSpice simulator.
8. Study and simulate relaxation oscillator using PSpice.
9. Smoke analysis using PSpice.
10. Study of IV characteristics of transistor using PSpice.
11. MOSFET switching simulation using PSpice.
12. Schmitt trigger circuit analysis using PSpice.
13. R-2R ladder circuit simulation using PSpice.
14. Design and simulate Adder circuit using logic gates in PSpice.
15. Study of 3 bit synchronous up counter using Flip Flop in PSpice.
16. Study of 3 bit synchronous down counter using Flip Flop in PSpice.
17. Simulation of decoder using PSpice.
18. Study of decimal to BCD encoder using logic gates in PSpice.
19. Study of Multiplexer using PSpice simulator.
20. Study of Demultiplexer using PSpice simulator.

Activity List: (Any one Activity equivalent to two experiments)

5. Industrial Visit.
6. Study Tour
7. Internet Survey on different Simulators in Electronics
8. Any one extra practical done by student from the above list but, excluding regular laboratory practical

Table of Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
CO1	3			3		2				2		3	
CO2				3		1	3				2		
CO3					3			3					2
CO4	1		2							3			3
CO5			3						2		1	3	
CO6		3							3				
CO7		3			2		2	3					

Justification of Mapping

PO1: Comprehensive Knowledge and Understanding:
CO1: This CO directly supports a deep understanding of foundational theories and methodologies by fostering skills in problem-solving, which is integral to comprehending and applying core principles in the field.
CO4: While soft skills are valuable for professional development, they do not directly contribute to the comprehensive understanding of foundational theories and methodologies in the field.

PO2: Practical, Professional, and Procedural Knowledge:
CO6: Explaining PSPICE tools involves practical knowledge of industry-standard tools and their application, reflecting a strong alignment with professional and procedural expertise.
CO7: Acquaintance with PSpice software provides hands-on experience with industry tools and best practices, demonstrating a strong alignment with practical and procedural knowledge.

PO3: Entrepreneurial Mindset and Knowledge:
CO4: Developing soft skills is crucial for fostering an entrepreneurial mindset, including communication, leadership, and innovation.
CO5: Knowledge of self-employability directly supports an entrepreneurial mindset by preparing graduates to identify opportunities and manage their own ventures.

PO4: Specialized Skills and Competencies
CO1: Directly relates to developing specialized problem-solving skills.
CO2: Involves technical skills and analytical abilities.

PO5: Capacity for Application, Problem-Solving, and Analytical Reasoning
CO3: Supports the PO by fostering adaptability and readiness to learn about current technology and development, which are crucial for problem-solving and practical application.
CO7: Familiarity with PSpice software involves analytical reasoning and application, making this CO strongly aligned with the PO.

PO6: Communication Skills and Collaboration
CO1: Problem-solving often requires collaboration and communication to share ideas and solutions, but the focus of CO1 is more on individual skill development.
CO2: This CO is more technical and focuses on individual analytical skills rather than collaboration or communication.

PO7: Research-related Skills

CO2: Running a parametric analysis requires using research-related skills such as data collection, analysis, and interpretation, making it strongly aligned with this PO.

CO7: Familiarity with PSpice features may involve inquiry and analysis but doesn't require in-depth research methodologies, making it a moderate fit with this PO.

PO8: Learning How to Learn Skills

CO3: Staying updated with the latest technology requires self-directed learning and the ability to adapt to evolving knowledge, aligning strongly with the PO.

CO7: Getting familiar with software involves some level of self-directed learning, but the focus is on specific software features rather than general learning adaptability.

PO9: Digital and Technological Skills

CO5: Self-employability may require the use of digital platforms for business, but this CO focuses more on personal career knowledge than technological skills.

CO6: PSPICE EDA tools are a key aspect of digital proficiency, as mastering these tools requires deep knowledge of software and digital applications.

PO10: Multicultural Competence, Inclusive Spirit, and Empathy

CO1: Problem-solving can occur in diverse teams where multicultural competence may be useful, but it is not the central focus of this CO.

CO4: Soft skills development is crucial for working in diverse, multicultural settings, as it includes communication, empathy, and understanding different perspectives.

PO11: Value Inculcation and Environmental Awareness

CO2: This CO is more technical and focused on analysis, with limited relevance to ethical issues or environmental awareness.

CO5: Self-employability focuses more on personal career development and less on ethical values or environmental sustainability.

PO12: Autonomy, Responsibility, and Accountability

CO1: Problem-solving often requires independent thinking, accountability for solutions, and responsibility in applying knowledge, making this CO strongly aligned with the PO.

CO5: Self-employability requires autonomy, responsibility for personal development, and accountability in career decisions, making this CO strongly aligned with the PO.

PO13: Community Engagement and Service

CO3: Technological understanding can potentially be applied to societal well-being, but the direct focus on community service is limited.

CO4: Soft skills are essential for effective community engagement, as they facilitate communication, teamwork, and collaboration in service-oriented activities.