Anekant Education Society's

Tuljaram Chaturchand College, Baramati

(Autonomous)

Four Year B.Sc. Degree Program in Electronics

(Faculty of Science & Technology)

CBCS Syllabus

F.Y.B. Sc. (Electronics) Semester -I

For Department of Electronics

Tuljaram Chaturchand College, Baramati

Choice Based Credit System Syllabus (2023 Pattern)

(As Per NEP 2020)

To be implemented from Academic Year 2023-2024

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

Preamble

AES's Tuljaram Chaturchand College has made the decision to change the syllabus of across various faculties from June, 2023 by incorporating the guidelines and provisions outlined 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 outcome approach for the development of the students. By establishing a nationally accepted and internationally comparable credit structure and courses framework, the NEP 2020 aims to promote educational excellence, facilitate seamless academic mobility, and enhance the global competitiveness of Indian students. It fosters a system where educational achievements can be recognized and valued not only within the country but also in the international arena, expanding opportunities and opening doors for students to pursue their aspirations on a global scale.

In response to the rapid advancements in science and technology and the evolving approaches in various domains of Electronics and related subjects, the Board of Studies in Electronics at Tuljaram Chaturchand College, Baramati - Pune, has developed the curriculum for the first semester of F.Y.B.Sc. Electronics, which goes beyond traditional academic boundaries. The syllabus is aligned with the NEP 2020 guidelines to ensure that students receive an education that prepares them for the challenges and opportunities of the 21st century. This syllabus has been designed under the framework of the Choice Based Credit System (CBCS), taking into consideration the guidelines set forth by the National Education Policy (NEP) 2020, LOCF (UGC), NCrF, NHEQF, Prof. R.D. Kulkarni's Report, Government of Maharashtra's General Resolution dated 20th April and 16th May 2023, and the Circular issued by SPPU, Pune on 31st May 2023.

BSc (Honours) 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 also provide 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: Acquire the knowledge in Electronic Devices and Circuits, Analog & Digital communication, Embedded systems, AI, WSN , MEMS and other core areas of Electronics.

PSO2: Understand the principles and working of both hardware and software aspects of Electronic systems.

PSO3: Gain theoretical and practical knowledge in developing areas of Electronics.

PSO4: To analyze, design and implement analog and digital electronic systems, information and communication systems

***PSO5*:** Assess the impact of new technologies and solve complex problems.

PSO6: Develop research oriented skills and to inculcate laboratory skills in students so that they can take up independent 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, Baramati

(Autonomous)

Board of Studies (BOS) in Electronics

From 2022-23 to 2024-25

Sr. No.	Name	Designation
1.	Dr. Deshpande J.D.	Chairman
2.	Dr. Mrs. Pawar A. M.	Member
3.	Dr. Patil S. N.,	Member
4.	Mrs. Rupnawar P. D.,	Member
5.	Dr. Kothawale A. S,	Member
6.	Mrs. Gawade S. A.,	Member
7.	Mrs. Patil S. S.	Invitee
8.	Mrs. Shinde P. K.	Invitee
9.	Mrs. Adsul K. R.	Invitee
10.	Prof. Dr. S. R. Kumbhar	Expert from other University
11.	Dr. Sadistap Shashikant	Expert from other University
12.	Dr. Mudassar Shaikh	Expert from University
13.	Mr. Patil Sharad. V.	Industry Expert
14.	Miss. Salunkhe Yogita.	Meritorious Alumni
15.	Miss Ekatpure Arti	Student Representative
16.	Mr. Khaire Kiran	Student Representative

Credit Distribution Structure for F.Y.B.Sc.-2023-2024 (Electronics)

<table>
<tr><th rowspan="2">Level</th><th rowspan="2">Semester</th><th colspan="2">Major</th><th rowspan="2">Minor</th><th rowspan="2">GE/OE</th><th rowspan="2">VSC, SEC (VSEC)</th><th rowspan="2">AEC, VEC, IKS</th><th rowspan="2">OJT, FP, CEP, CC, RP</th><th rowspan="2">Cum. Cr./ Sem.</th><th rowspan="2">Degree/ Cum. Cr.</th></tr>
<tr><th>Mandatory</th><th>Electives</th></tr>
<tr><td>4.5</td><td>I</td><td>ELE-101-MJM: Basic Electronics and Network Theorems

ELE-102-MJM: Fundamentals of Digital Electronics

ELE-103-MJM Electronics Practical-I

Credits-2+2+2</td><td></td><td>--</td><td>ELE-116-OE: Basic Electronics-I

ELE-117-OE: Electronics Practical-I

Credit- 2+2</td><td>ELE-121-VSC: Applied Electronics

ELE-126-SEC: Introduction of Circuit Simulator-I

Credit- 2+2</td><td>ENG-131-AEC: Functional English – I

ELE-137-IKS: Evolution & Future Prospects of Electronics in India

ELE-135-VEC: Environmental Science

Credit- 2+2+2</td><td>US--CC1: NSS/NCC/Yoga /Cultural Activity/Sports

Credit- 2</td><td>22</td><td>UG

Certificate 44</td></tr>
</table>

II	**ELE-151-MJM** Semiconductor Devices & Circuits **ELE-152-MJM** Digital Electronic Circuits **ELE -153-MJM:** Electronics Practical-II Credits-2+2+2		**ELE -161-MN** Introduction to Electronic Devices Credits-2	**ELE -166-OE:** Basic Electronics-II **ELE -167-OE:** Electronics Practical-II Credit- 2+2	**ELE -171-VSC:** Designing of Experimental Electronic Systems **ELE -176-SEC:** Introduction of Circuit Simulator-II Credit- 2+2	**ELE -181-AEC:** Functional English-II **ELE -185-VEC:** Digital and Technological Solutions Credit- 2+2	**US--CC2:** NSS/NCC/Yoga /Cultural Activity/Sports Credit- 2	22
Cum Cr.	**12**	**-**	**2**	**8**	**8**	**10**	**4**	**44**

Exit option: Award of UG Certificate in Major with 44 credits and an additional 4 credits core NSQF course/ Internship OR Continue with Major and Minor

Course Structure for F. Y. B.Sc. Electronics (2023 Pattern)

Sem.	Course Type	Course Code	Course Title	Theory/ Practical	No. of credits
I	Major Mandatory	**ELE-101-MJM**	Basic Electronics and Network Theorems	Theory	02
	Major Mandatory	**ELE-102-MJM**	Fundamentals of Digital Electronics	Theory	02
	Major Mandatory	**ELE-103-MJM**	Electronics Practical-I	Practical	02
	Open Elective (OE)	**ELE-116-OE**	Basic Electronics-I	Theory	02
	Open Elective (OE)	**ELE-117-OE**	Electronics Practical-I	Practical	02
	Vocational Skill Course (VSC)	**ELE-121-VSC**	Applied Electronics	Theory	02
	Skill Enhancement Course (SEC)	**ELE-126-SEC**	Introduction of Circuit Simulator-I	Practical-	02
	Ability Enhancement Course (AEC)	**ENG-131-AEC**	Functional English – I	Theory	02
	Value Education Course (VEC)	**ELE-135-VEC**	Environmental Science	Theory	02
	Indian Knowledge System (IKS)	**ELE-137-IKS**	Evolution & Future Prospects of Electronics in India	Theory	02
	Co-curricular Course (CC)	**--**	To be selected from the basket	Theory	02
	Total credits Semester-I				**22**
II	Major Mandatory	**ELE-151-MJM**	Semiconductor Devices & Circuits	Theory	02
	Major Mandatory	**ELE-152-MJM**	Digital Electronic Circuits	Theory	02
	Major Mandatory	**ELE -153-MJM**	Electronics Practical-II	Practical	02
	Minor	**ELE -161-MN**	Introduction to Electronic Devices	Theory	02
	Open Elective (OE)	**ELE -166-OE**	Basic Electronics-II	Theory	02
	Open Elective (OE)	**ELE -167-OE**	Electronics Practical-II	Practical	02
	Vocational Skill Course (VSC)	**ELE -171-VSC**	Designing of Experimental Electronic Systems	Practical	02
	Skill Enhancement Course (SEC)	**ELE -176-SEC**	Introduction of Circuit Simulator-II	Practical	02
	Ability Enhancement Course (AEC)	**ENG -181-AEC**	Functional English-II	Theory	02
	Value Education Course (VEC)	**ELE -185-VEC**	Digital and Technological Solutions	Theory	02
	Co-curricular Course (CC)	--	To be selected from the Basket	Theory	02
	Total Credits Semester-II				**22**
	Cumulative Credits Semester I + Semester II				**44**

CBCS Syllabus as per NEP 2020 for F. Y. B.Sc. Electronics (2023 Pattern)

Name of the Programme	**:** B.Sc. Electronics
Programme Code	**:** USEL
Class	**:** F. Y. B.Sc.
Semester	**:** I
Course Type	**:** Major Mandatory (Theory)
Course Code	**:** ELE-101-MJM
Course Title	**:** Basic Electronics and Network Theorems
No. of Credits	**:** 02
No. of Teaching Hours	**:** 30

Course Objectives:

1. To get familiar with basic electronics components.
2. To understand DC circuit theorems and their use in circuit analysis.
3. To know the AC circuits and related terminologies.
4. To study elementary electronic circuits and applications.

Course Outcomes:

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

CO1. To identify different parameters, specifications of components used in electronics.

CO2. Capability to understand the working principles of the electronic devices and their applications.

CO3. Aptitude to apply Logic thinking and Basic Science knowledge for problem solving in various fields of electronics both in industries and research.

CO4. Capacity to identify and implementation of formulate to solve the electronic related issues and analyze the problems in various sub disciplines of electronics.

CO5. To solve problem based on network theorems.

Topics and Learning Points

Unit 1: Basic Elements: (10L)
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 (10L)
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 (10L)
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
3. Circuits and Networks Analysis and Synthesis: Sudhkar and S. P. Shyammohan, Tata McGraw-Hill Publishing Company Limited, 3rd Edition, (2006).
4. Principles of Electronics: V.K. Mehta, S.Chand and Co.
5. A text book of electrical technology: B.L.Theraja, S.Chand and Co.
6. Basic Electronics and Linear Circuits: Bhargava N.N., Kulshreshtha D.C., Gupta S.C., Tata McGraw Hill.

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.

CBCS Syllabus as per NEP 2020 for F. Y. B.Sc. Electronics (2023 Pattern)

Name of the Programme : B.Sc. Electronics

Programme Code : USEL

Class : F. Y. B.Sc.

Semester : I

Course Type : Major Mandatory (Theory)

Course Code : ELE-102-MJM

Course Title : Fundamentals of Digital Electronics

No. of Credits : 02

No. of Teaching Hours : 30

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.

Course Outcomes:

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

CO1. To solve problems based on inter-conversion of number systems.
CO2. To reduce expressions using Boolean Laws.
CO3. To reduce expressions using k-map in SOP and POS forms.
CO4. Capacity to identify and implementation of the formulate to solve the arithmetic circuits and analyze the problems in digital electronics
CO5. Capability to understand the working principles of the logical devices and their applications

Topics and Learning Points

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

Number Systems - Introduction to decimal, Octal, Binary and hexadecimal number systems, 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 to Excess-3, Alphanumeric representation using ASCII code.

Unit II: Logic Gates (7L)

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 gates EX 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 (8L)

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 (7L)

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, IC 4008.

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.

CBCS Syllabus as per NEP 2020 for F. Y. B.Sc. Electronics (2023 Pattern)

Name of the Programme : B.Sc. Electronics

Programme Code : USEL

Class : F. Y. B.Sc.

Semester : I

Course Type : Major Mandatory (Practical)

Course Code : ELE-103-MJM

Course Title : Electronics Practical

No. of Credits : 02

No. of Teaching Hours : 60

Course Objectives:

1. To teach students how to know, identify, draw different symbols, logic diagrams and circuit diagrams.
2. To develop skill of circuit connections.
3. To train them to design and analyse circuits for specific purpose.
4. To motivate them to work on different mini projects.

Course Outcomes:

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

CO1. To identify different components, devices, IC's, as well as their types.
CO2. To understand basic parameters.
CO3. To know operation of different instruments used in the laboratory.
CO4. To connect circuit and do required performance analysis
CO5. Capability to develop experimental skills, analyzing the results and interpret data..
CO6. Develop hobby projects.

List of Practicals: (Any 8)

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, Power supply)
3. Measurement of signal parameters (amplitude, period, frequency, peak voltage, peak to peak voltage, RMS value)
4. Verification of network theorems: KCL and KVL.
5. Verification of Superposition Theorem.
6. Verification of network theorems: Thevenin/ Norton/ Maximum Power Transfer.
7. Build and test Clipper / Clamper circuit.

8. Study of filters (First order passive Low pass & High pass filter)
9. LCR series resonance
10. Verification of logic gates using IC’s (7400, 7402, 7408, 7404, 7432, 7486)
11. Realization of basic gates using universal gates (NAND, NOR)
12. Study of Half & Full adder using gates.
13. Code converter : Binary to Gray and Gray to Binary
14. Design of Parity checker/ Generator using XOR gates.
15. Verification of DE Morgan’s theorem
16. To study Universal adder & Subtractor

Activity: (Any one Activity equivalent to two experiments)

Students must perform at least one additional activity out of two activities in addition to eight experiments mentioned above. Total Laboratory work with additional activities should be equivalent to ten experiments.

- Industrial Visit / Study Tour / Field visit

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	3	-	-	-	1	-	-	3
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.

CBCS Syllabus as per NEP 2020 for F. Y. B.Sc. Electronics (2023 Pattern)

Name of the Programme : B.Sc. Electronics

Programme Code : USEL

Class : F. Y. B.Sc.

Semester : I

Course Type : Open Elective (OE)

Course Code : ELE-116-OE

Course Title : Basic Electronics 1

No. of Credits : 02

No. of Teaching Hours : 30

Course Objectives:

1. To get familiar with basic circuit elements and passive components.
2. To get familiar with basic semiconductor components.
3. To understand the working principle of semiconductor diodes and its types.
4. To study characteristic features of semiconductor diodes and its applications.
5. To learn working principle of semiconductor BJT, FET, MOSFET, UJT.
6. To study characteristic of semiconductor BJT, FET, MOSFET, UJT.
7. To learn applications of BJT, FET and UJT.

Course Outcomes:

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

CO1: Understand the fundamental knowledge of passive devices.

CO2: Know the concept of semiconductor devices.

CO3: Understand the basic material and properties of semiconductors.

CO4: Explore constructional features and I-V characteristics of basic semiconductor Diodes.

CO5: Apply basic concepts of P-N junction in developing simple application circuits.

CO6: Understand the constructional features BJT, FET, MOSFET, UJT.

CO7: Demonstrate and analyze the behavior of BJT, FET, MOSFET, UJT.

Topics and Learning Points

Unit 1: Passive Components **(10L)**
Study of basic circuit elements and passive components (with special reference to working principle, circuit symbols, types, specifications and applications): Resistor, Capacitor, Inductor, Transformer, Cables, Switches, Fuses, Batteries.

Unit 2: Semiconductor Devices- Diode **(10L)**
Study of semiconductor active components (with reference to symbol, working principle, I-V characteristics, parameters, specifications, applications): p-n junction diode, zener diode, varactor diode, light emitting diode, photo diode.Clipper and clamper

Unit 3: Semiconductor Devices- Transistor and its types: **(10L)**
BJT: symbol, types, construction, working principle, I-V characteristics, parameters, specifications, concept of amplifier, configurations of transistors (CC,CE& CB) Brief study of : Uni-Junction Transistor (UJT), Junction Field Effect Transistor (JFET), Metal Oxide Semiconductor FET (MOSFET) , Applications of transistors.

Reference Books:

1. Electronic Principles : Albert Malvino, David J Bates, McGraw Hill 7th Edition. 2012
2. Principles of Electronics: V.K. Mehta, S.Chand and Co.
3. A text book of electrical technology: B.L.Theraja, S.Chand and Co.
4. Basic Electronics and Linear Circuits: Bhargava N.N., Kulshreshtha D.C., Gupta S.C., Tata McGraw Hill.

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

Justification of Mapping

PO1: Disciplinary Knowledge

CO1: It focuses on building the foundational knowledge of passive devices, providing students with a fundamental understanding of electronic components, which is crucial within the discipline.
CO2: Introducing students to semiconductor devices, a key area within the discipline, ensuring a foundational understanding of the concepts and principles related to semiconductor components.
CO3: It emphasizes understanding the core material and properties of semiconductors, providing essential knowledge that forms the basis for semiconductor device applications in electronics.
CO4: Delving into the construction and characteristics of semiconductor diodes, ensuring students acquire detailed knowledge of these fundamental electronic components.
CO5: It involves applying the basic concepts of P-N junctions, a crucial aspect of semiconductor devices, in developing circuits, contributing to a practical understanding within the discipline.
CO6: Focusing on understanding the constructional features of key semiconductor devices (BJT, FET, MOSFET, UJT), ensuring a comprehensive grasp of these devices within the field of electronics.

PO2: Critical Thinking and Problem solving

CO4: It requires exploration and analysis of the constructional features and I-V characteristics of semiconductor diodes, fostering critical thinking in solving problems related to diode circuits.
CO5: It involves applying basic concepts of P-N junctions to develop circuits, requiring critical thinking and problem-solving skills in designing and troubleshooting semiconductor-based applications.
CO6: It involves understanding the constructional features of key semiconductor devices, necessitating critical thinking in analyzing and solving problems associated with these devices.
CO7: It involves the demonstration and analysis of the behavior of semiconductor devices, fostering critical thinking in evaluating and solving problems related to the operation of these devices.

PO3: Social competence

CO4: Enables students to share insights and collaborate effectively in the analysis and application of diodes within the social context of electronic projects.
CO5: Fostering the application of shared knowledge and encouraging collaboration in the creation of semiconductor-based applications.
CO6: Promotes collective knowledge, enhancing communication and collaboration when working on projects involving BJT, FET, MOSFET, and UJT.
CO7: Facilitating shared understanding and collaborative analysis of the operational characteristics of BJT, FET, MOSFET, and UJT.

PO5: Trans-disciplinary knowledge
CO5: Involves knowledge that can be applied across disciplines, demonstrating the trans-disciplinary nature of semiconductor-based applications.
CO7: Contributes to knowledge that can be applied across various disciplines, reflecting the trans-disciplinary nature of semiconductor technology.

PO6: Personal and professional competence

CO1: Providing a foundational understanding of passive devices, contributing to the professional competence of individuals working in the field of electronics.

CO2: Knowing the concepts of semiconductor devices is fundamental for individuals in the electronics profession, enhancing their professional competence.

CO4: Involving exploration of constructional features and characteristics of semiconductor diodes, enhancing individuals' competence in working with these fundamental electronic components.

CO5: Enhances the practical competence of individuals, contributing to their effectiveness in real-world applications.

CO6: Understanding the constructional features of key semiconductor devices (BJT, FET, MOSFET, UJT) is essential for professional competence in electronics.

CO7: Involving the demonstration and analysis of semiconductor device behavior, enhancing individuals' competence in evaluating and troubleshooting devices commonly used in professional settings.

PO9: Self-directed and life-long learning

CO1: Encouraging individuals to autonomously seek and acquire knowledge about passive devices throughout their professional journey.

CO2: Introducing the concepts of semiconductor devices, fostering a mindset of self-directed learning, and encouraging individuals to stay informed about advancements in semiconductor technology.

CO3: It involves understanding the material and properties of semiconductors, encouraging individuals to engage in lifelong learning to stay updated on semiconductor materials and their evolving properties.

CO4: Involving the exploration of constructional features and characteristics of semiconductor diodes, promoting a self-directed approach to learning and staying current with diode technologies.

CO5: It requires the application of P-N junction concepts in circuit development, fostering a self-directed learning mindset and motivating individuals to continually apply and adapt these concepts.

CO6: It involves understanding the constructional features of key semiconductor devices, prompting individuals to engage in self-directed learning to stay abreast of advancements in BJT, FET, MOSFET, and UJT technologies.

CO7: Requiring individuals to demonstrate and analyze the behavior of semiconductor devices, fostering a commitment to ongoing learning and skill development in the field.

CBCS Syllabus as per NEP 2020 for F. Y. B.Sc. Electronics (2023 Pattern)

Name of the Programme : B.Sc. Electronics

Programme Code : USEL

Class : F. Y. B.Sc.

Semester : I

Course Type : Open Elective (OE)

Course Code : ELE-117-OE

Course Title : Electronics Practical

No. of Credits : 02

No. of Teaching Hours : 60

Course Objectives:

1. To teach students how to know, identify, draw different symbols, logic diagrams and circuit diagrams.
2. To develop skill of circuit connections.
3. To train them to design and analyse circuits for specific purpose.
4. To motivate them to work on different mini projects.

Course Outcomes:

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

CO1. To identify different components, devices, IC's, as well as their types.
CO2. To understand basic parameters.
CO3. To know operation of different instruments used in the laboratory.
CO4. To connect circuit and do required performance analysis
CO5. Capability to develop experimental skills, analyzing the results and interpret data.
CO6. Develop hobby projects.

List of Practicals: (Any 8)

1. Study of Basic Electronic Devices - Multimeters
2. Study of Basic Electronic Devices - Signal Generators
3. Study of Basic Electronic Devices - CRO
4. Study of different resistors and its color coding.
5. Study of Passive and Active Components.
6. Study of Transformers.
7. Study of relay and Switches.
8. Study of voltage sources in series, parallel and series- parallel
9. Charging and Discharging of Capacitor
10. Voltage and Current divider

11. Diode characteristics
12. Rectifier circuits
13. Study of transistor charactristics
14. Study of UJT characteristics
15. Study of Zener voltage regulator
16. Clipper/ Clamper

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

Justification

PO1: Disciplinary Knowledge

CO1: as it involves acquiring specific knowledge about the components and devices in the field.

PO2 :Critical Thinking and Problem Solving

CO2: as understanding basic parameters requires analytical thinking and problem-solving skills.

PO3:Social Competence

Not explicitly addressed in the provided Course Outcomes.

PO4: Research-related Skills and Scientific Temper

CO5: as it involves developing experimental skills and interpreting data, which are crucial research-related skills**.**

PO5: Trans-disciplinary Knowledge

CO3: as it involves understanding instruments that may span multiple disciplines in a laboratory setting.

PO6: Personal and Professional Competence

CO6: as practical application implies the development of competence in applying theoretical knowledge to real-world scenarios.

CO7: as it involves applying knowledge and skills in a creative and self-directed manner.

PO7: Effective Citizenship and Ethics.

Not explicitly addressed in the provided Course Outcomes.

PO8: Environment and Sustainability

Not explicitly addressed in the provided Course Outcomes.

PO9: Self-directed and Life-long Learning

CO7: as developing hobby projects involves self-directed learning.

CBCS Syllabus as per NEP 2020 for F. Y. B.Sc. Electronics (2023 Pattern)

Name of the Programme : B.Sc. Electronics

Programme Code : USEL

Class : F. Y. B.Sc.

Semester : I

Course Type : Vocational Skill Course (VSC)

Course Code : ELE-121-VSC

Course Title : Applied Electronics

No. of Credits : 02

No. of Teaching Hours : 30

Course Objectives:

1) Apply knowledge of computer architecture and organization appropriate to the discipline
2) Analyze given processing element, and identify and define the computing requirements.
3) Design, implement, and evaluate a microcontroller-based system, process, component, or
4) program to meet desired needs.
5) Use current techniques, skills, and tools necessary for Low-Level computing

Course Outcomes:

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

CO1. To understand types of memory and its parameters
CO2. To know the bus architecture and IO device communication.
CO3. Understand the CPU and memory organization.
CO4. To know the serial and parallel communication and interfacing concept.
CO5. Understand the architecture of Embedded system and its application
CO6. To have better idea on C and embedded C programming.
CO7. Understand the basic interfacing devices to controller and its programming

Topics and Learning Points

UNIT- 1: Memory **[10]**

Memory Architecture, Memory Hierarchy, Introduction to USB storage device, Memory parameters (Access time, speed, capacity, cost), Vertical & horizontal Memory expansion (increasing the capacity, increasing word size, increasing the capacity and word size), Associative Memory, Cache memory, cache mapping techniques, virtual memory.

UNIT- 2: Computer Organization **[10]**

Concept of Address Bus, Data Bus, Control Bus. Register based CPU organization, stack organization, I/O organization: need of interface, block diagram of general I/O interface. Working concepts like polling, interrupt initiated data transfer. Concept of DMA, DMA transfer, DMA Controller Serial communication: Synchronous, asynchronous and their data transmission formats, RS–232, General block diagram of UART, USB.

UNIT- 3: Introduction To Embedded System **[10]**

History & need of Embedded System, Definition of an embedded system, Basic components of Embedded System, characteristics of embedded systems, Applications of embedded systems. Classification of Embedded System, Advantage & Disadvantage, Introduction to Embedded C, Difference between C & Embedded C, Basic structure of embedded C program, interfacing LED, Switch, sensors etc.

Reference Books:

1. Fundamental of Digital electronics : R.P. Jain
2. Digital design : M. Morris Mano, Prentice-Hall of India
3. Computer System Architecture : Morris Mano, Prentice-Hall of India
4. Embedded C - Michael J Point
5. The Pentium Microprocessor : James Antonakos
6. Microprocessors and Interfacing Programming and Hardware: Douglas V. Hall- TATA McGRAW-HILL EDITION
7. The Intel Microprocessors : Barry B. Brey- Pearson Education Asia
8. Embedded System, Architecture and programming,Rajkamal,TMH,2008

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	3	2	1						
CO2	3	2							
CO3	3	2							
CO4	3		1						
CO5	3			2	5				
CO6	3								
CO7	3		1	1	1				

Justification for Mapping

PO1: Disciplinary Knowledge

CO1: This directly contributes to the comprehensive knowledge of computer architecture and embedded systems, a key aspect of the graduate program.

CO2: Understanding bus architecture and IO device communication is crucial for a comprehensive understanding of computer systems, aligning with the graduate program's objectives.

CO3: Knowledge of CPU and memory organization is fundamental to the broader understanding of computer systems, forming a significant part of the graduate program.

CO4: Serial and parallel communication concepts are essential components of the broader knowledge required in the graduate program.

CO5: Embedded systems architecture directly aligns with the disciplines of the graduate program, contributing significantly to comprehensive knowledge.

CO6: Proficiency in C and embedded C programming is a specific skill set expected in the graduate program, making it strongly related to the overall objectives.

CO7: Knowledge of interfacing devices and programming is directly applicable to the graduate program's goal of comprehensive understanding of embedded systems.

PO2: Critical Thinking and Problem solving

CO1: Analyzing and interpreting memory types and parameters is integral to problem-solving in the broader context of computer systems.
CO2: Understanding bus architecture and IO device communication is crucial for problem-solving in designing efficient and effective communication pathways within a system.
CO3: Critical thinking and problem-solving skills are directly applied when comprehending and optimizing CPU and memory organization in a system.

PO3: **Social competence**

CO1: While the technical knowledge of memory types and parameters is important, it has a limited connection to social competence and effective communication skills.
CO4: Understanding communication concepts contributes to technical skills but has a limited impact on social competence or group work.
CO7: While important for technical knowledge, interfacing devices and programming have limited direct impact on social competence.

PO4: **Research-related skills and Scientific temper**

CO5: Knowledge of embedded systems architecture is highly relevant to research-related skills, especially when designing and conducting experiments in the field of embedded systems.
CO7: Knowledge of interfacing devices and programming is moderately relevant to research-related skills, especially in the context of designing experiments involving controllers.

PO5: **Trans-disciplinary knowledge:**

CO5: Knowledge of embedded systems architecture strongly supports trans-disciplinary approaches by providing a comprehensive understanding applicable to a wide range of common problems.

CO6 : Understand the basic interfacing devices to controller and its programming - Weightage: 2 (Moderately related) - Knowledge of interfacing devices and programming moderately aids trans-disciplinary approaches by fostering cognitive abilities in addressing common problems.

CBCS Syllabus as per NEP 2020 for F. Y. B.Sc. Electronics (2023 Pattern)

Name of the Programme : B.Sc. Electronics

Programme Code : USEL

Class : F. Y. B.Sc.

Semester : I

Course Type : Skill Enhancement Course (SEC)

Course Code : ELE-126-SEC

Course Title : Introduction of Circuit Simulator-I

No. of Credits : 02

No. of Teaching Hours : 60

Course Objectives:

1. To develop hands-on skills of students
2. To promote entrepreneurship among the students
3. To enhance technical knowledge
4. To increase employment opportunities of students
5. To develop hands on working experience with reference to Solve, Simulate and Analyse Electrical & Electronics Circuits using PSPICE environments.

Course Outcomes:

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

CO1. Create, design and develop problem solving ability

CO2. Understand state of the art, technology and development

CO3. Develop soft skills needed.

CO4. Get knowledge of self-employability.

CO5. Identify Electronic components and understand simulating tool

CO6. Explain PSPICE EDA tools

Topics and Learning Points

1. Study of PSPICE environment.
2. Study of Simulation and Circuit Schematic using PSPICE
3. Pspice simulation of resistive circuit
4. Pspice simulation of capacitive circuit
5. Pspice simulation of diode clipper
6. Pspice simulation of nodal analysis for dc circuits
7. Pspice simulation of transient and parametric analysis of series RLC circuits using step and pulse input
8. Pspice simulation of transient and parametric analysis of series RLC circuits using sine input

9. Analysis of three phase circuit representing generator transmission line and load
10. Pspice simulation of D.C. Circuit for determining Thevenin's equivalent
11. Pspice simulation of maximum power transfer theorem for dc circuits
12. Pspice simulation of superposition theorem for dc circuits
13. Pspice simulation of ac circuits
14. Pspice simulation of transformer circuit
15. Pspice simulation of ac sweep of filter with ideal op-amp (filter circuit)
16. Pspice simulation of rectifier circuit (peak detector).
17. Pspice simulation of AM modulated signal

Reference Books:

1. Essential Electronic Design Automation (EDA), Mark.D.Birnbaum, Prentice Hall, 2004
2. Introduction ToPSpice Using OrCADfor Circuits and Electronics, Muhammad H. Rashid,Paperback – Import,3rd Edition, 2003.
3. Printed circuit Board – Design & Technology by Walter C. Bosshart, TMH.
4. Printed Circuit Board –Design, Fabrication, Assembly & Testing, R.S. Khandpur, TMH,3rd Edition,2017.
5. Electronic Devices and circuit theory, Robert Boylstead and Louis Nashelsky, PHI, 10th Edition, 2009.

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

PO1: Disciplinary Knowledge:

CO1: Creating, designing, and developing problem-solving ability directly aligns with the program outcome of fostering analytical skills and problem-solving capabilities.

CO2: Understanding state-of-the-art technology aligns with the program outcome of staying updated with current advancements, emphasizing the relevance of contemporary knowledge.

CO3: While soft skills development contributes to overall competence, it is moderately related to the program outcome of mastering core technical concepts.

CO4: Acquiring knowledge of self-employability directly aligns with the program outcome of preparing students for diverse career paths, including entrepreneurship.

CO5: Identifying electronic components aligns with the program outcome of comprehensive knowledge and practical understanding in the graduate discipline.

CO6: Explaining PSPICE EDA tools directly contributes to strong theoretical and practical understanding, aligning with the program outcome.

PO2 Critical Thinking and Problem solving:

CO1: Developing problem-solving ability directly aligns with the program outcome of exhibiting critical thinking and problem-solving skills through analysis and design.

CO2: Understanding current technology aligns with the program outcome of critical thinking and problem-solving, requiring analysis of the state of the art and developments.

CO3: Soft skills development is moderately related to critical thinking and problem-solving as it contributes to effective communication and collaboration in the solution design process.

CO4: Knowledge of self-employability contributes to critical thinking, but it is moderately related as it involves analyzing one's career path rather than specific problem-solving scenarios.

CO5: Identifying electronic components and using simulating tools aligns with the program outcome of critical thinking and problem-solving through observation and solution design.

CO6: Explaining PSPICE EDA tools directly contributes to critical thinking and problem-solving, involving the interpretation and application of simulation tools for solution design.

PO3 Social competence:

CO1: Developing problem-solving ability contributes to social competence by fostering effective communication and collaboration in group work.

CO2: Understanding current technology is moderately related to social competence as it involves effective communication of thoughts and ideas related to technological advancements.

CO3: Developing soft skills is directly related to social competence, emphasizing effective communication and collaboration in various social and professional settings.

CO4: Knowledge of self-employability is moderately related to social competence as it involves effective communication of one's thoughts and ideas in the context of career development.

CO5: Identifying electronic components and using simulating tools contribute to social competence by enhancing communication skills within a technical context.

CO6: Explaining PSPICE EDA tools is moderately related to social competence as it involves effective communication of technical concepts within a collaborative environment.

PO4 Research-related skills and Scientific temper

CO1: Developing problem-solving ability contributes to research-related skills by fostering critical thinking essential for experimental design and hypothesis formulation.

CO2: Understanding current technology is strongly related to research-related skills as it provides the knowledge base for incorporating the latest advancements in experimental setups.

CO3: Developing soft skills is partially related to research-related skills; effective communication is valuable, but the emphasis here is on technical and experimental proficiency.

CO4: Knowledge of self-employability is partially related to research-related skills; while autonomy is essential, the focus here is on laboratory techniques and experimental independence.

CO5: Identifying electronic components and using simulating tools moderately relates to research-related skills by providing a foundational understanding applicable to experimental setups.

CO6: Explaining PSPICE EDA tools is moderately related to research-related skills as it involves understanding simulation tools that are often used in experimental design.

PO5 Trans-disciplinary knowledge:

CO1: Developing problem-solving ability contributes moderately to trans-disciplinary knowledge by fostering cognitive abilities necessary for addressing common problems across different

CO2: Understanding current technology is strongly related to trans-disciplinary knowledge as it involves integrating technological advancements across disciplines to address common challenges.

CO3: Developing soft skills is moderately related to trans-disciplinary knowledge by enhancing effective communication and collaboration, essential for working across diverse disciplines.

CO4: Knowledge of self-employability is partially related to trans-disciplinary knowledge, as autonomy and entrepreneurial skills contribute, but the focus is more on individual career paths.

CO5: Identifying electronic components and using simulating tools contributes moderately to trans-disciplinary knowledge by providing a foundational understanding applicable across different domains.

CO6: Explaining PSPICE EDA tools is moderately related to trans-disciplinary knowledge as it involves understanding simulation tools that can be applied across various disciplines.

PO6 Personal and professional competence:

CO1: Developing problem-solving ability is strongly related to personal and professional competence, as it contributes to the skills needed to perform both independently and collaboratively within a team.

CO2: Understanding current technology is strongly related to personal and professional competence, as it enables individuals to meet defined objectives and work across interdisciplinary fields.

CO3: Developing soft skills is strongly related to personal and professional competence, emphasizing interpersonal relationships, self-motivation, and adaptability skills.

CO4: Knowledge of self-employability is moderately related to personal and professional competence, as it involves commitment to professional ethics and adaptability in different roles.

CO5: Identifying electronic components and using simulating tools moderately relates to personal and professional competence, contributing to skills needed for collaborative work and interdisciplinary fields.

CO6: Explaining PSPICE EDA tools is moderately related to personal and professional competence, as it involves skills applicable in teamwork and interdisciplinary projects.

PO7 Effective Citizenship and Ethics:

CO1: Developing problem-solving ability is moderately related to effective citizenship and ethics, contributing to an informed awareness of moral and ethical issues.

CO2: Understanding current technology is moderately related to effective citizenship and ethics, as it enables individuals to contribute to equity-centered national development.

CO3: Developing soft skills is strongly related to effective citizenship and ethics, emphasizing empathetic social concern and interpersonal skills essential for ethical engagement.

CO4: Knowledge of self-employability is moderately related to effective citizenship and ethics, involving a commitment to professional ethics and responsibility in a broader societal context.

CO5: Identifying electronic components and using simulating tools moderately relates to effective citizenship and ethics by contributing to skills applicable in promoting equitable national development.

CO6: Explaining PSPICE EDA tools is moderately related to effective citizenship and ethics, as it involves skills applicable in addressing moral and ethical issues in technological development.

PO8 Environment and Sustainability:

CO1: Developing problem-solving ability is moderately related to environment and sustainability, contributing to understanding the societal and environmental impact of scientific solutions.

CO2: Understanding current technology is strongly related to environment and sustainability, as it involves awareness of the impact of technological development on the environment and the need for sustainable solutions.

CO3: Developing soft skills is moderately related to environment and sustainability, contributing to effective communication about the importance of sustainable development.

CO4: Knowledge of self-employability is moderately related to environment and sustainability, as it involves considering sustainable practices in one's professional endeavors.

CO5: Identifying electronic components and using simulating tools is moderately related to environment and sustainability, contributing to the development of environmentally conscious engineering practices.

CO6: Explaining PSPICE EDA tools is moderately related to environment and sustainability, as it involves understanding the environmental implications of electronic circuit design.

PO9 Self-directed and Life-long learning:

CO1: Developing problem-solving ability is strongly related to self-directed and life-long learning, as it enhances the capacity for independent learning and adaptation to socio-technological changes.

CO2: Understanding current technology is strongly related to self-directed and life-long learning, as it enables individuals to stay abreast of technological changes and engage in continuous learning.

CO3: Developing soft skills is moderately related to self-directed and life-long learning, contributing to effective communication and adaptability, essential aspects of ongoing learning.

CO4: Knowledge of self-employability is strongly related to self-directed and life-long learning, as it involves an understanding of one's career path and the skills needed for continuous professional development.

CO5: Identifying electronic components and using simulating tools is moderately related to self-directed and life-long learning, contributing to technical skills necessary for ongoing learning in engineering.

CO6: Explaining PSPICE EDA tools is moderately related to self-directed and life-long learning, as it involves understanding and applying simulation tools, a skill relevant for continuous learning in electronics.

CBCS Syllabus as per NEP 2020 for F. Y. B.Sc. Electronics (2023 Pattern)

Name of the Programme	: B.Sc. Electronics
Programme Code	: USEL
Class	: F. Y. B.Sc.
Semester	: I
Course Type	: Indian Knowledge System (IKS)
Course Code	: ELE-137-IKS
Course Title	: Evolution & Future Prospects of Electronics in India
No. of Credits	: 02
No. of Teaching Hours	: 30

Course Objectives:

1. Study traditional Indian knowledge system.
2. To study history of Electronic industry development in India.
3. To study evolution of Science and technology in India
4. To Study development of new technology and its applications.

Course Outcomes:

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

CO1. Describe the traditional Indian knowledge system.

CO2. Analyse the need to protect traditional Indian knowledge system.

CO3. Understand the history and development of Electronics technology in India.

CO4. To learn today's electronics technology in India.

Topics and Learning Points

1. Introduction to Electronics Knowledge System:

Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge. The need for protecting traditional knowledge, the value of traditional knowledge in the global economy, Role of Government to harness traditional knowledge.

2. Science and Technology in India:

Milestones of India in Science and Technology, IKS in ancient India and in modern India, History of Electronic industry development in India, Achievements of Indians in Science and Technology in Ancient and medieval India, Nobel laureates of India in Science, Achievements of Indians in Science & Technology in the modern era.

3. Future Prospects:

Impact of New Technologies and Applications, social networking sites- Facebook, LinkedIn, Instagram, myspace, twitter, Online chat, video chatting, Internet telephony- voice, video, blogs, ChatGPT, IoT, Artificial Intelligence.

Reference Books:

1. A.K. Maini and J. Ramamurthy, Making sense of electronics: Understanding discreet components and their applications, , Tata McGraw-Hill Education, 2008.
2. Charles Harrell, Designing Electronics for Manufacturing and Testability: A Guide to Designing Automated, Cost-Effective Manufacturing and Test Systems, by Wiley, 2015.
3. Hamid R. Arabnia, Embedded Systems Design Challenges in the Electronic InTech, 2013.
4. Asok Kumar Das and Chandra Shekhar Bose , Artificial Intelligence in Electronics and Communication, , Cambridge University Press, 2004.
5. NitinGautam , Handbook of Electronics Manufacturing Engineering– CRC Press, 2016
6. Electronic Communication - Dennis Roddy, John Coolen, Pearson Education
7. Communication Electronics: Principles and Applications, Louis Frenzel , McGraw Hill Education

Mapping

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

Justification

CO1: as it involves understanding and describing a specific field of knowledge, in this case,

the traditional Indian knowledge system**.**

CO7:different electronics tools include Disciplinary Knowledge.

PO2 Critical Thinking and Problem Solving

CO2: It requires analyzing and critically evaluating the importance of protecting traditional

Indian knowledge.

CO7 :Different tools required critical thinking and problem solving.

PO3: Social Competence

CO3: Provide social Competence

PO4: Research-related Skills and Scientific Temper

CO1: it involves understanding and describing a specific field of Research , in this case,

the traditional Indian knowledge system.

CO5: it involves Research related skills and scientific temper to the contributions of Indians

in the field of science**.**

CO7: as it involves understanding and utilizing tools in the field of electronics for research purposes**.**

PO5: Trans-disciplinary Knowledge

CO1: it involves understanding and describing a specific field Trans-disciplinary Knowledge, in this case,

the traditional Indian knowledge system.

CO4: The necessary knowledge and skills to navigate and work with current electronics technology.

PO6: Personal and Professional Competence

CO4: as it implies acquiring the necessary knowledge and skills to navigate and work with

current electronics technology.

PO7: Effective Citizenship and Ethics

CO3: As it involves understanding Effective Citizenship and Ethics of

Electronics technology in the Indian context.

PO8: Environment and Sustainability

CO1: it involves understanding and describing a specific field Environment and Sustainability, in case of

the traditional Indian knowledge system

CO5: it involves Environment and Sustainability to the contributions of Indians in the field of science**.**

PO9: Self-directed and Life-long Learning

CO1 to CO7: all Course Outcomes, as learning about traditional knowledge, historical

development, current technology, and advancements requires ongoing learning.