Rayat Shikshan Sanstha's

Yashavantrao Chavan Institute of Science, Satara (Autonomous)

Lead College of

Karmaveer Bhaurao Patil University, Satara

Re Accredited by NAAC (3rdCycle) with 'A+' grade (CGPA 3.57).

ISO 9001:2015 Certified

Bachelor of Science

Part - I

ELECTRONICS

Syllabus

to be implemented w .e. f. June, 2023

NEP 2020

Rayat Shikshan Sanstha's
Yashavantrao Chavan Institute of Science, Satara
Department of Electronics
Syllabus for Bachelor of Science (Electronics)
B.Sc. Electronic

PREAMBLE:

Bachelor of Science is an integrated academic degree in the faculty of Science. The faculty is not ignoring the developments in the field of Electronics. The students from science faculty should also be competent for this change in technology. The Programme will helpful to make students aware of professional ethics of the Industry, prepare them with basic soft skills essential for working in community, professional teams and prepare them for competitive examinations, enabling them to reach higher echelons of excellence and Exploring world with Entrepreneurship approach. The competitive curriculum has prepared at par as per needs of industries and research fields. The topics of the curriculum are well defined, taking into consideration the level and capacity of students. The revision of the existing curriculum of the Electronics subject in science faculty is essential. This is a humble endeavor to initiate the process towards an era of knowledge.

General Objectives of the Program:

1. To nurture academics with a focus commitment to higher subjects.
2. To shape good and informed citizens from the students entering into Programme
3. To create a skilled workforce to match the requirements of the society
4. To impart knowledge of science is the basic objective of this Programme
5. To develop scientific attitude is the major objective so as to make the students open minded, critical and curious.
6. To develop skill in practical work, experiments and laboratory materials and equipments along with the collection and interpretation of scientific data to contribute to science

Program Outcomes:

1.The students will graduate with proficiency in the subject of their choice
2.The students will be eligible to continue higher studies in their subject
3.The students will be eligible to pursue higher studies abroad
4.The students will be eligible to appear for the examinations for job in government organizations and cope up with industry, research fields.
5. The students will be eligible to apply for jobs with minimum requirements of B.Sc. Programme.

Program Specific Objectives

1.To create graduates with sound knowledge of fundamentals of Electronics, who can contribute towards advancing science and technology and make them ready for life- long learning process.
2.To create graduates with sufficient capabilities in Electronics who can become researchers and developers to satisfy the needs of the core Electronics industry.
3.To develop ability among students to formulate, analyze and solve real life problems faced in Electronics industry as well as prepare students for graduate studies through competitive examinations, enabling them to reach higher echelons of excellence
4.To make the students aware of professional ethics of the Industry, and prepare them with basic soft skills essential for working in community and professional teams.

5. To produce electronic professionals who can be directly employed or start his/her own work as Electronic circuit Designer, Electronics consultant, testing professional, Service engineer and even an entrepreneur in the electronic industry.

Program specific Outcomes:

After completing this courses students shall be expert in following things:

1. To prepare students to excel in postgraduate programs or to succeed in industry/technical profession through global and comprehensive education.
2. To provide students with a solid foundation in scientific and quantitative electronics fundamentals required to solve technical problems and also to pursue higher studies.
3. To train students with good technical and scientific breadth so as to comprehend, analyze, design and create novel products and solutions for real life problems.
4. To inculcate in students professional and ethical attitude, effective communication skills, teamwork skills, multidisciplinary approach and an ability to relate Science and engineering issues to broader social context.
5. To prepare student with an academic environment aware of excellence, leadership, written ethical codes and guidelines and the life-long learning needed for a successful professional career.

Programme Outcomes (Subject)

The Undergraduate Students will reveal...

1. Knowledge of differential equations, vector calculus, complex variables, matrix theory, probability theory, physio-chemical study of device properties and network analysis, EM field analysis of electrical and electronics objects.
2. An ability to identify, formulate and solve electrical and electronics problems as well as conduct experiments on electrical and electronics systems, analyze and interpret data.
3. An ability to design electronics systems skills, Critical and analytical thinking skills, Simulating skills, Knowledge on computer hardware and maintenance skills.
4. Skills to use modern industrial tools, software and equipment to analyze and synthesize problems.
5. An ability to visualize and work on laboratory and multidisciplinary tasks.
6. An ability to participate and succeed in competitive examinations and/or seek employment in the industry as well as develop entrepreneurship skills to form a startup.
7. An ability to communicate effectively in both verbal and written form
8. Knowledge of professional and ethical responsibilities.
9. The understanding of the impact of industrial solutions on society and will also be aware of contemporary issues.
10. Confidence for self-education and ability for life-long learning.

Rayat Shikshan Sanstha's
Yashavantrao Chavan Institute of Science, Satara
Department of Electronics
Syllabus for Bachelor of Science (Electronics) Part I

SUBJECT: Electronics

YEAR OF IMPLEMENTATION: New Syllabi for the B.Sc. I Electronics will be implemented from 2022-23 onwards.

1. PREAMBLE:

Bachelor of Science is an integrated academic degree in the faculty of Science. The faculty is not ignoring the developments in the field of Electronics. The students from science faculty should also be competent for this change in technology. The Programme will help to make students aware of professional ethics of the Industry, prepare them with basic soft skills essential for working in community, professional teams and prepare them for competitive examinations, enabling them to reach higher echelons of excellence and explore the world with an Entrepreneurship approach. The competitive curriculum has prepared at par as per needs of industries and research fields. The topics of the curriculum are well defined, taking into consideration the level and capacity of students. The revision of the existing curriculum of the Electronics subject in science faculty is essential. This is a humble endeavor to initiate the process towards an era of knowledge.

2. GENERAL OBJECTIVES OF THE COURSE:

1. To create graduates with sound knowledge of fundamentals of Electronics, who can contribute towards advancing science and technology.
2.To create graduates with sufficient capabilities in Electronics who can become researchers and developers to satisfy the needs of the core Electronics industry.
3.To develop the ability among students to formulate, analyze and solve real life problems faced in the Electronics industry.
4.To provide opportunity to students to learn the latest trends in Electronics and make them ready for a life-long learning process.
5.To make the students aware of professional ethics of the Industry, and prepare them with basic soft skills essential for working in community and professional teams.
6.To prepare the students for graduate studies through competitive examinations, enabling them to reach higher echelons of excellence
7.To produce electronic professionals who can be directly employed or start his/her own work as Electronic circuit Designer, Electronics consultant, testing professional, Service engineer and even an entrepreneur in the electronic industry.

1. Title: Electronics
2. Year of Implementation: The syllabus will be implemented from June, 2022 onwards.
3. Duration: The course shall be a full time.
4. Pattern: Semester examination.
5. Medium of Instruction: English.

B.Sc. Sem - I (Electronics)

Sr.no.	Course Category	Name of Course	Course Code	Credits		Total credits
				TH	PR	
1	Major -I	Fundamental of Electronics and Network Analysis	BET111	2	1	3
2	Major -II	Digital Electronics-I	BET112	2	1	3
3	Minor-I	Electronics Circuit -I	BET114	2	1	3
4	Minor-II	Fundamental of Digital Electronics	BET115	2	1	3
5	GE/OE	Electronics For Everyone	BET117	2	1	3
		Mobile Communication	BET118	2	1	3
6	IKS	Indian Knowledge System	IKS101	2	-	2
7	CC	NSS/NCC/Yoga/Health & Wellness	CC102	2	-	2
				16	6	22

B.Sc. Sem - II (Electronics)

Sr.no.	Course Category	Name of Course	Course Code	Credits		Total credits
				TH	PR	
1	Major -I	Semiconductor Devices	BET121	2	1	3
2	Major -II	Digital Electronics-II	BET122	2	1	3
3	Minor-I	Electronics Circuit -II	BET124	2	1	3
4	Minor-I	Digital Electronics	BET125	2	1	3
5	GE/OE	Consumer Electronics	BET127	2	1	3
		Introduction to Electric Vehicles	BET128	2	1	3
6	VEC	Understanding India	VEC104	2	-	2
7	SEC	Design and Fabrication of Printed Circuit Board	SEC103	1	1	2
				15	7	22

Abbreviations:
OE: Generic/ Open Electives
VSEC: Vocational Skill and Skill Enhancement Courses;
VSC: Vocational Skill Courses;
SEC: Skill Enhancement Courses;
AEC: Ability Enhancement Courses;
IKS: Indian Knowledge System;
VEC: Value Education Courses; FP: Field projects;
CC: Co-curricular Courses; RM: Research Methodology; RP: Research Project;
CEP: Community engagement and service; OJT: On Job Training: Internship/ Apprenticeship;

Major:

Course Structure for B.Sc. I (Semester- I)

Theory				Practical				
Course Title	**Course Code**	**Lecture per week**	**Credits**	**Course**	**Course Title**	**Course Code**	**Lecture per week**	**Credits**
Fundamental of Electronics and Network Analysis	BET111	4	2	Practical -1	Fundamental of Electronics, Network Analysis and Digital Electronics Lab-I	BEP113	4	2
Digital Electronics-I	BET112		2					

Course Structure for B.Sc. I. (Semester- II)

Theory				Practical				
Paper Title	**Paper Code**	**Lecture per week**	**Credits**	**Course**	**Paper Title**	**Paper Code**	**Lecture per week**	**Credits**
Semiconductor Devices	BET121	4	2	Practical-2	Semiconductor Devices and Digital Electronics Lab-II	BEP123	4	2
Digital Electronics-II	BET122		2					

Note: B: B. Sc. T=Theory and P= Practical

Structure and Title of Courses of B. Sc. Course:

*** B. Sc. I Semester I ***

Course Number	Course Code	Course Name
I	BET111	Fundamental of Electronics and Network Analysis
II	BET112	Digital Electronics-I
III	BEP113	Fundamental of Electronics, Network Analysis and Digital Electronics Lab- I

*** B. Sc. I Semester II***

Course Number	Course Code	Course Name
I	BET121	Semiconductor Devices
II	BET122	Digital Electronics-II
III	BEP123	Semiconductor Devices and Digital Electronics- Lab II

Semester I

Course I: BET111: Fundamental of Electronics and Network Analysis

Course Objectives: Students should be able to …

1. learn the fundamentals of electronic circuits.
2. study and verify different and theorems
3. summarize Two Port Networks.
4. understand dc and ac circuits

(Total Credits 2)	SEMESTER-I Course: I Fundamental of Electronics and Network Analysis	No. of Lectures per unit
UNIT - I	**Circuit Elements**	**(08)**
	● Introduction, Classification ● Resistors, Capacitor, Inductor: Introduction, Classification, Application's, Color coding, series and parallel Connections, Numerical problems. ● Transformer and Relays: Principle and construction, Types, Applications ● Switches: SPDT, DPDT etc. (Explanation using Symbols) ● Introduction to SMD component.	
UNIT - II	**Network Theorems**	**(07)**
	● Ohm's Law, Kirchhoff's Laws (KCL and KVL), and Numerical problems. ● Theorems: Thevenin's Theorem, Norton's Theorem, Superposition Theorem, Maximum Power Transfer Theorem, Numerical problems based on these network theorems and Numerical problems.	
UNIT - III	**Network Analysis**	**(08)**
	● Two Port Networks: z, y and h parameters and their conversion, Numerical problems ● Star and Delta network, Star to Delta Conversion, and Delta to Star Conversion, Numerical problems,	
UNIT - IV	**Fundamental of AC Circuits**	**(07)**
	● Introduction AC, DC Sources, Voltage and Current Sources, Direction of current and voltage, Comparison AC and DC Sources ● Concept of Power, Instantaneous value , Peak, Peak to Peak, Root Mean Square and Average Values, Phase Difference, ● Voltage-Current Relationship: Resistor, Inductor and Capacitor, Sinusoidal Circuit Analysis for RC circuit.	

	● Resonance: Series and Parallel RLC Circuits, Frequency Response, Quality (Q) Factor and Bandwidth,	

Course Outcome: Students will be able to…

1 identify active and passive components and understand basic circuit theory

2 evaluate mesh and nodal analysis of ac and dc circuits.

3 solve & minimize complex electronic circuits.

4 design a resonance circuit.

Reference Books:

1. R. S. Sedha, A Textbook of applied electronics, S. Chand Publication, (2003).
2. Sudhkar and S. P. Shyammohan, Circuits and Networks Analysis and Synthesis, Tata McGraw-Hill Publishing Company Limited, 3rd Edition, (2006).
3. B. L. Thereja, Basic Electronics Solid State, S. Chand & Company LTD, 4th Edition,(2004)
4. M. L. Soni & J. C. Gupta, A course in Electrical Circuits Analysis, Delhi Dhanpat Rai & Sons, (1979)
5. Charles K. Alexander, Matthew N. O. Sadiku, Fundamentals of Electric Circuits, McGraw-Hill Education (INDIA) PVT. LTD, (2008)
6. B. L.Thereja, A. K. Thereja, A Textbook of Electrical Technology Volume 1 Basic Electrical Engineering, S. Chand & Company LTD,1st Multicolor Edition, (2005)
7. M. Nahvi and J. Edminister, Theory and Problems of Electric Circuits, Schaum's outline series, McGraw-Hill Book Company,1st Edition, (2005)

Semester I

Course II:

BET112: Digital Electronics-I

Course Objectives: Students should be able to…

1. learn and verify various number systems.
2. study logic gates and Boolean algebra.
3. Classify different logic families.
4. understand the concept of combinational logic circuits.

(Total Credits 2)	**Semester I Course II: Digital Electronics-I**	**No. of Lectures per unit**
UNIT - I	**Number System and Binary Codes**	**(07)**
	● Number System: Introduction, Decimal, Binary, Octal and Hexadecimal number systems, and there interconversion, One's and two's complements, Rules of Binary Addition, Subtraction. Signed and Unsigned numbers, ● Binary Codes: BCD, Excess-3 Code, Gray, ASCII code, Parity Code, Hamming Code.	
UNIT - II	**Logic Gates and Boolean Algebra**	**(07)**
	● Study of Basic Gates, Study of Derived Gates, Universal gates (NOR and NAND),De-Morgan's Theorems ● Boolean algebra and Logic Gates: Introduction to Boolean Algebra and Boolean operators, Standard representation of logic functions (SOP and POS), simplification of logic equation using Boolean algebra. ● Karnaugh map Techniques	
UNIT - III	**Digital Logic Families**	**(08)**
	● Bipolar and MOS Integrated circuits: Characteristics, limitations and applications. ● Analysis of digital logic families: TTL, MOS, CMOS Inverters. ● Interfacing between logic families; various logic functions and their implementation. ● Comparison of CMOS and TTL logic families.	
UNIT - IV	**Combinational Logic Design**	**(08)**
	● Multiplexers: Introduction, 4 to 1, 8 to1, Study of IC 74151/74153,Application ● Demultiplexer: Introduction, 1 to 4, 1 to 8, Study of IC 74139, Application ● Code Convertor: Introduction, Encoder, Decimal to Binary/BCD encoder, Octal to Binary/BCD encoder, Decoder,	

	BCD to 7 Segment decoder, Study of IC 7446/47 Application ● Arithmetic Circuits: Adder, Subtractor, ALU.	

Course Outcomes: The students will be able to…

1 Solve the problems related to interconversion of number system and design

2 Develop logic circuits using logic gates and Boolean algebra.

3 Analyze different logic families.

4 Design combinational logic circuits

Reference Books:

1. M. Morris Mano, Digital System Design, Pearson Education Asia, 4th Edition, (2001)

2. Thomas L. Flyod, Digital Fundamentals, Pearson Education Asia, 5th Edition, (1994)

3. W. H. Gothmann,Digital Electronics: An Introduction to Theory and Practice, Prentice Hall of India, (2000).

4. S Salivahan, S Arivazhagan, Digital Circuit and Design, Vikas publishing house PVT Limited, (2000)

Semester I

Practical I:BEP113

Fundamental of Electronics and Digital Electronics Lab-I

Course Objectives: Students should be able to…

1. identify basic electronics components and circuits.
2. verify different laws and theorem for solving complex circuit to simplified circuit
3. simplify the expressions using Boolean algebra and learn logic gates.
4. construct sequential and combinational logic circuits.

Total Credits 2	**Semester I Practical I: BEP113 (based on BET111 and BET112) Fundamental of Electronics and Digital Electronics Lab-I**		**No. of Lectures (60)**
	Group A		
	1	Study of Electronics components and tools.	4
	2	Study of Voltage sources in series and parallel	4
	3	Study of Voltage and Current dividers.	4
	4	Study of CRO: Measurement of Amplitude, frequency, and phase difference.	4
	5	To verify Kirchhoff's Voltage and Current law.	4
	6	To study and verification Thevenin's Theorem.	4
	7	To study and verification Superposition Theorem.	4
	8	To study and verification Norton's Theorem.	4
Group B			
	1	Study of Code converters Binary to Gray and Gray to Binary.	4
	2	Study of Logic gates. (IC 7400,7402,7404,7408,7432,7486)	4
	3	Verify the NAND and NOR gates as universal logic gates.	4
	4	Study of Demorgan's theorem using gates.	4
	5	Design and verification of the truth tables of Half and Full adder circuits	4
	6	Verification of the truth table of the Multiplexer 74150.	4
	7	6. Verification of the truth table of the De-Multiplexer 74154.	4
	8	Study of BCD to 7 Segment Decoder	4

Course Outcome: Students will be able to…

1	utilize basic electronics components and circuits.
2	apply the basic theory & mathematical relationships in electronic circuits.
3	design, construct and verify logic circuits.
4	develop combinational and sequential logic circuits

Reference Books:

1. R. S. Sedha, Textbook of Applied Electronics, S. Chand Publication, (2003)
2. S. M. Sze, Semiconductor Devices: Physics and Technology, Wiley India edition, 2nd Edition, (2002)
3. Ben G Streetman and S. Banerjee, Solid State Electronic Devices, Pearson Education, 6th Edition, (2006).
4. M. Morris Mano, Digital System Design, Pearson Education Asia, 4th Edition, (2001)
5. Thomas L. Flyod, Digital Fundamentals, Pearson Education Asia, 5th Edition, (1994)
6. W. H. Gothmann,Digital Electronics: An Introduction to Theory and Practice, Prentice Hall of India, (2000).
7. S. Salivahan, S Arivazhagan, Digital Circuit and Design, Vikas publishing house PVT Limited, (2000)

Semester II
Course I: BET121:Semiconductor Devices

Course Objectives: Students should be able to ….

1. learn the basics of a semiconductor materials
2. interpret rectifiers and regulators.
3. understand the basics of transistors and various configurations.
4. explain the field effect transistor.

(Total Credits 2)	**Semester II** **Course I:** **Semiconductor Devices**	**No. of Lectures per unit**
UNIT - I	**Fundamentals of Semiconductor**	**(08)**
	● Introduction, Types of material, Energy Band diagram, Fermi Level, Types of Semiconductors, Intrinsic & Extrinsic Semiconductors, ● Constructions and working of PN junction diode, Formation of Depletion Layer, I-V characteristics, Applications ● Zener and avalanche breakdown mechanism, Zener diode ● I-V characteristics, Applications ● Photo diode. Light Emitting Diode (LED), 7-segment display, Organic LED. Applications	
UNIT - II	**Unit II: Rectifiers and Regulators**	**(08)**
	● Half wave rectifier, Full wave rectifiers (center tapped and bridge), circuit diagrams, working and waveforms, ripple factor and efficiency. ● Filters: Types, C, L, LC, RC filters (Qualitative analysis) ● Fixed and variable regulators: Zener diode as voltage regulator, IC 78xx and IC 79xx, IC LM 317, Transistor as Regulator	
UNIT - III	**Bipolar Junction Transistors (BJT)**	**(07)**
	● Introduction, Types, Transistor working , CE, CB, CC configurations, Characteristics of CB and CE configurations, Regions of operation (active, cut off and saturation) ● Current gains α and β. Relations between α and β. dc load line and Q point. ● Applications: Transistor as Amplifier, Transistor as a switch.	

UNIT - IV	Field Effect Transistors	(07)
	● JFET: Type of FET, Symbol, Construction, working and I-V characteristics (output and transfer), Pinch-Off and Saturation Voltage ● MOSFET: Terminals, Symbol, Basic operation, characteristics and MOSFET as switch	

Course Outcome: Students will be able to…

1 verify and interpret basics of semiconductor materials

2 inspect rectifiers and regulators.

3 analyze and interpret the characteristics of transistors

4 determine characteristics and performance of field effect transistor.

Reference Books:

1. R.S. Sedha, Textbook of Applied Electronics, S. Chand Publication, (2003)
2. Robert Boylestad and Louis Nashelsky, Electronics Devices and Circuits Theory, PHI 9th Edition, (2013)
3. Allen Mottershead, Electronic Devices and Circuits, Goodyear Publishing Corporation, (1973)
4. Donald Neamen, Electronic Circuit Analysis and Design, Tata McGraw Hill, 3rd Edition, (2002)
5. J. Millman and C. C. Halkias, Integrated Electronics, Tata McGraw Hill, (2001)

Semester II

Course II:BET122: Digital Electronics-II

Course Objectives: Students should be able to …

1. learn sequential logic circuits.
2. study counter circuits.
3. understand the concept of Shift register and Programmable Logic Device.
4. explain computer memory organization.

(Total Credits 2)	Semester II Course IV: Digital Electronics-II	No. of Lectures per unit
UNIT - I	**Sequential Logic Design**	**(07)**
	● Latches and Flip flops, Edge triggered and Level triggered Flip flops, ● S-R Flip flop, J-K Flip flop, J-K Master Slave flip flop, T and D type Flip flop,	
UNIT - II	**Counters**	**(08)**
	● Introduction, Classification, ● Synchronous and Asynchronous Counter, Up/down counter, Decade Counter, Ring Counter, Johnson Counter, Modulo-N Counter, ● Study of IC 7490, Application of counter	
UNIT - III	**Shift Register**	**(07)**
	● Introduction of Shift registers, Serial-in-Serial-out, Serial-in-Parallel-out, Parallel-in-Serial-out and Parallel-in-Parallel-out Shift Registers, ● Study of IC 7495.Applications of Shift Register	
UNIT - IV	**Computer Memory Organization**	**(08)**
	● Introduction, Classification of Memory, Memory Characteristics ● RAM, SRAM, DRAM, ROM, PROM, EPROM, UV-EPROM, EEPROM, FLASH, ● Introduction to cache memory, Memory Hierarchy	

Course Outcomes: The students will be able to…

1 design sequential logic circuits

2 develop a counter circuit.

3 demonstrate shift register circuit.

4 describe computer memory organization.

Reference Books:

1. M. Morris Mano, Digital System Design, Pearson Education Asia, 4th Edition,(2001)

2. Thomas L. Flyod, Digital Fundamentals, Pearson Education Asia ,5th Edition,(1994)

3. W. H. Gothmann,Digital Electronics: An Introduction to Theory and Practice, Prentice Hall of India, (2000).

4. S Salivahan, S Arivazhagan, Digital Circuit and Design, Vikas publishing house PVT Limited, (2000)

Semester II
Practical II: BEP123: (Based on BET121 & BET122)

Semiconductor Devices and Digital Electronics Lab-II

Course Objectives: Students should be able to…

1. learn half wave and full wave rectifier circuits.
2. study fixed and variable IC regulators.
3. understand Flip-flop circuits.
4. contrast the counter and shift register circuit.

Total Credits 2	**Semester II Practical II: BEP123: (Based on BET121 & BET122) Semiconductor Devices and Digital Electronics Lab-II**		**No. of Lectures (60)**
	Group A		
	1	Study of I-V Characteristics of PN Junction Diode	4
	2	Study of I-V Characteristics of Zener Diode.	4
	3	Transistor as a switch (LED ON/OFF)	4
	4	Study of Three terminal voltage regulators.	4
	5	Study of Half Wave Rectifier with and without capacitor filter.	4
	6	Study of Full Wave Rectifier with and without capacitor filter.	4
	7	Study of input and output I-V Characteristics of BJT in Common Emitter configuration.	4
	8	Study of input and output I-V Characteristics of BJT in Common Base configuration.	4
Group B			
	1	Design and test of an S-R flip-flop using NOR/NAND gates.	4
	2	Verify the truth table of a J-K flip-flop (7476)	4
	3	Verify the truth table of a D flip-flop (7474)	4
	4	Study of synchronous counter. (4-bit / 8 bit)	4
	5	Study of asynchronous counter. (4-bit / 8 bit)	4
	6	Study of Right shift register. (4-bit / 8 bit)	4
	7	Study of Left shift register. (4-bit / 8 bit)	4
	8	Study of computer architecture.	4

Course Outcome: Students will be able to…

1 design and verify half wave and full wave rectifier circuit.

2 develop fixed and variable ic regulators.

3 construct flip flop circuits.

4 utilize the counter and shift register circuit.

Reference Books:

1. Robert Boylestad and Louis Nashelsky,Electronic Devices and Circuit Theory, PHI,9th Edition, (2013)
2. L. Schilling and C. Belove, Electronic Circuits: Discrete and Integrated, Tata McGraw Hill, (2002).
3. Donald A. Neamen, Electronic Circuit Analysis and Design, Tata McGraw Hill,3rdEdition, (2002)
4. J. Millman and C. C. Halkias, Integrated Electronics, Tata McGraw Hill, (2001)
5. R. C. Jaegar and T. N. Blalock, Microelectronic Circuit Design, Tata McGraw Hill 4th Edition, (2010)
6. J. J. Cathey, 2000 Solved Problems in Electronics, Schaum's outline Series, TataMcGraw Hill, (1991)

1. Title: **Electronics (Minor)**

2. Year of Implementation: The syllabus will be implemented from June, 2023 onwards.

3. Duration: The course shall be full time.

4. Pattern: Semester examination.

5. Medium of Instruction: English.

Course Structure for B.Sc. I (Semester- I)

Theory				Practical				
Course Title	**Course Code**	**Lecture per week**	**Credits**	**Course**	**Course Title**	**Course Code**	**Lecture per week**	**Credits**
Electronic Circuits -I	BET114	4	2	Practical -1	Electronic Circuits and Fundamental of Digital Electronics Lab-I	BEP116	4	2
Fundamental of Digital Electronics	BET115		2					

Course Structure for B.Sc. I. (Semester- II)

Theory				Practical				
Paper Title	**Paper Code**	**Lecture per week**	**Credits**	**Course**	**Paper Title**	**Paper Code**	**Lecture per week**	**Credits**
Electronic Circuits -II	BET124	4	2	Practical – 2	Electronic Circuits and Digital Electronics Lab-II	BEP126	4	2
Digital Electronics	BET125		2					

Note: B: B. Sc. T=Theory and P= Practical

Structure and Title of Courses of B. Sc. Course: Minor

*** B. Sc. I Semester I ***

Course Number	Course Code	Course Name
IV	BET114	Electronic Circuits-I
VI	BET115	Fundamental of Digital Electronics
VII	BEP116	Electronic Circuits and Fundamental of Digital Electronics Lab-I

*** B. Sc. I Semester II***

Course Number	Course Code	Course Name
IV	BET124	Electronic Circuits-II
VI	BET125	Digital Electronics
VII	BEP126	Electronic Circuits and Digital Electronics Lab-II

Semester I
Minor

Course IV: BET114: Electronic Circuit-I

Course Objectives: Students should be able to…

1. learn the fundamentals of electronic circuits.
2. understand dc and ac circuits.
3. study various resonance circuits and passive filters.
4. illustrate different and theorems

(Total Credits 2)	SEMESTER-I Course IV: BET114: Electronic Circuit-I	No. of Lectures per unit
UNIT - I	**Circuit Elements**	**(08)**
	• Resistors, Capacitor, Inductor: Introduction, Classification, Application's, Color coding, series and parallel Connections • Transformer and Relays: Types, Principle and construction, Applications • Switches, Cables.	
UNIT - II	**Circuit Fundamental**	**(07)**
	• Zero reference level, chassis ground , Ohm's Law, Graphical representation of Ohm's Law • Primary and secondary cell, Cell and Battery, Voltage and current of cell, Battery rating .	
UNIT - III	**Fundamental of AC Circuits**	**(08)**
	• Introduction AC, DC Sources, Voltage and Current Sources, Direction of current and voltage, Comparison AC and DC Sources • Concept of Power, Instantaneous value , Peak, Peak to Peak, Root Mean Square and Average Values, Phase Difference, • Voltage-Current Relationship: Resistor, Inductor and Capacitor, Sinusoidal Circuit Analysis for RC circuit.	
UNIT - IV	**Network Theorems**	**(07)**
	• Kirchhoff's Laws (KCL and KVL) • Thevenin's Theorem, Norton's Theorem, Superposition Theorem, Maximum Power Transfer Theorem	

Course Outcomes: The students will be able to…

1 identify active and passive components and understand basic circuit theory

2 solve mesh and nodal analysis of ac and dc circuit.

3 evaluate a resonance circuit

4 evaluate electronic circuits theorems.

Reference Books:

1. R. S. Sedha, A Textbook of applied electronics, S. Chand Publication, (2003).
2. Sudhkar and S. P. Shyammohan, Circuits and Networks Analysis and Synthesis, Tata McGraw-Hill Publishing Company Limited, 3rd Edition, (2006).
3. B. L. Thereja, Basic Electronics Solid State, S. Chand & Company LTD, 4th Edition,(2004)
4. M. L. Soni & J. C. Gupta, A course in Electrical Circuits Analysis, Delhi Dhanpat Rai & Sons, (1979)
5. Charles K. Alexander, Matthew N. O. Sadiku, Fundamentals of Electric Circuits, McGraw-Hill Education (INDIA) PVT. LTD, (2008)
6. B. L.Thereja, A. K. Thereja, A Textbook of Electrical Technology Volume 1 Basic Electrical Engineering, S. Chand & Company LTD,1st Multicolor Edition, (2005)
7. M. Nahvi and J. Edminister, Theory and Problems of Electric Circuits, Schaum's outline series, McGraw-Hill Book Company,1st Edition, (2005)

Semester I
Minor
Course V: BET115: Fundamental of Digital Electronics

Course Objectives: Students should be able to …

1. study and verify various number systems.
2. Interpret logic gates and Boolean algebra.
3. learn sequential logic circuits.
4. understand the concept of combinational logic circuits.

(Total Credits 2)	Semester I Course V: BET115: Fundamental of Digital Electronics	No. of Lectures per unit
UNIT - I	**Number System and Binary Codes**	**(07)**
	• Number System: Introduction, Decimal, Binary, Octal and Hexadecimal number systems and their inter conversion, One's and two's complements, Rules of Binary Addition, Subtraction. Signed and Unsigned numbers, • Binary Codes: BCD, Excess-3 Code, Gray, ASCII code, Parity Code.	
UNIT - II	**Logic Gates and Boolean Algebra**	**(07)**
	• Study of Basic Gates, Study of Derived Gates, Universal gates (NOR and NAND),De-Morgan's Theorems • Boolean algebra and Logic Gates: Introduction to Boolean Algebra and Boolean operators, Standard representation of logic functions (SOP and POS), simplification of logic equations using Boolean algebra. • Introduction to Karnaugh map Techniques	
UNIT - III	**Logic Families**	**(08)**
	• Introduction, Types of logic families, characteristics • TTL, TTL NAND gate, MOS, CMOS Inverters. • C) Comparison of CMOS and TTL logic families.	
UNIT - IV	**Combinational Logic Design**	**(08)**
	• Multiplexers: Introduction, 4 to 1, 8 to1, Study of IC 74150/74153/74157, Application • Demultiplexer: Introduction, 1 to 4, 1 to 8, Study of IC 74138/74155, Application • Code Convertor: Introduction, Encoder, Decimal to Binary/BCD encoder, Octal to Binary/BCD encoder, Decoder, BCD to 7 Segment decoder, Study of IC 7446/7447 Application • Arithmetic Circuits: Adder, Subtractor, ALU.	

Course Outcomes: The students will be able to…

1 solve the problems related to inter conversion of number system and design

2 develop logic circuits using logic gates and boolean algebra.

3 design & verify combinational logic circuits

4 contrast sequential logic circuits

Reference Books:

1. M. Morris Mano, Digital System Design, Pearson Education Asia, 4th Edition, (2001)

2. Thomas L. Flyod, Digital Fundamentals, Pearson Education Asia, 5th Edition, (1994)

3. W. H. Gothmann,Digital Electronics: An Introduction to Theory and Practice, Prentice Hall of India, (2000).

4. S Salivahan, S Arivazhagan, Digital Circuit and Design, Vikas publishing house PVT Limited, (2000)

Semester I

Practical I : BEP116 (Based on BET114 & BET115)

Electronic circuit and Fundamental of Digital Electronics Lab-I

Course Objectives: Students should be able to …

1. identify basic electronics components and circuits.
2. understand different laws and theorem for solving complex circuit to simplified circuit
3. verify the expressions using boolean algebra and learn logic gates.
4. develop sequential and combinational circuits.

Total Credits 2	Semester I Practical I : BEP116(Based on BET114 & BET115) Electronic circuit and Fundamental of Digital Electronics Lab-I		No. of Lectures (60)
	Group A		
	1	Study of Electronics components and tools.	4
	2	Study of Voltage sources in series and parallel	4
	3	Study of Voltage and Current dividers.	4
	4	Study of CRO.	4
	5	To verify Kirchhoff's Voltage and Current law.	4
	6	To verify Thevenin's Theorem.	4
	7	To verify Superposition Theorem.	4
	8	To verify Norton's Theorem.	4
	Group B		
	1	Study of Code converters.	4
	2	Study of Logic gates	4
	3	Study of universal gates.	4
	4	Study of Demorgan's theorem.	4
	5	Study of Half adder and Full Adder.	4
	6	Study of Multiplexer	4
	7	Study of Demultiplexer	4
	8	Study of BCD to 7 Segment Decoder	4

Course Outcomes: The students will be able to…

1 design & analyze basic electronics components and circuits.

2 illustrate the basic theory & mathematical relationships in circuit analysis.

3 construct logic circuits.

4 demonstrate combinational and sequential logic circuits

Reference Books:

1. R. S. Sedha, Textbook of Applied Electronics, S. Chand Publication, (2003)
2. S. M. Sze, Semiconductor Devices: Physics and Technology, Wiley India edition, 2nd Edition, (2002)
3. Ben G Streetman and S. Banerjee, Solid State Electronic Devices, Pearson Education, 6th Edition, (2006).
4. M. Morris Mano, Digital System Design, Pearson Education Asia, 4th Edition, (2001)
5. Thomas L. Flyod, Digital Fundamentals, Pearson Education Asia, 5th Edition, (1994)
6. W. H. Gothmann,Digital Electronics: An Introduction to Theory and Practice, Prentice Hall of India, (2000).
7. S. Salivahan, S Arivazhagan, Digital Circuit and Design, Vikas publishing house PVT Limited, (2000)

Semester II
Minor
Course IV: BET124: Electronic Circuit-II

Course Objectives: Student should be able to…

1. learn the basics of a semiconductor materials
2. study and interpret rectifiers and regulators.
3. understand the basics of transistors and various configurations.
4. study field effect transistor.

(Total Credits 2)	Semester II Course IV: BET124: Electronic Circuit-II	No. of Lectures per unit
UNIT - I	**Fundamentals of Semiconductor**	**(08)**
	• Introduction, Types of material, types of Semiconductors, Intrinsic & Extrinsic Semiconductors. • Constructions and working of PN junction diode, Biasing of diode, I-V characteristics. • Zener diode, Photo diode, Light Emitting Diode (LED)	
UNIT - II	**Rectifiers and Regulators**	**(08)**
	• Half wave rectifier, Full wave rectifiers (center tapped and bridge), circuit diagrams, working and waveforms, ripple factor and efficiency. • Filters: Types, C, L, LC, RC filters • Fixed regulators: Zener diode as voltage regulator, IC 78xx and IC 79xx,	
UNIT - III	**Bipolar Junction Transistors (BJT)**	**(07)**
	• Introduction, Types, Transistor working, transistor configurations, Characteristics of CE configurations. • Current gains α and β, Relations between α and β, dc load line and Q point. • Applications: Transistor as Amplifier, Transistor as a switch.	
UNIT - IV	**Field Effect Transistors**	**(07)**
	• JFET: Type of FET, Symbol, Construction, working and I-V characteristics (output and transfer), • MOSFET: Introduction and Symbol.	

Course Outcomes: The students will be able to…

1 verify and interpret basics of semiconductor materials

2 classify rectifier and regulators.

3 analyze and interpret the characteristics of transistors

4 determine characteristics and performance of field effect transistor.

Reference Books:

1. R.S. Sedha, Textbook of Applied Electronics, S. Chand Publication, (2003)
2. Robert Boylestad and Louis Nashelsky, Electronics Devices and Circuits Theory, PHI 9th Edition, (2013)
3. Allen Mottershead, Electronic Devices and Circuits, Goodyear Publishing Corporation, (1973)
4. Donald Neamen, Electronic Circuit Analysis and Design, Tata McGraw Hill, 3rd Edition, (2002)
5. J. Millman and C. C. Halkias, Integrated Electronics, Tata McGraw Hill, (2001)

Semester II
Minor
Course IV: BEP125: Digital Electronics

Course Objectives: Student should be able to …

1. learn sequential logic circuits.
2. study counter circuits.
3. understand the concept of Shift register and Programmable Logic Device.
4. explain computer memory organization.

(Total Credits 2)	Semester II Course IV: BEP125:Digital Electronics	No. of Lectures per unit
UNIT - I	**Sequential Logic Design**	**(07)**
	• Latches and Flip flops, Edge triggered and Level triggered Flip flops, • S-R Flip flop, J-K Flip flop, J-K Master Slave flip flop, T and D type Flip flop,	
UNIT - II	**Counters**	**(08)**
	• Introduction, Synchronous and Asynchronous Counter, Up/down counter, Decade Counter, Ring Counter. • Study of IC 7490, Application of counter	
UNIT - III	**Shift Register**	**(07)**
	• Introduction of Shift registers, Serial-in-Serial-out, Serial-in-Parallel-out, Parallel-in-Serial-out and Parallel- in-Parallel-out Shift Registers, • Study of IC 7495.	
UNIT - IV	**Computer Memory Organization**	**(08)**
	• Introduction, Classification of Memory, Memory Characteristics. • RAM, SRAM, DRAM, ROM, PROM, EPROM, UV-EPROM, EEPROM, FLASH, Cache memory	

Course Outcomes: The students will be able to…

1 design sequential logic circuits

2 analyze counter circuit.

3 develop shift register circuit.

4 describe computer memory organization.

Reference Books:

1. M. Morris Mano, Digital System Design, Pearson Education Asia, 4th Edition,(2001)

2. Thomas L. Flyod, Digital Fundamentals, Pearson Education Asia ,5th Edition,(1994)

3. W. H. Gothmann,Digital Electronics: An Introduction to Theory and Practice, Prentice Hall of India, (2000).

4. S Salivahan, S Arivazhagan, Digital Circuit and Design, Vikas publishing house PVT Limited, (2000)

Semester II Minor
Practical II: BEP126:(Based on BET124 & BET125) Electronic Circuits and Digital Electronics Lab-II

Course Objectives: Student should be able to…

1. learn half wave and full wave rectifier circuit.
2. study fixed and variable IC regulators.
3. know about Flip-flop circuit.
4. understand the counter and shift register circuit.

(Total Credits 2)	Semester II Practical II: BEP126:Electronic Circuits and Digital Electronics Lab-II		No. of Lectures (60 hr)
	Group A		
	1	Study of I-V Characteristics of PN Junction Diode	4
	2	Study of I-V Characteristics of Zener Diode.	4
	3	Transistor as a switch (LED ON/OFF)	4
	4	Study of Three terminal voltage regulators.	4
	5	Study of Half Wave Rectifier.	4
	6	Study of Full Wave Rectifier.	4
	7	Study of I-V Characteristics of BJT in CE configuration	4
	8	Study of I-V Characteristics of BJT in CB configuration	4
	Group B		
	1	Study of R-S Flip- Flop.	4
	2	Study of J-K Flip- Flop.	4
	3	Study of D Flip- Flop	4
	4	Study of synchronous counter.	4
	5	Study of asynchronous counter.	4
	6	Study of Right shift register.	4
	7	Study of Left shift register.	4
	8	Study of computer architecture.	4

Course Outcomes: The students will be able to…

1 design and verify half wave and full wave rectifier circuit.

2 develop fixed and variable ic regulators.

3 construct flip flop circuits.

4 utilize counter and shift register circuit.

Reference Books:

1. Robert Boylestad and Louis Nashelsky,Electronic Devices and Circuit Theory, PHI,9th Edition, (2013)
2. L. Schilling and C. Belove, Electronic Circuits: Discrete and Integrated, Tata McGraw Hill, (2002).
3. Donald A. Neamen, Electronic Circuit Analysis and Design, Tata McGraw Hill,3rdEdition, (2002)
4. J. Millman and C. C. Halkias, Integrated Electronics, Tata McGraw Hill, (2001)
5. R. C. Jaegar and T. N. Blalock, Microelectronic Circuit Design, Tata McGraw Hill4th Edition, (2010)
6. J. J. Cathey, 2000 Solved Problems in Electronics, Schaum's outline Series, TataMcGraw Hill, (1991)

1. Title: Electronics (OPEN ELECTIVE)

2. Year of Implementation: The syllabus will be implemented from June, 2023 onwards.

3. Duration: The course shall be a full time.

4. Pattern: Semester examination.

5. Medium of Instruction: English.

Course Structure for B.Sc. I (Semester- I)

Theory				Practical				
Course Title	**Course Code**	**Lecture per week**	**Credits**	**Course**	**Course Title**	**Course Code**	**Lecture per week**	**Credits**
Electronics For Everyone	BET117	4	2	Practical -1	Electronics For Everyone and Mobile Communication Lab	BEP119	4	2
Mobile Communication	BET118		2					

Course Structure for B.Sc. I. (Semester- II)

Theory				Practical				
Paper Title	**Paper Code**	**Lecture per week**	**Credits**	**Course**	**Paper Title**	**Paper Code**	**Lecture per week**	**Credits**
Consumer Electronics	BET127	4	2	Practical – 2	Consumer Electronics and Electric Vehicles Lab	BEP129	4	2
Introduction to Electric Vehicles	BET128		2					

Note: B: B. Sc. T=Theory and P= Practical

Structure and Title of Courses of B. Sc. Course:

*** B. Sc. I Semester I***

Course Number	Course Code	Course Name
VII	BET117	Electronics For Everyone
VIII	BET118	Mobile Communication
IX	BEP119	Electronics For Everyone and Mobile Communication Lab

*** B. Sc. I Semester II***

Course Number	Course Code	Course Name
VII	BET127	Consumer Electronics
VIII	BET128	Introduction to Electric Vehicles
IX	BEP129	Consumer Electronics and Electric Vehicles Lab

Semester I

Course VII: BET117: Electronics for Everyone

Course Objectives: Student should be able to…

1. learn fundamentals of electronic circuits.
2. gain the basics of a semiconductor materials.
3. study and verify various number systems.
4. understand logic gates and Boolean algebra.

(Total Credits 2)	**SEMESTER-I** **Course VII: BET117:** Electronics for Everyone	**No. of Lectures per unit**
UNIT - I	**Circuit Elements**	**(08)**
	• Introduction, Resistors: Classification of resistors (Quantitative), Color coding of resistors, resistors in series and parallel, • Capacitors: Classification of capacitor (Quantitative), Capacitors in series and parallel. • Inductors: Inductor, Types of inductors, • Transformer: Working Principle and construction of transformer, • Laws: Ohm's law, Kirchhoff's Law (KCL& KVL)	
UNIT - II	**Semiconductor**	**(07)**
	• Introduction to Semiconductor, Types of Semiconductors, Constructions of PN junction diode, Forward & Reverse biasing, I-V characteristics • Introduction to rectifiers and Filter • Zener Diode, Photo diode. Light Emitting Diode (LED), 7-segment display, Organic LED.	
UNIT - III	**Number System and Binary Codes**	**(08)**
	• Number System: Introduction, Decimal, Binary, Octal and Hexadecimal number systems, and there interconversion, One's and two's complements,Rules of Binary Addition, Subtraction. • Binary Codes: BCD, Excess-3 Code, ASCII code.	
UNIT - IV	**Logic Gates and Boolean Algebra**	**(07)**
	• Study of Basic Gates, Study of Derived Gates, Universal gates (NOR and NAND),De-Morgan's Theorems • Boolean algebra and Logic Gates: Introduction to Boolean Algebra and Boolean operators, Standard representation of logic functions (SOP and POS).	

Course Outcomes: The students will be able to…

1 identify active and passive components.

2 verify and interpret basics of semiconductor materials

3 solve the problems related to inter conversion of number system and design

4 develop logic circuits using logic gates and boolean algebra.

Reference Books:

1. R. S. Sedha, A Textbook of applied electronics, S. Chand Publication, (2003).
2. Sudhkar and S. P. Shyammohan, Circuits and Networks Analysis and Synthesis, Tata McGraw-Hill Publishing Company Limited, 3rd Edition, (2006).
3. B. L. Thereja, Basic Electronics Solid State, S. Chand & Company LTD, 4th Edition,(2004)
4. M. L. Soni& J. C. Gupta, A course in Electrical Circuits Analysis, Delhi DhanpatRai& Sons, (1979)
5. Charles K. Alexander, Matthew N. O. Sadiku, Fundamentals of Electric Circuits, McGraw-Hill Education (INDIA) PVT. LTD, (2008)
6. M. Morris Mano, Digital System Design, Pearson Education Asia, 4th Edition, (2001)
7. Thomas L. Flyod, Digital Fundamentals, Pearson Education Asia, 5th Edition, (1994)
8. W. H. Gothmann,Digital Electronics: An Introduction to Theory and Practice, Prentice Hall of India, (2000).
9. S Salivahan, S Arivazhagan, Digital Circuit and Design, Vikas publishing house PVT Limited, (2000)

Semester I

Course VIII: BET118: Mobile Communication

Course Objectives: Student should be able to …

1. study basic of wireless communication techniques.
2. learn cellular mobile system.
3. understand GSM system and advanced concept in mobile communication.
4. explain wireless network used in mobile communication.

(Total Credits 2)	**Semester I** **Course VIII: BET118:** Mobile Communication	**No. of Lectures per unit**
UNIT - I	**Introduction to Wireless communication**	**(08)**
	Wireless communication system, Application of wireless communication system, types of wireless communication system, trends in mobile communication system.	
UNIT - II	**Cellular Mobile System**	**(07)**
	Concept of cellular mobile system, performance criteria, uniqueness of mobile radio environment, operation of cellular system, analog and digital cellular system, cell and cell splitting, roaming and hand off, concept of SIM card.	
UNIT - III	**GSM System**	**(08)**
	GSM System Overview, GSM System architecture, GSM radio subsystem, GSM channel types, frame structure for GSM, Signal processing in GSM, GPRS and EDGE. Comparative study of GSM and CDMA, 2G, 3G, 4G LTE and 5G concepts.	
Unit IV	**Wireless Network**	**(07)**
	Overview of Wi-Fi, WiMAX, Zigbee, satellite and Bluetooth technology (basic features and physical specification)	

Course Outcomes: The students will be able to…

1. utilize basic wireless communication techniques.
2. explain cellular mobile system.
3. apply advanced concept in mobile communication.
4. illustrate wireless network used in mobile communication.

Reference Books:

1. W.Tomasi,Electronic communication Systems: Fundamentals through Advanced, Pearson Education, 6th Edition, 2014.

2. D. Roddy and J. Coolen, Electronic Communications, Pearson Education India.4th edition, 2008.

3. B. P. Lathi,Modern digital and analog Communication systemsOxford University press, 4th Edition 2009

4. Frenzel, Principles of Electronics communication systems, , McGraw Hill3rdedition, 2012.

5. S. Haykin, Communication Systems, Wiley India , 2006

6. G. Kennedy,Electronic Communication systems, Tata McGraw Hill. 5th edition 2011

7. Roy Blake, Electronic Communication system, Cengage, 5th edition, 2015

8. Sanjay Sharma,S.K. Kataria& Sons ,Communication Systems, 6th Edition,2012

Semester I

Practical I:

BEP119: (Based on BET 117 &BET 118)

Electronics for Everyone and Mobile Communication Lab

Course Objectives: Student should be able to …

1. identify basic electronics components and circuits.
2. verify the expressions using Boolean algebra and learn logic gates.
3. study basic of wireless communication techniques.
4. learn GSM system and advanced concept in mobile communication.

(Total Credits 2)	Semester I Practical I **BEP119:** Electronics for Everyone and Mobile Communication Lab		No. of Lectures (60)
	Group A		
	1	To verify Ohm's law	4
	2	To verify Kirchhoff's Voltage and Current law	4
	3	Study of Multimeter	4
	4	Study of Voltage sources in series	4
	5	Study of Logic gates	4
	6	Study of Demorgan's theorem.	4
	7	Study of universal gates	4
	8	Study of Half adder	4
Group B			
	1	Study of Mobile Communication System.	4
	2	Study of Satellite Communication System.	4
	3	Introduction to GSM trainer and PC interfacing using serial port	4
	4	Understanding of GSM software setting	4
	5	Call setup for GSM software and manual command	4
	6	Retrieving call register for missed, received and dialed calls	4
	7	study of Wi-Fi Module	4
	8	Study of Blue tooth module	4

Course Outcomes: The students will be able to…

1 design & analyze basic electronics components and circuit.

2 develop logic circuits.

3 utilize basic wireless communication techniques.

4. illustrate cellular mobile system.

Reference Books:

1. R. S. Sedha, Textbook of Applied Electronics, S. Chand Publication, (2003)
2. S. M. Sze, Semiconductor Devices: Physics and Technology, Wiley India edition, 2nd Edition, (2002)
3. Ben G Streetman and S. Banerjee, Solid State Electronic Devices, Pearson Education, 6th Edition, (2006).
4. M. Morris Mano, Digital System Design, Pearson Education Asia, 4th Edition, (2001)
5. Thomas L. Flyod, Digital Fundamentals, Pearson Education Asia, 5th Edition, (1994)
6. W. H. Gothmann,Digital Electronics: An Introduction to Theory and Practice, Prentice Hall of India, (2000).
7. S.Salivahan, S Arivazhagan, Digital Circuit and Design, Vikas publishing house PVT Limited, (2000)

Semester II

Course VII: BET127: Consumer Electronics

Course Objectives: Student should be able to…

1. learn knowledge for problem solving In various fields of electronics in industries.
2. understand audio and video system.
3. study electronic gadgets / systems and their specification.
4. solve Electronics related issue and problems of Modern Tools

(Total Credits 2)	SEMESTER-II **Course VII: BET127: Consumer Electronics**	**No. of Lectures per unit**
UNIT - I	**Audio Video Systems**	**(08)**
	Audio Systems: PA system, Microphones, Amplifier, Loudspeakers, Radio Receivers, AM/FM, Audio Recording, and reproduction, MP3.	
UNIT - II	**Video System:**	**(07)**
	MP4 players, set top box, CATV and Dish TV, LCD, Plasma and LED TV, Projectors, Home Theatres, Remote controls	
UNIT - III	**Landline and Mobile Telephony**	**(08)**
	Basic landline equipment, **Mobile phones:** GPRS and Bluetooth, Wi-Fi, GPS Navigation system, smart phones **Office Equipment:** Scanners, Barcode / flat bed, printers, Xerox, Multifunction units (Print, Scan, fax, and copy)	
UNIT - IV	**Electronic gadgets and Domestic Appliances**	**(07)**
	Digital Clock, Digital Camera, Home security system, Air conditioners, Refrigerators, washing machine , Microwave oven, Vacuum cleaners, Geyser.	

Course Outcomes: The students will be able to…

1. apply logic thinking and basic science knowledge for problem solving in various fields of electronics both in industries and research.
2. analyze the working of audio and video system.
3. design and develop sophisticated electronic gadgets / systems that conforms to a given specification.
4. identify and solve the electronic related issue and analyze the problems by using modern tools / techniques.

Reference Books:

1. R.P.Bali, Consumer Electronics, Pearson Education (2008)

2. R.G. Gupta, Audio and Video systems, Tata McGraw Hill (2004)

Semester II

Course VIII: BET128: Introduction to Electric Vehicles

Course Objectives: Student should be able to…

1. learn a comprehensive overview of Electric Vehicles.
2. understand energy storage systems for vehicle applications.
3. study general aspects of advanced Electric and Hybrid Electric Vehicles.
4. provide knowledge on modeling and implementation of HEV using Power Electronics concepts

(Total Credits 2)	SEMESTER-I Course VIII: BET128: Introduction to Electric Vehicles	No. of Lectures per unit
UNIT - I	**Electric Vehicle Machineries**	(07)
	Introduction, Basics of vehicle mechanisms, history of electric vehicles (EV) and hybrid electric vehicles (HEV), need and importance of EV and HEV, Power/Energy supply requirements. Electric system components for EV/HEV, suitability of DC and AC machines for EV/HEV applications,	
UNIT - II	**Energy Storage Systems**	(08)
	Requirements of Storage systems in EV/HEV, Review of batteries, fuel cells, flywheels and ultra-capacitors as energy sources for EV/HEV, comparison and characteristics	
UNIT - III	**Drives for Electric Vehicles**	(07)
	Basics of electric traction and hybrid traction systems, various EV/HEV drive-train topologies, power flow control in drive-train topologies. Modeling and analysis of EV/HEV drive train, sizing of motor, power electronics in HEV, various vehicle subsystems.	
UNIT - IV	**Energy Management Strategies and Energy Efficiency**	(08)
	EV/HEV energy management strategies, classification and comparison of various energy management strategies, energy efficiency comparison for various EV and HEV variants.	

Course Outcomes: The students will be able to…

1. Infer the concepts of different configurations of electric vehicles.
2. Identify proper energy storage systems for vehicle applications.
3. Interpret the basic drive system of electric vehicles.
4. Comprehend the energy management strategies in Electric Vehicles.

Reference Books:

1. Iqbal Hussain, "Electric & Hybrid Vehicles – Design Fundamentals", Second Edition, CRC Press, 2011.
2. James Larminie, "Electric Vehicle Technology Explained", John Wiley & Sons, 2003.
3. MehrdadEhsani, YiminGao, Ali Emadi, "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals", CRC Press, 2010.
4. Chris MI, M. Abul and David WenzhongGao, "Hybrid Electrical Vehicle Principles and Application with Practical Perspectives", Wiley, 2nd Edition, 2017.
5. Wei Liu, "Introduction to Hybrid Vehicle System Modeling and Control", Wiley 1st Edition, 2013

Semester II
Practical II: (Based of BET127 & BET128)

BEP129: Consumer Electronics and Electric Vehicle Lab

Course Objectives: Student should be able to…

1. learn knowledge for problem solving in various fields of electronics both in industries and research.
2. study electronic gadgets / systems and their specification.
3. learn a comprehensive overview of Electric Vehicles.
4. understand energy storage systems for vehicle applications.

(Total Credits 2)	Semester II Practical II: OE-VI: Consumer Electronics and Electric Vehicle Lab		No. of Lectures per (60)
	Group A		
	1	Study of PA systems for various situations	4
	2	Installation of Audio/Video System	4
	3	Market survey of products (at least one from each module)	4
	4	Identification of block and tracing the system, Assembly and Disassembly of system using toolkit.	4
	5	Study of Printer	4
	6	Study of Air conditioners	4
	7	Study of Refrigerators,	4
	8	Study of Microwave oven/Vacuum cleaners/Geyser	4
	Group B		
	1	Study of AC Motor	4
	2	Study of DC Motor	4
	3	Study of Stepper Motor	4
	4	Study Brushless DC motor	4
	5	Study of Series Parallel connection of Batteries	4
	6	Simulation of AC to DC Conversion	4
	7	Simulation of DC to AC Conversion	4
	8	Use of voltage converters	4

Course Outcomes: The students will be able to…

1. apply logic thinking and basic electronics knowledge for problem solving in various fields of electronics both in industries and research.
2. design and develop sophisticated electronic gadgets / systems that conforms to a given specification
3. infer the concepts of different configurations of electric vehicles.
4. identify proper energy storage systems for vehicle applications.

Reference Books:

1. R.P.Bali, Consumer Electronics, Pearson Education (2008)
2. R.G. Gupta, Audio and Video systems, Tata McGraw Hill (2004)
3. Iqbal Hussain, "Electric & Hybrid Vehicles – Design Fundamentals", Second Edition, CRC Press, 2011.
4. James Larminie, "Electric Vehicle Technology Explained", John Wiley & Sons, 2003.
5. MehrdadEhsani, YiminGao, Ali Emadi, "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals", CRC Press, 2010.
6. Chris MI, M. Abul and David WenzhongGao, "Hybrid Electrical Vehicle Principles and Application with Practical Perspectives", Wiley, 2nd Edition, 2017.
7. Wei Liu, "Introduction to Hybrid Vehicle System Modeling and Control", Wiley 1st Edition, 2013

Rayat Shikshan Sanstha's

Yashavantrao Chavan Institute of Science, Satara (Autonomous)

Department of Electronics

Course Name: Contribution of Electronics in Indian knowledge

Course Objectives: Students will be able to,

1. Understand role of traditional Indian Knowledge system.
2. Learn need to protect traditional Indian Knowledge
3. Study roll of Electronics in Indian Knowledge system.
4. Understand Future of Electronics in India

Credits (Total Credits 2)	**Semester – I** **IKS101: Contribution of Electronics in Indian knowledge**	**No. of hours per unit**
Unit – I	**Introduction to Traditional Knowledge**	**6**
	Define traditional knowledge, nature and characteristics, scope and importance, kinds of, traditional knowledge, Indigenous, Knowledge (IK), characteristics, traditional knowledge Vs western knowledge	
Unit – II	**Protection of Traditional knowledge**	**8**
	The need for protecting traditional knowledge Significance of TK Protection, the value of TK in the global economy, Role of Government to harness TK.	
Unit – III	**Introduction to Electronics Knowledge System**	**8**
	Introduction of Indian Electronics,Contribution of Jagdish Chandra Bose in Electronic, Satellite communication in India, Param Computer	
Unit – IV	**Future Prospects**	**8**
	Enhancing Access and Availability of Resources ,Impact of New Technologies and Applications , Technology Trends , Innovative Approaches, Digital Transformation	

Course Outcomes: Students should be able to,

1. Describe the traditional Indian knowledge system.

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

3. Understand the contribution of Electronics in Indian Knowledge system.

4. Assess the rapidly changing technology landscape and its implications for electronics in India.

Reference Book

1. A.K. Maini and J. Ramamurthy, Making sense of electronics: Understanding discreet components and their applications, , Tata McGraw-Hill Education, 2008.

2. NitinGautam , Handbook of Electronics Manufacturing Engineering– CRC Press, 2016

3. Charles Harrell, Designing Electronics for Manufacturing and Testability: A Guide to Designing Automated, Cost-Effective Manufacturing and Test Systems, by Wiley, 2015.

4. Hamid R. Arabnia, Embedded Systems Design Challenges in the Electronic InTech, 2013.

5. Muhammad H. Rashid et al , RF and Microwave Circuit Design Challenges in System Integration and Miniaturization edited by. –CRC Press, 2012.

6. Asok Kumar Das and Chandra Shekhar Bose , Artificial Intelligence in Electronics and Communication, , Cambridge University Press, 2004.

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Department of Electronics

Semester -II Skill Enhancement Course

Theory				Practical				
Course Title	**Course Code**	**Lecture per week**	**Credits**	**Course**	**Course Title**	**Course Code**	**Lecture per week**	**Credits**
Design and Fabrication of Printed Circuit Board	SEC103	2	1	Practical	Design and Fabrication of Printed Circuit Board hardware and Software Lab	--	2	1

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Department of Electronics

Skill Enhancement Course

Semester –II

Course Name: Design and Fabrication of Printed Circuit Board

Course Objectives: Students will be able to...

1. understand Electronics Design simulator
2. realize the need for PCB Design and steps involved in PCB Design and Fabrication process
3. familiarize with PCB Etching and Soldering

Credits (Total Credits 1)	**SEMESTER – II** **SEC103: Design and Fabrication of Printed Circuit Board**	**No. of hours per unit**
Unit - I	**PCB designing Tools**	**5**
	Introduction to Electronics Designing Using simulator Introduction to simulator , Brief History, Model Editor, Understanding the Environment, Drawing a Circuit using Simulation, sources for simulation	
Unit – II	**Artwork Design and**	**5**
	Trends in PCB Designing, Schematic, Layout – Parts of layout, Artwork, Study of layout design software, design of artwork, Design rules: Pads and track size, footprint, netlist, single and double sided PCB, PTH and footprint for surface mount devices, Gerber files.	
Unit – III	**Soldering Techniques**	**5**
	Introduction, Plating and Etching techniques, Exporting Drill and Gerber Files; Drills; Footprints and Libraries Adding and Editing Pins Principles of Solder Connection, Soldering, Disordering tools and Techniques.	

Course Outcomes: Students will be able to...

1. describe Electronic design with simulator
2. illustrate the steps involved in schematic, layout, fabrication and assembly process of PCB design.
3. explain PCB Etching and Soldering Techniques.

Reference Book

1. Mark.D.Birnbaum , Essential Electronic Design Automation (EDA), Prentice Hall, 2004
2. Muhammad H. Rashid, Introduction ToPSpice Using OrCADfor Circuits and Electronics, Paperback – Import, 3rd Edition, 2003.
3. Walter C. Bosshart, Printed circuit Board – Design & Technology , TMH. 2004.
4. R.S. Khandpur, Printed Circuit Board –Design, Fabrication, Assembly & Testing, TMH,3rd Edition,2017.
5. Robert Boylstead and Louis Nashelsky, Electronic Devices and circuit theory, PHI, 10th Edition, 2009.
6. Paul B. Zbar,Electronics text lab manual, 1989
7. D.C. Kulshresta& D.C Gupta,Basic Electronics & Linear circuits, N.N. Bhargava, TMH, 51 reprint,2008.
8. David A Bell, Electronic devices, Reston Publishing Company, 4th Edition, 2009.
9. Clyde F. Coombs, Printed circuits Handbook McGraw Hill, 3rd Edition,2015

Skill Enhancement Course Practical

Design and Fabrication of Printed Circuit Board hardware and Software Lab

Course Objectives: Students will be able to..

1. learn conceptual knowledge PCB designing simulation tools.
2. acquire factual knowledge of PCB board, it's soldering and disordering techniques.
3. understand electronics circuits designing using EDA tool
4. develop electronic circuit using EDA tool.

Credits (Total Credits 1)	Semester-II Practical Course - Design and Fabrication of Printed Circuit Board hardware and Software Lab List of Practical	No. of hours per Practical
1.	Introduction to Simulation tools	**2**
2.	Designing a Circuit using Simulator	**2**
3.	Development and Etching of single layer PCB	**2**
4.	Study of Soldering and Disordering Techniques	**2**
5.	PCB Drilling and Assembly of components	**2**
6.	Design schematic of a Half wave Rectifier / full wave rectifier using Simulator	**2**
7.	Study of PN junction diode characteristics	**2**
8.	Study of Astable Multivibrator.	**2**
9.	Design, fabrication and testing of a 12 V power supply.	**2**

Course Outcomes: Students will be able to...

1. Utilize the simulating tool
2. Demonstrate PCB board, it's soldering and disordering techniques.
3. Develop Electronics circuits Designing Using EDA Tool.
4. Design and verify Various Electronic circuits

Reference Book

1. Birnbaum, Mark D., Essential Electronic Design Automation (EDA) Prentice Hall Modern Semiconductor Design, 2004
2. Muhammad H. Rashid ,Introduction ToPSpice Using OrCAD For Circuits And Electronics, 3rd Edition 3rd Edition , 2003
3. Walter C. Bosshart, Printed circuit Board – Design & Technology TMH,2013
4. R.S. Khandpur, Printed Circuit Board –Design, Fabrication, Assembly & Testing, TMH,2000
5. Robert Boylstead and Louis Nashelsky, Electronic Devices and circuit theory, PHI, 2017.

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Yashavantrao Chavan Institute of Science, Satara (Autonomous)

(Lead College, Karmaveer Bhaurao Patil University, Satara)

Value Education Course

Syllabus

w.e.f. 2023

1. **TITLE** : Understanding India
2. **YEAR OF IMPLEMENTATION** : 2023-2024
3. **CLASS** : B.Sc. I
4. DURATION : Semester II
5. **MEDIUM OF INSTRUCTION** : English/Marathi

Credits	Theory Lectures
2	30

Understanding India

Learning objectives:
Students should be able to

1. Understand India's geographical, social, and economic scenario
2. Comprehend the Cultural heritage and literary traditions of India
3. Familiarise with the phases of making of contemporary India

Unit	Title	No. of hours per unit
Unit I	**Introducing India** I.The Land of India: landscape, mountains and rivers II. The People of India: demography , religion and languages III. The Name of our Country: Jambudvipa, Sindhu (Indus), Inde, Hind, Hindustan, Bharat, India	6
Unit II	**UnderstandingCultural heritage** I. Architecture and Sculpture: Indus Valley town planning, rock cut architecture, major styles of temples, Mughal architecture, modern and contemporary architecture, stone and metal sculpture II. Painting: Ajanta murals, Mughal paintings, Madhubani paintings, paintings of Jharkhand (Kohbar, Sohrai, Jadopatia, etc.). III. Music, Theatre and Dance: Overview of various forms of music and dances in India, IV. Science, Technology and Medicine: A general survey of the progress of science, Technology, and Medicine in ancient India	8
Unit III	**Understanding Literary Traditions** Panini, Kalidasa, Veda Vyasa, Valmiki Regional literary traditions, Bhakti Poetry, Folk literature	8
Unit IV	**Making of contemporary India** Political and Social Movements in Pre and Post Independent India	8

Learning outcomes:
After completion of the course , students will be able to

1. Explain the Unity in diversity in India
2. Evaluate the cultural heritage of India
3. Describe the literary traditions of India
4. Apply the theories and practices concerning the movements in making of contemporary

India

References:

- Basham A. L. , A Cultural History of India, Oxford University Press, 1997
- LahiriNayanjot, Marshaling the Past: Ancient India and its Modern Histories, Permanent Black, 2012
- Ray Tirthankar, The Economic History of India 1857-1947, OUP, 2006
- Braj, B. Kachru, et.al., Languages in South Asia, Cambridge University Press, 2013
- Herman Kulke and DeitmarRothermund, A History of India, Taylor and Francis, 2016
- Krishna Chaitanya, A Profile of Indian Culture, The Indian Book Company, New Delhi, 1976
- N.R. Ray, An Approach to Indian Art, Publication Bureau, Chandigarh, 1974
- R.S. Sharma, India's Ancient Past, Oxford University Press, 2020