Rayat Shikshan Sanstha's

Yashavantrao Chavan Institute of Science, Satara
(Autonomous)

B. Sc. I

Revised Syllabus 2021-22

Rayat Shikshan Sanstha's

Yashavantrao Chavan Institute of Science, Satara

Department of Electronics

Syllabus for Bachelor of Science (Electronics)

B.Sc. Electronics

PREAMBLE:

Bachelor of Science is an integrated academic degree in 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 the 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 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 existing curriculum of 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 academicians with focus commitment to higher subject.
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 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 impact of industrial solutions on the 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 2021-22 onwards.

1. PREAMBLE:

Bachelor of Science is an integrated academic degree in 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 the 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 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 existing curriculum of 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 ability among students to formulate, analyze and solve real life problems faced in Electronics industry.
4. To provide opportunity to students to learn the latest trends in Electronics and make them ready for 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 electronic industry.

3. DURATION:

03 Years (Full Time)

4. PATTERN:

SEMESTER EXAM (CBCS)

5. MEDIUM OF INSTRUCTIONS: ENGLISH

6. STRUCTURE OF COURSE:

1. FIRST SEMESTER

Sr. No.	SUBJECT TITLE	Theory			Practical		
		COURSE NO & Course Code	No. of lectures per week	Credits		No. of lectures Per week	Credits
1	Electronics	Course-I: BET101	5	4	Practical Course – I : BEP103	4	2
		Course-II: BET102					

2. SECOND SEMESTER

Sr. No.	SUBJECT TITLE	Theory			Practical		
		COURSE NO & Course Code	No. of lectures Per week	Credits		No. of lectures Per week	Credits
1	Electronics	Course-III: BET201	5	4	Practical Course – II : BEP203	4	2
		Course-IV: BET202					

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

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

Course I: Fundamental of Electronics and Network Analyses
Course II: Semiconductor Devices

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

Course III: Digital Electronics
Course IV: Electronic Circuits

4. OTHER FEATURES:

A. <u>LIBRARY:</u>

- **REFERENCE BOOKS**

1. R. S. Sedha, Textbook of Applied Electronics, S. Chand Publication
2. Soni and Gupta, Network Analysis,
3. S. A. Nasar, Electric Circuits, Schaum's outline series, Tata McGraw Hill (2004)
4. M. Nahvi and J. Edminister, Electrical Circuits, Schaum's Outline Series, Tata McGraw-Hill.(2005)
5. Robert L. Boylestad, Essentials of Circuit Analysis, Pearson Education (2004)
6. W. H. Hayt, J. E. Kemmerly, S. M. Durbin, Engineering Circuit Analysis, Tata McGraw Hill (2005)

7. Alexander and M. Sadiku, Fundamentals of Electric Circuits , McGraw Hill (2008)
8. S. M. Sze, Semiconductor Devices: Physics and Technology, 2nd Edn, Wiley India edition (2002).
9. Ben G Streetman and S. Banerjee, Solid State Electronic Devices, Pearson Education (2006)
10. Dennis Le Croissette, Transistors, Pearson Education (1989)
11. Jasprit Singh, Semiconductor Devices: Basic Principles, John Wiley and Sons (2001)
12. Kanaan Kano, Semiconductor Devices, Pearson Education (2004)
13. Robert F. Pierret, Semiconductor Device Fundamentals, Pearson Education (2006)
14. M. Morris Mano Digital System Design, Pearson Education Asia, (Fourth Edition)
15. Thomas L. Flyod, Digital Fundamentals, Pearson Education Asia (1994)
16. W. H. Gothmann, Digital Electronics: An Introduction To Theory And Practice, Prentice Hall of India(2000)
17. R. L. Tokheim, Digital Principles, Schaum's Outline Series, Tata McGraw- Hill (1994)
18. Robert Boylestad and Louis Nashelsky, Electronic Devices and circuit theory, 9th Edition, 2013, PHI
19. David A Bell, Electronic devices, Reston Publishing Company,(1980)
20. D. L. Schilling and C. Belove, Electronic Circuits: Discrete and Integrated, Tata McGraw Hill (2002)
21. Donald A. Neamen, Electronic Circuit Analysis and Design, Tata McGraw Hill (2002)
22. J. Millman and C. C. Halkias, Integrated Electronics, Tata McGraw Hill (2001)
23. J. R. C. Jaegar and T. N. Blalock, Microelectronic Circuit Design, Tata McGraw Hill (2010)
24. J. J. Cathey, 2000 Solved Problems in Electronics, Schaum's outline Series, Tata McGraw Hill (1991)
25. Allen Mottershed, Electronic Devices and Circuits, Goodyear Publishing Corporation

- **JOURNALS AND PERIODICALS**

1. Journal of Instrument Society of India
2. Express Computer
3. Embedded For You
4. Electronics Maker
5. Electronics For You
6. PCQUEST
7. Digit

B. <u>SPECIFIC EQUIPMENTS:</u>

Computers, Laptops, Printers, Scanners, LCD Projectors, E- Podium, Smart Board, Document Camera, Visualizer

C. <u>LABORATORY EQUIPMENTS</u>:

1. Digital storage Oscilloscope: 60 MHz
2. Signal generator
3. Microwave Test bench (Gunn Source)
4. Antenna Trainer
5. Arduino Development Board
6. CPLD development boards

7. Microcontroller Boards – 8051, MSP430, PIC18F, AVR MEGA32, ARDUINO NANO, UNO, MEGA
8. KEIL - IDE
9. Mikro C Compilers for 8051, PIC and ARM
10. Soft Computing Tools – SCILAB, MATLAB
11. PCB Designing Tool: DipTrace

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Syllabus Introduced from 2021-22 B.Sc. Part I: Electronics

Semester I

Course I

BET101: Fundamental of Electronics and Network Analysis

- **Learning Objectives:**

1. To learn fundamentals of electronic circuits.
2. To analyze dc and ac circuits.
3. To study various resonance circuits and passive filters.
4. To learn and verify different and theorems

Unit I: Circuit Elements **10** L

Electric circuit, Active and Passive elements, Bilateral and unilateral element, Linear and non-linear element, Lumped and distributed element.

Resistors: Classification of resistors (Quantitative), Color coding of resistors, resistors in series and parallel, Numerical problems.
Capacitors: Principles of capacitance, Permittivity, Dielectric Constant, Dielectric strength, Energy stored in a capacitor, Charging and discharging of a capacitor, leakage current in capacitor, stray capacitance. Numerical problems.

Classification of capacitor (Quantitative), Color coding of capacitor, applications of Capacitors, capacitors in series and parallel, factors governing the value of capacitors. Numerical problems.

Inductors: Inductor, Types of inductors, Self and mutual inductance, Faraday's law and Lenz's law of electromagnetic induction, Energy stored in an inductor, Q factor, Applications of inductors, Inductance in series and parallel. Numerical problems.

Transformer: Principle and construction of transformer, Types of Transformer: Step-up, step-down, current Transformer, Pulse transformer, auto transformer, Applications, Numerical problems.
Relays: Principle, construction and working of electromagnetic or solid-state relays.

Types of Switches: SPDT, DPDT etc. (Explanation using Symbols)

Unit II: Circuit Analysis **08** L

Kirchhoff's Current Law (KCL), Kirchhoff's Voltage Law (KVL), Node Analysis, Mesh Analysis, Star and Delta network, Star to Delta Conversion
DC Transient Analysis: RC Circuit- Charging and discharging with initial charge, RL Circuit with Initial Current, Time Constant, RL and RC Circuits with Sources, DC Response of Series RLC Circuits.

Unit III: AC Circuit Analysis **08** L

AC, DC Sources, Voltage and Current Sources, direction of current and voltage
Definition of Instantaneous, Peak, Peak to Peak, Root Mean Square and Average Values, Phase, Phase Difference, Voltage-Current relationship in Resistor, Inductor and Capacitor, Phasor, Complex Impedance
Power in AC Circuits: Instantaneous Power, Average Power, Reactive Power, Power Factor.
Sinusoidal Circuit Analysis for RL, RC and RLC Circuits
Resonance in Series and Parallel RLC Circuits, Frequency Response of Series and Parallel RLC Circuits, Quality (Q) Factor and Bandwidth

Unit IV: Network Theorems **10** L

Principal of Duality, Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Reciprocity Theorem, Millman's Theorem, Maximum Power Transfer Theorem. AC circuit analysis using Network theorems
Two Port Networks: Impedance (Z) Parameters, Admittance (Y) Parameters, Hybrid (H) Parameters and their Interconversions. Definitions of Twin T and Ladder Network

- **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)

- **Learning Outcomes:**

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

1. Identify active and passive components and understand basic circuit theory
2. Evaluate mesh and nodal analysis of ac and dc circuit.
3. Design a resonance circuit
4. Solve & minimize complex electronic circuits.

Semester I

Course II

BET102: Semiconductor Devices

- **Learning Objectives:**
  1. To learn the basics of a semiconductor materials
  2. To study and interpret PN junction diodes
  3. To learn and interpret basics of transistors and various configuration.
  4. To study various types of semiconductor power devices.

Unit I: Semiconductor Basics **10** L

Conductor, Semiconductor, Insulator, Introduction to Semiconductor Materials, Crystal Structure, Planes and Miller Indices, Energy Band in Solids, Concept of Effective Mass, Density of States, Carrier Concentration at Normal Equilibrium in Intrinsic Semiconductors, Fermi Level for Intrinsic & Extrinsic Semiconductors, Dependence of Fermi Level on Temperature and Doping Concentration, Temperature Dependence of Carrier Concentrations.

Carrier Transport Phenomena: Carrier Drift, Mobility, Resistivity, Hall Effect, Diffusion Process, Einstein Relation, Current Density Equation, Carrier Injection, Generation and Recombination Processes, Continuity Equation.

Unit II: Diodes and Photovoltaic Cell **08** L

Formation of Depletion Layer, Space Charge, Electrostatic Potential Difference at Thermal Equilibrium, Depletion Width and Depletion Capacitance of an Abrupt Junction, Concept of Linearly Graded Junction, Derivation of Diode Equation and I-V Characteristics, Idea of Static and Dynamic Resistance, Q point and DC Load Line Zener and Avalanche Breakdown Mechanism, LED, organic LED, Photodiode.

Photovoltaic cell: circuit symbol, characteristics, working principal and applications

Unit III: Bipolar Junction Transistors (BJT) **10** L

PNP and NPN Transistors, Basic Transistor Action, Emitter Efficiency, Base Transport Factor, Current Gain, Base-Width Modulation, Modes of operation, Regions of Operation, Input and Output Characteristics of CB, CE and CC Configurations, Current gains α and β, DC load line and Q point, stability, stability factors, Leakage Currents in transistor and their relations, Parameters of BJT (H, Y and Z)

Metal Semiconductor Junctions: Ohmic and Rectifying Contacts.

Unit IV: Field Effect Transistors **08** L

JFET: Type of FET, Symbol, Construction, Idea of Channel Formation, Pinch-Off and Saturation Voltage, Current-Voltage Output Characteristics, Parameters of FET.

MOSFET: types of MOSFETs, symbols, Working and Characteristic curves of Depletion type MOSFET (both N channel and P Channel) and Enhancement type MOSFET (both N channel and P channel). Complimentary MOS (CMOS), FET as Switch

UJT, Basic construction and working, Equivalent circuit, intrinsic Standoff Ratio, Characteristics and relaxation oscillator-expression.

Reference Books:

1. R. S. Sedha, A Textbook of applied electronics, S. Chand Publication, (2003).
2. Ben G Streetman and S. Banerjee , Solid State Electronic Devices, Pearson

Education, , 6th Edition, (2006).

3. S. M. Sze, Semiconductor Devices: Physics and Technology, Wiley India edition, 2nd Edition, (2002).
4. Jasprit Singh, Semiconductor Devices: Basic Principles, John Wiley and Sons, (2001)
5. B. L. Thereja, Basic Electronics Solid State, S. Chand & Company LTD, (2005).
6. Kanaan Kano, Semiconductor Devices, Pearson Education, (2004)
7. Robert F. Pierret, Semiconductor Device Fundamentals, Pearson Education, (2006).

- **Learning Outcomes:**

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

  1. Verify and interpret basics of semiconductor materials
  2. Make application of PN junction diodes.
  3. Analyze and interpret the characteristics of transistors
  4. Determine characteristics and performance of semiconductor devices

Semester I

Practical I

BEP103: Fundamental of Electronics, Network Analysis and Semiconductor Devices Lab (Hardware and Circuit Simulation Software)

- **Learning Objectives:**
  1. To identify basic electronics components and circuits.
  2. To verify different laws and theorem for solving complex circuit to simplified circuit
  3. To learn the principles of a semiconductor materials.
  4. To examine I-V characteristics & applications of diode and other Semiconductor devices.
  5. To simulate electrical and electronics circuits using simulating software.

GROUP A

1. Familiarization with
   a) Resistance in series, parallel and series – Parallel.
   b) Capacitors & Inductors in series & Parallel.
   c) Multimeter – Checking of components.
   d) Voltage sources in series, parallel and series – Parallel
   e) Voltage and Current dividers
2. Study of CRO: Measurement of Amplitude, Frequency & Phase difference.
3. Verification and Study of Network theorems:
   a) Kirchhoff's Laws.
   b) Norton's theorem.
   c) Thevenin's Theorem.
   d) Superposition Theorem.
   e) Reciprocity Theorem.
   f) Maximum Power Transfer Theorem.
4. Study and applications of RC Circuits:
   a) Time Constant
   b) RC Differentiator and Integrator.
   c) Designing of passive filters and study of their Frequency Response (Low Pass/ High Pass)
5. Study of the Series and Parallel LCR Circuit and determine:
   a) Resonant Frequency
   b) Impedance at Resonance
   c) Quality Factor Q
   d) Band Width.
6. Fabrication and Characterization of Organic Light Emitting Diode (OLED)

- **Reference Books:**

1. R. S. Sedha, Textbook of Applied Electronics, S. Chand Publication, (2003)
2. S. A. Nasar, Electric Circuits, Schaum's outline series, Tata McGraw Hill, (2004)

3. M. Nahvi and J. Edminister, Theory and Problems of Electric Circuits, Schaum's outline series, McGraw-Hill Book Company,1st Edition, (2005)
4. Robert L. Boylestad, Essentials of Circuit Analysis, Pearson Education, (2004)
5. W. H. Hayt, J. E. Kemmerly, S. M. Durbin, Engineering Circuit Analysis, Tata McGraw Hill, 7th Edition, (2005)
6. Alexander and M. Sadiku, Fundamentals of Electric Circuits, McGraw Hill, (2008)

GROUP B

1. Study of I-V Characteristics of:
   a) PN Junction Diode
   b) Zener Diode.
   c) Solar Cell
2. Study of I-V Characteristics of:
   a) CE configuration of BJT and obtain ri, ro, β.
3. Study of I-V Characteristics of:
   a) CB configuration of BJT and obtain ri, ro, α.
   b) CC configuration of BJT and obtain voltage gain, ri, ro.
4. Study of I-V Characteristics of FET:
   a) N channel
   b) P Channel
5. Study of I-V Characteristics of MOSFET.
6. Study of I-V Characteristics of the UJT.

- **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. Jasprit Singh, Semiconductor Devices: Basic Principles, John Wiley and Sons, (2001)
5. Kanaan Kano, Semiconductor Devices, Pearson Education, (2004)
6. Robert F. Pierret, Semiconductor Device Fundamentals, Pearson Education, (2006)

- **Learning Outcomes:**

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

1. Design & analyze basic electronics components and circuit.
2. Understand the basic theory & mathematical relationships in circuit analysis.
3. Simplify complex Electronics circuits.
4. Analyze the characteristics of semiconductor devices.
5. Design and verify performance of electronics circuit using simulating software

Semester II

Course III

BET201: Digital Electronics

- **Learning Objectives:**
  1. To study and verify various number systems, Boolean algebra and logic gates
  2. To verify laws and theorems.
  3. To learn sequential logic circuits
  4. To study combinational logic circuits
  5. understand concept of Programmable devices

Unit I: Number System and Codes **10** L

Decimal, Binary, Hexadecimal and Octal number systems, base conversions, Binary, octal and hexadecimal, arithmetic (addition, subtraction by complement method, multiplication), representation of signed and unsigned numbers, BCD, ASCII code etc.
Boolean algebra and Logic Gates: Introduction to Boolean Algebra and Boolean operators, Study of OR, AND, NOT gates, Basic postulates, construction and symbolic representation of XOR, XNOR, Universal (NOR and NAND) gates. De-Morgan's Theorem and fundamental theorems of Boolean algebra
Digital Logic families: Fan-in, Fan out, Noise Margin, Power Dissipation, Noise, Figure of merit, Speed power product, TTL and CMOS families and their comparison.

Unit II: Combinational Logic Design and Analysis **08** L

Standard representation of logic functions (SOP and POS), Karnaugh map minimization, Encoder and Decoder, Multiplexers and Demultiplexer, Implementing logic functions with multiplexer
Arithmetic Circuits: Binary addition, Adder (Half and Full), Subtractor (Half and Full) parallel adder/subtractor, ALU.

Unit III: Sequential Logic Design **10** L

Latches and Flip flops, S-R Flip flop, J-K Flip flop, T and D type Flip flop, Clocked and edge triggered Flip flops, master slave flip flop

Counters: Synchronous and asynchronous and modulo-N, State Table, State Diagrams, counter design using excitation table and equations, Ring counter and Johnson counter, Decade Counter.
Shift registers: Serial-in-Serial-out, Serial-in-Parallel-out, Parallel-in-Serial-out and Parallel- in-Parallel-out Shift Registers

Unit IV: Computer Memory Organization and Programmable Logic Devices **08L**

Computer Memory Organization: RAM, SRAM, DRAM, ROM, PROM, EPROM, UV-EPROM, EEPROM, FLASH, Introduction to cache memory.
Programmable logic devices: Introduction to PLA, PAL, PLD, CPLD, FPGA, ASIC

- **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)

- **Learning Outcomes:**

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

1. Solve the problems related to interconversion of number system
2. Design and develop logic circuits
3. Design & analyze combinational logic circuits
4. Design & analyze sequential logic circuits
5. Analyze programmable logic device

Semester II

Course IV

BET202: Electronic Circuits

- **Learning Objectives:**
  1. To understand working of rectifier circuits
  2. To study transistors biasing techniques
  3. To learn design concepts of transistor power amplifiers
  4. To learn feedback amplifiers and oscillators

Unit I: Power Supply and Voltage regulators **08** L

Rectifiers: HWR, FWR (center tapped and bridge). Circuit diagrams, working and waveforms ripple factor & efficiency, comparison. Filters: types, shunt, LC, CLC (π) filter (Qualitative analysis)
Zener diode as a regulator, circuit diagram and explanation for load and line regulation, disadvantages of Zener diode regulator. Transistor as series & Shunt regulator

Fixed and variable IC regulators: IC 78xx and IC 79xx, IC LM317 (output voltage equation).

Unit II: Biasing of Transistor **10** L

AC & DC Operating point, DC & AC load line, Need of transistor biasing & stability of Q point, Thermal Instability, Heat sink, Transistor biasing methods, Fixed bias, collector to base bias, voltage divider bias and emitter bias (+VCC and –VEE bias), Temperature Compensation using single & double diode, Transistor rating & specifications Typically SL-100, BC148, BC548 etc. Transistor as a switch. Biasing of MOSFETs, Common Source amplifier circuit analysis

Unit III: Power Amplifiers **10** L

Power Amplifiers: Difference between voltage and power amplifier, classification of power amplifiers, Class A, Class B, Class C and their comparisons.
Operation of a Class A single ended power amplifier. Operation of Transformer coupled Class A power amplifier, overall efficiency. Circuit operation of complementary symmetry Class B push pull power amplifier, distortion in power amplifier, crossover distortion, heat sinks

RC Coupled amplifier: Effect on gain and bandwidth for single stage CE amplifier, Cascaded CE amplifiers, two stage RC amplifiers and its frequency response.
RF tuned amplifiers: Circuit diagram, Working and Frequency Response for each, Limitations of RF tuned amplifier, Applications of tuned amplifiers in communication circuits.

Unit IV: Feedback Amplifiers and Oscillators **08** L

Concept of feedback, negative and positive feedback, General Characteristics of feedback circuits advantages and disadvantages of negative feedback, voltage, current feedback amplifiers (series and shunt), and gain, input and output impedances. Barkhausen criteria for oscillations, Study of phase shift oscillator, Colpitts oscillator, Hartley oscillator, Wien Bridge Oscillator and Crystal Oscillator.

- **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)

- **Learning Outcomes:**

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

1. Design various rectifier circuits
2. Design biasing circuit for transistor amplifier
3. Design and develop voltage and current power amplifier
4. Design and develop feedback amplifier and oscillators.

Semester II

Practical II

BEP203: Digital Electronics and Electronics Circuits Lab (Hardware and CircuitSimulation Software)

- **Learning Objectives:**
  1. To verify the expressions using Boolean algebra and learn logic gates
  2. To develop designing and analyzing attitude about sequential and combinationalcircuits.
  3. To design and develop rectifier circuits for fixed and variable IC regulators.
  4. To understand and design transistors biasing techniques
  5. To analyze feedback amplifiers and oscillators
  6. To simulate electrical and electronics circuits using simulating software

GROUP A

1. Study of Number Systems, Codes and Logic circuits:
   a) Code converters (Binary to Gray and vice versa).
   b) Basic gates
   c) Verify and design AND, OR, NOT and XOR gates using NAND/NOR gates.
   d) Convert a Boolean expression into logic gate circuit and assemble it usinglogic gate IC's.
2. Design of Adder circuit:
   a) Half and Full Adder.
   b) Half and Full Subtractor.
3. Study of Multiplexer/Demultiplexer:
   a) Design 4 X 1 Multiplexer using gates.
   b) Demultiplexer using logic gates.
4. Study of Encoders and Decoders:
   a) BCD to seven-segment decoder.
   b) Decoder (2x4, 3x8), Encoders and Priority Encoders.
5. Study of Flip flops:
   a) Build a Flip- Flop Circuits using elementary gates. (RS, Clocked RS, D-type).
   b) Design a counter using D/T/JK Flip-Flop.
   c) Ripple counter.
   d) Design n-bit asynchronous counter using Flip-Flop ICs.
   e) Design a shift register and study Serial and parallel shifting of data.

- **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. R. L. Tokheim, Digital Principles, Schaum's Outline Series, Tata McGraw Hill,(1994)

GROUP B

1. Study of Rectifier and Power supply design:
    a) Half wave Rectifier – without and with shunt capacitance filter
    b) Centre tapped full wave rectifier – without and with shunt capacitance filter.
    c) Zener diode as voltage regulator – load regulation.
    d) Designing of Fixed voltage power supply using IC regulators using 78xxseries and 79xx series
    e) Design and testing of Transistor linear regulator
2. BJT amplifier circuits:
    a) Transistor characteristics in CE mode – determination of ri, ro and β.
    b) Study of Fixed Bias, Voltage divider and Collector-to-Base bias Feedbackconfiguration for transistors.
    c) Design and study of voltage divider biasing.
    d) Designing of a Single Stage CE amplifier of given gain
3. Study of power amplifiers:
    a) Class A, B and C Power Amplifier.
4. Study of oscillator:
    a) Study of the Colpitt's Oscillator.
    b) Study of the Hartley's Oscillator.
    c) Study of the Phase Shift Oscillator
5. Study of the frequency response of Common Source FET amplifier.

- **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)

- **Learning Outcomes:**

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

1. Design, construct and verify logic circuits.
2. Design and analyze combinational and sequential logic circuits
3. Design and develop rectifier circuit , variable power supply using IC regulators
4. Design and analyze the dc biasing circuit of BJT
5. Design and analyze feedback amplifier and oscillator.
6. Design and verify performance of electronics circuit using simulator

1. STRUCTURE OF COURSE:

1. THIRD SEMESTER

Sr. No.	SUBJECT TITLE	Theory			Practical		
		COURSE NO & Course Code	No. of lectures per week	Credits		No. of lectures Per week	Credits
1	Electronics	Course-V: BET301	6	4	Practical Course – III: BEP303	8	4
		Course-VI: BET302					

2. FOURTH SEMESTER

Sr. No.	SUBJECT TITLE	Theory			Practical		
		COURSE NO & Course Code	No. of lectures Per week	Credits		No. of lectures Per week	Credits
1	Electronics	Course-VII: BET401	6	4	Practical Course – IV: BEP403	8	4
		Course-VIII: BET402					

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

- **B. Sc. II Semester III**

Course V: Analog Communication
Course VI: Wave Shaping and Operational Amplifier

- **B. Sc. II Semester IV**

Course VII: Digital Communication
Course VIII: 8085 microprocessor and 8051 microcontroller

B.Sc. III (Electronics)

1. STRUCTURE OF COURSE:

1. FIFTHSEMESTER

Sr.No.	SUBJECT TITLE	Theory			Practical		
		COURSE NO & Course Code	No. of lectures per week	Credits		No. of lectures Per week	Credits
1	Electronics	Course-IX:BET501	12	8	Practical Course – V & VI (BEP508& BEP509)	20	8
		Course-X: BET502					
		Course-XI: BET503					
		Course-XII: BET50X (Elective: BET504/505/506)					
		SECCET507	01	01	SECCEP510	02	01
		AECC: BET: English	03	02	00	00	00

2. Structure and Title of Courses of B.Sc. Course:
   - **B. Sc. III Semester V**

Course IX: BET501:Power Electronics Devices and Applications
Course X: BET502: Linear Integrated Circuit
Course XI: BET503: 8051 microcontroller Interfacing and Application
Course XII: BET50X: Elective

Elective: BET50X

1. **BET504**:Optoelectronics and IoT
2. **BET505**:Mechatronics
3. **BET506**:Nanoelectronics

SECCET507: **Numerical Skill:** MATLAB Programming
SECCEP510:MATLAB Programming LAB

AECC:BET:English

3. SIXTHSEMESTER

Sr. No.	SUBJECT TITLE	Theory			Practical		
		COURSE NO & Course Code	No. of lectures per week	Credits		No. of lectures Per week	Credits
1	Electronics	Course-XIII:BET601	12	8	Practical Course – VII & VIII (BEP 608& BEP 609)	20	8
		Course-XIV: BET602					
		Course-XV: BET603					
		Course-XVI: BET60X (Elective: BET604/605/606)					
		SECCET607	01	01	SECCEP610	02	01
		AECC:BET: English	03	02	00	00	00

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

CourseXIII:BET601: Electronic Instrumentation
CourseXIV:BET602: Antennas and Wave Propagation
CourseXV:BET603: Advanced Microcontroller: PIC
CourseXVI:BET60X: Elective

Elective:BET60X

1. **BET604**:Digital Signal Processing and Artificial Intelligence
2. **BET605**:Industrial Process control and PLC Programming
3. **BET606**:Robotics

SECCET607: Entrepreneurship Development Program
SECCEP610: Industrial Project

AECC: BET: English

BET/Pxyz:
B:B.Sc.
E:Electronics
T:Theory
P:Practical
x: Semester I to VI
yz: 01to 10
SECC: Skill Enhancement Compulsory Course

Mr. J. A. Wagh
Chairman
B.O.S. (Electronics)