M. C. E. Society's
Abeda Inamdar Senior College
Of Arts, Science and Commerce, Camp, Pune-1
(Autonomous) Affiliated to Savitribai Phule Pune University
NAAC accredited 'A' Grade

B.Sc. Electronic Science (Minor) as per NEP 2.0

Choice Based Credit System (CBCS 2026 Pattern)

(w. e. f. 2026-2027)

Course Offered as	Minor
Course/ Paper Title	**Principles of Analog Electronics**
Course Code	26SBEL11MN
Semester	I
No. of Credits	2
Total Teaching Hours	30

Course Objectives	
1	To introduce students to the fundamental semiconductor devices used in electronic circuits
2	To develop understanding of Bipolar Junction Transistors (BJT) and their applications
3	To explain the working of power supply systems used in electronic equipment
4	To build a strong foundation for advanced electronics and practical applications

Course Outcome	
CO1	Explain the working principles and characteristics of semiconductor devices such as PN junction diode, Zener diode, LED, photodiode, optocoupler, and solar cell.
C02	Analyze the construction, operation, characteristics, and applications of Bipolar Junction Transistors in different configurations.
C03	Apply the concepts of rectifiers, filters, voltage regulators, and oscillators to explain the functioning of power supplies.

Syllabus

Unit No	Title with Contents	No. of Lectures
Unit I	**Semiconductor Devices and Applications**	**10**
	1) Concept of semiconductor materials (Not for Exam) 2) P-type and N-type semiconductors(Not for Exam) 3) PN junction diode: formation and working 4) Forward and reverse bias characteristics 5) Zener diode: Working principle, Breakdown mechanism, V–I characteristics 6) Light Emitting Diode (LED): working principle 7) Photodiode: working principle 8) Optocoupler: working principle and applications 9) Solar cell: working principle and characteristics	
Unit II	**Bipolar Junction Transistor (BJT)**	**12**
	1) BJT: symbol, types (NPN, PNP) 2) Construction and working principle of BJT 3) Transistor configurations: a) Common Base (CB) – concept only b) Common Collector (CC) – concept only c) Common Emitter (CE): Input and Output characteristics 4) Biasing of transistor: a) Need for biasing b) Potential divider bias 5) Transistor applications: 6) Transistor as an amplifier 7) Concept of gain and bandwidth 8) Transistor as a switch	
Unit III	**Power Supplies**	**08**
	1) Block diagram of regulated power supply 2) Rectifiers: Half-wave rectifier , Full-wave rectifier & Bridge	

Syllabus passed in BOS Electronics meeting held on 28th Jan 2026

	rectifier 3) Rectifier with capacitor filter 4) Zener diode as voltage regulator 5) IC voltage regulators: 78XX and 79XX series 6) SMPS: block diagram and working 7) UPS: block diagram and working	

Reference Books

1) Grob, B. (2010). Basic Electronics (8th Edition). McGraw Hill Education.
2) Mehta, V. K., & Mehta, R. (2013). Principles of Electronics. S. Chand & Company.
3) Sedha, R. S. (2011). A Textbook of Applied Electronics (Multicolour Edition, 3rd Edition). S. Chand & Company.
4) Bhargava, N. N., Kulshreshtha, D. C., & Gupta, S. C.,Basic Electronics and Linear Circuits. Tata McGraw-Hill Publishing Company.
5) Malvino, A. P., Electronic Principles. Tata McGraw-Hill Publishing Company.
6) Mehta, V. K., & Mehta, R., Principles of Electronics. S. Chand & Company.
7) Boylestad, R. L., & Nashelsky, L., Electronic Devices and Circuit Theory. Pearson India.

Online Learning Platforms

- **NPTEL (IITs & IISc)**
- **SWAYAM Portal**
- **YouTube Channels**
    1) **Neso Academy**
       PN junction diode, Zener diode, LED, photodiode, optocoupler, solar cell (clear animations), BJT working, CB/CC/CE configurations, transistor as switch & amplifier.
    2) **Gate Smashers**
       Biasing, gain, bandwidth, applications (exam-oriented + conceptual)
    3) **Easy Engineering Classes**
       Step-by-step explanation of CE characteristics and biasing
    4) **Engineering Funda**
       Semiconductor basics, biasing, characteristics (simple explanations)
    5) **All About Electronics**
       Practical understanding of diodes, LEDs, optocouplers, solar cells

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Course/ Paper Title	Electronics Practical –I
Code	26SBEL12MN
Semester	I
No. of Credits	**2**

Objectives	
1	To understand the practical behavior of semiconductor devices
2	To study characteristics of diodes, transistors, and power supply circuits
3	To analyze transistor operation as amplifier and switch
4	To gain hands-on experience with rectifiers and voltage regulators

List of Practical (Minimum 10)

Sr. No.	Title of Experiment
1)	Study of PN junction diode and verification of forward bias operation
2)	Study of Zener diode and determination of Zener breakdown voltage
3)	Study of solar cell and plotting V–I characteristics
4)	Study and characteristics of Light Emitting Diode (LED)
5)	Study of optocoupler operation and applications
6)	Study of BJT (NPN & PNP): symbol, pin configuration and operation
7)	Input and output characteristics of BJT in Common Emitter (CE) configuration
8)	Study of transistor biasing using potential divider bias
9)	Transistor as a switch (ON–OFF operation)
10)	Study of Half-wave rectifier with capacitor filter
11)	Study of Full-wave with capacitor filter

12)	Study of Bridge rectifier with capacitor filter
13)	Zener diode voltage regulator
14)	Study of IC 555 as an Astable Multivibrator.

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Course Offered as	Skill Enhancement Course (SEC)
Course/ Paper Title	Basic Electronics and Digital Tools
Course Code	**26SBEL11SE**
Semester	I
No. of Credits	2
No of Hours	60

Course Objectives	
1)	Identify and recognize basic electronic components and digital tools.
2)	Explain the working principles of simple electronic circuits and logic gates.
3)	Apply electronic laws, measurement techniques, and software tools in practical tasks.
4)	Analyze circuit behavior and document structures for correctness and functionality.
5)	Create simple electronic systems and professional digital documents

Course Outcome	
CO1	Identify basic electronic components using symbols and real components
CO2	Use resistor color codes and digital multimeter for electrical measurements
CO3	Construct and test simple DC circuits, verifying Ohm's Law
CO4	Analyze the functioning of LEDs, transistors, DC motors, and logic gate circuits
CO5	Design simple electronic applications such as torch and encoder circuits
CO6	Create professional documents and presentations using MS Word,

	PowerPoint, and Google Forms

Total 15 practical sessions (4 hours each).

Sr. No.	Title of Experiment
1)	Identification and Testing of Electronic Components
2)	Resistor Color Code & Digital Multimeter (DMM) Use
3)	Construct simple resistor networks and measure total resistance in series and parallel circuit combinations.
4)	**Ohm's Law Verification:** Build an electrical circuit, measure voltage and current, and verify Ohm's Law experimentally.
5)	**Basic LED and Switch Circuit :** understand LED polarity and construct a basic LED circuit using a switch for control.
6)	**Study and demonstrate the working of a transistor used as an electronic switch.**
7)	**DC Motor Control :** control a DC motor using a switch and battery and understand the concept of electrical load.
8)	**Make a Simple Torch :** design and build a simple torch using an LED, battery, and switch.
9)	**Logic Gates :** demonstrate the working of basic logic gates (AND, OR, NOT) .
10)	**Logic Gates :** demonstrate the working derived logic gates (NAND, NOR, and XOR).
11)	**Decimal to BCD Encoder:** test a decimal-to-BCD encoder circuit using NAND logic gates.
12)	**Introduction to MS Word and Text Formatting**
13)	**Enhancing Documents in MS Word**
14)	**Tables and Lists in MS Word**
15)	**MS Word – Resume/Assignment Creation**
16)	**MS PowerPoint – Slide Design and Insertion**
17)	**Google Forms Feedback/Quiz Creation**
18)	**Assignment**

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Open Elective (OE) course As per NEP 2.0

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Course Offered as	Practical (Open Elective)
Course/ Paper Title	Basics of Electricity and House Wiring
Course Code	**26SBEL11OE**
Semester	I
No. of Credits	2
No of Hours	60

Course Objectives	
1.	Familiarize students with fundamental electrical components, tools, and accessories used in domestic wiring.
2.	Develop practical skills in electrical measurements, wiring techniques, and safe handling of electrical equipment.
3.	Enable students to design, assemble, test, and troubleshoot common household electrical circuits.
4.	Encourage application of theoretical concepts to real-life domestic electrical installations.

Learning Outcome	
CO1	Identify basic electrical components, tools, accessories, and wiring symbols used in domestic electrical systems.
CO2	Apply appropriate techniques to: a) Measure resistor values using color code and digital multimeter b) Perform single-way and two-way (staircase) wiring. c) Install and test bulb holders, sockets, plugs, and doorbell circuits
CO3	Evaluate wiring layouts for safety, efficiency, and correctness in: Portable extension boards, Small room wiring (lamp, fan, socket), Domestic installations such as a 1 BHK flat
CO4	Design and assemble functional electrical systems including: Portable extension boards, Multi-socket wiring setups, LED emergency lamp and customized household electrical circuits
CO5	Perform basic domestic wiring independently.

List of Practical (Minimum 10)

Sr. No.	Title of Experiment
1	Identification and testing of fundamental electrical components.
2	Identification and usage of common electrical tools and accessories.
3	Measurement of resistor values using color code and digital multimeter.
4	Wiring a bulb holder with a switch.
5	Wiring and testing of a 1- Switch and 1-Socket Electric Board.
6	Wiring and testing of a 2- Switch and 2-Socket Electric Board.
7	Wiring and testing of a 4- Switch and 4-Socket Electric Board.
8	Wiring and testing of a 1- Switch and 4-Socket Electric Board.
9	Designing and assembling of a portable Extension Board.
10	Two-way switch wiring (staircase wiring)
11	Wiring and testing of an Extension Board with Indicator and FAN regulator.
12	Wiring and testing of an Extension Board with MCB.
13	Electrical wiring setup for a single room (lamp, fan, and socket).
14	Complete wiring layout for a 1 BHK flat.
15	Installation and testing of a door bell or buzzer circuit.
16	Demonstration of electric iron operation and common fault diagnosis.
17	Demonstration and basic working of an electric grinder.
18	Designing and assembling an LED emergency lamp. (Assignment)

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Co-Curricular Course (CC) as per NEP 2.0
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S.Y.B.C.A.(Sc.)-Semester III

Course Title : Robotics and Automation	**Semester: II**
Course Code: 26SBEL31CC	**No. of Credits: 02**
Nature of Course: Co-Curricular Course (CC) (Practical)	**Total Teaching Hours : 60**

Course Objectives	
1.	To introduce students to the fundamentals of robotics and automation systems.
2.	To develop basic programming skills using Arduino IDE.
3.	To interface sensors and actuators used in robotic systems.
4.	To implement wireless control and automation using Wi-Fi communication.
5.	To design simple robotic and automation based applications.

Learning Outcome	
CO1	Understand the basic concepts of robotics and automation systems.
CO2	Program Arduino Uno & ESP8266/ESP32 using Arduino IDE.
CO3	Interface different sensors, motors, and actuators used in robotic systems.
CO4	Implement wireless communication and remote control using Wi-Fi.
CO5	Design and develop basic robotic and automation applications.

Laboratory Setup Requirements:

a) Arduino Uno Board
b) ESP8266/ESP32 boards
c) Sensors (LDR, DHT11, IR, PIR, Ultrasonic Sensor)
d) 16X2 LCD Display Module
e) Motor Driver Module
f) LEDs, Buzzers, Push Buttons
g) Jumper Wires and Breadboards
h) **Software Tools:** Arduino IDE.

Syllabus (Practical)

Sr. No.	Title of Practical
1)	Study of Arduino Uno Board and understanding I/O pins
2)	Study of ESP8266 / ESP32 boards and understanding GPIO pins
3)	Installation of Arduino IDE
4)	LED Blinking using Arduino Uno Board
5)	LED Blinking using ESP8266 / ESP32
6)	LED Brightness Control using PWM
7)	Push Button Interfacing with Arduino Uno Board
8)	Buzzer Alarm System using Arduino Uno Board
9)	Interfacing of 16×2 LCD Display for message display
10)	LDR Sensor Interfacing for Light Detection
11)	Temperature and Humidity Monitoring using DHT11
12)	Ultrasonic Sensor for Distance Measurement
13)	Motion Detection using PIR Sensor
14)	DC Motor Control using Motor Driver
15)	Servomotor Interfacing with Arduino Uno Board
16)	Stepper Motor Control using Arduino Uno Board
17)	Wi-Fi Connectivity using ESP8266 / ESP32
18)	Sending Sensor Data to Serial Monitor and Web Page
19)	Wi-Fi Controlled LED using Smartphone
20)	Wi-Fi Controlled Robot

21)	Mini Projects(Optional) • Obstacle Avoiding Robot • Smart Security Alarm System • Smart Water Level Monitoring System • IoT Weather Monitoring System • Smart Home Automation System