

F.Y.B.Sc. (Electronic Science) Sem - I

Progressive Education Society's
Modern College of Arts, Science and Commerce(Autonomous),
Shivajinagar, Pune - 5
First Year of B.Sc.
(Course under NEP 2024)

Course Code: 24ScEleU1101

Course Name: Fundamentals of Analog and Digital Electronics

Teaching Scheme: TH:4 Hours/Week

Credit: 02

Examination Scheme: CIA: 20 Marks

End-Sem: 30 Marks

Prerequisite Courses:

- 12th Science with PCM

Course Objectives:

- To get familiar with basic electronic components
- To understand different network theorems.
- To get familiar with number systems and codes.
- To understand basic logic gates, Boolean algebra, k-maps.

Course Outcomes:

On completion of the course, student will be able to–

- Solve problems on network theorems.
- Understand working and types of Semiconductor Diode
- Understand number systems and logic gates and Simplify Boolean expressions.

Course Contents

Unit 1	Elements of Basic Electronics and Network Theorems	10 L
	Study of basic circuit elements: Resistor, Capacitor and Inductor: Definition, symbol, types, color coding of resistor, Transformer- Definition, symbol, working principle, types and applications, Ideal and practical voltage and current sources, Voltage and Current divider rules, Ohm's law, Kirchhoff's Laws (Kirchhoff's Current Law, Kirchhoff's Voltage Law), Thevenin's theorem, Maximum power transfer theorem.	
Unit 2	Semiconductor Diodes	5 L
	Introduction to Semiconductors, Extrinsic and Intrinsic semiconductor. P-N junction diode (construction, symbol, types and working principle), I-V characteristics, parameters and rectifiers. LED: Construction, symbol, types and working principle.	

Unit 3	Logic Gates	5 L
	Introduction to analog signals and digital signals, Positive and Negative Logic, Logic gates: definition, symbols, truth tables, Boolean expressions of NOT, OR, AND, NAND, NOR, EX-OR, EX-NOR gates	
Unit 2	Number Systems and Boolean Algebra	10 L
	Introduction to decimal, binary and hexadecimal number systems, Binary addition, and subtraction, BCD code, Excess-3 code and Gray code, ASCII codes, Code conversion –binary to gray and gray to binary, Boolean algebra and Boolean laws:Commutative, Associative, Distributive, AND, OR and Inversion laws, DeMorgan's theorem, NAND, NOR as universal gate,	

Text/ Reference Books:

1. Principles of Electronics: V.K. Mehta, S. Chand and Co., 12th Edition, 2021.
2. Electronic Principles: Albert Melvino, David J Bates, McGraw Hill 7th Edition, 2012.
3. A Textbook of Applied Electronics (Multicolour Edition), Dr. R S Sedha, S. Chand Publishing, Revised Edition, 2022.
4. Digital Electronics: Jain R.P., Tata McGraw Hill, Fourth Edition, 2009.
5. Digital Principles and Applications: Malvino Leach, Tata McGraw-Hill, 8th Edition, 2014.
6. Digital Fundamentals: Floyd T.M., Pearson Education, 11th Edition, 2014.

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First Year of B.Sc.
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Course Code: 24ScEleU1102

Course Name: Analog and Digital Electronics Lab

Teaching Scheme: TH: 4 Hours/Week

Examination Scheme: CIA: 20 Marks

Credit: 02

End-Sem: 30 Marks

Prerequisite Courses:

- 12th Science with PCM

Course Objectives:

- To learn identification of electronic circuit components, specifications, and characteristics
- To verify various circuit laws used in electronics.
- To verify truth tables of digital gates and basic conversions of logical expressions using gates

Course Outcomes:

On completion of the course, student will be able to–

- Understand how to identify, use and construct electronic circuits with circuit elements.
- Differentiate different logic gates and simplification of logic expressions using them.

List of Experiments

Experiments (Any 12) + Activity/Study tour report/Assignments/Demonstration/Virtual lab

1. Introduction to Electronics Lab Instruments -Multimeter, Power Supply, Signal generator, CRO.
2. Identification of electronic components and study its types and specifications:
R, L, C, Transformer, Switches
3. Identification of electronic components and study its specifications:
Diode, LED, Seven Segment Display, Transistor, LDR
4. Study of Series and Parallel combination of resistors
5. Verification of Kirchhoff's voltage and current laws
6. Verification of Thevenin's theorem
7. Verification of the Maximum Power Transfer Theorem
8. Study of the I-V Characteristics of P-N junction diode
9. Study of Half and full wave rectifier
10. Study of Basic Gates

11. Study of Basic Gates using Universal Gates
12. Realizations of logic expressions using logic gates
13. Verification of DeMorgan's theorem
14. Code converter- Binary to Gray
15. Decimal to BCD code converter

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First Year of B.Sc.
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Course Code: 24ScEleU1401

Course Name: Fundamentals of Computer Hardware and Software

Teaching Scheme: TH: 2 Hours/Week

Credit: 02

Examination Scheme: CIA: 20 Marks

End-Sem: 30 Marks

Prerequisite Courses:

- 12th Arts/Commerce

Course Objectives:

- To Study Basics of computer hardware
- To learn the computer software

Course Outcomes:

On completion of the course, student will be able to–

- Understand various components of computer
- Understand the OS and application softwares

Course Contents

List of Experiments

Experiments (Any 12) + Activity/Study tour report/Assignments/Demonstration/Virtual lab

1. Identification of different components inside a computer
2. Identification of front panel indicators , switches and front and rear side connectors
3. Familiarization of computer system motherboard
4. Study of PC power system
5. Study of Computer system configuration
6. Installation of OS
7. Installation of antivirus
8. Installation of external peripherals (Printer)
9. Installation of application software (MS office)
10. Use of computer settings (Program/Apps)

11. Computer Memory Management tools
12. Installation of drivers(Electronic board)
13. Study of OS supported applications
14. Remote access to a PC(Any desk)
15. Wireless Connectivity to other devices (WiFi and Bluetooth)

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**First Year of B.Sc.
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Course Code: 24ScEleU1601

Course Name: Basic Electronics

Teaching Scheme: TH: 4 Hours/Week

Examination Scheme: CIA: 20 Marks

Credit: 02

End-Sem: 30 Marks

Prerequisite Courses:

- 12th Science with PCM

Course Objectives:

- To learn identification of electronic circuit components, specifications and characteristics
- To build simple electronic circuits
- To test simple electronic circuits

Course Outcomes:

On completion of the course, student will be able to–

- Understand how to identify, use and construct electronic circuits with circuit elements.
- Develop skill of assembling simple electronic circuits
- Test assembled electronic circuit.

List of Experiments (Any 15)

1. Identification, Specification of Electronic components-
Fuse, MCB, Relays, Batteries, Switches, Cables, Connectors, Speaker, Mic
2. Identification, Specification of Electronic components-
Relay, Photodiode, Thermistor, Heat sinks, PCBs
3. Measurement of resistor using color code and Multimeter
4. Testing of Diode and Transistor
5. Study of Breadboard and Tagboard
6. Voltage and Current divider Circuit
7. LED Circuit: Intensity Variation

8. Light sensitive switching: Application of LDR
9. Wiring of light circuit using Two-way switches. (Staircase wiring)
10. One-way light bulb
11. Slow light bulb. (Charging and discharging of Capacitor)
12. Burglar alarm (Use of IR led and photodiode)
13. Touch Sensor circuit
14. Fire alarm circuit (Use of Thermistor)
15. LED Flasher circuit (Transistorized a stable multivibrator)
16. Isolation using optocoupler.
17. Relay testing circuit

F.Y.B.Sc. (Electronic Science) Sem - II

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First Year of B.Sc.
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Course Code: 24ScEleU2101

Course Name: Principles of Analog and Digital Circuits

Teaching Scheme: TH: 2 Hours/Week

Credit: 02

Examination Scheme: CIA: 20 Marks

End-Sem: 30 Marks

Prerequisite Courses:

- Basic information of semiconductor.
- Basic information logic gates, positive and negative logic concept
- Information of Number Systems
- Knowledge of Boolean Algebra

Course Objectives:

- To study BJT, FET and UJT
- To study Combinational circuits
- To study flip flops and sequential circuits

Course Outcomes:

On completion of the course, student will be able to–

- Understand working of basic analog circuits.
- Understand Combinational circuits
- Understand types of flip flops and sequential circuit construction using them.

Course Contents

Unit 1	Transistors	10 L
	BJT: Introduction, Symbol, NPN and PNP, working principle, I-V characteristics, , DC load line, Q (operating point). UJT: Symbol, construction, working principle, equivalent circuit, I-V characteristics, intrinsic standoff ratio. JFET: Symbol, construction, working principle, IV characteristics.	
Unit 2	Basic Analog Circuits	5 L
	BJT as a switch, BJT amplifier (CE), UJT relaxation oscillator, FET as a switch, FET amplifier	

Unit 3	Combinational and sequential Circuits	10 L
	Multiplexer 2:1, Demultiplexer 1:2, Concept of cascading, Encoders- Decimal to binary, Decoder- BCD to seven segment decoder, Code converters - Binary to Gray, Gray to Binary Arithmetic Circuits- Half adder, full adder, Half subtractor Flip flops: RS, JK, Master slave JK, D and T flip-flops, Difference between Latch and Flip-flop, Flip flop operation using truth table and timing diagram.	
Unit 4	Counters and Shift Registers	5 L
	Counters: Definition, Types- Synchronous, Ripple (Asynchronous) binary counter, up down counter, concept of modulus counters Shift registers: Definition, Types- SISO, SIPO, PISO, PIPO shift registers, Ring counter and Johnson counter	

Text/ Reference Books:

1. Principles of Electronics: V.K. Mehta, S. Chand and Co., 12th Edition, 2021.
2. Electronic Principles: Albert Melvino, David J Bates, McGraw Hill 7th Edition, 2012.
3. A Textbook of Applied Electronics (Multicolour Edition), Dr. R S Sedha, S. Chand Publishing, Revised Edition, 2022.
4. Digital Electronics: Jain R.P., Tata McGraw Hill, Fourth Edition, 2009.
5. Digital Principles and Applications: Malvino Leach, Tata McGraw-Hill, 8th Edition, 2014.
6. Digital Fundamentals: Floyd T.M., Pearson Education, 11th Edition, 2014.

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Course Code: 24ScEleU2102

Course Name: Analog and Digital Circuits Lab

Teaching Scheme: TH: 4 Hours/Week

Examination Scheme: CIA: 20 Marks

Credit: 02

End-Sem: 30 Marks

Prerequisite Courses:

- Basic information regarding semiconductor devices
- General information of electronic components and basic laws used in electronics.
- Characteristics and identification of electronic components

Course Objectives:

- To learn working of rectifiers, flip flops, adder,
- To verify truth tables of adder, subtractor

Course Outcomes:

On completion of the course, student will be able to–

- Understand BJT, FET, UJT Characteristics
- Understand working of Multiplexer De-multiplexer, 4-bit Shift register, decade counter.

List of Experiments

Experiments (Any 12 from 1 to 16) + Activity / Study tour report / Assignments / Demonstration/Virtual lab

1. Study of output I-V Characteristics of BJT in CE Configuration
2. Study of transistor as switch
3. Study of JFET Characteristics
4. Study of UJT Characteristics and Relaxation oscillator
5. Study of High pass and Low pass filters
6. Study of CE amplifier
7. Study of RS and D flip flops
8. Study of JK and T flip flops
9. Build and Test Half and Full Adder
10. Build and Test Half and Full subtractor
11. Build and Test 2:1 Multiplexer and 1:2 Demultiplexer using gates
12. Study of 4-bit Shift register IC 7495
13. Study of decade counter using IC 7490

14. Study of Modulo counters using IC7490
15. Binary to Gray and Gray to Binary code converter
16. Decimal to BCD Encoder
17. Study of BCD to seven segment decoder.

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Course Code: 24ScEleU2301

Course Name: Information Technology for everyone

Teaching Scheme: TH: 4 Hours/Week

Credit: 02

Examination Scheme: CIA: 20 Marks

End-Sem: 30 Marks

Prerequisite Courses:

- 12th Arts/ Commerce

Course Objectives:

- To Study different tools used in IT.
- To learn how to use google account to carry out various tasks.

Course Outcomes:

On completion of the course, student will be able to–

- Identify the tools used in IT
- Understand the use of IT tools
- Develop skill of Digital Documentation

List of Experiments

Experiments (Any 12 from 1 to 15) + Activity/ Study tour report /Assignments /Demonstration / Virtual lab

1. Template creation-(Certificate creation)
2. Use of online document converters
3. Image cropping and Inserting Image
4. Email Service
5. Mail Merge
6. Google form
7. Google spreadsheet
8. Video Conferencing: Google Meet
9. Google drive management
10. Google Chat
11. Use of Chat GPT
12. Mobile apps
13. Net Banking
14. Use of Google input
15. Language translation tools

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First Year of B.Sc.
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Course Code: 24ScEleU2601

Course Name: PCB Designing and Fabrication

Teaching Scheme: TH: 4 Hours/Week

Credit: 02

Examination Scheme: CIA: 20 Marks

End-Sem: 30 Marks

Prerequisite Courses:

- Basic knowledge of electronic components and circuits.

Course Objectives:

- To study use of PCB in electronic system.
- Identify dimensions of electronic and mechanical components for PCB layouts.
- Prepare PCB layout for analog and digital circuits using software.
- To understand the process of PCB making and assembling electronic components on PCB.

Course Outcomes:

On completion of the course, student will be able to–

- To prepare PCB layout for given circuit.
- Use software for creating layout.
- Make PCB and solder components on PCB.

List of Experiments

Experiments (Expt 1 to 7 are compulsory and perform any 8 from remaining)

1. Creating the schematic of circuit.
2. Using a schematic capture tool to create PCB layout.
3. Placing components with proper footprints and routing the traces (DRC).
4. Adding labels, identifiers and generating design/layout files.
5. Printing the PCB layout on actual copper clad and masking the tacks, pads etc.
6. Etching and Drilling of PCB.
7. Mounting and soldering of components.

Making PCBs of following Circuits

8. Light switching using LDR
9. Water level controller circuit (Use of Transistor)
10. Debounce switch for Digital board
11. Half adder

12. Full adder
13. Rectifier - Half wave, Full wave (Bridge)
14. Seven Segment Display driver interface
15. Decade counter
16. 2:1 Multiplexer
17. 1:2 De-multiplexer
18. LED Flasher circuit