Savitribai Phule Pune University

(Formerly University of Pune)

Faculty of Science & Technology

F.Y.B.Sc. (Computer Science) Electronic Science

(For Colleges Affiliated to Savitribai Phule Pune University)

Choice Based Credit System (CBCS) Syllabus

Under National Education Policy (NEP)

To be implemented from Academic Year 2024-2025

Title of the Course: F.Y. B. Sc. Electronics of B.Sc.(Computer Science)

Preamble of the Syllabus:

The systematic and planned curricula for first year and second year Electronics shall motivate and encourage the students for pursuing higher studies in Electronics and Computer and for becoming an entrepreneur.

Introduction:

At **first year of under-graduation:** The basic topics related to the fundamentals of electronics are covered. Since electronics is an inherent part of technological advancements, the practical course is intended to achieve the basic skills required for computer science students.

At **second year under-graduation**: The level of the theory and practical courses shall be one step ahead of the first year B.Sc. Courses based on content of first year shall be introduced. Concepts of Communication, embedded system, Internet of things will be introduced at this stage.

Objectives:

- To provide knowledge of technological and practical aspects of electronics.
- To familiarize with current and recent technological developments.
- To enrich knowledge through activities such as industrial visits, seminars, projects etc.
- To train students in skills related to computer industry and market.
- To create foundation for research and development in Electronics/ Computer.
- To develop analytical abilities towards real world problems
- To help students to build-up a progressive and successful career.

Titles of Papers and Scheme of Study

F. Y. B. Sc. Electronic Science of B.Sc. (Computer Science)

SEM	Paper / subject code	Paper Title	Credits	Lectures/ practical per week	Evaluation		
					C.A.	U.E.	Total
I	ELS-101T	Principles of Analog Electronics	2	2	15	35*	50
	ELS-102P	Electronics Practical Course I	1.5	3	15	35**	50
II	ELS-151T	Principles of Digital Electronics	2	2	15	35*	50
	ELS-152P	Electronics Practical Course I	1.5	3	15	35**	50

F.Y.B.Sc. Electronic Science (Computer Science)
Semester I
ELS-101T: Principles of Analog Electronics
Credits:2 Lectures: 30

Objectives :

1. To study various types of semiconductor devices
2. To study elementary electronic circuits and systems
3. To study Instrumentation System
4. To study various blocks of instrumentation System
5. To study smart instrumentation system

Unit 1. Semiconductor Diodes **5L**

Semiconductor, P and N type semiconductors, Formation of PN junction diode, it's working. Zener diode, LED, Photo diode(Symbol, working principal, list of applications only)

Unit 2. Bipolar Junction Transistor (BJT) **5L**

Bipolar Junction Transistor (BJT) symbol, types, construction, working principle, Transistor. Amplifier configurations - CB, CC (only concept), CE configuration: input and output characteristics, Definition of α, β and ϒ , Concept of Biasing (numerical problems not expected),

Unit 3. OSCILLATORS **3L**

Barkhauson Criteria, Low frequency Wein-bridge oscillator, High frequency crystal oscillator

Unit 4. DATA CONVERTERS **5L**

Need of Digital to Analog converters, parameters, weighted resistive network, R-2R ladder network, need of Analog to Digital converters, parameters, Flash ADC

Unit 5 : Introduction to Instrumentation System **7L**

Block diagram of Instrumentation system, Definition of sensor and transducer Classification of sensors: Active and passive sensors. Specifications of sensors: Accuracy, range, linearity, sensitivity, resolution, reproducibility. Temperature sensor

(Thermistor, LM-35), Passive Infrared sensor (PIR),

Actuators: DC Motor, stepper motor

Unit 6: OPAMP as signal Conditioner **5L**

Concept, block diagram of Op amp, basic parameters (ideal and practical): input and output impedance, bandwidth, differential and common mode gain, CMRR, slew rate, IC741/ LM324, Concept of virtual ground.

Reference Books:

1. Electronic Devices and Circuits I – T. L. Floyd- PHI Fifth Edition
2. Principles of Analog Electronics - A.P.Malvino
3. Sedha R.S., A Text Book Of Applied Electronics, S.Chand& CompanyLtd
4. Sensors and Transducers : D. Patranabis, PHI publication, 2nd Edition
5. Sensors and Transducers : Prof A.D.Shaligram
6. Op Amp and Linear Integrated Circuits: Ramakant Gaykwad

F.Y.B.Sc. Electronic Science (Computer Science)
Semester I
ELS-102P: Electronics Practical Course I
Credits:2

Objectives:

1. To study different semiconductor diodes.
2. To understand applications of IC 555 as a multivibrator.
3. To study different applications of op-amp.
4. To understand applications of sensors.

Detailed Syllabus:

GROUP A (Any 13)

1. Study of forward and reverse bias characteristics of PN junction diode.
2. To study the forward characteristics of LED for different colours.
3. Study of Zener diode as a voltage regulator
4. Study of Optocoupler (mechanism and characteristics, Working principle of Light emitting diode, photo diode)
5. Study of Transistor as a switch.
6. Study of FET characteristics.
7. Study of IC 555 as astable multivibrator used as square wave generator / clock
8. Study of Digital to Analog Converter using R-2R ladder network
9. Study of optical sensor (LDR)
10. Study of temperature sensor (LM35)
11. Study of PIR sensor
12. Study of Study of Op amp as inverting and non inverting amplifier
13. Op Amp as a Unity gain follower
14. Study of Op-amp as adder/subtractor
15. Study of Flash ADC.
16. Study of Wein-bridge oscillator.
17. Study of crystal oscillator

GROUP B: Activity (Any 1: Equivalent to 2 practicals)

1. Identification of components (Passive and Active) and study of multimeter -

a. Minimum 10 different types of components are expected.
b. Identification based on visual inspection / data sheets.
c. Measure the various parameters using multimeter.

2. Technical survey of 5 electronic appliances used in different fields (Home, Hospital, Agriculture, Chemical industry, Automobile industry)

(Note: basics of the devices will be explained in theory and practical will be based on applications of different types and configurations of the devices learnt in theory. In this way they will learn in class as well as in lab and more concepts can be covered in given number of credits.)

F.Y.B.Sc. Electronic Science (Computer Science)
Semester I
ELS-151T: Principles of Digital Electronics
Credits:2 Lectures: 30

Learning Objectives:

1. To learn different number system and their interconversion.
2. To understand logic gates and their applications.
3. To study rules and laws of Boolean Algebra.
4. To understand design of combinational circuit and their different types.

Detailed Syllabus:

Unit I: Number Systems and Digital Codes (08)

Introduction to decimal, binary, octal and hexadecimal number system and their inter-conversions, the concept of 1's and 2's complements, binary addition, binary subtraction using 1's and 2's complements. BCD code, Excess-3 code, Gray code

and ASCII code.

Unit II: Logic Gates and Logic Families (06)

Logic gates – basic and derived (symbol, Boolean equation and truth table), concept of universal gates. Introduction of CMOS and TTL logic families. Parameters of logic families: voltage levels, propagation delay, noise margin, fan in, fan out, power dissipation Comparison between CMOS and TTL logic families.

Unit III: Boolean Algebra and Karnaugh Map (06)

Laws of Boolean Algebra, De-Morgan's theorems, simplification of logic equations usingBoolean algebra, minterms, maxterms, Boolean expression in SOP and POS form, conversionof SOP/POS expression to its standard SOP/POS form.

Introduction to Karnaugh map,problems based on SOP (up to 4 variables), digital designing using K-map for 3-bit gray tobinary and binary to gray conversion. Ex-OR gate as a 4-bit Parity Checker and Generator.

Unit III: Combinational Circuits (10)

Introduction to Arithmetic Circuits, half adder, full adder, half subtractor, full subtractor, four-bit parallel adder, universal adder / subtractor, digital comparator, introduction to ALU. Introduction, Multiplexer (2:1, 4:1), demultiplexer (1:2, 1:4) and their applications. Encoders: decimal to BCD/binary, 3x4 matrix keyboard encoder and priority encoder. Decoders: BCD to decimal and BCD to seven segment decoder.

Suggested Readings/Material:

1. Digital Design - M. Morris Mano, PHI, New Delhi.
2. Digital Systems Principles and Applications - Ronald J. Tocci.
3. Digital electronics - G. K. Kharate, Oxford University Press.
4. Fundamentals of Digital Circuits - Anand Kumar.
5. Digital Principles and Applications - Malvino and Leach, TMG Hill Edition.

F.Y.B.Sc. Electronic Science (Computer Science)
Semester I
ELS-152P: Electronics Practical Course II
Credits:2

Learning Objectives:

1. To understand logic gates ICs and their applications in Digital Design.
2. To design different digital circuits using logic gates.
3. To study different combinational circuits.

Detailed Syllabus:

GROUP A (Any 13)

1. Verification of logic gates by using digital ICs.
2. Realization of basic gates using discrete components.
3. Realization of basic gates using universal logic gates.
4. Verification of De Morgan's theorems.
5. Study of half adder and full adder using logic gates.
6. Study of half subtractor and full subtractor using logic gates.
7. 4-bit binary parallel adder and subtractor using IC7483.
8. 3-bit binary to Gray conversion using logic gates.
9. 3-bit Gray to Binary conversion using logic gates.
10. Study of EX-OR gate as a 4-bit parity checker.
11. Study of EX-OR gate as a 4-bit parity generator.

12. Study of 1-bit digital comparator.
13. Study of ALU using IC 74181.
14. Study of multiplexer and demultiplexer.
15. Study of Decimal to BCD/Binary encoder.
16. Study of Priority Encoder IC 74148
17. Study of BCD to seven segment decoder using IC 7447.

GROUP B (Any 1: Equivalent to 2 practicals)

1. Perform any 2 experiments from Group A using circuit simulation software LTSPICE /CircuitMod / Proteus etc. (Give preference to not performed experiments).
2. Perform survey of following topics –
   a. Study of laboratory safety and precautionary measures.
   b. Study of e-waste management or any relevant topic of Electronics.