Progressive Education Society's , Modern College of Arts, Science and Commerce, Ganeshkhind,Pune-411016

Faculty of Science

F.Y.B.Sc. Electronics of B.Sc. Computer Science

Choice Based Credit System Syllabus of an autonomous college

To be implemented from Academic Year 2022-2023

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 Science.
- 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	Paper Title	Credits	Lectures/ practical per week	Evaluation		
						C.A.	C.E.	Total
I	22-ELC-111	I	Semiconductor Devices and Basic Electronic Systems	2 (36L)	3	15	35*	50
	22-ELC-112	II	Principles of Digital Electronics	2 (36L)	3	15	35*	50
	22-ELC-113[P]	III	Electronics Lab IA	1.5 (48 L)	4	15	35**	50
II	22-ELC-121	I	Instrumentation System	2 (36L)	3	15	35*	50
	22-ELC-122	II	Basics of Computer Organisation	2 (36L)	3	15	35*	50
	22-ELC-123[P]	III	Electronics Lab IB	1.5 (48L)	4	15	35**	50

Detail Syllabus:

SEMESTER I

Paper I

22-ELC-111: Semiconductor Devices and Basic Electronic Systems

(2 Credits, 36 lectures)

Course Outcomes :-
After completion of this course student will be able :

CO1. To analyse performance parameters based on study of characteristics of electronic devices like diode, transistors and MOSFETs.
CO2. To analyse the Regulated Power supply using discrete components and using ICs.
CO3. To analyse the signal generating circuits- Oscillators and study their applications.
CO4. To build and test Data converters such as Analog to Digital and Digital to analog converters.

Unit 1. Semiconductor Diodes and Transistors

(18 L)

Semiconductor Diode :- Introduction to Semiconductors, P and N type semiconductors, Formation of PN junction diode, it's working, Forward and Reverse bias characteristics, Zener diode: working principle, breakdown mechanism and characteristics, Working principle of Light emitting diode (LED), photo diode, opto-coupler, Solar cell-working principle and characteristics.
Transistors:- 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 Concept of Biasing, Potential Divider Bias, Transistor as amplifier ,Transistor as a switch.
MOSFET- MOSFET types, working principle, characteristics, application of MOSFET as a Switch

Unit 2. Power Supply and Oscillators *(11L)*

Power Supply:- Block Diagram of Regulated Power Supply, Rectifiers (half wave, full wave, Bridge), rectifier with capacitor-filter, Use of Zener Diode as a Voltage Regulator. IC 78XX and 79XX as regulator.
Oscillators:- Barkhauson Criteria, Low frequency Wein-bridge oscillator, High frequency crystal oscillator using NAND gate , IC555 as astable multi-vibrator used as square wave generator /clock, IC555 as Bistable Multi-vibrator.

Unit 3. Data Converters (*7L*)

Need of Digital to Analog converters, parameters- Resolution, Accuracy, Conversion Time, weighted resistive network, R-2R ladder network, need of Analog to Digital converters, Flash ADC, successive approximation ADC ,Applications of ADC & DAC.

Text/reference books :

1. Electronic Devices and Circuits I – T. L. Floyd- PHI Fifth Edition
2. Principles of Analog Electronics - A.P.Malvino
3. Electronics Devices and Circuit Theory -Robert Boylestad
4. Sedha R.S., A Text Book Of Applied Electronics, S.Chand& CompanyLtd

SEMESTER I

PAPER II

22-ELC-112: Principles of Digital Electronics
(2 Credits, 36 lectures)

Objectives:

1. To get familiar with concepts of digital electronics
2. To learn number systems and their representation
3. To understand basic logic gates, Boolean algebra and K-maps
4. To study arithmetic circuits, combinational circuits and sequential circuits

Course Outcome:
After completion of this course student will be able:

CO1. To solve problems based on inter-conversion of number systems
CO2. To study methods to reduce logic circuits by reducing Boolean expression.
CO3. To understand the operation of all types of Logic Gates, their families etc.
CO4. To understand the design and function of different Combinational Logic circuits.

Unit 1: Number Systems and Digital codes (10 L)

Introduction to Decimal, Binary and Hexadecimal number systems and their inter-conversions, binary addition and binary subtraction using 2's complement, Binary Coded Decimal number, Gray Codes, Gray to Binary and Binary to Gray conversion, Alphanumeric representation in ASCII codes.

Unit 2: Logic gates and Boolean Algebra (12L)

Logic gates (NOT, AND, OR, NAND, NOR, XOR gate) with their symbol, Boolean equation and truth table, Universal gates**.** Draw logic diagram from given Boolean equation and vice versa.

Rules and laws of Boolean algebra, De Morgan's theorem, simplification of Logic equations using Boolean algebra rules, Min terms, Max terms, Boolean expression in SOP and POS form, conversion of SOP/POS expression to its standard SOP/POS form Introduction to Karnaugh Map, problems based on SOP (upto 4 variables), digital designing using K Map. Introduction of CMOS and TTL logic families, Parameters like voltage levels, propagation delay, noise margin, fan in, fan out, power dissipation

Unit 3: Combinational Circuits (*14L*)

Half adder and full adder, 4-Bit Universal adder/ Subtractor, study of Multiplexer (4:1) and DE multiplexer (1:4), Encoders :Decimal to BCD , 3X4 matrix keyboard encoder, priority encoder, Decoder- 3:8 decoder, IC 74138, BCD to seven segment decoder, IC 7447, Digital comparator, Concept of parity, applications of Ex-OR gates as parity checker and generator

Reference Books:

1. Digital Fundamentals: Floyd T.M., Jain R.P., Pearson Education
2. Digital Electronics: Jain R.P., Tata McGraw Hill
3. Digital Principles and Applications: Malvino Leach, Tata McGraw-Hill
4. M.Morris Mano, " Digital Design " 3rdEdition, PHI, NewDelhi.
5. Ronald J. Tocci. "Digital Systems-Principles and Applications" 6/e. PHI. New Delhi. 1999.(UNITS I to IV)
6. G.K.Kharate-Digital electronics-Oxford university press
7. S.Salivahana & S.Arivazhagan-Digital circuits and design

SEMESTER I

Paper III

22-ELC-113[P]: ELECTRONICS LAB IA (1.5 Credits)

The practical course consists of **10 experiments** out of which two will be preparatory experiments. These will be evaluated in an oral examination for 15% marks at internal and external semester examination. **Each Practical batch will have maximum 15 students.**

Course outcomes:
After completion of this course student will be able

CO1. To identify different components and devices as well as their types and *basic parameters.*
CO2. To understand the use of various measuring Instruments and operate the devices in the laboratory .
CO3. To connect circuit and do required performance analysis
CO4. To compare expected and actual results of given particular experiment.
CO5. To analyse the output of the circuits through Observation Tables and Graphical representation.

Preparatory Experiments

1. Identification of Components (Passive and Active) /Tools

- e. g resistor, capacitor, inductor, transistor, transformer, IC.
- Identification based on visual inspection using DMM must be carried out.

2. Study of Signal Generator & CRO

- Understand how to use Signal Generator, CRO
- Study of front panel controls of both
- Measurement of amplitude and frequency of Sine/Square waveform
- Demonstrate the use of Component testing facility

Semester I- List of Practical

Group A

1. Study of IV characteristics of PN junction Diode.
2. Study of half wave, full wave and bridge rectifier circuit with and without capacitor filters.
3. Study of Bipolar Junction Transistor as a Switch.
4. Study of 4-Bit R-2R Ladder Network type of DAC.

Group B

1. Study of Logic Gates (Verification of Truth tables).
2. Study of Half Adder and Full Adder using Logic Gates.
3. Study of Decimal to BCD converter
4. Study of Binary to Gray and Gray to Binary Conversion.

SEMESTER II

PAPER I

22-ELC-121: Instrumentation Systems
(2 Credits, 36 lectures)

Objectives :

1. To study Instrumentation System
2. To study various blocks of Instrumentation System
3. To study Smart Instrumentation System
4.

Course outcomes:
After completion of this course student will be able

CO1. To understand the Instrumentation System and role of Sensors along with their types.
CO2. To understand the specifications of different sensors .
CO3. To understand the use of different Sensors and Actuators.
CO4. To realize the Smart Instrumentation system and analyze the use of Smart Sensors.
CO5. To understand the use of Operational Amplifier as a Signal conditioning element.

Unit 1: Introduction to Instrumentation System (8 L)

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

Unit 2: Sensors and Actuators (12 L)

Temperature sensor (Thermistor, LM-35), optical sensor (LDR), Passive Infrared sensor (PIR), Tilt Sensor, ultrasonic sensor, Motion sensor, Image Sensor, Actuators: DC Motor, stepper motor

Unit 3:Operational Amplifier

(8 L)

Concept, block diagram of Op amp, basic parameters (ideal and practical): input and output impedance, bandwidth, differential and common mode gain, CMRR, , IC741/ LM324,
Concept of virtual ground, Op amp as inverting and non-inverting amplifier, Unity gain follower

Unit 4: OPAMP as signal Conditioner (8 L)

Opamp as adder, substractor, Op amp as current to voltage and voltage to current convertor, Op amp as comparator, Problems based on above Op Amp applications.

Reference Books:

1. Sensors and Transducers : D. Patranabis, PHI publication, 2nd Edition
2. Sensors and Transducers : Prof A.D.Shaligram
3. Op Amp and Linear Integrated Circuits: Ramakant Gaykwad

SEMESTER II

PAPER II

22-ELC-122 : Basics of Computer Organisation
(2 Credits, 36 lectures)

Objectives:

1. To get familiar with digital sequential circuits
2. To study Basic computer Organization
3. To study Memory architecture

Course outcomes:
After completion of this course student will be able

1. To understand the working of different Sequential logic circuits
2.To understand working operations of different types of Flip flops as a basic building block.
3. To know the operations of shift registers and Binary Counters
4. To understand the basic Computer System and general organization of different blocks.
5. To understand the organization of memory in the Computer system and know different types of Memories.

Unit 1: Flip-flops ***(6 L)***

Introduction to sequential circuits with block diagram and need of Flip-flop, RS Latch using NAND gate, concept of clocked (triggered) flip flop, clocked RS Flip Flop, D Flip Flop, J K Flip Flop, T Flip Flop

Unit 2: Shift registers and Counters ***(8L)***

Shift registers - SISO, SIPO, PISO, PIPO shift registers, Ring Counter using D Flip flop, Counters - Synchronous and Asynchronous type, 3-bit Up, Down and Up –Down counter, Concept of modulus Counters-Use of IC 7490 as Mod-2,Mod-5 and Mod-10 counter (Timing Diagram of all above are expected)

Unit 3: Basics of Computer System (12 L)

Basic Computer Organization, Concept of Address Bus, Data Bus, Control Bus.
CPU organization: Block Diagram of CPU and Explanation of each block, Block diagram of Arithmetic and Logic unit [ALU], Register based CPU organization and sequence of micro operations for arithmetic or logical instruction execution, Concept of Stack & its organization, I/O organization: Basic I/O devices, need of I/O interface, and block diagram of general I/O interface

Unit 4: Memory Organization **(**10 L)

Memory hierarchy, Types of Memories, Block diagram representation of RAM and ROM memory and Data Read/ Write process, Vertical and Horizontal Memory Expansion, Role of Cache memory, Virtual Memory.

Reference Books:

1. Digital Fundamentals: Floyd T.M., Jain R.P., Pearson Education
2. Digital Electronics: Jain R.P., Tata McGraw Hill
3. Digital Logic and Computer Design : M. Morris Mano, Pearson Education
4. Computer Organization and Architecture, William Stallings, Pearson, 10th Edi.

SEMESTER II

Paper III

22-ELC-123[P]: Electronics Lab IB

The practical course consists of **10 experiments** out of which **one will be activity equivalent to 2 practical** sessions. Activity will carry 15% marks at internal and external semester examination. Activity can be any one of the following:

1. Hobby projects
2. Industrial visit / live work experience
3. Circuit Simulations using Circuit-mod**.**

Course outcomes:

After completion of this course student will be able

CO1. To experience activity based learning through hobby projects ,Market survey Industrial visits. *Or*

CO 2. To learn the project development process through Circuit Simulation and other tools.

CO 3. To understand the working operations of various sensors.

CO 4. To know the use of Operational Amplifier.

CO 5. To understand the operation of different Sequential Circuits.

CO 6. To know the functional operation of memories.

GROUP A

1. To study temperature sensor LM 35
2. Use of LDR to control light intensity
3. Use of OPAMP as comparator and its use in DC motor driving.
4. Build and test adder and subtractor circuits using OPAMP.

GROUP B

1. Study of RS, JK and D flip flops using NAND gates/ICS
2. Study of decade counter IC 7490 circuit configurations
3. Study of read and write action of RAM (using IC 2112/4 or equivalent).
4. Study of Diode Matrix ROM