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

Three Year B.Sc. Degree Program in Electronic Science

(Faculty of Science & Technology)

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

Choice Based Credit System (CBCS) Syllabus of an autonomous college

To be implemented from Academic Year 2022-2023

Title of the Course: B. Sc (Electronic Science)

Preamble:

Electronics technology has revolutionized various fields including communication, consumer appliances, medical, defense and so on. The advances in technology are making systems smaller, smarter and powerful. Electronics is an important branch of Science devoted to design implementation and analysis of circuits and systems. Knowledge of Electronics is based on fundamental laws of Physics and though new chips/SOC's are fabricated every day, basic principles remain the same.

The goal of the three-year course is to instill in students a confidence that they can get a grip of the subject and apply it for designing, testing and analyzing systems. The course will also make use of problem-solving approach wherein the students will be trained to apply the acquired knowledge to design and analyze circuits for specific applications. The students will be familiarized with programming languages, various development tools, modeling and simulation tools through lab sessions.

The syllabus has been designed such that basic fundamental concepts, knowledge and specific practical skills of the students are developed. The students will be first introduced to various components, devices and their applications, Network theorems and applications of electronics in day to day life. Digital Electronics fundamentals, Operational amplifier circuits, and its applications will be covered in the second semester. In the Second year the students will be taught the basic principles of communication, Analog and digital circuit design and Microcontrollers. In the third year the students will be given an insight to concepts of Embedded System Design, VLSI Technology, Communication systems and various discipline specific courses with a Project in the final semester.

Titles of Papers and Scheme of Study Evaluation

F. Y. B. Sc. Electronic Science

Sem	Paper Code	Paper	Paper title	Credits	Lectures/Week			Evaluation		
					Th	Tut	Pr.	CA	UE	Total
I	22-EL-111	I	Basics of Applied Electronics	2	3			15	35	50
	22-EL-112	II	Electronic Devices and Circuits	2	3			15	35	50
	22-EL-113[P]	III	Electronics Lab IA	1.5			3.15	15	35	50
II	22-EL-121	I	Fundamentals of Digital Electronics	2	3			15	35	50
	22-EL-122	II	Analog and Digital device Applications	2	3			15	35	50
	22-EL-123[P]	III	Electronics Lab IB	1.5			3.15	15	35	50

Semester I

Paper I: 22-EL- 111: Basics of Applied Electronics (2 Credits, 36 lectures)

Semester 1 **Theory Lectures: 36**

Objective

1. *To understand importance of Electronics in day today life*
2. *To understand basics of electronic circuits*
3. *To make the students learn through problem solving*
4. *To understand few electronic systems*

Course Outcomes:

C01 :To identify different parameters/functions/specifications of components used inelectronic circuits
CO2: To solve problems based on network theorems.
CO3: To learn about basic building blocks for various advanced systems.

Unit 1: Fundamentals of Electronics (14 L)

Introduction to Electronics, applications of Electronics

Electronic Components: Resistors, Capacitors, Inductors, Relays, Batteries, Switches, cables and connectors, fuses (Only basic concept, working, Specifications and application is expected) Series and parallel combination of resistors, capacitors and inductors

Voltage and Current Sources: Input and output impedance of AC and DC voltage and/or current sources Variable and constant voltage and current sources

Unit 2: Network Theorems (10L)

Kirchoff's Voltage Law and Kirchoff's Current Law, Thevenin, Norton , superposition andmaximum power transfer theorems

DC and AC analysis of network, Numerical problems based on these network theorems

Unit 3: Introduction to electronic systems (12 L)

Building blocks, working principle and features of Smart Phone System, Security systems: Surveillance Camera System CCTV, Public Address System and thermostat

[12]

TEXT BOOKS AND REFERENCE BOOKS:

1. Electronic Principles by Malvino
2. Consumer Electronics by J. S. Chitode Technical Publications, Jan-2007
3. Mobile Cellular Telecommunications Analog and Digital System-By Lee.
4. ***Fundamentals of Wireless communication: David Tse,Pramod Viswanath***

Paper II: 22-EL- 112: Electronic Devices and Circuits (2 Credits, 36 lectures)

Semester 1 **Theory lectures:36**

Objectives:

1. *To know about basics of Semiconductor Devices and its parameters*
2. *To know about the details of diode, transistors, FET and MOSFETS*
3. *To build and understand application circuits of electronic devices.*
4. *To encourage the students for making use of simulation software for testing the circuits before experimentation.*

Course outcomes:

CO1:To analyze performance parameters based on study of characteristics of electronicdevices like diode, transistors etc

CO2:To learn selection of proper electronic devices as per the need of application

CO3:To build and test the circuits for various applications.[like street light controller using electronic device]

Unit 1: PN Junction Diodes (14L)

Junction Diode, Construction, working and V-I characteristics, Depletion region, Barrier Potential, Forward and Reverse bias condition – Junction capacitance.

Diode current equation–Effect of temperature on reverse saturation current

Types of diodes: rectifier diodes, Zener diode

Applications: Voltage regulator using Zener diode, Rectifiers: Half wave, full wave and bridge rectifiers ripple factor, Use of diode in mobile charger and power supply (includes transformer, diodes, C- filter, regulator IC(78XX or78XXseries))

Unit 2: BJT, FET and MOSFET Basics and Applications(12L)

BJT: Symbol, terminals, types, basic operation, configurations andcharacteristics (Showing different regions)

Applications: Transistor as switch, Transistor as amplifier Transistor as impedance matching network

FET: Terminals, Symbol, Basic operation and FET as Voltage Variable Resistance

MOSFET: Terminals, Symbol, Basic operation, characteristics and MOSFET as switch

Unit 3: Photo Electric Devices:(10L)

Light-Emitting Diodes (LEDs): Symbol and its use in circuit, IR transmitter and receiver applications ,Photo diode circuit , Photo transistors, LDR and its use in street light controller and Opto-Isolators (MCT2E) and its use in isolation,

TEXT BOOKS:

1. *Electronic Devices and* Circuit Theory --- Robert L. Boylestad & Louis Nashelsky.
2. Electronic Devices and Circuits I – T.L.Floyd- PHI Fifth Edition

REFERENCE BOOKS:

1. Integrated Electronics –Millmam & Halkias.
2. Electronic Devices & Circuits – Bogart.
3. Sedha R.S., A Text Book Of Applied Electronics, S.Chand & Company Ltd

Semester I

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

Number of Practicals:10

Objectives:

1. *To teach students how to draw different symbols and circuit diagrams*
2. *To develop skill of circuit connections*
3. *To familiarize the student with different components and devices used in the laboratory and the device manuals*
4. *To familiarize students with laboratory instruments like Ammeter, voltmeter, DMM, Signal Generator, Function Generator, CRO and tools like cutter, stripper etc.*
5. *To train them to design and analyze the circuits for specific purpose*
6. *To teach the students how to analyze the results and calculate performance parameters*
7. *To motivate them to work on different mini projects*

Course outcomes:

CO1:To identify different components and devices as well as their types and understand basic technical parameters.
CO2:To know operation of different instruments used in the laboratory
CO3:To connect circuit and do required performance analysis

List :

1. Assignment type experiment: finding values of Electronic components like resistors from color code, capacitors, inductors and their types, know the components like cables, fuses, wires and tools like stripper, cutter, soldering gun etc
2. Know your laboratory instruments: Signal Generators and CRO,DMM
3. To verify Kirchhoff's Voltage and current laws
4. To verify Thevenin's Theorem
5. .To verify Maximum Power Transfer Theorem

6. To study application circuit of LED
7. To study forward and reverse characteristics of Diode
8. To study diode rectifier circuits
9. To design Zener voltage regulator
10. To design Transistor as a switch(LEDON/OFF)
11. How it works: GSM, GPS and Bluetooth(Assignment experiment)
12. Simulation experiment using pSpice (any of the above experiment)

Semester II

Paper I: 22-EL-121: Fundamentals of Digital Electronics (2 Credits, 36 lectures)

Semester II **Theory lectures: 36**

Objectives:

1. *To know about different number systems and codes*
2. *To understand logic gates and truth tables*
3. *To understand combinational logical circuits*
4. *To understand sequential logical circuits*
5. *To encourage the students for making use of simulation software for testing and building the circuits before experimentation.*

Course outcomes:

CO1:To solve problems based on inter conversion of number systems
CO2:To minimization techniques of Boolean expressions
CO3:To understand types , operation of flip flops.
CO5:To familiarize with various applications of flip flops

Unit 1 : Basics of Digital Electronics(16L)

Number Systems: Decimal, Binary, Hexadecimal, BCD, Gray code and their inter-conversions, ASCII, Complements (1's, 2's), Rules of binary Addition, Subtraction.

Logic gates: positive and negative logic, AND, OR, NOT, EX-OR, NAND, NOR, EX-NOR and truth tables, NAND and NOR universal gates

Boolean Algebra and Theorems: Boolean Theorems, De-Morgan's laws. Digital logic gates, Multi level NAND & NOR gates. Standard representation of logic functions (SOP and POS), Minimization Techniques (Karnaugh Map Method: 3 variables),don't care condition.

Basic concept of Arithmetic and logical unit (ALU)

Unit-2 Combinational Logic Circuits (10 L)

Adders-Half & full adder, Subtractor-Half and full subtractors, Parallel binary adder, Magnitude Comparator, Digital lock using magnitude comparator Multiplexers (2:1,4:1)) and Demultiplexers (1:2,4:1), Encoder (8-line-to-3-line) and Decoder (3-line-to-8-line). Parity generator and checker

Unit 3: Sequential Logic Circuits (10 L)

Flip Flops and truth tables: S-R FF , J-K FF, T and D type FFs, Master-Slave FFs, Flip flop as memory device

Shift Registers and their types, serial to parallel and parallel to serial converters using shift registers Counters : Asynchronous-Mod16, Mod-10, Mod-8, up down counter,

Synchronous-Ring counter, Event counter

TEXT BOOKS:

1. M.Morris Mano, "Digital Design " 3rdEdition, PHI,New Delhi.
2. Ronald J. Tocci. "Digital Systems-Principles and Applications" 6/e. PHI. New Delhi. 1999.(UNITS I to IV)
3. G.K.Kharate :Digital electronics-Oxford University Press
4. S.Salivahana &S. Arivazhagan-Digital circuits and design
5. Fundamentals of Digital Circuits byAnandKumar

Reference Books :

1. Herbert Taub and Donald Schilling. "Digital Integrated Electronics" . McGrawHill.1985.
2. Malvino and Leach. " Digital Principles and Applications". TMGHill Edition.

Semester II

Paper II: 22-EL-122: Analog and Digital Device applications (2 Credits, 36 lectures)

Total lectures: 36

Objectives:

1. *To know basics of operational amplifier*
2. *To compare performance parameters of opamp ICs available in market*
3. *To understand basic application circuits of opamp.*
4. *To basics of timer IC 555 and its applications*
5. *To understand data converters and their performance parameters*

Course outcomes:

CO1:To study basic opamps block diagram and it's specifications or performance parameters
CO2:To understand opamp circuits and its usefulness in different applications
CO3:To know operating principle of IC 555 in different configurations
CO4:To understand different types of data converters and their performance parameters

Unit 1 : Operational Amplifiers(10 L)

Definition, Basic op-amp Ideal op-amp, Block diagram of op-amp, ideal and practical characteristics of inverting, non inverting configuration, virtual ground

Introduction of OPAMP ICs(comparative study)

Unit 2: Applications of Opamp and IC 555 (14 L)

Wave shaping circuits using integrator and differentiator, ON-OFF controller using comparator or Schmitt trigger, Function generator, Audio amplifier, V to I converter, PWM generation

IC-555 –functional block diagram , formula of output frequency, duty cycle, pin diagram, astable, monostable and bistable operation

Application circuits: Moisture detector circuit, PWM generation, FSK generator, 50% duty cycle circuit using diode

Unit 3: Data Converters (12 L)

D/A converter: R-2R Ladder network, Binary Weighted DAC

A/D converter:-Counter type ADC, Successive Approximation ADC

Basic operation and block diagram: Digital thermometer

TEXT BOOKS:

1. G.K.Kharate-Digital electronics-oxford university press
2. M.Morris Mano, " Digital Design " 3rdEdition, PHI, New Delhi.
3. Op Amp and Linear Integrated Circuits By Ramakant Gaykwad
4. Linear Integrated Circuits By Roy Choudary

REFERENCE BOOKS :

1. Jacob Millan,MicroElectronics,McGrawHill.
2. Mithal G K, Electronic Devices and Circuits, ThanaPublishers.
3. Allan Mottershead ,Electronic Devices and Circuits – An Introduction-PrenticeHall

Semester II

22EL- 123[P]: ELECTRONICS LAB IB (1.5 Credits)

Number of Practicals:10

Objectives:

1. *To build opamp configurations and study its performance*
2. *To build application circuits of opamp and study its performance*
3. *To build application circuits of IC555*
4. *To understand types of ADC and DAC and its performance parameters like accuracy, resolution etc*
5. *To teach the students how to analyze the results and calculate performance parameters*
6. *To understand features of laboratory instruments like Ammeter, voltmeter, DMM, Signal Generator, Function Generator, CRO*

Course outcomes:

CO1:To connect opamp circuits and analyze the output
CO2:To build application circuits of opamp
CO3:To design the output frequency of IC 555 as astable/monostable multivibrator
CO4:To compare simulated and actual results of given circuit

Section A: List of Experiments (Any 05)

1. Op-Amp as inverting and non-inverting
2. Op-Amp as integrator and differentiator
3. Op-Amp as adder &subtractor
4. Op-Amp as voltage to current converter
5. Op-Amp as sine wave generator (Wien bridge oscillator)
6. Op-Amp as function generator
7. Astable multivibrator determination of frequency(usingIC-555)
8. Schmitt trigger usingIC-555timer
9. Smoke detector circuit
10. Simulation experiment using pSpice (any of the above experiment)

Section B: List of Experiments(Any 05)

1. Study of logic families (assignment type practical)
2. Verification of IC-logic gates
3. Realization of basic gates using discrete components (resistor, diodes & transistor)
4. Realization of basic gates using Universal gates (NAND & NOR gates)
5. Verify Half adder and full adder using gates
6. Verify Half subtractor and full subtractor using gates.
7. Verify the truth table of RS , JK, T-F/F using NAND gates
8. 4-bit binary parallel adder and subtractor using IC7483
9. BCD to Seven Segment Decoder using IC-7447/7448
10. Simulation experiment using pSpice (any of the above experiment)