F.Y.B.Sc.General (Electronics) revised syllabus for implementation of Revised NEP 2020 structure for autonomous college

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

F.Y.B.Sc.General (Electronics)

Revised Syllabus to be implemented from Academic Year 2024-2025

as per guidelins of

New NEP structure on 28th March 2024

National Education Policy -2020 (NEP -2020)

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

Titles of Papers and Scheme of Evaluation

F. Y. B. Sc. Electronic Science

Type of the Course	Course Code	Course Title	Credits		Evaluation		
Semester -I							
			TH	PR	CIE	ESE	Total
Electronic Sc as a Major 2							
Major (Discipline Specific Courses)	24-EL-11101	Basics of Electronic devices and Systems	2	-	20	30	50
	24-EL-11102	Laboratory course on Basic Electronic devices	-	1	20	30	50
Open Elective for other faculty (OE)	24-EL-11303	Basic Applications in Electronics	2	-	20	30	50
Skill Enhancement Courses (SEC)	24-EL-11404	Computer Hardware and Networking	-	2	20	30	50
Semester -II							
Electronic Sc as a Major 2							
Mandatory (Discipline Specific Courses)	24-EL-12101	Fundamentals of Digital Electronics	2	-	20	30	50
	24-EL-12102	Practical on Digital Electronics	-	1	20	30	50
Open Elective for other faculty	24-EL-12303	Computer Hardware	2	-			
Skill Enhancement Courses (SEC)	24-EL-12404	Data Analytics using MATLAB	-	2	20	30	50
Semester -III							
Open Elective for other faculty	24-EL-23301	Renewable Energy Sources and Systems	2				

TH: Theory   **PR**: Practical

CIE: Continuous Internal Evaluation   **ESE**: External Semester Examination

Course Title: Basics of Electronic devices and Systems
Course Code:24-EL-11101

Teaching Scheme: 2 Hours / Week

No. of Credits: 2Cr (Theory)

Examination Scheme :- CIE: 20 Marks , ESE: 30 Marks

➢ **Course outcomes:**

CO1: To analyse performance parameters based on study of characteristics of electronic devices like diode, transistors etc.

CO2. To choose proper electronic devices as per the need of application.

CO3. To perform simulations for designing and analysing diode/transistor circuits.

CO4. To build and test the circuits like street light controller using electronic devices

Course Contents

Unit 1: PN Junction Diodes   **(14L)**

Semiconductor Materials and use for Electronic devices:
Properties of Pure semiconductor materials, Doping , P-type ,N-Type semiconductor
Junction Diode, Construction, working and V-I characteristics, Depletion region, Barrier Potential, Forward and Reverse bias condition – Junction capacitance.
Applications: Voltage regulator using Zener diode, Rectifiers: Half wave, full wave and bridge rectifiers [Parameters like ripple factor, Efficiency]
Photo Devices: Light-Emitting Diodes (LEDs) , Photo diode , Photo transistors, LDR , Solar Cell: Symbol Characteristics & Applications ,

Unit 2: BJT, FET and MOSFET Basics and Applications   **(10L)**

BJT: Symbol, types, basic operation, configurations and characteristics (Showing different regions)
Applications: Transistor as switch, Transistor as amplifier Transistor as impedance matching network
FET: Symbol, Basic operation and FET as Voltage Variable Resistance
MOSFET: Symbol, Basic operation, characteristics and MOSFET as switch

Unit 3: Introduction to Organic devices   **(06L)**

Introduction to organic semiconductors & Flexible Electronics , Advantages and disadvantages

Organic OLED (Organic LED), OFET(Organic FET), Organic Solar Cell, electrochemical Transistors

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. Electronic Structure of Organic Semiconductors : Luís Alcácer ,Morgan & Claypool Publishers (institution needs to have access to this IOP ebook content.)

4. Physics of Organic Semiconductors :Prof. Dr. Wolfgang Brütting, https://onlinelibrary.wiley.com/

****

Course Title: Laboratory course on Basic Electronic devices
Course Code:24- EL-11102
Teaching Scheme:4 Hours / week

No. of Credits: 2Cr (Practical)

Examination Scheme: **CIE:** 20 Marks   ,   **ES**E: 30 Marks

➢ **Course outcomes**

CO1: To build experimental setup for the study of Characteristics of basic electronic devices.

CO2: To verify working of basic electronic devices

CO2: To make students aware about integrated circuits (IC) and their use.

➢ Laboratory Requirements :

Experiment board, Testing and Measuring instruments: Digital Mustimeters, CRO, Function generator

One computer per student with Simulation software

Course Contents

List of Experiments :

1. Identification of Electronic Components and introduction to Digital Multimeter
2. Build the experiment setup and Study IV characteristics of PN junction diode.
3. Build the experiment setup and Study Reverse characteristics of Zener Diode.
4. Verify the diode equation for effect of temperature.
5. Study Transistor Characteristics.
6. Study photo transistor/ Study Solar cell characteristics.
7. To study operation of Rectifier circuits.
8. To study the voltage regulation using IC 78XX/79XX
9. To study use of LDR for light control using transistor as a switch.
10. To verify operation of transistor amplifier using simulation software.

****

Open/General Elective Course

Course Title: Basic Applications in Electronics

Course Type: Open Elective   Course Code: 24-EL-11303

Teaching Scheme:2 Hours / week

No. of Credits: 2Cr (Theory)

Examination Scheme: **CIE:** 20 Marks   ,   **ES**E: 30 Marks

➢ **Course Outcomes:**

CO1: To learn the basics of electricity and electronic component.

CO2: To familiarize with measuring instruments of Electronics for basic household

applications.

CO3: To learn how to prototype circuits with a breadboard

CO4: To design and Develop simple project ideas.

Course Content:

Unit 1: Basics of Electronics
Introduction: Representation of Analog and Digital signals . Electrical Parameters :Current,
Voltage, Power , Advantages of Digital Systems
 Study of active & passive components of Electricity- Resistors, Capacitors, Diodes,
 Study of Logic gates.

Unit 2: Basic technical skills in Electronics:
Test various component & parameters. Develop skills soldering & desoldering techniques of
electronic component. Introduction to basic sensors & actuators: role in instrumentation system

Unit 3: Development of Electronic products
Basic consumer items: LED decoration items/solar cell based devices,

Reference Books:

1. Electronic Materials and Components – D.G.Joshi,P.C.Rao ,D.V.Sutrave
2. LED Lighting – Sal Cangeleso
****

Skill Enhancement Course

Course Title: Computer Hardware and Networking

Course Type: Skill Enhancement Course   Course Code: 24-EL-11404

Teaching Scheme: 4 Hours / week

No. of Credits: 2Cr (Practical)

Examination Scheme: **CIE:** 20 Marks   ,   **ES**E: 30 Marks

Course Outcome: Students will learn

1. To Identify the basic hardware components of a computer.
2. To Build a basic computer.
3. To build network of computers

course content

1. Introduction to use of computer for general purpose.
2. Cables and connectors used for interconnection.
3. Types of Keyboards, Mouse and connector .
4. Various Ports and their use
5. Study of SMPS.
7. Study of Motherboard (Identification of CPU, Memory: ROM BIOS,ROM & RAM array,CMOS RAM & RTC, CMOS battery, Clock generator .
8. Study the interface between central of the computer and peripherals .
9. Use of Expansion slots & Buses to enhance system performance.
10. Introduction to networking devices.
11. Study of computer Networks using Simulation software

Reference Books:
1. PC Hardware beginner's Guide: Ron Gilster
2. Computer Hardware : Installation ,Interfacing, Troubleshooting, Maintenance computers :K.L.James,PHI publication
3. Troubleshooting, Maintaining and Repairing of PCs : by Biglow,,TATA MC Grow Hll
4. Computer System Architecture by Morrias Mano
5. Upgrading and repairing PCs by Scott Muller
   6. The architecture of Computer Hardware, System Software and Networking : R.V.Engalnder,Wiley
   ****

Course Title: **Fundamentals of Digital Electronics**
Course Code:24- EL- 12101
Teaching Scheme:2 Hours / week

No. of Credits: 2Cr Theory

Examination Scheme: **CIE:** 20 Marks   ,   **ES**E: 30 Marks

> **Course outcomes:**

CO1: To learn Problems solving based on number systems.

CO2: To learn minimization techniques of Boolean expressions and draw logic circuits.

CO3: To know the operation of combinational and sequential logic circuits.

Course Contents

Unit 1 : Basics of Digital Electronics   **(12L)**
Number Systems: Decimal, Binary, Hexadecimal, BCD, Gray code and their inter- conversions, ASCII, Complements (1's, 2's), Rules of binary Addition, Subtraction. Signed and Unsigned numbers, 1's and 2's complement of binary numbers, Binary arithmetic (Addition, subtraction and subtraction using1's complement and 2's complement)

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.

Logic Functions and logic circuits, Minimization techniques using Boolean Algebra

Unit-2 Combinational Logic Circuits   **(10 L)**

Adders-Half & full adder, Subtractor-Half and full subtractors, Parallel binary adder, Magnitude Comparator, Multiplexers (2:1,4:1)) and DE multiplexers (1:2,4:1), Encoder (8-line-to-3-line) and Decoder (3-line-to-8-line).

Data converters: Need, Parameters, R-2R DAC , Flash ADC

Unit 3: Sequential Circuits   **(08 L)**

Flip-Flop: Type of clocked Flip Flop, Block Diagram representation, truth table,: S-R FF , J-K FF, T and D type FFs, Master-Slave FFs,

Excitation Table for JK and T FF

Flip flop as memory device & Frequency divider,

Shift Registers and their types, serial to parallel and parallel to serial converters using shift registers

Counters : Definition, Concept of Modulus,Asynchronous-4-Bit, up down counter, Synchronous-Ring 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.

****

<h1 style="text-align:center">Course Title: Practical on Digital Electronics</h1>

<p style="text-align:center">Course Code: 24-EL-12102</p>

<p style="text-align:center">**Teaching Scheme:4 Hours / week**</p>

<p style="text-align:center">**No. of Credits: 2Cr (P)**</p>

<p style="text-align:center">Examination Scheme: **CIE:** 20 Marks   ,   **ES**E: 30 Marks</p>

➢ **Course outcomes**

CO1: To build experimental setup for study of logic circuits.

CO2: To verify working of fundamental logic/digital circuits .

CO2: To make students aware about integrated circuits (IC) and their use.

Laboratory Requirements: Experiment Boards, IC Mannual ,

<p style="text-align:center">Course Content</p>

List of Experiments :

1. Study of Logic gates

2. Study of Half adder/Full adder

3. Study of 4 bit Adder/subtractor

4. Study of Multiplexer / De-multiplexer

5. Study of Flip-flop

6. Study of 3 bit Counter/ Decade Counter

7. Study of Encoder/Decoder

8. Study of Code converter: 4 bit R-2R DAC

9. Virtual Lab Practical- 4 bit Up/Down Counter

10. Virtual Lab Practical- 4 Shift Register

11.   Seat belt Warning System using basic AND and NOT gate :IIT Bombay

   https://da-iitb.vlabs.ac.in/exp/seat-belt-warning-system/procedure.html

****

<p align="center">**Open/General Elective Course**</p>

<p align="center">**Course Title: <u>Computer Hardware</u>**</p>

Course Type: Open /General Elective   Course Code: 24-EL-12303

<p align="center">**Teaching Scheme:2 Hours / week**</p>

<p align="center">**No. of Credits: 2Cr (Theory)**</p>

<p align="center">Examination Scheme: **CIE:** 20 Marks   ,   **ES**E: 30 Marks</p>

> **<u>Course Outcome:</u>** Students will learn

4. To Identify the basic hardware components of a computer.
5. To Explain how software creates a functional and productive computer.
6. To Build a basic computer.
7. To build network of computers

<p align="center">**course content**</p>

Unit 1 : <u>Introduction to computer system</u>:   **[12L]**

Block Diagram of Computer system with Role of Each Subsystem, Types of General purpose computer systems, ,
Study of Motherboard : CPU, Memory: (Role and Selection parameters)
 Types of Memory and Selection parameters: ROM BIOS, ROM & RAM array, CMOS RAM
Other circuits on Motherboard and their use: RTC, CMOS battery, Clock generator

Unit 2 : <u>Input output peripheral system</u>   [10L]

 Need of I/O system , Types of Keyboards & Mouse : Wired and Wireless
 Types of displays [Monitor], Various Ports and their use
 Cables and connectors used for interconnecting the I/O system to the Central of computer system.
 Concept of Power Supply , Need of SMPS.

 <u>Unit:3.: Introduction to networking devices</u>   [08L]

 Devices and connectors used for Networking of computers

Reference Books:

1. PC Hardware beginner's Guide: Ron Gilster
2. Computer Hardware : Installation ,Interfacing, Troubleshooting, Maintenance computers :K.L.James,PHI publication
3. Troubleshooting, Maintaining and Repairing of PCs : by Biglow,,TATA MC Grow Hll
4. Upgrading and repairing PCs by Scott Muller
5.   The architecture of Computer Hardware, System Software and Networking : R.V.Engalnder,Wiley

Skill Enhancement Course

Course Title: Data Analytics Using MATLAB

Course Type: Skill Enhancement Course   Course Code: 24-EL-12404

Teaching Scheme:4 Hours / week

No. of Credits: 2Cr (Practical)

Examination Scheme: **CIE:** 20 Marks   ,   **ES**E: 30 Marks

> **Course Outcomes:** Students will learn
>   1. To develop the programming skills.
>   2. To get good employment in IT field
>   3. about financial model development, its simulation, prediction, data analysis and GUI.

Course Content

1. **Introduction**   **(2 hrs)**

    1.1 Introduction of MATLAB

    1.2 Installation of MATLAB

2. **Basic MATLAB Concepts**   **(5 hrs)**
    Basic MATLAB Commands

3. **Variable Manipulation**   **(5 hrs)**

    3.1 Variables in MATLAB
    3.2 Vectors and matrices in MATLAB
    3.3 Useful functions and operations in MATLAB

4. **Graphs and plots**   **(5 hrs)**

    Plotting graphs with MATLAB
    Accessing, exploring, and analyzing data stored in files, statistical functions.

5. **Modeling and simulation**   **(8 hrs)**

    Develop and Deploy financial model in MATLAB

6. **Graphical User Interface**   **(5 hrs)**

    Designing and Implementation of GUI.

Reference Books :

1. MATLAB, A Practical Introduction to Programming and Problem Solving
    By Stormy Attaway Ph.D. Boston
2. INTRODUCTION TO MATLAB FOR ENGINEERING STUDENTS
    By David Houcque
    ****

Course Title: Renewable Energy and Systems

Course Type: Open /General Electives   Course Code: 24-EL-23301

Teaching Scheme: 2 Hours / Week
No. of Credits: 2Cr (T)
Examination Scheme :- CIE: 20 Marks   , ESE: 30 Marks

➤ **Course Objective**

1. To create awareness of renewable energy, sustainability and economic concern

2. To create awareness of equipment used for solar and wind energy conversion.

3. To promote use of renewable energy systems in daily need.

Course Content

Unit 1: Basics of Solar and Wind Energy: **[12 L]**

 Concept and need of use of renewable energy sources

 Solar Energy: Sun as a source of energy, Various methods of using Solar Energy: Photothermal, Photovoltaic ,Photosynthesis,

 Present scenario of solar energy generation and use in India

 Wind Energy: Basic concept and components of wind energy conversion, Types and applications of wind machines,

 Hybrid systems for solar and Wind energy conversion.

Other sources of renewable energy

Unit2: Solar Energy devices   **[10 L]**

Types, use and selection of devices: Solar air heating and cooling systems ,Thermal pads, Solar Water heater, Solar Cookers, Solar Dryers,   Solar photovoltaic System , Solar energy Motor Pumps ,Simple devices like solar lamps, street lights

Unit 3:Awareness on use of solar energy   **[08L]**

Case study: Site analysis, Calculation of need of energy on site, selection of solar energy system,
What is energy audit, career opportunities, Government schemes.

Reference Books:

1. Handbook of Solar Energy : G. N. Tiwari
2. Wind Energy Explaned: J.F.Manwell
3. Handbook of Renewable Energy Technology : Ramesh Bansal
4.   Solar panel installation guide and user manual:

****