Punyashlok Ahilyadevi Holkar Solapur University, Solapur

NAAC Accredited-2022
'B^{++}'Grade (CGPA 2.96)

Name of the Faculty: Science &Technology

(As per New Education Policy 2020)

Syllabus: Electronics

Name of the Course: B. Sc. I (Sem. I &II)

(Syllabus to be implemented from June 2024)

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Faculty of Science and Technology

Syllabus for **B.Sc. I Electronics**

NEP2020

To be implemented from **Academic Year June 2024**

1. **Preamble:**

B.Sc. I syllabus is designed to provide an insight into basic and fundamentalsof electronic devices and circuits, both analog and digital.Hands-on on these circuits and devices is inculcated in this syllabus. In the theory course of 200 marks adequate knowledge of analog and digital circuittheory will be acquired by the students. Students taking admission at First Year B. Sc. Electronics has to complete four theory papers,two at each semester and a practical course (Annual). In the practical course of 100 marks there are compulsory experiments for Practical I, which include understanding and practical study of analog and digital circuits and devices. The details are mentioned in the syllabus.

2. **Objectives of the Course:**

The aim of this course is to generate trained manpower with adequate theoretical and practical knowledge of the various facets of fundamentals of electronics. Due care is taken to inculcate conceptual understanding in basic principles, semiconductor devices&circuits, and development of appropriate practical skills suitable for advanced study in electronics.The objectives of this course are as below.

- To encourage students to develop approach towards upcoming electronic technologies.
- To equip students with adequate fundamental concepts and knowledge base.
- To develop specific practical skills.
- To impart training on electronic devicetesting and analysis.
- To prepare students for demonstrating the acquired knowledge.

3. **Course Outcome:**After the completion ofB.Sc.-I Electronics
    - Students will get basic understanding of the subject.
    - Students will get expose to electronics technologies.
    - Students will get hands-on on various circuits and instruments.
4. **Eligibility Criteria:** 12^{th} Science or equivalent.

5. Course Structure:

Structure as per NEP-2020

Level/ Difficulty	Sem.	Faculty			Generic/ Open Elective GE/ OE	Vocational and Skill Enhancement Courses (SEC/VSC)	Ability Enhancement Course (AEC), IKS, VEC	Field Project/ RP/CC/Internship/ Apprenticeship/ Community Engagement & Services	Credits	Cumulative Credits
		Major		Minor						
		DSC	DSE							
4.5 100-200	I	DSC1-1 (2+2)#				SEC1 (2)	L1-1(2) IKS (2) VEC1(2) (Constitution of India)	CC1 (2)	22	**44** **UG** **Certificate** **(44)**
		DSC2-1 (2+2)#								
		DSC3-1 (2+2)#								
	II	DSC1-2 (2+2)#			GE1/ OE1(2)	SEC 2 (2)	L1-2(2) VEC2(2) (Environmental Studies)	CC2 (2)	22	
		DSC2-2 (2+2)#								
		DSC3-2 (2+2)#								

Exit option: Award of UG Certificate in Major with 44 credits and an additional 4 credits core NSQF course/ Internship OR Continue with Major and Minor

#Out of the three major courses in the first year, one major (comprising 4 credits for the 1st semester and 4 credits for the 2nd semester) will transition intoa minor starting from the second year. Consequently, 8 credits will be reallocated from the major course credit count and added to the minor credit count, thereby meeting the requisite credit criteria for the minor as stipulated in the guidelines.

SEM -I				
S.No.	**Course Type**	**Course Code**	**Paper Title**	**Credit**
1	Major	DSC 1-1	Digital Fundamentals	2
2	Skill Enhancement Courses	SEC 1	Electronics Circuit Simulation With Proteus	2
3	Indian Knowledge System	IKS	General IKS	2
4	Practicals Based on DSC 1-1	Practical Lab 1	Practical Lab 1	2
SEM -II				
S.No.	**Course Type**	**Course Code**	**Paper Title**	**Credit**
1	Major	DSC 1-2	Basic Circuit Theory and Network Analysis	2
2	Skill Enhancement Courses	SEC 2	Introduction to Arduino Programming	2
3	Generic / Open Elective	GE 1 / OE 1	Basic Electronic Consumer Applications	2
4	Practicals Based on DSC 1-2	Practical Lab 2	Practical Lab 2	2

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

B.Sc.-I (Electronics) Semester- I

Major Paper – I (DSC 1-1)

Title of Paper: -Digital Fundamentals

Total Marks: 30 **Credits: 02 (30 Periods)**

Unit 1. Number Systems, Binary Codes and Logic Gates (15)

Binary, Octal, Decimal, Hexadecimal number systems and their inter-conversions, 1's compliment, 2's compliment, Arithmetic operations, Signed binary numbers

8421 code, Excess-3 code, Gray code, ASCII code, Parity bit

Logic Gates: OR, AND, NOT, NAND, NOR, Ex-OR,, Positive and Negative logic, De Morgan's Theorems, Universality of NAND and NOR gates, Study of ICs 7400, 7402, 7404, 7408, 7432, 7486

Unit 2. Boolean algebra and Arithmetic Circuits (15)

Rules and laws of Boolean algebra, Simplification of Boolean expression using Boolean algebra, Karnaugh maps: K- maps for two, three and four variables, Use of K-map for reduction of Boolean expressions, Design the Half adder, Full adder circuits using K map.

Half and Full subtractor circuits, Exclusive OR gate as a Controlled inverter, Binary to Gray and Gray to Binary converter, Parity checker, 4-bit Binary Adder cum Subtractor

Recommended Books:

1. Digital Fundamentals by Floyd, Pearson Education
2. Digital Principles & Applications by A.P. Malvino & D.P. Leach (TMH, New Delhi)
3. Modern Digital Electronics by R.P. Jain
4. Digital Systems: Principles and Applications by Ronald J Tocci, Neat S. Widerman, PEA
5. Digital Electronics, Circuits & Systems by V. K. Puri, TMH, New Delhi.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
B.Sc.-I (Electronics) Semester- I

Skill Enhancement Course (SEC1)

Course Title: Introduction to Electronic Simulation with Proteus

Total Marks: 30 **Credits: 02 (30 Periods)**

Course Description:

This course is designed to introduce students to electronic simulation using Proteus software. Through a combination of theoretical lectures and practical exercises, students will learn how to design, simulate, and analyse electronic circuits using basic components.

Course Objectives:

1. Understand the fundamentals of electronic simulation and its applications.
2. Learn how to navigate and utilize Proteus software for circuit design and simulation.
3. Gain proficiency in building and simulating electronic circuits using Proteus's extensive component library.
4. Explore advanced simulation techniques and analyses.
5. Apply simulation results to optimize circuit performance and troubleshoot design issues.

Course Outline:

Module 1: Introduction to Electronic Simulation

- Overview of electronic simulation and its importance in circuit design.
- Introduction to Proteus software and its capabilities.
- Basic features and user interface navigation in Proteus.

Module 2: Building Circuits in Proteus

- Creating schematic diagrams using Proteus's design tools.
- Adding components from the Proteus component library.
- Wiring components together and configuring properties.

Module 3: Simulating Circuits

- Setting up simulations for basic digital circuits using logic gates.
- Running simulations and analysing results.
- Understanding simulation parameters and settings.

Module 4: Circuit Optimization and Analysis

- Analysing simulation data to optimize circuit performance.
- Using Proteus's built-in analysis tools (e.g., oscilloscope, waveform viewer).
- Troubleshooting common design issues through simulation.

Practical using PROTEUS Simulation Software

1. Understand the behaviour of an OR, AND, NOT, NAND, NOR, XOR gate by using simulation and observe the LED behaviour for all possible input combinations (00, 01, 10, and 11) to verify their truth table.
2. Verify the truth tables of half adder and full adder circuits through simulation.
3. Understand how to connect multiple half adders to create a full adder.
4. Verify the DeMorgan’s Theorems using basic gates through simulation.
5. Verify the Universality property of NAND and NOR gates through simulation

General IKS (2-Ccredit)

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

B.Sc.-I (Electronics) Semester- II

Major Paper – II (DSC 1-2)

Title of Paper: -Basic Circuit Theory and Network Analysis

Total Marks: 30 **Credits: 02 (30 Periods)**

Unit 1. Passive Circuit Elements and Network Theorems (15)

Introduction, Resistors, Capacitors, Inductors, Transformers, Relays & their classification, PCB & its classification, Fuses, Mechanical switches. Ohm's law, Kirchhoff's Law, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem, Black box theory, Concept of equivalent network, Z, Y, H & Transmission (ABCD) parameters, T-network, π-network (Numerical examples are expected)

Unit 2. AC-DC Fundamentals (15)

DC sources: Introduction, Batteries, Regulated power supplies, Ideal, & practical Voltage source, Ideal & practical current source. AC sources: Introduction, Sinusoidal and non-sinusoidal sources, RMS current and voltage, Phase relationship of current and voltage in pure resistor, in pure capacitor and in pure inductor. RC and RL and RLC Series circuit. Series & parallel resonance circuit & resonant frequency. (Numerical examples are expected)

Recommended Books:

Circuit and Networks: Analysis and Synthesis by A. Sudhakar & S.P. ShamMohan, (TMH)
Network Lines and Fields by J.D. Ryder, (McGraw Hill)
Network Analysis by M.E. Van Valkenberg(PHI, New Delhi)
Basic Electronics by Bernard Grob
A Text Book of Applied Electronics by R.S. Shedha (S.Chand& Co.)

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
B.Sc.-I (Electronics) Semester- I

Skill Enhancement Course (SEC2)

Total Marks: 30 **Credits: 02 (30 Periods)**

Course Title: Introduction to Arduino Programming

Course Description:

This course is designed to introduce students to the fundamentals of programming using Arduino, an open-source electronics platform based on easy-to-use hardware and software. Through hands-on projects and interactive lessons, students will learn the basics of coding, electronic circuits, and how to build and program their own Arduino projects.

Course Objectives:

Understand the basics of Arduino hardware and software.

Learn programming fundamentals using the Arduino IDE.

Gain proficiency in writing and debugging Arduino code.

Explore various sensors, actuators, and components compatible with Arduino.

Apply programming concepts to build interactive Arduino projects.

Course Outline:

Module 1: Introduction to Arduino

What is Arduino?

Overview of Arduino boards and components.

Installing the Arduino IDE.

Writing and uploading your first Arduino sketch.

Module 2: Programming Basics

Introduction to C/C++ syntax.

Variables, data types, and operators.

Control structures: if statements, loops, and functions.

Debugging techniques.

Module 3: Working with Inputs and Outputs

Understanding digital and analog signals.

Reading from digital and analog pins.

Controlling LEDs.

Using push buttons and switches.

Practical: 1: LED Blinking

Connect an LED to one of the Arduino's digital pins.

Write a program to make the LED blink at a specific rate.

Experiment with different blinking patterns (e.g., Morse code).

Practical 2: Controlling LEDs with Switches

Connect one or more switches to digital pins.

Write a program to turn LEDs on or off based on the state of the switches.

Implement more complex logic, such as toggling LEDs with a single switch.

Module 4: Sensors and Actuators

Introduction to common sensors (e.g., temperature, light, motion).

Interfacing sensors with Arduino.

Practical 3: Using a 7-Segment Display

Connect a 7-segment display to the Arduino.

Write a program to display numbers or characters on the display.

Practical 4: Analog Input with Potentiometer

Connect a potentiometer (analog input device) to one of the Arduino's analog pins.

Write a program to read the analog value from the potentiometer.

Use the analog input to control the brightness of an LED

Practical 5: Digital Input with Push Buttons

Connect push buttons to digital pins, possibly using pull-up or pull-down resistors.

Write a program to detect button presses and perform actions based on the input.

Reference Books:-

1) Arduino Made Simple by Ashwin Pajankar BPB Publications
2) Getting Started with Arduino by Massino Banzi and Michael Shiloh
3) Basics of Arduino Programming by Dr. K. Bikshalu Educreation Publishing
4) Arduino Book for Beginners by Mike Cheich Programming Electronics Academy Publication

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
B.Sc.-I (Electronics) Semester- I
Generic/Open Elective (GE1/OE1)
Title: Basic Electronics Consumer Applications

Total Marks: 30 **Credits: 02 (30 Periods)**

Unit 1. General Consumer Applications (15)

I) Mobile Charger Power Supply - Basic information about mobile charger power supply, making 3.3 volt and 5 volt mobile charging power supply

II) On/Off control using transistor and relay - Basic study of transistor as a switch and electromagnetic relay, Use of power transistor and relay in on/off control of a fan/tube/LED bulb

III) Use of LED lighting strips, power transistor and Timer IC-555 in decoration lighting.

IV) Solar cell applications - Basic study of solar cell, use of solar cell (panel) for two-wheeler battery charging.

V) TV remote control application - Basic study of IR transmitter and receiver, use of TV remote control to turn on/off fan/tubelight/LED bulb etc.

Unit 2. Sensors, actuators and their Consumer Applications (15)

i) LDR and Burglar Alarm - Basic study of LDR and its application as burglar alarm

ii) RTD and Temperature Controller - Basic study of RTD and its application in automatic water heaters

iii) PIR Sensor and Motion Detection - Basic study of PIR sensor and its application in detecting motion in restricted area

iv) Infrared transmitter-receiver & solenoid valve control - Basic study of infrared transmitter-receiver and solenoid valve, Use of IR(Tx and Rx) in of/off control of solenoid valve in Wash basin and toilet flushing system

v) LM-35 temperature sensor and fan-speed control - Basic study of LM-35 and its application in ceiling fan-speed control

Reference Books:-

1) Sensors and Transducers by Patranabis 2nd Edition, PHI publications

2) A text book of applied electronics by R S Sedha, S Chand and Co. Pub.

3) Fundamentals of Sensors for Engineering and Science by Patrik F Dunn , CRC Press Inc.

4) Make Electronics (A hands on primer) by Charles Platt

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
B.Sc.-I (Electronics)CBCS Pattern
Practical Course (30 marks UA & 20 marks CA)

List of Experiments

Practical LAB 1:-

1. Study of Basic Gates
2. Study De Morgan's Theorems
3. Study of Universal Gates
4. Study Half and Full Adder
5. Study Half and full Subtractor
6. 4-bit Parallel Binary Adder/Subtractor converter
7. 4-bit Binary to Gray converter/Gray to Binary converter

Practical LAB 2:-

1. Ohm's Law
2. Study of Kirchhoff's Laws
3. Study Series /Parallel Resonance
4. Study Thevenin's Theorem
5. Study Superposition Theorem
6. Study Maximum Power Transfer Theorem
7. Measurement of Z, Y and h-parameters for two port resistive network