

**Punyashlok Ahilyadevi Holkar Solapur University, Solapur**



NAAC Accredited-2022

'B++' Grade (CGPA 2.96)

**Name of the Faculty: Science & Technology**

**CHOICE BASED CREDIT SYSTEM**

**Syllabus: Electronics**

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

**(Syllabus to be implemented from June 2022)**

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

**Syllabus for B.Sc. I Electronics (CBCS Pattern)**

Choice Based Credit System Pattern

To be implemented from **Academic Year 2022-23**

**1. Preamble:**

B.Sc. I syllabus is designed to provide an insight into basic and fundamentals of 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 circuit theory 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 device testing and analysis.
- To prepare students for demonstrating the acquired knowledge.

**3. Course Outcome:** After the completion of B.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<sup>th</sup> Science or equivalent.

## 5. Course Structure:

Paper No.	Subject	Title of the Paper	Hrs/Week			Total Mark	UA	CA	Credits
			L	T	P				
<b>Semester –I</b>									
I	Electronics	Basic Circuit Theory and Network Analysis	2.5	-	-	50	40	10	2
II	Electronics	Digital Fundamentals	2.5	-	-	50	40	10	2
		<b>Total</b>	<b>5</b>	<b>-</b>	<b>-</b>	<b>100</b>	<b>80</b>	<b>20</b>	<b>4</b>
<b>Semester –II</b>									
III	Electronics	Semiconductor Devices	2.5	-	-	50	40	10	2
IV	Electronics	Digital Electronics	2.5	-	-	50	40	10	2
		<b>Total</b>	<b>5</b>	<b>-</b>	<b>-</b>	<b>100</b>	<b>80</b>	<b>20</b>	<b>4</b>
Practical		Practical I	--	-	4	100	80	20	4
		<b>Total</b>	<b>--</b>	<b>-</b>	<b>4</b>	<b>100</b>	<b>80</b>	<b>20</b>	<b>4</b>
<b>Grand Total</b>			<b>10</b>	<b>-</b>	<b>4</b>	<b>300</b>	<b>240</b>	<b>60</b>	<b>12</b>

### 6. Distribution of each Theory Paper (Marks 50)

- a. University Assessment (UA) : 40 Marks  
 b. College Assessment (CA) : 10 Marks

#### Scheme of College Assessment (Marks 10)

1. Unit Test : 5 Marks  
 2. Home Assignment : 5 Marks

### 7. Distribution of Practical Marks (100)

Practical examination will be at the end of second semester. The candidate has to perform two practicals, one from each group.

#### A. University Practical Examination (80) Marks : (UA)

- a) Practical from group A : 35 Marks  
 b) Practical from group B : 35 Marks  
 e) Journal : 10 Marks

#### B. Break up of 35 marks for each practical (UA)

- a) Circuit diagram : 08 Marks  
 b) Assembly of the circuit : 08 Marks  
 c) Procedure / Observations : 08 Marks  
 d) Calculations & Graphs/ Verification : 08 Marks  
 of Truth table/ Timing diagrams  
 e) Results/Comments : 03 Marks

#### C. Practical: College Assessment (20 marks)

Break up of 20 marks

- Practical Unit Test : 10 Marks
- Circuit Diagram Test/ Industrial Visit : 10 Marks

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**Paper - I : Basic Circuit Theory and Network Analysis**

Total Marks: 50

Credits: 02 (30 Periods)

**Unit 1. Circuit Elements and AC-DC Fundamentals (15)**

Active and passive elements, Resistors, Capacitors, Inductors, Transformers, Relays and Fuses (Classification, Specifications and Applications only)

DC sources, Constant voltage and current sources, AC sources, Sinusoidal and non-sinusoidal sources, RMS current and voltage, Phase relationship of current and voltage with pure resistor, capacitor and inductor. (Numerical examples are expected)

Series and Parallel RLC circuits, Phase diagram, Impedance, Admittance, Series and Parallel resonance, Response curve, Band width, Quality factor (Numerical Examples are expected)

**Unit 2. Network Analysis (15)**

Kirchhoff's Laws, Mesh and Nodal analysis [Only DC resistive circuits], Thevenin's Theorem, Norton's Theorem, Superposition Theorem, Millman's Theorem, Maximum power transfer theorem (Numerical examples are expected)

Black box theory, Concept of equivalent network, Z, Y, H & Transmission (ABCD) parameters, T-network,  $\pi$ -network and their inter-conversion expressions only (Numerical examples are expected)

**Recommended Books:**

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

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**Paper - II : Digital Fundamentals**

Total Marks: 50

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

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

**Unit 2. Boolean Algebra and Arithmetic Circuits (15)**

Rules and laws of Boolean algebra, Simplification of Boolean expression, K-map, K-maps for 2, 3 and 4 variables, Use of K-map for reduction of Boolean expressions

Exclusive OR gate as a Binary to Gray converter, Parity checker, Controlled inverter, Half adder, Full adder, Parallel binary adder, Half and Full subtractor, Block diagram of digital computer and its organization

**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. Wideman, PEA
5. Digital Electronics, Circuits & Systems by V. K. Puri, TMH, New Delhi.

**Paper - III : Semiconductor Devices**

Total Marks: 50

Credits: 02 (30 Periods)

**Unit 1. Semiconductors, Junction Diodes and BJT (15)**

Intrinsic and extrinsic semiconductors, Formation of p-n junction, Barrier potential, I-V characteristics, Diode equation, Static and dynamic resistance, Junction capacitance

Zener diode, Breakdown mechanism (Zener & avalanche), I-V characteristics, LED, Photo diode, Varactor Diode, Tunnel Diode (Construction, working and applications only)

BJT construction and operation, Transistor configurations, I/P and O/P characteristics of CE and CB configurations, Graphical determination of  $\alpha$  and  $\beta$ , (Numerical examples are expected)

**Unit 2. Field Effect Transistor and Power Devices (15)**

FET, Comparison between BJT and FET, Structure and operation of n-channel JFET, I-V characteristics, Parameters, Applications (Numerical examples are expected)  
Depletion and Enhancement MOSFET, Structure and operation, I-V characteristics

Construction, working and characteristics of SCR, DIAC, TRIAC and UJT

**Recommended Books:**

1. Electronic Devices and Circuits by Jacob Milman & Chrstes S Halkias, MGH
2. Electronic Devices and Circuits, An introduction by Allen Mottershed (PHI Delhi)
3. A Text Book of Applied Electronics by R.S. Shedha (S. Chand & Co.)
4. Basic Electronics & Linear Circuits by N.N Bhargava, D.C. Kulshreshta, S.C. Gupta TMH)
5. Principles of Electronics (10th Edition) by V.K. Mehta (S. Chand & Co.)
6. Electronics Devices and Circuit Theory by R. L. Bolysted & L. Nashelsky

**Paper - IV : Digital Electronics**

Total Marks: 50

Credits: 02 (30 Periods)

**Unit 1. Digital Logic Families and Combinational Logic (15)**

Introduction to logic families, TTL NAND gate, Specifications of TTL logic family (Sinking, sourcing current, Input/output voltage limits, Fan-in, Fan-out, Noise margin, Propagation delay, Power dissipation)

Encoder: Decimal to BCD encoder, Priority encoder (IC 74147)

Decoder: 2-4 and 3-8 decoders (IC 74138), BCD-Decimal decoder, BCD-7 segment decoder (IC 7447).

Multiplexer: 4-1 and 8-1 multiplexer (IC 74153)

De-multiplexer: 1-4 and 1-8 de-multiplexer

**Unit 2. Sequential Logic (15)**

RS flip flop using NOR gates, Clocked RS flip flop, D-flip flop, Edge triggered D-flip flop, JK-flip flop, Master slave JK flip flop, T flip flop. Study of IC 7476. (Timing diagrams are expected)

Shift register, Types of shift registers, SISO, SIPO, PISO and PIPO, Serial and parallel loading, Study of Right shift, Left shift, Ring counter, Johnson counter (IC 7495) (Timing diagrams are expected)

Basic counter operation, 4-bit asynchronous and synchronous counters, Combination counter, study of IC 7490 as MOD-2, MOD-5 and Decade counter. (Timing diagrams are expected)

**Recommended Books:**

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

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**Practical Course**  
List of Experiments

**Group-A**

1. Study of Kirchhoff's Laws
2. Study Series /Parallel Resonance
3. Study Thevenin's Theorem
4. Study Superposition Theorem
5. Study Maximum Power Transfer Theorem
6. Measurement of Z, Y and h-parameters for two port resistive network
7. Characteristics of Semiconductor Diode
8. Characteristics of Zener Diode
9. Characteristics of CE/CB configuration
10. Characteristics of JFET

**Group-B**

1. Study De Morgan's Theorems
2. Study of Universal Gates
3. Study Half and Full Adder
4. Study Half Subtractor
5. Study of RS, D and JK Flip flop
6. Study of Counters (divided by 2, 5 and 10) using IC-7490
7. Study of Left shift and Johnson counter using IC 7495
8. Study Right shift and Ring counter using IC7495
9. Study of Multiplexer and De-multiplexer
10. Study of Encoder (74148) and Decoder (74138)
11. Study of BCD to 7 segment decoder

**N.B.:**

1. Minimum 08 experiments from each group should be completed.
2. In addition to above experiments, the students should be exposed to the laboratory equipment such as, Cathode Ray Oscilloscope, Function Generator, Power supplies, Multi-meters, etc.
3. Students should be encouraged to use data sheets, manuals, etc.
4. They should be encouraged for employing innovative ideas in current trends of Electronics.