

**Punyashlok Ahilyadevi Holkar Solapur University, Solapur**



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

**CHOICE BASED CREDIT SYSTEM (CBCS)**

**Syllabus: Electronics**

**Name of the Course: B.Sc. II (Semester III & IV)**

**(Syllabus to be implemented June 2023)**

# **Punyashlok Ahilyadevi Holkar Solapur University, Solapur**

**Faculty of Science & Technology**

**Choice Based Credit System (CBCS) (w.e.f. 2023-24)**

**Revised Structure for B. Sc.- II**

## **1. Preamble:**

B.Sc. II syllabus is designed to provide an insight into applications of various circuit blocks, design analog and digital systems, methods to analyze working of systems and some of consumer products. Training on system design and simulations. In the theory courses adequate knowledge of analog systems design, digital system design and communication systems will be acquired by the students. Student taking admission at B.Sc. II Electronics has to complete 4 theory courses (papers), 2 for each semester, two practical courses (Annual). In the practical course of 200 marks there are compulsory experiments from Semester III and IV. The details are mentioned in the syllabus.

## **2. Objectives of the course:**

The aim of the course is to generate trained manpower with adequate theoretical and practical knowledge of the various facets of electronic circuits and systems. Due care is taken to inculcate conceptual understanding in basic phenomena, materials, devices, circuits and products and development of appropriate practical skills suitable for industrial needs. Objectives are

- To design the syllabus with specific focus on key Learning Areas.
- To equip student with necessary fundamental concepts and knowledge base.
- To develop specific practical skills.
- To impart training on circuit design, analysis, building and testing.
- To prepare students for demonstrating the acquired knowledge.
- To encourage student to develop skills for accepting challenges of upcoming technological advancements.

### 3. B.Sc. II General Course Structure:-

Subject/ Core Course	Name and Type of the Paper		No. of papers/ Practical	Hrs/week			Total Marks Per Paper	UA	CA	Credi ts
	Type	Name		L	T	P				
<b>Class :</b>										
<b>B.Sc.- II Semester – III</b>										
<b>Core Courses</b> (*Students can opt any Three subjects among the Four Subjects offered at B. Sc. I.  <b>OR</b> Students can opt any Two subjects among the Four Subjects offered at B. Sc. I and any one from the Additional Interdisciplinary subjects.	DSC 1C	AIC-1A	Paper-V	3	--	--	50	40	10	4.0
			Paper-VI	3	--	--	50	40	10	
	DSC 2C		Paper-V	3	--	--	50	40	10	4.0
			Paper-VI	3	--	--	50	40	10	
	DSC 3C		Paper-V	3	--	--	50	40	10	4.0
			Paper-VI	3	--	--	50	40	10	
<b>Total Sem.-III</b>				<b>18</b>	--	--	<b>300</b>	<b>240</b>	<b>60</b>	<b>12</b>
\$ SEC-1				4	--	--	100	80	20	4
<b>Class :</b>										
<b>B.Sc.- II Semester –IV</b>										
<b>Core Courses</b> (*Students can opt any Three subjects among the Four Subjects offered at B.Sc. I.  <b>OR</b> Students can opt any Two subjects among the Four Subjects offered at B.Sc. I and any one from the Additional Interdisciplinary subjects.	DSC 1D	AIC-1B	Paper-VII	3	--	--	50	40	10	4.0
			Paper-VIII	3	--	--	50	40	10	
	DSC 2D		Paper-VII	3	--	--	50	40	10	4.0
			Paper-VIII	3	--	--	50	40	10	
	DSC 3D		Paper-VII	3	--	--	50	40	10	4.0
			Paper-VIII	3	--	--	50	40	10	
Environmental Studies				<b>3</b>	--	--	<b>50</b>	<b>40</b>	<b>10</b>	<b>NC</b>
<b>Total Sem-IV</b>				<b>18</b>			<b>300</b>	<b>240</b>	<b>60</b>	<b>12</b>
<b>Total (Theory)</b>				<b>36</b>	--	--	<b>600</b>	<b>480</b>	<b>120</b>	<b>24</b>
<b>Core Practical</b>	DSC 1C & 1D	AIC 1A & 1B	Pr. II & III	--	--	8	200	160	40	4.0
	DSC 2C & 2D		Pr. II & III	--	--	8	200	160	40	4.0
	DSC 3C & 3D		Pr. II & III	--	--	8	200	160	40	4.0
<b>Total (Practicals)</b>						<b>24</b>	<b>600</b>	<b>480</b>	<b>120</b>	<b>24</b>
<b>Grand Total</b>				<b>36</b>		<b>24</b>	<b>1200</b>	<b>960</b>	<b>240</b>	<b>48</b>
\$ SEC-1				<b>4</b>			<b>100</b>	<b>80</b>	<b>20</b>	<b>4</b>

\$The students can choose MOOCs/ NPTEL/SWAYAM/Pathshala/Add-on / Skill based courses of university/college initiated courses of same credits.

\$ These courses are not compulsory, but after completion of these courses students get additional credits on their Mark lists. \$SEC Courses initiated by colleges should be communicated to university for information and necessary action.

#### Abbreviations:

L: Lectures T: Tutorials P: Practical UA: University Assessment CA : College Assessment CC: Core Course AEC : Ability Enhancement Course DSE : Discipline Specific Elective Paper SEC : Skill Enhancement Course, AIC: Additional Interdisciplinary Courses

Note: Each theory paper of 50 Marks should be of two Units. Each theory paper Unit is of 15 Lectures. Practical paper of 200 Marks is of at least 40 practical.

#### 4. B.Sc.II Electronics Course Structure:-

Paper No.	Subject	Title of the course	Marking Scheme			L	T	P	Credits
			UA	CA	Total				
<b>Semester –III Electronics</b>									
V	Electronics	Electronic Circuits	40	10	50	3	-	-	2
VI	Electronics	Pulse and Switching Circuits	40	10	50	3	-	-	2
<b>Total</b>			<b>80</b>	<b>20</b>	<b>100</b>	<b>6</b>	<b>-</b>	<b>-</b>	<b>4</b>
<b>Semester –IV Electronics</b>									
VII	Electronics	Operational Amplifier and Applications	40	10	50	3	-	-	2
VIII	Electronics	Digital Techniques and Microprocessor	40	10	50	3	-	-	2
<b>Total</b>			<b>80</b>	<b>20</b>	<b>100</b>	<b>6</b>	<b>-</b>	<b>-</b>	<b>4</b>
Practicals		Practical Sem III & IV	160	40	200	-	-	8	4
<b>Total</b>			<b>160</b>	<b>40</b>	<b>200</b>	<b>-</b>	<b>-</b>	<b>8</b>	<b>4</b>
<b>Grand Total</b>			<b>320</b>	<b>80</b>	<b>400</b>	<b>12</b>	<b>-</b>	<b>8</b>	<b>12</b>

#### 5. Distribution of each Theory paper (Marks 50)

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

#### Scheme of College Assessment (CA)

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

#### 6. Distribution of Practical Marks (200)

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

#### A. University Practical Examination (160) Marks : (UA)

- a) Practical from group A : 36  
 b) Practical from group B : 36  
 c) Practical from group C : 36  
 d) Practical from group D : 36  
 e) Journal : 16

#### B. Break up of 36 marks for each practical (UA)

- a) Circuit diagram / Flow Charts : 06  
 b) Assembly of the circuit /Programming : 06  
 c) Procedure / Observations : 06  
 d) Graph /Calculations/ Execution : 06  
 e) Results/Comments : 06  
 f) Oral : 06

Note: University Practical Examination Mark Distribution

Practical Paper- II ----- Group A + Group B

Practical Paper- III ----- Group C + Group D

Journal marks should be distributed in two Papers i. e. Pr. Paper II & III

**C. Practical: Internal Continuous Assessment (40 marks)**

**Scheme of Marking**

- Internal Test on practical's / Skill enhancement mini project : 20 Marks
- Home assignment/Seminars/conference/workshop/industrial visit : 20 Marks

## B.Sc. II-Electronics (CBCS Pattern)

### Semester – III

### Paper –V-Electronic Circuits

Total Marks: 50 (2 credits)

(30 periods)

#### Unit - I : Diode and Transistor Circuits

(15)

##### 1. Rectifiers, Filters and Regulators

(03)

Diode rectifiers: Half wave, full wave and bridge rectifier, derivation of Ripple factor, Efficiency and PIV of half wave and full wave rectifier (center tapped), Capacitor filter, Zener regulator

##### 2. Transistor Biasing

(03)

Transistor biasing, DC load line, Operating point, Stability factor, Methods of transistor biasing: Fixed Bias, Emitter Bias, Voltage divider bias with mathematical treatment

##### 3. Transistor Amplifiers

(09)

Basic action of transistor amplifier, DC (Thevenin's) and AC analysis of CB, CE, CC configurations, comparison of CB, CE, CC configuration, FET as CS amplifier (Analysis and its applications)

**Multistage Transistor Amplifier:** RC Coupled, Transformer Coupled, Direct Coupled amplifier, Darlington pair amplifier

**Power Amplifiers:** Types of power amplifiers - Class A, Class B and Class C amplifiers by Graphical Method, Class A and Class B push pull amplifier, cross over distortion, Class AB amplifier, complementary-symmetry amplifier, harmonic distortion in power amplifiers

#### Unit - II : Feedback amplifiers and Oscillators

(15)

##### 1. Feedback Amplifiers

(07)

Theory of feedback amplifier, positive and negative feedback, Effect of negative feedback on Gain, Bandwidth, Distortion, Noise, Input impedance and Output impedance, Types of negative feedback, Analysis of current series feedback circuit (Numerical Examples)

##### 2. Transistor Oscillators

(08)

Barkhausen criterion, **RC oscillators:** Wien bridge oscillator, Phase shift oscillator, **LC oscillators:** Hartley oscillator, Colpitt's oscillator (Without mathematical treatment), Piezoelectric crystal and its equivalent circuit, Pierce Crystal oscillator (Circuit description, condition for oscillation and Numerical Examples)

#### Reference Books:

1. A text book of Applied Electronics by R. S. Sedha. S. Chand Publication.
2. Electronic Devices and Circuits by Boylestad
3. Basic Electronics (Solid State) by B. L. Theraja, S. Chand & Company Ltd.
4. Basic Electronics and Linear Circuits by N. N. Bhargava D. C. Kulshreshtha & S. C. Gupta TMH

**B.Sc. II-Electronics (CBCS Pattern)**  
**Semester – III**  
**Paper –VI- Pulse and Switching Circuits**

Total Marks: 50 (2 credits)

(30 periods)

**Unit - I:- Waveshaping and Timing Circuits** (15)

**1. Wave shaping Circuits** (07)

Need of wave shaping circuit, linear wave shaping circuits: Differentiator and Integrator Non linear wave shaping: Diode Clipping and Clamping circuits.

**2. Time base Circuits** (08)

General features of Time base signals, Concept of RC time base circuit, UJT as a relaxation oscillator, Linearity considerations with constant current source, Miller integrator and Bootstrap circuit.

**Unit - II:- Multivibrators** (15)

**1. Multi-vibrators using BJT** (07)

Transistor as a switch, switching characteristics, Types of multivibrator  
**Astable multivibrator (collector coupled):** Operation, Wave forms, Derivation of output frequency.

**Monostable multivibrator (collector coupled):** Operation, Triggering methods, Waveforms, Derivation of gate width.

**Bistable Multivibrator (collector coupled):** Operation, Triggering methods, Wave forms,

**Schmitt's Trigger:** Operation, Hysteresis curve (UTP, LTP),  
(Uses and Numerical Examples)

**2. Multi-vibrators using Gates** (02)

Astable multivibrator using gates, Monostable Multivibrator using gates and IC74121.

**3. IC 555 Timer** (06)

IC-555 timer- Pin configuration, functional block diagram, Astable multivibrator: Operation, wave forms, Derivation of frequency and duty cycle, Monostable multivibrator: Operation, wave forms, Derivation of gate width, Applications of IC 555 as Sequential Timer, Battery charger, Voltage controlled Oscillator. (Numerical examples)

**Reference Books**

1. Pulse and Switching circuits by Millman and Taub
2. Hand book of Electronics by Sony Gupta.
3. A Text of Applied Electronics by R.S.Sedha, S. Chand Publication
4. Electronic Devices and Circuit by Boylestead
5. Linear Integrated Circuit – D. Roy Choudhari, Shail Jain (Wiley Eastern Ltd.)

## **B.Sc. II-Electronics (CBCS Pattern)**

### **Semester – IV**

#### **Paper –VII : Operational Amplifier and Applications**

**Total Marks: 50 (2 credits)**

**(30 periods)**

#### **Unit - I:- Introduction to OPAMP**

**(15)**

##### **1. Differential Amplifier**

**(07)**

Need of differential amplifier, Types of differential amplifiers, Emitter coupled differential amplifier, Operation, Common mode gain and Differential mode gain, Derivation of  $A_d$ ,  $A_c$  and CMRR, Constant current bias, Current mirror bias.

##### **2. Operational Amplifier**

**(08)**

Introduction, Block diagram, Equivalent circuit of op-amp, Ideal characteristics, open loop and closed loop configuration and its need, Op-amp parameters: Output offset voltage, Input offset voltage, Input bias current, Input offset current, Input impedance, Output impedance, CMRR, Slew rate, Maximum power bandwidth, PSRR, Specifications of IC 741

#### **Unit - II:- OPAMP Applications**

**(15)**

##### **1. Operational Amplifier Linear Systems**

**(07)**

Concept of virtual ground, Inverting amplifier, Non-inverting amplifier, Voltage follower, summing amplifier (Adder), Op-amp differential amplifier (subtractor), Differentiator, Integrator, Current to Voltage converter and Voltage to Current converter

##### **2. Operational Amplifier Non-linear Systems**

**(03)**

Basic comparator, Zero-crossing detector, Regenerative comparator (Schmitt Trigger), Precision rectifier (Half wave)

##### **3. Wave form Generators**

**(05)**

Oscillators - Phase shift oscillator, Wien Bridge oscillator, (without mathematical treatment)

Astable multivibrator, Monostable multivibrator (with mathematical treatment)

Triangular wave generator, Saw tooth oscillator,

#### **Reference Books:**

1. Linear Integrated Circuit – D. Roy Choudhari, Shail Jain (Wiley Eastern Ltd.)
2. Integrated Circuit (New Edition) – K. R. Botkar
3. Integrated Electronics – Millman, Halkies ( MGH)
4. Op-Amps and Linear circuits – Ramakant A. Gaikwad (PHI)
5. Operational Amplifiers and Linear ICs – Caughlin and Driscoll (PHI)
6. Design with Operational Amplifiers and Analog ICs – Franco (McGraw Hill, 2000)



**B.Sc.-II-Electronics (CBCS Pattern)**  
**Semester-IV**  
**Paper-VIII : Digital Techniques and Microprocessor**

**Total Marks: 50 (2 credits)**

**(30 periods)**

**Unit - I:- Semiconductor Memories and Data Converters (15)**

**1. Semiconductor Memories: (7)**

Memory cell (Static and Dynamic), Memory organization, memory parameters (type, size), Classification of memory (volatile and non volatile) and their comparison, Concept of flash memory  
Study of memory chips: 2764, 6264 (Features & Pin description)

**2. Data Converters: (8)**

Basic concepts of Digital to analog conversion (DAC) and Analog to digital conversion (ADC), specifications  
Digital to analog conversion: Binary weighted and R - 2 R ladder networks  
Analog to digital conversion: Comparative (Flash), Successive approximation, dual slope ADC techniques, Study of DAC (IC 0808) & ADC (IC 0804) (Features & functional description)

**Unit - II:- Microprocessor 8085: Fundamentals, Programming and Interfacing (15)**

**1. Fundamentals of Microprocessor: (05)**

Introduction to microprocessor, Basic system with Bus Architecture  
The microprocessor Intel 8085: Salient Features, Block diagram, pin descriptions, Address/data bus, Data bus, control signals, ALU, Accumulator, Flags, Registers, Interrupts, Clock & reset circuit, concepts of T-state, Machine cycle, Instruction cycle.

**2. Programming with Microprocessor: (05)**

The Instruction, Instruction set of 8085, Instruction format, Addressing modes, Classification of instruction set, as per function, Algorithm, Flowchart, Assembly language programming of Data transfer (Block transfer & exchange), Arithmetic operation (addition, subtraction, multiplication, division), logical operation (AND, OR, NOT, XOR), ALP on Branch operation.

**3. Interfacing techniques: (05)**

Concept of Tristate logic, Study of IC 74244, 74245, 74373 (Features and Pin diagram)  
De-multiplexing of Address/data bus using IC74373  
Generation of control signal  $\overline{MEMR}$ ,  $\overline{MEMW}$ ,  $\overline{IOR}$ ,  $\overline{IOW}$  (using gates and IC 74138)  
Need of Interfacing, Interfacing techniques, I/O mapped I/O, Memory mapped I/O and their comparison  
Address decoding (absolute and linear), Interfacing of memory chips 2764 and 6264 to the 8085 microprocessor

**Recommended Books:**

1. Digital Principles and Applications by A. P. Malvino & D.P. Leach (TMH), Delhi
2. Digital Fundamental by Floyd, Pearson Education.
3. Microprocessor Architecture, Programming and Applications with the 8085 by Ramesh S. Gaonkar
4. Microprocessor by A. P. Godse

**B.Sc.–II-Electronics (CBCS Pattern)  
Practical Course (4 credits)  
List of Experiments**

**Group A**

- 1) Designing of biasing network by using simulation software.
- 2) Study of single stage CE / CB amplifier. (Gain, I/P & O/P impedance)
- 3) FET CS amplifier (Gain, I/P & O/P impedance)
- 4) Emitter follower (Gain, I/P & O/P impedance)
- 5) Negative feedback amplifier. (Frequency response & feedback factor)
- 6) RC Phase shift oscillator (Design & testing)
- 7) Wein bridge oscillator by using simulation software
- 8) Hartley oscillator (Design & testing)
- 9) Colpitt's (Design & testing)
- 10) Crystal oscillator (Pierce oscillator )

**Group B**

- 1) Miller integrator
- 2) UJT oscillator with constant current source
- 3) Astable multivibrator using BJT
- 4) Monostable multivibrator using BJT
- 5) Bistable multivibrator using BJT (AC & DC) triggering by using simulation software)
- 6) Schmitt's trigger (hysteresis curve & square wave testing)
- 7) Astable multivibrator using IC 555.
- 8) Monostable multivibrator using IC 555
- 9) Astable multivibrator using IC7400 by using simulation software
- 10) Monostable multivibrator using IC74121

**Group C**

- 1) Op-amp parameters (O/P offset voltage, I/P offset voltage and slew rate)
- 2) Inverting and non inverting amplifier using op-amp
- 3) Op-Amp as a Adder / subtractor
- 4) Op-amp as voltmeter / ammeter
- 5) Op-amp as Schmitt's trigger
- 6) Wein-bridge oscillator using op-amp
- 7) Phase Shift Oscillator using op-amp by using simulation software

- 8) Astable multivibrator using op-amp by using simulation software
- 9) Monostable multivibrator using op-amp
- 10) Integrator / Differentiator using op-amp

#### **Group D**

- 1) DAC using R-2R Ladder network (4 bits)
- 2) Study of DAC (IC 0808)
- 3) Study of ADC (IC 0804)
- 4) Data transfer using 8085
- 5) Arithmetic operations using 8085 (8-bit Addition)
- 6) Arithmetic operations using 8085 (8-bit Subtraction)
- 7) Arithmetic operations using 8085 (8-bit Multiplication) by using simulation software / kit
- 8) Arithmetic operations using 8085 (8-bit Division) by using simulation software / kit
- 9) Logical operations ( AND and OR) using 8085
- 10) Logical operations (NOT and XOR) using 8085

**N.B:**

- 1) Minimum 32 experiments must be performed out of which at least eight from each group.