M.C.E. Society's
Abeda Inamdar Senior College, Pune
(Autonomous)

Syllabus under Autonomy
F.Y. B. Sc.
Electronic Science
(For Computer Science)

Academic Year
(2021-22)

(Under the faculty of Science and Technology)

Syllabus under Autonomy
F.Y. B. Sc.
Electronic Science
(For Computer Science)

Titles of Papers and Scheme of Study

SEM	Paper / subject code	Paper	Paper Title	Credits	Lectures/ practical per week	Evaluation		
						C.A.	U.E.	Total
I	21SBCS111E	I	Principles of Analog Electronics	2	3	15	35	50
	21SBCS112E	II	Principles of Digital Electronics	2	3	15	35	50
	21SBCS113E	III	Electronics Lab-IA	1.5	3	15	35	50
II	21SBCS121E	I	Instrumentation System	2	3	15	35	50
	21SBCS122E	II	Basics of Computer Organization	2	3	15	35	50
	21SBCS123E	III	Electronics Lab-IB	1.5	3	15	35	50

M. C. E. Society's
Abeda Inamdar Senior College
Of Arts, Science and Commerce, Camp, Pune-1
(Autonomous) Affiliated to Savitribai Phule Pune University
NAAC accredited 'A' Grade

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

(CBCS – Autonomy 21 Pattern)

Course/ Paper Title	Principles of Analog Electronics
Course Code	SBCS111E
Semester	I
No. of Credits	2(36 Lectures of 50 minutes each)

Aims & Objectives of the Course:

Sr. No.	Objectives
1	The course has been designed to introduce fundamental principles of analog electronics commonly used in engineering , IT and Industries
2	Aim is to identify the functions of different electronic components.
3	To understand the concepts, working principles and key applications of different semiconductor devices.
4	To study elementary electronic circuits

Expected Course Specific Learning Outcome

Sr. No.	Learning Outcome
1.	Acquires the knowledge about the characteristics and working principles of semiconductor diodes, Bipolar Junction Transistor, Field Effect Transistor and Uni Junction Transistor.
2.	Know about different rectifier circuits and their use in electronics and communication circuits.
3.	Design the different oscillator circuits for various frequencies

Syllabus

Unit No	Title with Contents	No. of Lectures
Unit I	**Semiconductor Diodes**	**10**
	1. Semiconductors and its types	1
	2. P and N type semiconductors	1
	3. Formation of PN junction diode and it's working	1
	4. Forward and Reverse bias characteristics of diode	1
	5. Zener diode: i) Working principle ii) Breakdown mechanism iii) Characteristics	2
	6. Working principle of Light Emitting Diode	1
	7. Working principle of photo diode	1
	8. Study of Opto-coupler	1
	9. Solar cell working principle and characteristics	1
Unit II	**Bipolar Junction Transistor (BJT)**	**10**
	1. Bipolar Junction Transistor (BJT) i) Symbol ii) Types of BJTs iii) Construction of BJTs iv) Working principle of BJTs	3
	2. Transistor amplifier configurations - CB, CC (only concept),	2
	3. CE configuration: Input and Output characteristics,	1
	4. Concept of Biasing: Potential Divider bias	1
	5. Transistor as amplifier (Concept of Gain and Bandwidth expected)	1
	6. Transistor as a switch.	1
	7. Relation between alpha and Beta with problems	1
Unit III	**FET and UJT Transistors**	**05**
	1. Symbol, types, construction, working principle	3
	2. I-V characteristics	1
	3. Specifications parameters.	1

Unit IV	**POWER SUPPLY**	**06**
	1 Block Diagram of Regulated Power Supply	1
	2 Rectifiers (half wave, full wave, and Bridge) with filter circuit	1
	3 Use of Zener Diode as a Voltage Regulator	1
	4 IC 78XX and 79XX as regulator	1
	5 SMPS: Block Diagram and explanation	1
	6 UPS: Block diagram and explanation	1
Unit V	**OSCILLATORS**	**05**
	1. Barkhauson Criteria	1
	2. Low frequency Wien-bridge oscillator and problems	2
	3. High frequency crystal oscillator	1
	4. IC 555 as Astable multivibrator used as square wave generator / clock	1

References:

1) Floyd T.M., Jain R.P, Electronic Devices and Circuits, Prentice-Hall of India Pvt. Ltd
2) A.P. Malvino, Electronics Principles , Tata McGraw Hill
3) B.L. Thereja, Basic Electronics, S. Chand Publication
4) V.K. Mehta, Principle of Electronics , S. Chand Publication

M. C. E. Society's
Abeda Inamdar Senior College
Of Arts, Science and Commerce, Camp, Pune-1
(Autonomous) Affiliated to Savitribai Phule Pune University
NAAC accredited 'A' Grade

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

(CBCS – Autonomy 21 Pattern)

Course/ Paper Title	**Instrumentation System**
Course Code	SBCS121E
Semester	II
No. of Credits	2 (36 Lectures of 50 minutes each)

Aims & Objectives of the Course:

Sr. No.	**Objectives**
1	To provide basic knowledge about the various sensors and their application in Instrumentation System.
2	To study Instrumentation System
3	To study various blocks of Instrumentation System
4	To study types of data convertors.
5	To study OP-AMP characteristics and its application

Expected Course Specific Learning Outcome

Sr. No.	**Learning Outcome**
1.	The students will be familiar with various types of sensors used in electronic circuits
2.	Students will be able to explain principle of operation for various sensors
3.	Students will be able to describe functional blocks of Instrumentation System
4.	Application of OP-AMP in electronic circuits to design arithmetic circuits, Oscillators and as Signal Conditioning Circuit.

Syllabus

Unit No	Title with Contents	No. of Lectures
Unit I	**DATA CONVERTERS**	**06**
	1. Need of Digital to Analog converters i) Parameters ii) Types: Weighted Resistive Type and R-2R ladder Type DAC 2. Need of Analog to Digital converters i) Parameters ii) Types: Flash ADC, Counter Type ADC, Successive approximation ADC.	3 3
Unit II	**Introduction to Instrumentation System**	**04**
	1. Block diagram of Instrumentation system 2. Definition of sensor, transducer and Actuators 3. Classification of sensors: Active and passive sensors. 4. Specifications of sensors: Accuracy, range, linearity, sensitivity, resolution, reproducibility	1 1 1 1
Unit III	**Sensors and Actuators and Smart Instrumentation System**	**15**
	1. Types of Sensors i) Temperature sensor (Thermistor, LM-35), DHT11 Sensor ii) Optical sensor (LDR), iii) Passive Infrared sensor (PIR), iv) Tilt Sensor, v) Ultrasonic sensor vi) Motion sensor vii) Image Sensor 2. Actuators : DC Motor, Stepper motor 3. Concept of smart sensor 4. Film sensors 5. Nano Sensor 6. Block diagram of Smart Instrumentation system	9 2 1 1 1 1

Unit IV	OPAMP as signal Conditioner	11
	1 Concept, block diagram of Op amp	1
	2 Basic parameters (ideal and practical): input and output impedance, bandwidth, differential and common mode gain, CMRR, slew rate,	1
	3 IC741/ LM324	1
	4 Concept of virtual ground	1
	5 Applications of Op amp	7
	i) Inverting and Non-Inverting amplifier	
	ii) Unity gain follower	
	iii) OpAmps as adder, Subtractor,	
	iv) Op amp as current to voltage and voltage to current convertor and Voltage to frequency converter	
	v) Op amp as comparator	
	vi) Problems based on above Op Amp applications	

References:

1) Prof A.D. Shaligram, Sensors and Transducers, Chinttan Publications
2) D. Patranabis, Sensors and Transducers, Prentice-Hall of India Pvt. Ltd
3) Ramakant Gaykwad, Op Amp and Linear Integrated Circuits, Pearson
4) V.K. Mehta, Principle of Electronics , S. Chand Publication

M. C. E. Society's
Abeda Inamdar Senior College
Of Arts, Science and Commerce, Camp, Pune-1
(Autonomous) Affiliated to Savitribai Phule Pune University
NAAC accredited 'A' Grade

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

(CBCS – Autonomy 21 Pattern)

Course/ Paper Title	Principles of Digital Electronics
Course Code	SBCS112E
Semester	I
No. of Credits	2 (36 Lectures of 50 minutes each)

Aims & Objectives of the Course:

Sr. No.	Objectives
1	To get familiar with concepts of digital electronics
2	To learn number systems and their representation
3	To understand basic logic gates, Boolean algebra and K-maps
4	To study arithmetic circuits and combinational circuits

Expected Course Specific Learning Outcome

Sr. No.	Learning Outcome
1.	The students will learn number systems and their inter-conversion between them.
2.	Using the Boolean algebra and logic circuits using Karnaugh's map students will be able to simplify the Boolean equations.
3.	The students will be able to design logic circuits using arithmetic circuits, combinational circuits and sequential circuits
4.	The students will acquire the basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits.
5.	Analyze, design and implement combinational logic circuits

Syllabus

Unit No	Title with Contents	No. of Lectures
Unit I	**Number Systems and Digital codes**	**10**
	1. Introduction to Decimal, Binary and Hexadecimal Number Systems And their inter- conversions,	3
	2. Binary addition	1
	3. Binary subtraction using 2's complement	1
	4. Binary Coded Decimal Number	1
	5. Gray Codes: Gray to Binary and Binary to Gray conversion,	2
	6. Alphanumeric representation in ASCII codes.	1
	7. Parity bits	1
Unit II	**Logic gates and Boolean Algebra**	**14**
	1. Logic gates (NOT, AND,OR,NAND,NOR,XOR gate) With their symbol, Boolean Equation and truth table, Universal gates	2
	2. Boolean algebra rules and Boolean Laws	2
	3. De Morgan's theorem	1
	4. Simplifications of Logic equations using Boolean algebra rules.	3
	5. Introduction to Karnaugh Map,	1
	6. Problems based on the same (Upto 4 variables)	3
	7. Digital Designing using K Map for i) Gray to Binary Conversion ii) Binary to Gray conversion	2
Unit III	**Combinational Circuits**	**12**
	1. Introduction	1
	2. Half adder and full adder	1
	3. 4-Bit Universal adder/ Subtractor	1
	4. Applications of Ex-OR gates as parity checker and generator	1
	5. Study of Multiplexer (4:1) and Demultiplexer (1:4)	1
	6. Encoders - Decimal/ BCD to binary	1

	7. 3X4 Matrix Keyboard Encoder	1
	8. Priority Encoder	1
	9. Decoder- BCD to Seven Segment Decoder	1
	10. Study of IC 74138	1
	11. Study of IC 7447	1
	12. Digital comparator	1

References:

1) Floyd T.M., Jain R.P, Digital Fundamentals, Pearson Education
2) Jain R.P, Digital Electronics, Tata McGraw Hill
3) Malvino and Leach, Digital Principles and Applications, Tata McGraw-Hill
4) M. Morris Mano, Digital Design -3rdEdition, Prentice-Hall of India Pvt. Ltd
5) Ronald J. Tocci, Digital Systems-Principles and Applications, Prentice-Hall of India Pvt. Ltd
6) G. K. Kharate, Digital electronics, Oxford University Press
7) Anand Kumar, Fundamentals of Digital Circuits, Prentice-Hall of India Pvt. Ltd

M. C. E. Society's
Abeda Inamdar Senior College
Of Arts, Science and Commerce, Camp, Pune-1
(Autonomous) Affiliated to Savitribai Phule Pune University
NAAC accredited 'A' Grade

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

(CBCS – Autonomy 21 Pattern)

Course/ Paper Title	Basics of Computer Organization
Course Code	SBCS122E
Semester	II
No. of Credits	2 (36 Lectures of 50 minutes each)

Aims & Objectives of the Course:

Sr. No.	Objectives
1	To get familiar with sequential circuits
2	To study Basic computer Organization
3	To study Memory architecture
4	To get familiar digital sequential circuits

Expected Course Specific Learning Outcome

Sr. No.	Learning Outcome
1.	The students will be familiar with sequential circuits.
2.	The students will understand the basics of Computer Organization
3.	The students will be able to classify semiconductor memories

Syllabus

Unit No	Title with Contents	No. of Lectures
Unit I	**Flip Flops**	**07**
	1. RS Flip Flop using NAND gate	2
	2. Clocked RS Flip Flop	1
	3. D Latch	1
	4. J-K Flip Flop and Master Slave J-K FlipFlops	2
	5. T flip flop	1
Unit II	**Shift registers and Counters**	**14**
	1. Introduction	1
	2. Types of Shift registers -	4
	i) Serial In Serial Out (SISO) Register	
	ii) Serial In Parallel Out (SIPO) Register	
	iii) Parallel In Parallel Out (PIPO) Register	
	iv) Parallel In Serial Out (PISO) Register	
	3. Ring Counter using D Flip flop	1
	4. Counters -Synchronous and Asynchronous type	2
	5. 3 -bit Up, Down and Up - Down counter	2
	6. Concept of modulus Counters (Timing Diagram of all above are expected)	2
	7. Study IC 7490 with its internal Block Diagram and examples	2
Unit III	**Basics of Computer System**	**08**
	1 Introduction to Basic Computer Organization	1
	2 Concept of Address Bus, Data Bus, Control Bus.	1
	3 CPU Block Diagram and Explanation of each block	1
	4 Register based CPU organization	1
	5 Concept of Stack & its organization	1
	6 I/O organization:	3
	i) Need of interface	
	ii) Block diagram of general I/O interface	
	iii) Working	

Unit IV	Memory Organization	07
	1. Memory Architecture	1
	2. Memory hierarchy	1
	3. Types of Memories	2
	4. Vertical and Horizontal Memory Expansion	1
	5. Role of Cache memory	1
	6. Virtual Memory	1

References:

1) Floyd T.M., Jain R.P, Digital Fundamentals, Pearson Education
2) Jain R.P, Digital Electronics, Tata McGraw Hill
3) M. Morris Mano, Digital Logic and Computer Design, Pearson Education
4) William Stallings, Computer Organization and Architecture, Pearson Education

M. C. E. Society's
Abeda Inamdar Senior College
Of Arts, Science and Commerce, Camp, Pune-1
(Autonomous) Affiliated to Savitribai Phule Pune University
NAAC accredited 'A' Grade

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

(CBCS – Autonomy 21 Pattern)

Course/ Paper Title	Electronics Laboratory-I
Course Code	SBCS113E
Semester	IA
No. of Credits	1.5 (46.8 Lectures of 50 minutes each)

Aims & Objectives of the Course:

Sr. No.	Objectives
1	The electronics laboratory is the gateway of the electronics world. Hence, the practical course is intended to achieve the basic skills required for computer science students.
2	To get familiar with the various electronics instruments & components which basically equip them to design and test circuits in near future
3	To identify various Electronic Components , how to use various instruments like Digital Multi-Meter (DMM) to test electronic components , Signal Generators and Cathode Ray Oscilloscope (CRO)
4	To understand the concepts and working of various electronics devices like diodes , transistors , rectifier circuits, amplifiers, logic gates, combinational and sequential circuits.
5	To study various electronic circuits so that the students are able to understand the practical aspects of basic electronics theory.

Expected Course Specific Learning Outcome :

Sr. No.	Learning Outcome
1.	Experiments are performed using signal Generator, CRO, Regulated DC power supply. Hence after performing Preparatory Experiments, the students will be able to use various instruments

2.	Will be able to correlate the theoretical concepts of various electronics circuits with practical feasibility; thereby students can learn different electronics circuits and its electrical characteristics in a better way.
3.	Theoretical knowledge of electronic devices will be justified after performing practical.

The practical course consists of 10 experiments. After studying the theory and practical student can design and develop Hobby projects.

- The practical course consists of 10 experiments out of which two will be preparatory experiments.
- These will be evaluated in an oral examination for 15% marks at internal and external semester examination.
- Each Practical batch will have maximum 15 students.

Preparatory Experiments (Minimum 2/3)

1. Identification of Components (Passive and Active) /Tools

- Minimum 10 different types of components must be given
- Identification based on visual inspection / data sheets be carried out

2. Use of Digital Multimeter

- Measurement of AC/DC voltage and Current – on different ranges
- Measurement of R &C
- Testing of Diodes &Transistors
- Measurement of β.
- Use of Multimeter in measurement of Variation of Resistance of LDR.
- Thermistor

3. Study of Signal Generator & CRO

- Understand how to use Signal Generator, CRO
- Study of front panel controls of both
- Measurement of amplitude and frequency of Sine/Square waveform
- Demonstrate the use of Component testing facility

SEM-I: Electronics Laboratory-I (SBCS113E)

List of Practical (Minimum 08, 4 from each group)

Sr. No.	Title of Experiment
	Group-A
1	Study of I-V characteristics of Diode.
2	Study of breakdown characteristics and voltage regulation action of Zener diode.
3	Study of half wave, full wave and bridge rectifier circuit with and without capacitor filters.
4	Study of Bipolar Junction Transistor as a Switch.
5	Study of Single stage RC coupled CE transistor Amplifier (Gain/ Bandwidth).
6	Study of output and transfer characteristics of JFET.
7	Study of IC 555 as an Astable Multivibrator.
	Group-B
1	Study of Logic Gates (Verification of Truth tables)
2	Study of Binary to Gray & Gray to Binary Converter (K- Map based design).
3	Study of Half Adder and Full Adder using Logic Gates.
4	Use of Ex-OR as a 4-bit Parity Checker and Generator.
5	Study of Decimal to BCD (Binary) Converter using Gates.
6	Study of Multiplexer and Demultiplexer (4:1 & 1:4).
7	Study of BCD to Seven Segment Display using IC 74138 and IC 7447

Course/ Paper Title	Electronics Laboratory-IB
Course Code	21SBCS123E
Semester	II
No. of Credits	1.5 (46.8 Lectures of 50 minutes each)

SEM-I: Electronics Laboratory-IB (21SBCS123E)

List of Practical (Minimum 08, 4 from each group)

Sr. No.	Title of Experiment
Group-A	
1	To study temperature sensor LM 35
2	Use of LDR to control light intensity
3	Study of PIR and tilt sensor.
4	Use of OPAMP as comparator and its use in DC motor driving.
5	Build and test Inverting and non-inverting amplifier using OPAMP.
6	Build and test adder and Subtractor circuits using OPAMP.
7	Build and test voltage to frequency converter
Group-B	
1	Study of RS, JK and D flip flops using NAND gates
2	Study of Four bit ALU
3	Study of asynchronous Up/Down Counter
4	Study of decade counter IC circuit configurations.
5	Study of 4-bit SISO Shift register and its use as Ring Counter
6	Study of 4-Bit R-2R Ladder Network type of DAC.
7	Study of 3-bit Flash ADC