The Poona Gujarati Kelavani Mandal's
HARIBHAI V. DESAI COLLEGE
of Arts, Science & Commerce (Autonomous)
Affiliated to Savitribai Phule Pune University
(Linguistic Minority Institution) AICTE NO. : 1-44457797714
ID No.: PU / PN / ASC / 057/ (1984)
NAAC Grade B++ (2.86 CGPA) ■ AISHE CODE : C-41829
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Restructured Syllabus (CBCS Pattern as per NEP 2020)

To be implemented from Academic Year: 2024-25

Faculty	Science and Technology
Program	B.Sc. Computer Science
Department	Electronic Science
Class	F.Y.B.Sc. Computer Science

SEMESTER-1

Semester	Course Code	Type of Course	Course Title	Theory/ Practical	Credits	No. of clock hours per week
I	ELC-101-TH	Subject-3	**Principle of Analog Electronics**	Theory	2	2

Course Objectives:

- To study various types of semiconductor devices
- To study elementary electronic circuits and systems
- To study Instrumentation System
- To study various blocks of instrumentation System
- To study smart instrumentation system

Course Outcomes:

- Recall the key concepts related to diodes, BJTs, oscillators, converters, instrumentation, and op-amps.
- Understand the principles and characteristics of electronic components and circuits.
- Apply knowledge to design and build basic electronic circuits.
- Analyze the performance of electronic devices and systems.
- Evaluate the practical applications of electronic components.

Unit	Tile and Content	No. of lectures in Clock Hours
Chapter 1	**Semiconductor Diodes**	**05 Hrs**
	Semiconductor, P and N type semiconductors, Formation of PN junction diode, it's working. Zener diode, LED, Photo diode (Symbol, working principal, list of applications only)	

Chapter 2	Bipolar Junction Transistor (BJT)	05 Hrs
Bipolar Junction Transistor (BJT) symbol, types, construction, working principle, Transistor. Amplifier configurations - CB, CC (only concept), CE configuration: input and output characteristics, Definition of α, β and ϒ , Concept of Biasing (numerical problems not expected).		
Chapter 3	**Oscillators**	**05 Hrs**
Barkhauson Criteria, Low frequency Wein-bridge oscillator, High frequency crystal oscillator		
Chapter 4	**Data converters**	**05 Hrs**
Need of Digital to Analog converters, parameters, weighted resistive network, R-2R ladder network, need of Analog to Digital converters, parameters, Flash ADC.		
Chapter 5	**Introduction to Instrumentation System**	**05 Hrs**
Block diagram of Instrumentation system, Definition of sensor and transducer Classification of sensors: Active and passive sensors. Specifications of sensors: Accuracy, range, linearity, sensitivity, resolution, reproducibility. Temperature sensor (Thermistor, LM-35), Passive Infrared sensor (PIR), Actuators: DC Motor, stepper motor		
Chapter 6	**OPAMP as signal Conditioner**	**05 Hrs**
Concept, block diagram of Op amp, basic parameters (ideal and practical): input and output impedance, bandwidth, differential and common mode gain, CMRR, slew rate, IC741/ LM324, Concept of virtual ground.		

Reference Books:

1. Electronic Devices and Circuits I – T. L. Floyd- PHI Fifth Edition
2. Principles of Analog Electronics - A.P. Malvino
3. Sedha R.S., A Text Book Of Applied Electronics, S. Chand & Company Ltd
4. Sensors and Transducers : D. Patranabis, PHI publication, 2nd Edition
5. Sensors and Transducers : Prof A.D. Shaligram
6. Op Amp and Linear Integrated Circuits: Ramakant Gaikwad

Examination Scheme

Internal Evaluation: **15 Marks** (Internal Examination, Seminars, Presentation Assignments)
External Evaluation: **35 Marks (Final Theory Examination)**

Semester	Course Code	Type of Course	Course Title	Theory/ Practical	Credits	No. of clock hours per week
I	ELC-102-PR	Subject-3	**Electronics Practical Course I**	Practical	2	4

Course Objectives:

- To study different semiconductor diodes.
- To understand applications of IC 555 as a multivibrator.
- To study different applications of op-amp.
- To understand applications of sensors

Course Outcomes:

- Use different semiconductor diodes for various applications.
- Understand the different applications of diodes, BJT, Data convertors circuits, Sensors and Op-Amp.
- Analyze the performance of the circuits
- Design and test the circuits

Course Content	
Group A (Any 13)	
1.	Study of forward and reverse bias characteristics of PN junction diode.
2.	To study the forward characteristics of LED for different colours
3.	Study of Zener diode as a voltage regulator
4.	Study of Optocoupler (mechanism and characteristics, Working principle of Light emitting diode, photo diode)
5.	Study of Transistor as a switch.
6.	Study of IC 555 as astable multivibrator used as square wave generator / clock
7.	Study of Digital to Analog Converter using R-2R ladder network

8.	Study of optical sensor (LDR)
9.	Study of temperature sensor (LM35)
10.	Study of PIR sensor
11.	Study of Study of Op amp as inverting/non-inverting amplifier
12.	Op Amp as a Unity gain follower
13.	Study of Op-amp as adder/subtractor
14.	Study of Flash ADC.
15.	Study of Wein-bridge oscillator.
16.	Study of crystal oscillator
Group B: Activity (Any 1: Equivalent to 2 Practicals)	
1.	Bipolar Junction Transistor (BJT) symbol, types, construction, working principle, Transistor. Amplifier configurations - CB, CC (only concept), CE configuration: input and output characteristics, Definition of α, β and ϒ , Concept of Biasing (numerical problems not expected), Identification of components (Passive and Active) and study of multimeter - a) Minimum 10 different types of components are expected. b) Identification based on visual inspection / data sheets. c) Measure the various parameters using multimeter.
2.	Technical survey of 5 electronic appliances used in different fields (Home, Hospital, Agriculture, Chemical industry, Automobile industry)

Suggested Readings/Material:

1. Electronic Devices and Circuits I – T. L. Floyd- PHI Fifth Edition
2. Principles of Analog Electronics - A.P.Malvino
3. Sedha R.S., A Text Book Of Applied Electronics, S.Chand& CompanyLtd
4. Sensors and Transducers : D. Patranabis, PHI publication, 2nd Edition
5. Sensors and Transducers : Prof A.D.Shaligram
6. Op Amp and Linear Integrated Circuits: Ramakant Gaykwad

Examination Scheme

Internal Evaluation: **15 Marks** (Internal Examination, Journal Completion, Seminars, Projects)

External Evaluation: **35 Marks (Final Practical Examination)**

SEMESTER-2

Semester	Course Code	Type of Course	Course Title	Theory/ Practical	Credits	No. of clock hours per week
II	ELC-151-TH	Subject-3	**Principle of Digital Electronics**	Theory	2	2

Course Objectives:

- To learn different number systems and their inter conversion
- To understand logic gates and their applications,
- To study rules and laws of Boolean algebra
- To understand the design of combination circuits and their different types.
- To introduce flip flop and their role in sequential circuit.

Course Outcomes:

- Recall key concepts of number systems, digital codes, logic gates, Boolean algebra, and combinational circuits.
- Understand the principles and characteristics of logic gates, digital components and systems.
- Apply knowledge to conversions, logic circuit design, and Boolean simplification.
- Evaluate the functionality and applications of digital components or circuits.

Unit	Tile and Content	No. of lectures in Clock Hours
Chapter 1	**Number Systems and Digital Codes**	**Hrs**
Introduction to decimal, binary, octal and hexadecimal number system and their inter-conversions, the concept of 1's and 2's complements, binary addition, binary subtraction using 1's and 2's complements, BCD code, Excess-3 code, Gray code and ASCII code.		
Chapter 2	**Logic gates and Logic families**	**06 Hrs**
Logic gates: Basic and derived (symbol, Boolean equation and truth table), concept of universal gates. Concept parity and application Ex-OR gate as parity generator and Checker. **Logic Families:**		

Introduction of CMOS and TTL logic families. Parameters of logic families: voltage levels, propagation delay, noise margin, fan in, fan out, power dissipation. Comparison between CMOS and TTL logic families.

Chapter 3	**Boolean Algebra and K-Map**	**06 Hrs**

Laws of Boolean Algebra, De-Morgan's theorems, simplification of logic equations using Boolean algebra, minterms, maxterms, Boolean expression in SOP and POS form, conversion of SOP/POS expression to its standard SOP/POS form.

Introduction of K-Map (Only Concept).

Chapter 4	**Combinational Circuits**	**06 Hrs**

Introduction to Arithmetic Circuits, half adder, full adder, half subtractor, full subtractor, four-bit parallel adder, universal adder / subtractor, digital comparator, introduction to ALU. Introduction, Multiplexer (2:1, 4:1), demultiplexer (1:2, 1:4) and their applications. Encoders: decimal to BCD/binary, 3x4 matrix keyboard encoder and priority encoder. Decoders: BCD to decimal and BCD to seven segment decoders.

Chapter 5	**Flip-flops**	**05 Hrs**

RS Flip Flop using NAND gate, clocked RS Flip Flop, D Latch, J K Flip Flop, T Flip Flop

Reference Books:

1. Digital Design - M. Morris Mano, PHI, New Delhi.
2. Digital Systems Principles and Applications - Ronald J. Tocci.
3. Digital electronics - G. K. Kharate, Oxford University Press.
4. Fundamentals of Digital Circuits - Anand Kumar.
5. Digital Principles and Applications - Malvino and Leach, TMG Hill Edition.

Examination Scheme

Internal Evaluation: **15 Marks** (Internal Examination, Seminars, Presentation Assignments)
External Evaluation: **35 Marks (Final Theory Examination)**

Semester	Course Code	Type of Course	Course Title	Theory/ Practical	Credits	No. of clock hours per week
II	ELC-152-PR	Subject-3	**Electronics Practical Course II**	Practical	2	4

Course Objectives:

- To understand logic gates ICs and their applications in Digital Design.
- To design different digital circuits using logic gates.
- To study different combinational circuits.

Course Outcomes:

- Understand the design and build of digital circuits using logic gates.
- Use breadboard / tag-board for building small electronic circuits.
- Design digital circuits for different applications.
- Validate observed outputs with expected theoretical outputs.

Course Content	
Group A (Any 13)	
1.	Verification of logic gates by using digital ICs.
2.	Realization of basic gates using discrete components
3.	Realization of basic gates using universal logic gates.
4.	Verification of De Morgan's theorems.
5.	Study of half adder and full adder using logic gates.
6.	Study of half subtractor and full subtractor using logic gates.
7.	4-bit binary parallel adder and subtractor using IC7483.
8.	3-bit binary to Gray conversion using logic gates.
9.	3-bit Gray to Binary conversion using logic gates.

10.	Study of EX-OR gate as a 4-bit parity generator.
11.	Study of EX-OR gate as a 4-bit parity checker.
12.	Study of 1-bit digital comparator.
13.	Study of ALU using IC 74181.
14.	Study of multiplexer and demultiplexer.
15.	Study of Decimal to BCD/Binary encoder.
16.	Study of Priority Encoder IC 74148
17.	Study of BCD to seven segment decoder using IC 7447
18.	Study JK Flip Flop
19.	Study D and T Flip Flop
Group B: Activity (Any 1: Equivalent to 2 Practicals)	
1.	Perform any 2 experiments from Group A using circuit simulation software LTSPICE / Circuit Mod / Proteus etc. (Give preference to not performed experiments)
2.	Technical survey of 5 electronic appliances used in different fields (Home, Hospital, Agriculture, Chemical industry, Automobile industry)

Suggested Readings/Material:

1. Digital Design - M. Morris Mano, PHI, New Delhi.
2. Digital Systems Principles and Applications - Ronald J. Tocci.
3. Digital electronics - G. K. Kharate, Oxford University Press.
4. Fundamentals of Digital Circuits - Anand Kumar.
5. Digital Principles and Applications - Malvino and Leach, TMG Hill Edition.

Examination Scheme

Internal Evaluation: **15 Marks** (Internal Examination, Journal Completion, Seminars, Projects)

External Evaluation: **35 Marks (Final Practical Examination)**

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Restructured Syllabus (CBCS Pattern as per NEP 2020)

To be implemented from Academic Year: 2024-25

Faculty	Science and Technology
Program	Bachelor of Computer Application (Science)
Department	Electronic Science
Class	F.Y.B.C.A. (Science)

SEMESTER-1

Semester	Course Code	Type of Course	Course Title	Theory/ Practical	Credits	No. of clock hours per week
I	CA-103-TH	Subject-2	**Computer Organization and Architecture**	Theory	2	2

Course Objectives:

- To study number system, logic gates
- To understand combinational and sequential circuits
- To provide a broad overview of architecture and functioning of computer systems
- To learn the basic concepts behind the architecture and organization of computers

Course Outcomes:

- Recall key concepts of number systems, digital codes, logic gates, Boolean algebra, and combinational circuits.
- Understand the principles and characteristics of logic gates, digital components and block diagram of CPU, Memory and types of I/O transfers.
- Apply knowledge to conversions, logic circuit design, and Boolean simplification.
- Evaluate the functionality and applications of digital components or circuits.

Unit	Tile and Content	No. of lectures in Clock Hours
Chapter 1	**Data representation and Computer Arithmetic**	**06 Hrs**

Review of Decimal, Binary, Octal, Hexadecimal Number systems and their inter-conversion, BCD code, Gray code, Excess-3 code, ASCII, EBCDIC, Unicode, Signed and Unsigned numbers, 1's and 2's complements, Binary arithmetic.

Chapter 2	**Boolean Algebra & Logic Gates**	**06 Hrs**

Boolean theorems, Boolean Laws, De Morgan's Theorem, Reduction of Logic expression using Boolean Algebra, Introduction to Logic (AND, OR, NOT), Classification of Logic gates, Universal Logic gates, Implementation of other gates using universal gates.

Chapter 3	**Combinational Circuits**	**06 Hrs**

Definition of combinational circuits, Detail study of Half adder, Full adder, Half subtractor, Full subtractor, Multiplexer (4:1) & Demultiplexer (1:4), Encoder (8-line-to- 3-line) and Decoder (3-line-to-8-line), Parity generator and checker, Block diagram of ALU.

Chapter 4	**Sequential circuits**	**06 Hrs**

Definition of sequential circuits, Detail study of Flip Flops and truth tables: S-R FF, J- K FF, T and D type FFs, Flip flop as memory device.
Counters: Asynchronous-Up down counter, Synchronous- Ring counter, Event counter.
Shift Registers and their types, serial to parallel and parallel to serial converters using shift registers.

Chapter 5	**CPU, Memory and I/O Organization**	**06 Hrs**

Block diagram of CPU, functions of CPU, general register organization, flags, Concept of RISC and CISC Memory System hierarchy, Cache Memory, Internal Memory, External Memory, Concept of Virtual Memory. Basics of I/O organisation: types of I/O data transfers.

Reference Books:

1. R.P. Jain, "Modern Digital Electronics", McGraw-Hill Publications
2. Flod and Jain, "Digital Fundamentals", Pearson Publication.
3. Morris Mano, "Computer System Architecture" Prentice-Hall.

Examination Scheme

Internal Evaluation: **15 Marks** (Internal Examination, Seminars, Presentation Assignments)
External Evaluation: **35 Marks (Final Theory Examination)**

Semester	Course Code	Type of Course	Course Title	Theory/ Practical	Credits	No. of clock hours per week
I	CA-104-PR	Subject-2	**Lab Course on CA-103-TH**	Practical	2	4

Course Objectives:

- To study number system, logic gates
- To understand combinational and sequential circuits
- To provide a broad overview of architecture and the functioning of computer systems
- To learn the basic concepts behind the architecture and organization of computers.

Course Outcomes:

- Understand the design and build of digital circuits using logic gates.
- Use breadboard / tag-board for building small electronic circuits.
- Design digital circuits for different applications.
- Validate observed outputs with expected theoretical outputs.

Course Content	
Group A (Any 10)	
1.	Verification of logic gates by using digital ICs.
2.	Verification of De Morgan's theorems.
3.	Study of half adder and full adder using logic gates.
4.	3-bit binary to Gray conversion using logic gates.
5.	3-bit Gray to Binary conversion using logic gates.
6.	Study of EX-OR gate as a 4-bit parity generator.
7.	Study of EX-OR gate as a 4-bit parity checker.
8.	Study of ALU using IC 74181.
9.	Study of multiplexer and demultiplexer.

10.	Study of Decimal to BCD encoder.
11.	Study of up-down counter
12.	Study of SR and JK flip flop
13.	Study of D and T flip
14.	Study of Serial In Parallel Out Shift register.
15.	Study of Parallel In Serial Out Shift register.
16.	Study of Diode matrix ROM
Group B: Activity (Any 1: Equivalent to 2 Practicals)	
1.	a) Perform any 2 experiments from Group A using circuit simulation software LTSPICE / Circuit Mod / Proteus etc. (Give preference to not performed experiments)
2.	Technical survey of 5 electronic digital appliances used in different fields.

Suggested Readings/Material:

1. Digital Design - M. Morris Mano, PHI, New Delhi.
2. Digital Systems Principles and Applications - Ronald J. Tocci.
3. Digital electronics - G. K. Kharate, Oxford University Press.
4. Fundamentals of Digital Circuits - Anand Kumar.
5. Digital Principles and Applications - Malvino and Leach, TMG Hill Edition.

Examination Scheme

Internal Evaluation: **15 Marks** (Internal Examination, Journal Completion, Seminars, Projects)

External Evaluation: **35 Marks (Final Practical Examination)**

SEMESTER-2

Semester	Course Code	Type of Course	Course Title	Theory/ Practical	Credits	No. of clock hours per week
II	CA-153-TH	Subject-2	**Introduction to Microcontrollers**	Theory	2	2

Course Objectives:

- To study the basics of microcontroller.
- To learn 8051 Programming.
- To understand interfacing techniques of 8051microcontroller.
- To learn to design simple applications using 8051microcontroller.

Course Outcomes:

- Recall microcontroller concepts and 8051 architecture components.
- Explain the 8051-block diagram and SFR.
- Write assembly programs and interface 8051 with external memory.
- Debug assembly programs for I/O, timers, and interrupts.Develop C programs for 8051 I/O operations and applications.

Unit	Tile and Content	No. of lectures in Clock Hours
Chapter 1	**Introduction of 8051 Microcontroller**	**09 Hrs**
Introduction of microcontrollers and microprocessors, difference between microcontrollers and microprocessors, classification of microcontrollers, Applications of microcontrollers. Features of 8051 microcontrollers, block diagram & Architecture of 8051, Internal Memory organization, SFRS, PSW register, pin functions of 8051, Structure of I/O ports, External Memory Interface.		
Chapter 2	**8051 Programming Model**	**08 Hrs**
Introduction to Assembly programming, Compilers. Assemblers, Instruction classification, Instruction set, Addressing Modes: Immediate, register, direct, indirect and relative, assembler directives (ORG, END), features with examples. Introduction to 8051 programming in C.		

Chapter 3	Timers and Counters	06 Hrs
Timer / counter: TMOD, TCON, SCON, SBUF, PCON Registers, Timer modes, programming for time delay using mode 1 and mode 2.		
Chapter 4	**Interrupts and Interfacing**	**06 Hrs**
Interrupts: Introduction to interrupt, Interrupt types and their vector addresses, Interrupt enable register and interrupt priority register (IE, IP). Basics of Interfacing: ADC, DAC, LCD, stepper motor.		
Reference Books:		
1. 8051 microcontroller and Embedded system using assembly and C : Mazidi andMcKinley, Pearson publications. 2. The 8051 microcontroller – Architecture, programming and applications: K.UmaRao and Andhe Pallavi, Pearson publications.		
Examination Scheme Internal Evaluation: **15 Marks** (Internal Examination, Seminars, Presentation Assignments) External Evaluation: **35 Marks (Final Theory Examination)**		

Semester	Course Code	Type of Course	Course Title	Theory/ Practical	Credits	No. of clock hours per week
II	CA-154-PR	Subject-2	**Lab Course on CA-153-TH**	Practical	2	4

Course Objectives:

- To study the basics of microcontroller.
- To learn 8051 Programming.
- To understand interfacing techniques of 8051microcontroller.
- To learn to design simple applications using 8051microcontroller.

Course Outcomes:

- Write programs using instruction set of 8051 microcontrollers.
- Interface I/O peripherals to 8051 microcontroller.
- Design simple microcontroller-based applications.

Course Content	
Group A (Any 9)	
1.	Study of 8051 microcontroller chip, keil µvision-5.
2.	Study of proteus simulator for 8051 simulation.
3.	Program to find Largest/smallest from a series.
4.	Program to perform Addition / subtraction / multiplication/division of 8/16 bit data.
5.	Program to perform Arithmetic, logical & code conversion problems
6.	Program to perform data transfer/exchange between specified memorieslocations.
7.	Interfacing of LED/LEDs to 8051 microcontroller.
8.	Interfacing of switch & LED to 8051 microcontroller.
9.	Waveform generation using DAC Interface to 8051 Microcontroller.
10.	Traffic light controller using 8051 microcontroller.
11.	Interfacing LCD to 8051Microcontroller.
12.	Interfacing with IR sensor to 8051 microcontroller and LCD.

13.	ADC interfacing to 8051 Microcontroller.
14.	Stepper motor interfacing to 8051 microcontroller.
15.	DC motor interfacing to 8051 microcontroller.
Group B: Activity (Equivalent to 3 Practicals)	
1.	Develop a module based on microcontroller project

Suggested Readings/Material:

1. 8051 microcontroller and Embedded system using assembly and C : Mazidi and McKinley, Pearson publications.
2. The 8051 microcontroller – Architecture, programming and applications: K.UmaRao and Andhe Pallavi, Pearson publications.

Examination Scheme

Internal Evaluation: **15 Marks** (Internal Examination, Journal Completion, Seminars, Projects)

External Evaluation: **35 Marks (Final Practical Examination)**