**COURSES FOR ELECTRONICS MINOR TO COMPUTER SCIENCE**

# Mahatma Gandhi University Kottayam

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| **Programme** | | | | | | |
| **Course Name** | **Computer Fundamentals and Basics of PC Hardware** | | | | | |
| **Type of Course** | DSC B | | | | | |
| **Course Code** | **To be prepared by the University** | | | | | |
| **Course Level** | **100** | | | | | |
| **Course Summary** | This course covers the evolution, classification, and fundamental components of computers, exploring input and output devices, memory types, assembly procedures, and providing a comprehensive understanding of computer hardware. Students will gain practical insights into computer systems, preparing them for advanced studies in computer science. | | | | | |
| **Semester** | 1 | Credits | | | 4 | Total Hours |
| **Course Details** | Learning Approach | Lecture | Tutorial | Practical | Others | |
| | | 3 | 0 | 1 | 0 | 75 |
| **Pre-requisites, if any** | | | | | | |

**COURSE OUTCOMES (CO)**

| CO No. | Expected Course Outcome | Learning Domains * | PO No |
|---|---|---|---|
| 1 | Demonstrate understanding of computer fundamentals. | U | 1 |
| 2 | Describe computer hardware components and their respective roles in system functionality. | U | 1,2 |

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| 3 | Compare SSD/HDD, GPU, CPU, memory, VR/AR, green computing, future trends. | An | 1,2 |
| 4 | Designing and assembling PCs, OS installation, troubleshooting, networking, BIOS/UEFI, benchmarking, security. | C | 1,2,3 |
| ***Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)*** | | | |

**COURSE CONTENT**

**Content for Classroom transaction (Units)**

| Module | Units | Course description | Hrs | CO No. |
|---|---|---|---|---|
| 1 | 1.1 | Overview of Computing: Evolution and History, Components of a Computer System: CPU, Memory, Input/Output Devices, Operating Systems: Types, Functions, and Features, | 7 | 1 |
| | 1.2 | Data Representation: Binary, Hexadecimal, ASCII, Software vs Hardware: Understanding the Difference, Introduction to Networking: LAN, WAN, Internet | 8 | 1 |
| 2 | 2.1 | Motherboard and CPU: Architecture, Socket Types, and Compatibility, Memory (RAM): Types, Speed, Capacity, and Upgrading,Storage Devices: HDD, SSD, Flash Drives - Characteristics and Differences | 7 | 2 |
| | 2.2 | Input Devices: Keyboard, Mouse, Touchpad, and Other Peripheral Devices, Output Devices: Monitor, Printer, Speaker - Types and Functions, Power Supply Unit (PSU) and Cooling Systems: Importance and Components, Understanding Ports and Expansion Slots: USB, HDMI, PCI, PCIe | 8 | 2 |
| 3 | 3.1 | Solid State Drives (SSD) vs Hard Disk Drives (HDD): Advantages and Disadvantages, Graphics Processing Unit (GPU): Integrated vs Dedicated Graphics Cards, Latest CPU Architectures: Multi-Core Processors, Cache, and Clock Speed, Emerging Trends in Memory Technology: DDR4, DDR5, and Beyond | 7 | 3 |
| | 3.2 | Introduction to Virtual Reality (VR) and Augmented Reality (AR) Hardware Requirements, Green Computing: Energy-Efficient Components and Practices, Future of PC Hardware: Quantum | 8 | 3 |

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|---|---|---|---|---|
| | | Computing, Neuromorphic Computing, and Beyond | | |
| 4 | 4.1 | • Assembling a PC: Step-by-Step Guide to Building a Computer<br>• Installing Operating Systems: Windows, Linux, macOS - Hands-On Installation<br>• Troubleshooting Common Hardware Issues: Diagnosing and Fixing Problems<br>• Basic Networking Setup: Configuring LAN, Wi-Fi, and Internet Connection<br>• Introduction to BIOS/UEFI: Understanding Firmware and Basic Configuration<br>• Benchmarking and Performance Testing: Tools and Techniques<br>• Security Best Practices: Antivirus, Firewall, Data Encryption | 30 | 4 |
| 5 | | (Teacher specific content) | | |

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| **Teaching and Learning Approach** | **Classroom Procedure (Mode of transaction)**<br>• Use of ICT tools in conjunction with traditional classroom teaching methods<br>• Interactive sessions<br>• Class discussions<br>• Lab exercises |
| **Assessment Types** | **MODE OF ASSESSMENT**<br>**A. Continuous Comprehensive Assessment (CCA)**<br>**CCA for Theory: 25 Marks**<br>1. Written test<br>2. Assignments<br>**CCA for Practical: 15 Marks**<br>1. Practical assignments<br>2. Lab Record<br>3. Observation of practical skills<br>4. Viva |

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| | **B. Semester End Examination**<br><br>**ESE for Theory: 50 Marks (1.5 Hrs)**<br><br>**Written Test(50 Marks)**<br>Part A: MCQ (Answer all) - (10*1=10 Marks)<br>Part B: Short Answer Questions(4 out of 6 Questions) - (4*5=20 Marks)<br>Part C: Essay Questions(2 out of 3 Questions) - (2*10=20 Marks)<br><br>**ESE for Practical: 35 Marks (1.5 Hrs)**<br><br>1. Viva - 15 Marks<br>2. Demonstration - 10 Marks<br>3. Record - 10 Marks |

**REFERENCES**


1. John Smith (2023). Computer Fundamentals and PC Hardware: A Comprehensive Guide (1st Edition). TechBooks Publishing.


**SUGGESTED READINGS**


1. Randal E. Bryant and David R. O'Hallaron (2016). Computer Systems: A Programmer's Perspective (3rd Edition). Pearson Education.
2. Scott Mueller (2017). Upgrading and Repairing PCs (22nd Edition). Que Publishing.
3. Abraham Silberschatz, Peter B. Galvin, and Greg Gagne (2018). Operating System Concepts (10th Edition). John Wiley & Sons.
4. Mike Meyers (2019). CompTIA A+ Certification All-in-One Exam Guide (10th Edition). Sybex.

# Mahatma Gandhi University Kottayam

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|---|---|---|---|---|---|---|
| **Programme** | | | | | | |
| **Course Name** | **Data Communication** | | | | | |
| **Type of Course** | DSC B | | | | | |
| **Course Code** | **To be prepared by the University** | | | | | |
| **Course Level** | **100** | | | | | |
| **Course Summary** | This course covers fundamental concepts in data communication and networks, including data representation, signal conversion, modulation techniques, switching, and practical applications, providing students with a strong foundation in the field. | | | | | |
| **Semester** | 2 | Credits | | | 4 | Total Hours |
| **Course Details** | Learning Approach | Lecture | Tutorial | Practical | Others | |
| | | 3 | 0 | 1 | 0 | 75 |
| **Pre-requisites, if any** | | | | | | |

**COURSE OUTCOMES (CO)**

| CO No. | Expected Course Outcome | Learning Domains * | PO No |
|---|---|---|---|
| 1 | Describe the foundational elements of data communications | U | 1 |
| 2 | Illustrate guided and unguided media used in data transmission, | U | 1 |
| 3 | Illustrate understanding of digital communication and modulation techniques. | U | 1 |

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| 4 | Develop practical skills in signal quality measurement, delta modulation, and applying modulation techniques using microcontrollers in a lab. | A | 2 |
| ***Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)*** | | | |

**COURSE CONTENT**

**Content for Classroom transaction (Units)**

| Module | Units | Course description | Hrs | CO No. |
|---|---|---|---|---|
| 1 | 1.1 | Data Communications ,Components, Data Representation, Data Flow-Simplex, Half Duplex, Full Duplex. | 5 | 1 |
| | 1.2 | Analog and Digital Data, Analog and Digital Signals, Periodic and Nonperiodic, composite Signals, Bandwidth, Bit Rate, | 5 | 1 |
| | 1.3 | Transmission Impairment, Attenuation, Distortion, Noise, Noiseless Channel:Nyquist Bit Rate, Noisy Channel: Shannon Capacity. | 5 | 1 |
| 2 | 2.1 | Guided Media, Twisted Pair cable-UTP, STP, connectors, Coaxial cable, connectors, Fiber Optic Cable | 5 | 2 |
| | 2.2 | Unguided Media, Wireless Transmission, Terrestrial microwave, Satellite Microwave, Radio wave, Infrared | 5 | 2 |
| 3 | 3.1 | Analog to Digital Conversion: Block diagram of Digital Communication System, Parallel and Serial Port | 5 | 3 |
| | 3.2 | Pulse Code Modulation, Sampling, Quantization, Delta Modulation, Transmission Modes, Asynchronous and Synchronous Transmission. | 5 | 3 |
| | 3.3 | Digital to Analog Conversion, Modulation of Digital Data, Bit rate, Baud Rate, Carrier Signal,ASK,FSK,PSK,QAM. | 5 | 3 |
| | 3.4 | Analog to Analog Modulation, Amplitude Modulation, Frequency Modulation and Phase Modulation, Bandwidth Utilization: Multiplexing and Spread Spectrum, Multiplexing: FDM, WDM, TDM, Synchronous TDM, Statistical TDM, Spread spectrum: FHSS,DSSS | 5 | 3 |

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| 4 | 4.1 | Experiments:<br>1. Measure and compare the quality of the received signals, observing factors like attenuation and interference in different guided medias<br>2. Implement a simple delta modulation circuit using a microcontroller.<br>3. Use a microcontroller to generate digital data and Convert the digital data to analog using a Digital to Analog Converter (DAC).<br>4. Connect the DAC output to an oscilloscope or an audio speaker to visualize or hear the analog signal generated from the digital data.<br>5. Implement an ASK, FSK and PSK modulation circuit using the microcontroller and required components.<br>6. Implement Spread Spectrum techniques such as Frequency Hopping Spread Spectrum (FHSS) and Direct Sequence Spread Spectrum (DSSS). | 30 | 4 |
| 5 | | (Teacher specific content) | | |

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| **Teaching and Learning Approach** | **Classroom Procedure (Mode of transaction)**<br>● Use of ICT tools in conjunction with traditional classroom teaching method.<br>● Interactive sessions<br>● Class discussions<br>● Lab exercises |

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| **Assessment Types** | **MODE OF ASSESSMENT**<br>**A. Continuous Comprehensive Assessment (CCA)**<br>**CCA for Theory: 25 Marks**<br>1. Written test<br>2. Assignments<br>**CCA for Practical: 15 Marks**<br>1. Practical assignments<br>2. Lab Record<br>3. Observation of practical skills<br>4. Viva |
| | **B. Semester End Examination**<br>**ESE for Theory: 50 Marks (1.5 Hrs)**<br>**Written Test(50 Marks)**<br>Part A: MCQ (Answer all) - (10*1=10 Marks)<br>Part B: Short Answer Questions(4 out of 6 Questions) - (4*5=20 Marks)<br>Part C: Essay Questions(2 out of 3 Questions) - (2*10=20 Marks)<br>**ESE for Practical: 35 Marks (1.5 Hrs)**<br>1. Viva - 15 Marks<br>2. Demonstration - 10 Marks<br>3. Record - 10 Marks |

**REFERENCES**

Behrouz A Forouzan. Data Communications and Networking(Fifth Edition).TATA McGraw Hill Education

**SUGGESTED READINGS**

1. William Stallings. (2006). Data and Computer Communications (8th Edition). Pearson.
2. William L. Schweber. (2012). Data Communications (5th Edition). Tata McGraw-Hill Publishing Company Ltd.

# Mahatma Gandhi University Kottayam

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| **Programme** | | | | | | |
| **Course Name** | **Digital Fundamentals** | | | | | |
| **Type of Course** | DSC B | | | | | |
| **Course Code** | **To be prepared by the University** | | | | | |
| **Course Level** | **200** | | | | | |
| **Course Summary** | This course covers the fundamentals of digital electronics, including number systems, Boolean algebra, logic gates, combinational logic circuits, and sequential logic circuits. Through theoretical concepts and practical examples, students gain a comprehensive understanding of digital logic design principles and their applications. | | | | | |
| **Semester** | 3 | Credits | | | 4 | Total Hours |
| **Course Details** | Learning Approach | Lecture | Tutorial | Practical | Others | |
| | | 3 | 0 | 1 | 0 | 75 |
| **Pre-requisites, if any** | | | | | | |

**COURSE OUTCOMES (CO)**

| CO No. | Expected Course Outcome | Learning Domains * | PO No |
|---|---|---|---|
| 1 | Familiarization of number systems and their importance in computation | U | 1 |
| 2 | Analyse working of logic gates and formation of logic combinational circuits | An,A | 1,2 |
| 3 | Implementation of sequential logic circuit and Arithmetic Logic Units of a computer | U, A | 1,2 |

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| 4 | Demonstrate the ability to implement and verify basic digital logic circuits, including gates, adders, multiplexers, decoders, flip-flops, counters, and memory systems. | A | 2 |
| ***Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)*** | | | |

**COURSE CONTENT**

**Content for Classroom transaction (Units)**

| Module | Units | Course description | Hrs | CO No. |
|---|---|---|---|---|
| 1 | 1.1 | Number Systems, Decimal, Binary, Octal and Hexadecimal), Conversion-From one number system to another,. - | 4 | 1 |
| | 1.2 | Concept of binary addition and subtraction- 1's Complement , 2's complement, Subtraction using 1's and 2's Complement- BCD numbers- concept and addition | 4 | 1 |
| | 1.3 | Logic gates- AND, OR, NOT, NAND, NOR, XOR and XNOR. Truth tables - Basic laws of Boolean Algebra, Simplification of Expressions | 3 | 1 |
| 2 | 2.1 | DeMorgan's theorems, Simplification of expressions using K-MAP (up to 4 variables)- | 3 | 2 |
| | 2.2 | Combinational Logic Circuits : Adders-Half adder, Full adder – parity generator- Encoders- Decoders- Multiplexers – Demultiplexers | 8 | 2 |
| | 2.3 | Sequential - Logic Circuits: Flip flops- Latch, Clocked, RS, JK, T, D, Triggering of flip flops, Master Slave flip flops - Concept of Registers, Shift Registers- SISO, SIPO, PISO, PIPO - | 5 | 2 |
| | 2.4 | Basic Structure of computers – functional units - basic operational concepts - data representation - instruction execution, and memory hierarchy - bus structures- addressing modes. - | 3 | 2 |
| 3 | 3.1 | Memory system: basic concepts – semiconductor RAMs. memory system considerations interfacing | 5 | 3 |

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|---|---|---|---|---|
| | | memory with CPU- memory map- ROMs, cache memory, mapping Techniques | | |
| | 3.2 | Arithmetic algorithms: Adder and subtractor units - Booth's multiplication algorithm - access. | 5 | 3 |
| | 3.3 | Control organization – Hardwired control-microprogram control of processor unit – Microprogram sequencer, micro programmed CPU organization - I/O organization: accessing of I/O devices – interrupts, interrupt hardware -Direct memory access | 5 | 3 |
| 4 | 4.1 | Practical:<br>1. Familiarization of logic gates and verification of truth tables<br>2. Implementation of a logic equation using gates.<br>3. Verification of DeMorgan's Theorem<br>4. Implementation of logic gates using universal gates.<br>5. Implementation of flip flop using gates<br>6. Verification of flip flop IC, truth table states.<br>7. Implementation of Half Adder<br>8. Implementation of Full Adder<br>9. Implementation of 3 to 8 decoder<br>10. Implementation of seven segment display.<br>11. Implementation of 8:1 multiplexer<br>12. Implementation of 1:8 demultiplexer<br>13. Implementation of 3 bit counter<br>14. Understanding shift operations.<br>15. Implementation of a 4 bit memory system | 30 | 4 |
| 5 | | Teacher specific content | | |

| | |
|---|---|
| **Teaching and Learning Approach** | **Classroom Procedure (Mode of transaction)**<br>• Use of ICT tools in conjunction with traditional classroom teaching methods<br>• Interactive sessions<br>• Class discussions |
| **Assessment Types** | **MODE OF ASSESSMENT**<br>**A. Continuous Comprehensive Assessment (CCA)** |

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|---|---|
| | **CCA for Theory: 25 Marks**<br>1. Written test<br>2. Assignments<br>**CCA for Practical: 15 Marks**<br>1. Practical assignments<br>2. Lab Record<br>3. Observation of practical skills<br>4. Viva |
| | **B. Semester End Examination**<br>**ESE for Theory: 50 Marks (1.5 Hrs)**<br>**Written Test(50 Marks)**<br>Part A: MCQ (Answer all) - (10*1=10 Marks)<br>Part B: Short Answer Questions(4 out of 6 Questions) - (4*5=20 Marks)<br>Part C: Essay Questions(2 out of 3 Questions) - (2*10=20 Marks)<br>**ESE for Practical: 35 Marks (1.5 Hrs)**<br>1. Viva - 15 Marks<br>2. Demonstration - 10 Marks<br>3. Record - 10 Marks |

**REFERENCES**


1.Thomas L Floyd- Digital Fundamentals, Ninth edition, PEARSON Prentice Hall.

2. Carl Hamachar, ZvoncoVranesic and SafwatZaky(2019).Computer Organization (6th edition). McGraw Hill.


**SUGGESTED READINGS**


1. Thomas C Bartee- Digital computer Fundamentals, Sixth Edition, TATA McGraw Hill Edition
2. M Morris Mano. Digital Logic and Computer design (4th Edition). Prentice Hall.
3. David A. Patterson and John L. Hennessy, Computer Organization and Design: The Hardware/Software Interface, Elsevier.
4. John P. Hayes, Computer Architecture and Organization, McGraw Hill.
   William Stallings, Computer Organization and Architecture: Designing for Performance, Pearson Education

# Mahatma Gandhi University
# Kottayam

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|---|---|---|---|---|---|---|
| **Programme** | | | | | | |
| **Course Name** | **Computer Organization** | | | | | |
| **Type of Course** | DSC B | | | | | |
| **Course Code** | **To be prepared by the University** | | | | | |
| **Course Level** | **200** | | | | | |
| **Course Summary** | Understanding the design concepts of a computer system | | | | | |
| **Semester** | 4 | Credits | | | 4 | Total Hours |
| **Course Details** | Learning Approach | Lecture | Tutorial | Practical | Others | |
| | | 3 | 0 | 1 | 0 | 75 |
| **Pre-requisites, if any** | | | | | | |

**COURSE OUTCOMES (CO)**

| CO No. | Expected Course Outcome | Learning Domains * | PO No |
|---|---|---|---|
| 1 | Understand the fundamental structure and operation of computers | U | 1 |
| 2 | Understand and apply the principles of control organization, number systems, logic gates, Boolean algebra, and I/O organization | U,A | 1,2 |
| 3 | Understand and apply DeMorgan's theorems and Karnaugh Maps to simplify logic expressions, and design combinational and sequential circuits | U, A | 1,2 |

| | | | |
|---|---|---|---|
| 4 | Demonstrate the ability to implement and verify basic digital logic circuits, including gates, adders, multiplexers, decoders, flip-flops, counters, and memory systems. | A | 2 |
| ***Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)*** | | | |

**COURSE CONTENT**

**Content for Classroom transaction (Units)**

| Module | Units | Course description | Hrs | CO No. |
|---|---|---|---|---|
| 1 | 1.1 | Basic Structure of computers – functional units - basic operational concepts - data representation - instruction execution, and memory hierarchy - bus structures- addressing modes. | 3 | 1 |
| | 1.2 | Memory system: basic concepts – semiconductor RAMs. memory system considerations interfacing memory with CPU- memory map- ROMs, cache memory, mapping Techniques | 5 | 1 |
| | 1.3 | Arithmetic algorithms: Adder and subtractor units - Booth's multiplication algorithm - access. | 5 | 1 |
| 2 | 2.1 | Control organization – Hardwired control-microprogram control of processor unit – Microprogram sequencer, micro programmed CPU organization - I/O organization: accessing of I/O devices – interrupts, interrupt hardware -Direct memory access | 5 | 2 |
| | 2.2 | Number Systems, Decimal, Binary, Octal and Hexadecimal), Conversion-From one number system to another,. Concept of binary addition and subtraction- 1's Complement , 2's complement, Subtraction using 1's and 2's Complement- BCD numbers- concept and addition. | 8 | 2 |
| | 2.3 | Logic gates- AND, OR, NOT, NAND, NOR, XOR and XNOR. Truth tables - Basic laws of Boolean Algebra, Simplification of Expressions | 3 | 2 |
| 3 | 3.1 | DeMorgan's theorems, Simplification of expressions using K-MAP (up to 4 variables)- | 3 | 3 |

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|---|---|---|---|---|
| | 3.2 | Combinational Logic Circuits : Adders-Half adder, Full adder – parity generator- Encoders- Decoders- Multiplexers – Demultiplexers | 8 | 3 |
| | 3.3 | Sequential - Logic Circuits: Flip flops- Latch, Clocked, RS, JK, T, D, Triggering of flip flops, Master Slave flip flops - Concept of Registers, Shift Registers- SISO, SIPO, PISO, PIPO - | 5 | 3 |
| 4 | 4.1 | Practical:<br>1. Familiarization of logic gates and verification of truth tables<br>2. Implementation of a logic equation using gates.<br>3. Verification of DeMorgan's Theorem<br>4. Implementation of logic gates using universal gates.<br>5. Implementation of flip flop using gates<br>6. Verification of flip flop IC, truth table states.<br>7. Implementation of Half Adder<br>8. Implementation of Full Adder<br>9. Implementation of 3 to 8 decoder<br>10. Implementation of seven segment display.<br>11. Implementation of 8:1 multiplexer<br>12. Implementation of 1:8 demultiplexer<br>13. Implementation of 3 bit counter<br>14. Understanding shift operations.<br>15. Implementation of a 4 bit memory system | 30 | 4 |
| 5 | | (Teacher specific content) | | |

| | |
|---|---|
| **Teaching and Learning Approach** | **Classroom Procedure (Mode of transaction)**<br>ICT Enabled lectures, Group discussion, Peer discussion, Lab exercises |

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|---|---|
| **Assessment Types** | **MODE OF ASSESSMENT**<br>**A. Continuous Comprehensive Assessment (CCA)**<br>**CCA for Theory: 25 Marks**<br>1. Written test<br>2. Assignments<br>**CCA for Practical: 15 Marks**<br>1. Practical assignments<br>2. Lab Record<br>3. Observation of practical skills<br>4. Viva |
| | **B. Semester End Examination**<br>**ESE for Theory: 50 Marks (1.5 Hrs)**<br>**Written Test(50 Marks)**<br>Part A: Very Short Answer Questions (Answer all) - (10*1=10 Marks)<br>Part B: Short Answer Questions(4 out of 6 Questions) - (4*5=20 Marks)<br>Part C: Essay Questions(2 out of 3 Questions) - (2*10=20 Marks)<br>**ESE for Practical: 35 Marks (1.5 Hrs)**<br>1. Viva - 15 Marks<br>2. Demonstration - 10 Marks<br>3. Record - 10 Marks |

**REFERENCES**


1. Carl Hamachar, ZvoncoVranesic and SafwatZaky(2019).Computer Organization (6th edition). McGraw Hill.
2. Thomas L Floyd- Digital Fundamentals, Ninth edition, PEARSON Prentice Hall.


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2. John P. Hayes, Computer Architecture and Organization, McGraw Hill.William Stallings, Computer Organization and Architecture: Designing for Performance, Pearson Education

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