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| **Course Name:** | | | | | | | | | | Computer Organization and Architecture | | | | | | | | | | | | | | | | | | | | | | | | **Subject Code:** | | | | | | | | TMC 102 | | | |
|  | | | | | | | | | |  | | | | | | | | | | | | | | | | | | | | | | | |  | | | | | | | |  | | | |
| **Program Name:** | | | | | | | | | | Master of Computer Applications (MCA) | | | | | | | | | | | | | | | | | | | | | | | |  | | | | | | | |  | | | |
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| **1** | **Contact Hours:** | | | | | | | | | | | 45 | | | |  | | | | | | | | | | | | | | | | | | | **L** | | 3 | | | **T** | | | 0 | **P** | 0 |
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| **2** | **Examination Duration (Hrs):** | | | | | | | | | | | | | | | | | | | | |  | **Theory** | | | | | 0 | 3 |  | **Practical** | | | | | 0 | | 0 | |  | | | | | |
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| **3** | **Relative Weightage:** | | | | | | | | | | | | |  | | | | | **CWE:** | | | | | | | 25 | | **MTE:** | | | 25 | | **ETE:** | | | | 50 | | | |  | | | | |
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| **4** | **Credits:** | | | | | | | 0 | | | 3 |  | | | | | | | | | | | | |  | | |  | | |  | |  | | | |  | | | |  | | | | |
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| **5** | **Semester:** | | | | | | | | **\*** | | |  | | |  | | |  | | |  | | |  | | | | | | | | | | | | | | | | | | | | | |
|  |  | | | | | | **Autumn** | | | | | | **Spring** | | | | | | | **Both** | | | | | | |  | | | | | | | | | | | | | | | | | | |
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| **6** | **Pre-Requisite:** | | | | | | | | | | | Basic understanding of computers. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| **7** | **Subject Area:** | | | | | | | | | | | Computer Science | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| **8** | **Objective:** | | | | | | | | | | | To familiarize students with the organization and architecture of a basic computer. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| **9** | **Course Outcome:** | | | | | | | | | | | | | | After completion of course a student must be able to | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|  | **CO 1** | | | | | Understand the fundamental concepts of digital electronics, analyze and design the basic combinational and sequential circuits in lab using bread board. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|  | **CO 2** | | | | | Exhibit a good understanding of the organization and architecture of a computer system. Cognize the working of central processing unit. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|  | **CO 3** | | | | | Evaluate and describe the input output organization, various addressing modes and the concept of DMA. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|  | **CO 4** | | | | | Appraise the various types of memories used in a computer system. Analyze the importance and functionality of cache and virtual memory organization. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|  | **CO 5**  **CO 6** | | | | | Describe and discuss the parallel processing concepts, benefits and structure of a multiprocessor system.  Review the various aspects of computer organization and summarize the working principles of computer system | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| **10** | | **Details of the Course:** | | | | | | | | | | | | | | |  | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Unit No.** | | | | **CONTENT** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | **CONTACT HOURS** | | | | | | |
| **1** | | | | Introduction to Data Representation And Computer Arithmetic: Number Systems, Character Codes (BCD, ASCII, EBCDIC), Logic gates, Boolean Algebra, K-map simplification, Combination circuits, Sequential circuits, Flip-Flops, Registers, Counters (synchronous & asynchronous), Fixed point representation of numbers-algorithms for arithmetic operations: multiplication (Booths, Modified Booths) - division (restoring and non-restoring) - Floating point representation with IEEE standards and algorithms for common arithmetic operations**.** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | **10** | | | | | | |
| **2** | | | | **Basic Computer Architecture:** Introduction to computer systems - Overview of Organization and Architecture -Functional components of a computer -Registers and register files-Interconnection of components-  Organization of the von Neumann machine and Harvard architecture-Performance of processor**.** Introduction to ISA (Instruction Set Architecture)-Instruction formats- Instruction types and addressing modes- Instruction execution (Phases of instruction cycle)- Assembly language programming-Subroutine call and return mechanisms-Single cycle Data path design-Introduction to multi cycle data path-Multi cycle Instruction execution. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | **10** | | | | | | |
| **3** | | | | **Interfacing and Communication**: I/O fundamentals: handshaking, buffering-I/O techniques: programmed I/O, interrupt-driven I/O, DMA- Interrupt structures: vectored and prioritized-interrupt overhead- Buses: Syn- chronous and asynchronous- Arbitration. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | **8** | | | | | | |
| **4** | | | | Memory System Organization and Architecture: Memory systems hierarchy-Main memory organization-Types of Main memory-memory inter- leaving and its characteristics and performance- Cache memories: address mapping-line size- replacement and policies- coherence- Virtual memory systems- TLB- Reliability of memory systems- error detecting and error correcting systems. External storage systems-organization and structure of disk drives: Electronic- magnetic and optical technologies- RAID Levels- I/O Performance | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | **10** | | | | | | |
| **5** | | | | **Parallel Processing Concepts:** Classification of models - Flynns taxonomy of parallel machine models ( SISD, SIMD, MISD, MIMD)- Introduction to Pipelining- Pipelined data path-Introduction to hazards. Multiprocessor architecture: Overview of Shared Memory architecture, Distributed architecture. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | **7** | | | | | | |
|  | | | | **TOTAL** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | **45** | | | | | | |
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| **11** | | **Suggested Books:** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |  | | | | | | |
| **Sl. NO.** | | | **NAME OF AUTHERS/BOOKS/PUBLISHERS** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | **YEAR OF PUBLICATION** | | | | | |
| **1** | | | David A. Patterson and John L. Hennessy Computer Organization and Design-The Hardware/Software Interface 5th edition, Morgan Kaufmann. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 2013 | | | | | |
| **2** | | | Jain R. P. “Digital Electronics”4th Ed. Tata McGraw-Hill. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 2009 | | | | | |
| **3** | | | Stallings W.”Computer organization”,10th Ed. Prentice-Hall. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 2016 | | | | | |
| **4** | | | John P.Hayes. “Computer organization”,3rd Tata McGraw-Hill. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 2017 | | | | | |
| **5** | | | Vravice, Zaky & Hamacher, Computer Organization”, 5th Ed. McGraw-Hill. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 2011 | | | | | |