

Samrat Ashok Technological Institute Vidisha (M.P.)
M.C.A. Two Year Programme

S. No	Subject Code	Subject Name	Periods Per Week			Maximum Marks (Theory)			Maximum Marks (Practical)		Total Marks	Credits
			L	T	P	End sem. Exam.	Mid Sem.	Assignments/ Quiz	End Sem. Practical Viva	Practical records/Assignments/ Seminar		
1	MCA-101	Computer Organization & Architecture	3	1	-	60	20	20	-	-	100	4

Course Description	This course is a study of functioning of various components of digital computer system and execution of instructions by CPU besides memory management.
Prerequisite Knowledge	Fundamental of Computers.
Course Objectives	To impart knowledge about components of digital computers, number systems, Register transfer language, various micro-operations, execution of instructions and management of memory.
Course Outcomes	<p>This course is to develop student's abilities to:</p> <ol style="list-style-type: none"> 1. Understand the Components of Digital Computers. 2. Compute Arithmetic Operation 3. Design Various Circuits. 4. Perform Various Micro operations on Data. 5. Understand Instruction Execution Cycle 6. Compare Various Computer Memories

UNIT-I: Digital computers, Logic Gates, Boolean algebra, Map Simplification, Combinational circuit, Flip Flops, Multiplexer, Decoders, Registers

UNIT-II: Data Representations, Data types, Number systems, Conversion, Compliments, Fixed point representation, Computer Arithmetic, Floating Point Representation. Binary Codes

UNIT-III: Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Micro-Operations, Logic Micro Operations, Shift Micro-Operations, Arithmetic logic shift unit

UNIT-IV: Basic Computer Organization and Design, Instruction codes, Computer registers, Computer instructions, Timing and Control, Instruction cycle, Memory-Reference Instructions, Input-output and interrupt, Design of Basic computer
UNIT-V: MEMORY SYSTEM: Memory Hierarchy, Semiconductor Memories, RAM (Random Access Memory), Read Only Memory (ROM), Types of ROM, Cache Memory, Performance considerations, Virtual memory, Paging

Recommended Books:

1. "Computer System Architecture" by M. Moris Mano, 3rd edition, Pearson/PHI, India, 2007
2. "Structured Computer Organization" by Andrew S. Tanenbaum 6th edition, Pearson Education Inc,2013
3. "Computer Organization and Architecture", by W. Stalling, 8th PHI Publication,2010

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Kanak Saxena
Dr. Kanak Saxena
 Chairperson

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2	MCA-102	C Language	3	1	-	60	20	20	-	-	100	4

Course Description	This course is a study of basic concept of programming using C language.
Prerequisite Knowledge	Fundamental of Computers, Algorithm, Flowchart, system software.
Course Objectives	<ol style="list-style-type: none"> 1. To implement the flowchart and algorithms for solving Mathematical and Engineering problems. 2. To Acquire knowledge of C Language syntax to write program. 3. Ability to write user define function to incorporate modularity in program. 4. Ability to construct structure and union for managing records in C Language. 5. Ability to understand and use of pointer in the program.
Course Outcomes	<p>This course is to develop student's abilities to:</p> <ol style="list-style-type: none"> 1. Draw the flowchart. 2. Write Algorithm. 3. Understand syntax of C language. 4. Incorporate modularity in the program. 5. Manage group of homogeneous data using array. 6. Construct structure and union for managing records. 7. Demonstrate the concept of pointer and perform I/O operations.

UNIT-I: Basic computer organization, operating system, editor, compiler, interpreter, loader, linker, program development. Variable naming, basic function naming, indentation, usage and significance of comments for readability and program maintainability. Types of errors, debugging, tracing/stepwise execution of program, watching variables values in memory. Constants, Variables and data Types

UNIT-II: Introduction, Arithmetic Operators, Relational Operators, Logical Operators, Assignment Operators, Increment and Decrement Operators, Conditional Operators, Special Operators, Evaluation of expressions, Precedence of arithmetic operators, Type conversions in expressions, Operator precedence and associativity. Management Input and Output Operators: Introduction, reading a character, writing a character, formatted input, formatted output

UNIT-III: Introduction, Decision making with IF statement, Operator, the GOTO statement. Looping, **Array:** Introduction, One - dimensional arrays, Two-dimensional arrays, arrays, Concept of Multidimensional arrays

UNIT-IV: Introduction, Declaring and initializing string variables, reading string from terminal, writing string to screen, String Operations: User-Defined Functions: Introduction, need for user-defined functions, the form of C function, elements of UDF, return values and their types, Calling a function, category of functions, Nesting of functions, Recursion, Functions with arrays, The scope and Lifetime of variables in functions, multi file program

UNIT-V: Introduction, Structure definition, declaring and initializing Structure variables, accessing Structure members, Copying &

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Comparison of structures, Arrays of structures, Arrays within structures, Structures within Structures, Structures and functions, Unions.
Pointers: Introduction, understanding pointers, Accessing the address of variable, Declaring and initializing pointers, accessing a variable through its pointer, Pointer expressions, Pointer increments and scale factor, Pointers and arrays, Pointers & character strings, Pointers & Functions, Function returning multiple values, Pointers and structures. **File Management in C and CONSOLE I/O:** Introduction, Defining files and its Operations, Error handling during I/O operations, Random access files, Command line arguments. Types of files, File vs. Console, File structure, File attributes, Standard i/o, Formatted i/o, Sample programs

Recommended Books: -

1. "Programming in ANSI-C" By E. Balagurusami, 8th Edition TMH Publication, 2017
2. "Let us C By Yashwant Kanetkar" 15th Edition, BPB Publication, 2016
3. "C Programming language" By Kernighan, Brian, W, Retchie, Dennis, 2nd Edition, PHI Publication, 2015

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3	MCA-103	Operating System	3	1	-	60	20	20	-	-	100	4

Course Description	This course is a study of operating system functions such as Processes Management, Memory Management, Inter-process Communication and Synchronization and File System and Disk Scheduling.
Prerequisite Knowledge	Fundamental of Computers and system software's.
Course Objectives	<ol style="list-style-type: none"> 1. To be aware of the evolution and fundamental principles of operating system, processes and their communication. 2. To understand the various operating system components like process management and memory management. 3. To know about file management and disk scheduling concepts in operating systems. 4. To be aware of components of the operating system with relevant case study.
Course Outcomes	<p>This course is to develop student's abilities to:</p> <ol style="list-style-type: none"> 1. Understand the operating system components and its services. 2. Demonstrate the mapping between the physical memory and virtual memory. 3. Acquire knowledge about file and disk scheduling concepts. 4. Compare operating system components and services with the recent OS.


UNIT-I: Introduction: Evolution of operating systems (History of evolution of OS with the generations of computers), Types of operating systems, Multitasking, Timesharing, Multiprogramming and, Real time operating systems, Different views of the operating system, System Programmer's view, User's view


UNIT-II: Processes Management: The Process concept, The process control block, Operating system services for process management, Threads, Process v/s Threads, Scheduling algorithms, First come first serve, Round Robin, Shortest run time next, Highest response ratio next, Multilevel Feedback Queues

UNIT-III: Memory Management: Memory management without swapping or paging, Concepts of swapping and paging, Page replacement algorithms namely, Least recently used, Optimal page replacement, First in First out (This includes discussion of Belady's anomaly), Segmentation

UNIT-IV: Inter-process Communication and Synchronization: The need for inter-process synchronization, Concept of mutual exclusion, binary and counting semaphores, hardware support for mutual exclusion, Critical section, critical region. Deadlocks: Concepts of deadlock detection, deadlock prevention, deadlock avoidance. Banker's Algorithm

UNIT-V: File System and Disk Scheduling: File systems, directories, file system implementation, security protection mechanisms.




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Disks: Disk hardware, Disk scheduling algorithms (namely First come first serve, shortest seek time first, SCAN, C-SCAN, LOOK and C-LOOK algorithms)

Case Studies: WINDOWS and LINUX /UNIX Operating System

Recommended Books: -

1. "Operating System Concepts" by Galvin P., J.L. Abraham Silberschatz., 8th Edition, John Wiley & Sons Company 2009
2. "Modern Operating System" by Tanenbaum, A.S. 3rd Edition, Prentice Hall of India Pvt. Ltd. 2009
3. "Operating systems: A Modern Perspective" by Gary Nutt, 2nd Edition, Addison Wesley, 2001

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4	MCA-104	Data Base Management Systems	3	1	-	60	20	20	-	-	100	4

Course Description	This course is a study of storage and efficient management of data along with concurrent execution of transactions.
Prerequisite Knowledge	Fundamental of Computers.
Course Objectives	<ol style="list-style-type: none"> 1. To understand the role of a database management system in an organization. 2. To understand basic database concepts, including the structure and operation of the relational data model. 3. To construct simple and moderately advanced database queries using Structured Query Language (SQL). 4. To understand and successfully apply logical database design principles, including E-R diagrams and database normalization. 5. To understand the role of the database administrator.
Course Outcomes	<p>This course is to develop student's abilities to:</p> <ol style="list-style-type: none"> 1. Understand the basic concept of database and data models 2. Design a database using ER diagrams and map ER into relations and normalize the relations. 3. Acquire the knowledge of query evaluation to monitor the performance of the DBMS. 4. Acquire the knowledge of Transaction, concurrency and Recovery

UNIT-I: Introduction: An overview of database management system, Database System Vs File System, Characteristics of the database approach, Database system concepts and architecture, data models schema and instances, data independence, Database administrator and users, data dictionary

UNIT-II: Data Modeling using the Entity Relationship Model: Categories of data models, Entity types, Entity sets, attributes, ER model concepts, notation for ER diagram, mapping constraints, keys, Concepts of different keys like Super Key, candidate key, primary key, weak and strong entity sets, Generalization, aggregation

UNIT-III: Relational data Model and Language: Relational data model concepts and relational database, unary and binary relational operations, integrity constraints: entity integrity, referential integrity, Keys constraints, Domain constraints, relational algebra, Data definitions language, DML. **Introduction to SQL:** Characteristics of SQL, Advantages of SQL, SQL data types and literals, Types of SQL commands, basic structure of SQL, set operations, aggregate functions

UNIT-IV: Data Base Design & Normalization: Overview of Functional dependencies, trivial and non-trivial dependencies, closure set of dependencies, irreducible set of dependencies, introduction to normalization, non-loss decomposition, normal forms, first, second, third normal forms, dependency preservation, BCNF, multivalued dependencies and fourth normal form, Join dependency and fifth

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normal form

Unit-V: Transaction, concurrency and Recovery: basic concepts, ACID properties, Transaction states, implementation of atomicity and durability, concurrent executions, basic idea of serializability, basic idea of concurrency control, data access, recovery and atomicity- log based recovery, deferred Database modification, immediate Database modification, checkpoints

Recommended Books: -

- 1 "Database System Concepts" by A Silberschatz, H.F Korth, Sudersan, 7th Edition MGH Publication 2019 2
- "An introduction to Database Systems" by C.J Date 8th Edition 2003
- 3 "Fundamentals of Database systems" by Navathe & Elmasri,, Pearson, 2008

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5	MCA-105	Mathematical Foundation of Computer Science	3	1	-	60	20	20	-	-	100	4

Course Description	This course is a study of mathematical foundations for computer science.
Prerequisite Knowledge	Knowledge of basic mathematics.
Course Objectives	To impart knowledge about set theory, propositional logics, matrices, graph theory and probability.
Course Outcomes	This course is to develop student's abilities to understand and apply the following on given data: 1. Set operations 2. Propositional logics 3. Matrices operation 4. Probability

UNIT-I: Introduction to Logic. Propositional Logic, Truth tables, Deduction, Resolution, Predicates and Quantifiers, Mathematical Proofs. Infinite sets, well-ordering. Countable and Uncountable sets, Cantor's diagonalization. Mathematical Induction - weak and strong induction

UNIT-II: Matrices and their properties (determinants, traces, rank, nullity, etc.), solution of simultaneous equation by elementary transformation, consistency of equation, Eigenvalues and eigenvectors; Matrix factorizations, Diagonalization **UNIT-III:** Graphs and their basic properties - degree, path, cycle, subgraphs, isomorphism, Eulerian and Hamiltonian walks, graph coloring, planar graphs, trees

UNIT-IV: Probability-Random experiment, sample point and sample space, event, algebra of events. Definition of Probability: classical, empirical and axiomatic approaches to probability, properties of probability. Theorems on probability, conditional probability and independent events, Laws of total probability, Baye's theorem and its applications

UNIT-V: Theoretical frequency distribution, Binomial Distribution, Poisson Distribution, Normal Distribution. Elementary concepts of testing of hypothesis, t-test, F-distribution, chi-square distribution

Recommended Books: -

1. "An Introduction to Probability and Statistics" by Rohatgi V.K and Saleh E 3rd edition, John Wiley & Sons Inc., New Jersey, 2015
2. "Introduction to Linear Algebra" by G. Strang, Wellesley-Cambridge Press, Fifth edition, USA, 2016
3. "Discrete Mathematics and its Applications" by Kenneth H. Rosen 7th Edition -Tata McGraw Hill Publishers - 2007 4. "Elements of Discrete Mathematics" by C. L Liu, McGraw-Hill Inc, 1985. Applied Combinatorics, Alan Tucker, 2007

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6	MCA-106	Programming Lab-I (Program solving)	-	-	6	-	-	-	100	50	150	6

***Implementation of Scientific Problems using C Language**

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7	MCA-107	Programming Lab-II (RDBMS)	-	-	4	-	-	-	60	40	100	4

***Design of data base of various systems and management of its information using SQL**

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