Vikram University, Ujjain –M.C.A Syllabus
(As per CBCS pattern) w.e.f. 2016-17 and onwards

SCHEME OF MCA COURSE

MCA FIRST SEMESTER　　　Credits – 25　　　　　Total:- 700

Course No.	Course Name	C/E/S	L	T	P	Credits	Internal Assessment M.M.(Min)	Theory Semester Exam M.M. (Min)	Practical Semester Exam M.M.(Min)	Total
								Examination Scheme		
MCA 101	Mathematical foundation of computer science	Core	3	1	-	4	25(10)	75(25)		100
MCA 102	Operating system and system software	Core	3	1	-	4	25(10)	75(25)		100
MCA 103	Logical organization of computer system	Core	3	1	-	4	25(10)	75(25)		100
MCA 104	Programming with 'C' and 'C++'	Core	3	1	-	4	25(10)	75(25)		100
MCA 105	Financial Accounting & Organizational Behaviour	Core	3	1	-	4	25(10)	75(25)		100
MCA 106	Practical –I (Based on 104)	Core	-	-	6	3	25(10)		75(25)	100
MCA 107	Comprehensive Viva-voce (based on papers of I semester.)	Core	-	-	-	2	100 (40)			100
	Total		15	5	6	25	250	375	75	700

MCA SECOND SEMESTER　　　Credits – 25　　　　　Total:- 700

Course No.	Course Name	C/E/S	L	T	P	Credits	Internal Assessment M.M.(Min)	Theory Semester Exam M.M. (Min)	Practical Semester Exam M.M.(Min)	Total
								Examination Scheme		
MCA 201	Computer Oriented Optimization Techniques	Core	3	1		4	25(10)	75(25)		100
MCA 202	Data Base Management system	Core	3	1		4	25(10)	75(25)		100
MCA 203	Computer system Architecture & Parallel processing	Core	3	1		4	25(10)	75(25)		100
MCA 204	Data and File structure	Core	3	1		4	25(10)	75(25)		100
MCA 205	System Analysis & Design	Core	3	1		4	25(10)	75(25)		100
MCA 206	Practical –I (Based on 204)	Core	-	-	6	3	25(10)		75(25)	100
MCA 207	Comprehensive Viva-voce (based on papers of II semester.)	Core	-	-	-	2	100 (40)			100
	Total		15	5	6	25	250	375	75	700

13.10.16

13/10/16

Vikram University, Ujjain –M.C.A Syllabus
(As per CBCS pattern) w.e.f. 2016-17 and onwards

MCA THIRD SEMESTER Credits – 25 Total:- 700

Course No.	Course Name	C/E/S	L	T	P	Credits	Internal Assessment M.M.(Min)	Theory Semester Exam M.M. (Min)	Practical Semester Exam M.M.(Min)	Total
							Examination Scheme			
MCA 301	Data Communication & Computer Network	Core	3	1		4	25(10)	75(25)		100
MCA 302	Theory of Compiler Design	Core	3	1		4	25(10)	75(25)		100
MCA 303	Computer Graphics	Core	3	1		4	25(10)	75(25)		100
MCA 304	Programming with Visual Basic . Net	Core	3	1		4	25(10)	75(25)		100
MCA 305	E1/E2	Elective	3	1		4	25(10)	75(25)		100
MCA 306	Practical –I (Based on 304)	Core	-	-	6	3	25(10)		75(25)	100
MCA 307	Comprehensive Viva-voce (based on papers of III semester.)	Core	-	-	-	2	100 (40)			100
	Total		15	5	6	25	250	375	75	700

MCA FOURTH SEMESTER Credits – 25 Total:- 700

Course No.	Course Name	C/E/S	L	T	P	Credits	Internal Assessment M.M.(Min)	Theory Semester Exam M.M. (Min)	Practical Semester Exam M.M.(Min)	Total
							Examination Scheme			
MCA 401	Introduction to web Technology	Core	3	1	.	4	25(10)	75(25)		100
MCA 402	Artificial Intelligence	Core	3	1		4	25(10)	75(25)		100
MCA 403	Object Oriented Modeling Technique	Core	3	1		4	25(10)	75(25)		100
MCA 404	Data Mining	Core	3	1		4	25(10)	75(25)		100
MCA 405	E3/E4	Elective	3	1		4	25(10)	75(25)		100
MCA 406	Practical –I (Based on 401)	Core	-	-	6	3	25(10)		75(25)	100
MCA 407	Comprehensive Viva-voce (based on papers of IV semester.)	Core	-	-	-	2	100 (40)			100
	Total		15	5	6	25	250	375	75	700

Vikram University, Ujjain –M.C.A Syllabus
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MCA FIFTH SEMESTER   Credits – 25   Total:- 700

Course No.	Course Name	C/E/S	L	T	P	Credits	Internal Assessment M.M.(Min)	Theory Semester Exam M.M. (Min)	Practical Semester Exam M.M.(Min)	Total
MCA 501	Design and Analysis of Algorithm	Core	3	1		4	25(10)	75(25)		100
MCA 502	Network Security	Core	3	1		4	25(10)	75(25)		100
MCA 503	Minor Project	Skill	3	1		4	25(10)	75(25)		100
MCA 504	E5/E6	Elective	3	1		4	25(10)	75(25)		100
MCA 505	E7/E8	Elective	3	1		4	25(10)	75(25)		100
MCA 506	Practical I (Based on 501)	Core	-	-	6	3	25(10)		75(25)	100
MCA 507	Seminar	Skill	-	-	1	1	50 (20)	-	-	50
MCA 508	Comprehensive Viva-voce (based on papers of V semester.)	Core	-	-	-	1	50 (20)			50
	Total		15	5	7	25	250	375	75	700

MCA SIXTH SEMESTER   Credits – 15   Total:- 500

Course No.	Course Name	C/E/S	Credits	Internal Assessment			External Assessment		Total
				Progress Report- I M.M (Min)	Progress Report- II M.M (Min)	Seminar M.M (Min)	Thesis & Presentation M.M. (Min)	Viva- Voce M.M.(Min)	M.M.(Min)
MCA 601	Major Project	Skill	12	50 (20)	50 (20)	100 (40)	100 (40)	100 (40)	400 (160)
MCA 602	Comprehensive Viva-voce (based on all papers of MCA syllabus)	Core	3			100 (40)			100 (40)
	Total		15	50 (20)	50 (20)	200 (80)	100 (40)	100 (40)	500 (200)

Total Credits = First Sem 25 + Second Sem 25 + Third Sem 25 + Fourth Sem 25 +Fifth Sem 25 + Sixth Sem 15 =140 Credits

Elective Course List

Elective	Course Name
E1	Software Engineering
E2	Simulation and Modeling
E3	ASP.NET Technology using C#
E4	Distributed Computing
E5	Project Management with Java
E6	Cloud Computing
E7	Internetwork Application
E8	Mobile Computing

1. Credit Based Grading System

1.1 Each student, registered for a course, shall be awarded grade. The grades awarded to a student shall depend upon his continuous evaluation through performance in various examinations, assignments, quizzes, laboratory work, class work, mid semester test and regularity. The grades to be used and their numerical equivalence are as under:

Grade	% Marks Range (based on absolute marks system)	Grade Point	Description of Performance
A^+	91-100	10	Outstanding
A	81-90	9	Excellent
B^+	71-80	8	Very Good
B	61-70	7	Good
C^+	51-60	6	Average
C	41-50	5	Satisfactory
D	33-40	4	Marginal
F	Below 33	0	Fail

1.2 The Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA) shall be calculated as under:

$$SGPA = \frac{\sum_{i=1}^{n} c_i p_i}{\sum_{i=1}^{n} c_i}$$

1.3 Where c_i is the number of credits offered in the ith subject of a semester for which SGPA is to be calculated, p_i is the corresponding grade point earned in the ith subject, where i= 1,2,3,................n, are the number of subjects in that semester.

$$CGPA = \frac{\sum_{j=1}^{m} SG_j NC_j}{\sum_{j=1}^{m} NC_j}$$

Here NC_j is the number of total credits offered in the jth semester, SG_j is the SGPA earned in the jth semester, where $j = 1,2,3\ldots\ldots\ldots m$, are the number of semesters in that Programme.

1.4 The grade sheet at end of each semester examination for students shall also show CGPA till end of that semester the final examination grade at the end of final semester examination of the course shall also indicate CGPA, equivalent percentage marks and the division awarded, according to the rule as given in the next paragraph.

2. Award of Division

2.1 Division shall be awarded only after final semester examination based on integrated performance of the candidate for all the Semesters as per following details

CGPA SCORE	DIVISION
7.5<= CGPA	First Division With Honours
6.5<= CGPA < 7.5	First Division
4.5<= CGPA < 6.5	Second Division
4.0<= CGPA < 4.5	Third Division

2.2　The conversion from grade to an equivalent percentage in a given academic program shall be according to the following formula applicable.

Percentage Marks Scored =　CGPA obtained x10

FIRST SEMESTER

MCA-101 Mathematical Foundations of Computer Science

Paper Code	Course Name	Course Type	Contact Hours	Credit	Examination Scheme					
					Internal Assessment	Theory	Practical	Seminar/ Viva Voce	Assignment	Total
101	MCA	CORE	4	4	25	75				100

UNIT 1

Set Theory: Introduction, Sets and Elements, Universal Set and Empty Set, Subsets, Venn Diagrams. Relations: Introduction, Product Sets, Relations, Pictorial Representation of Relations, Composition of Relations, Types of Relations, Partial Ordering Relations. Functions: Introduction, One-to-One, Onto, and Invertible Functions, Cardinality. Logic and Propositional Calculus: Introduction, Propositions and Compound Propositions, Basic Logical Operations, Propositions and Truth Tables, Tautologies and Contradictions.

UNIT 2

Counting: Introduction, Basic Counting Principles, Factorial Notation, Binomial Coefficients, Permutations and Combinations. Pigeon hole Principle. Graph Theory: Introduction, Graphs and Multigraphs, Subgraphs, Paths, Connectivity, Weighted Graphs, Complete, Regular and Bipartite Graphs. Directed Graphs: Introduction, Rooted Trees, Graph Algorithms: Depth first and Breadth-First Searches.

UNIT 3

Finite Automata & Regular Expression: Finite State Systems, Basic Definitions, Nondeterministic Finite Automata, Finite Automata with ε-moves, Finite Automata with Output

UNIT 4

Regular Expressions, Two-way Finite Automata, Minimization of Automata, Closure Properties of Regular Sets.

UNIT 5

Context Free Grammars: Motivation and Introduction, Context-free Grammars, Derivation Trees, Simplification of Context-free Grammars. Chomsky Normal Forms, Closure properties of Context Free Languages. Turing Machines: Introduction, The Turing Machine Model, Representation of Turing Machine.

Reference Books:

1. Elements of Discrete Mathematics, C.L.Liu, Second Edition, TMH
2. Introduction to Automata Theory, Languages & Computation, J E Hopcraft & JD Ullman, Narosa Publications
3. Discrete Mathematics and its applications, Kenneth H. Rosen, (Fifth Edition), Tata McGraw Hill Publishing Company.
4. Theory and Problems of Discrete Mathematics, Semmour Lipschutz, Marc Lipson, Second Edition, Schaum's Outline, T.M.H
5. Theory of Computer Science, KLP Mishra & N Chandra Sekhar, PHI

MCA – 102 Operating Systems and System Software

Paper Code	Course Name	Course Type	Contact Hours	Credit	Examination Scheme					
					Internal Assessment	Theory	Practical	Seminar/ Viva Voce	Assignment	Total
102	MCA	CORE	4	4	25	75				100

UNIT -1

Introduction, Early systems, Simple monitor, Buffering, Spooling, Batch processing, Multiprogramming, Time sharing. Types of operating system services. File system : Concept, Support, Access methods, Allocation methods, Directory systems, File protection.

UNIT -2

PROCESSOR MANAGEMENT : Introduction , Scheduling levels ; Scheduling objectives ,Scheduling criteria, preemptive and non preemptive scheduling, Priorities, Deadline scheduling , FIFO scheduling, RR, SJF, SRT scheduling , Multilevel feedback Queues.

UNIT -3

MEMORY MANAGEMENT :Storage Organization, Management, Hierarchy, Strategies, Fixed and variable partition Multiprogramming, Virtual Storage : Basic concepts, Paging, Segmentation, Paging/Segmentation combined Systems, Page Replacement Strategies : Locality, Working Sets, Page fault, Demand paging, LRU, FIFO, MFU, LFU, Optimal.

UNIT -4

DISK, DRUM SCHEDULING AND DEADLOCKS :Physical Characteristics, Disk Scheduling Policies ; FCFS, Shortest Seek. Time First, SCAN, Disk scheduling Algorithms, DEADLOCK : Introduction, Necessary conditions, Deadlock Prevention, Avoidance, Detection, Recovery.

UNIT -5

System software and application software, layered organisation of system software. Assemblers, Macros, Compilers, Cross compilers, Linking and loading, Relocation.

Reference Books:
1. Peterson, James, L & Silberschats, A.: Operating system concepts, Addision-Wesley, publ. comp. 1985.
2. Detiel, H.M. : An Introduction to Operating system, Addision wesley publ. comp.

3. Milenkovic,M. : Operating system concept and design M.H. international Edn. 1987.

MCA- 103 Logical Organization of Computer Systems

Paper Code	Course Name	Course Type	Contact Hours	Credit	Examination Scheme					
					Internal Assessment	Theory	Practical	Seminar/ Viva Voce	Assignment	Total
103	MCA	CORE	4	4	25	75	-	-	-	100

UNIT-1.

Digital computers and digital systems: Binary, decimal, hexadecimal numbers, Binary codes: BCD, ASCII codes, Complements, Boolean algebra and Logic Gates: AND, OR and NOT gates. NAND and NOR gates.

UNIT-2.

Basic theorems and properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Other logic Operations, IC Digital Logic Families.

UNIT-3.

Simplification of Boolean Functions: Karnaugh Maps and Karnaugh Simplification. Don't Care Condition, Design of Combinational Logic Circuits, Half Adders, Full Adders and Binary Parallel Adders, Decoders and Multiplexers.

UNIT-4.

Sequential Logic: Introduction, FLIP FLOPs- RS Latches/FF, Master-Slave Flip-Flop Level Clocking , D- Latches and flip flop, JK Flip-Flops, T-Flip Flop.

UNIT-5.

Registers, Counters and Memories, Buffer Registers. Shift Registers, Ripple Conters, Synchronous Counters, ROMs, PROMs, EPROMS, RAMS.

Reference Books:
1.   Gear, C.W. : Computer Organization and Programming Mc-Graw Hill, 1975.
2.   Tannenbaum,A.S. : Structured Computer Organization, Prentics Hall of India.
3.   Mano, M. M.: Computer System Architecture, Prentice Hall of India, 1983.
4.   Langholz, G. : Elements of Computer Organization, Prentice Grancioni, J. & Hall International, 1988. Kandel, A.

MCA –104 Programming with 'C' & 'C++'

Paper Code	Course Name	Course Type	Contact Hours	Credit	Examination Scheme					
					Internal Assessment	Theory	Practical	Seminar/ Viva Voce	Assignment	Total
104	MCA	CORE	4	4	25	75				100
106	MCA	CORE	6	3	25		75			100

UNIT-1
Character Set, Identifiers, Keywords, Variables, Character Strings, Qualifiers, Typecasting, Constants, Operator and Expression, Operator Precedence and Associativity. Control Statements: If, If-Else, Multi-way decision, Compound Statements, loops: for, while do-while, break, switch, continue statement, Arrays, Strings.

UNIT-2
Functions: Introduction, Parameter Passing: call by value, call by reference, return values, recursion vs iteration, scope extent, passing arrays and function to functions. Pointers: Introduction, address operator, pointer variables, pointer arithmetic, pointer to pointer, array of pointers. Structures: Operations, self referential structure, array of structure.

UNIT-3
Introduction to traditional programming with C. Object Oriented Programming, Objectives of OOP, Procedural VS OOP, Concepts of Objects, Classes, Data Abstraction, Encapsulation, Inheritance, Polymorphism, Dynamic Binding and Message passing. Classes and Objects: Classes, Structure & Classes, Friend Function, Friend Classes, Inline Function, Static Data Member, Static Member Function, Passing object to function, Returning objects, Array of object.

UNIT-4
Constructor and Destructor: Introduction, Default constructor, Parameterized constructor, Multiple constructor in a class, Constructor with default argument, Copy constructor, Destructor. Function and Operator Overloading: Function overloading, Creating a member operator function, Operator overloading using friend function.

UNIT-5
Inheritance and Polymorphism: Introduction, Base and Derived Classes, Base class access control, Protected members, Single Inheritance, Multiple Inheritance, Multilevel inheritance, Hierarchical Inheritance, Hybrid inheritance. Virtual function, Virtual base classes.
Template: Class templates, Class templates with multiple parameters, Function templates, Function templates with multiple parameters, Overloading of template functions.

Reference Books:
1. Kanetkar Y: Let us C.
2. Cooper, Mullish : The spirit of C. An introduction to modern programming, Jaico Publ. House, New Delhi, 1987.
3. Kenneth, A. : C problem solving and programming, Prentice Hall international.
4. Object-Oriented Programming with C++: E. Balagurusamy, TMH, 2005
5. Object Oriented Programming in C++, Robert Lafore, Galgotia Publication.

MCA – 105 Financial Accounting & Organizational Behaviour

Paper Code	Course Name	Course Type	Contact Hours	Credit	Examination Scheme					
					Internal Assessment	Theory	Practical	Seminar/ Viva Voce	Assignment	Total
105	MCA	CORE	4	4	25	75	-	-	-	100

UNIT–1

The basic Financial Accounts, types of accounts, Rules of Entries of transactions, Journals. Cash Book – Types, Format of Cash Book, Balancing of Cash Book, Subsidiary books – Purchase, Sales. Purchase return and sales return. Ledger, posting of entries, Trial Balance, Rectification of errors, adjustment entries. Depreciation and Inflation.

UNIT-2

Principles of Cost Accounting, Material Cost, Labor Cost, Other Overheads Cost, Purchase Requisition Slip Format, Valuation of Stocks, Allocation of Overheads, Methods of material issues.

UNIT-3

Inventory account and store record, inventory or stock control and cost accounting. Department demand and supply method of stock control. Classification and condition of material Report on material handling. Overview of computerized accounting process – Introduction to accounting system software, their features and some basic operations.

UNIT-4

Introduction to organization and Individuals, what is an organization, components of organization, nature and variety of organization in terms objective, structure etc., Model of analyzing organizational phenomena.

UNIT-5

Organizational and business variables, organization in the Indian context, Institutions and Structure. Basic roles in an organization etc. Perception attitudes. Motives: achievement, poser, affiliation.

Reference Books:

1. Mazda, Engineering Management, Addisen Wesley
2. S P Gupta, Management Accounting
3. I.M.Pandey, Financial Management, Vikas Publication

MCA-106 Practical – I (Based on 104)

Paper Code	Course Name	Course Type	Contact Hours	Credit	Examination Scheme					
					Internal Assessment	Theory	Practical	Seminar/ Viva Voce	Assignment	Total
104	MCA	CORE	4	4	25	75				100
106	MCA	CORE	6	3	25		75			100

MCA-107 Comprehensive Viva-Voce (Based on papers of I Semester)

Course No.	Course Name	C/E/S	L	T	P	Credits	Examination Scheme			
							Internal Assessment M.M.(Min)	Theory Semester Exam M.M. (Min)	Practical Semester Exam M.M.(Min)	Total
MCA 107	Comprehensive Viva-voce (based on papers of I semester.)	Core	-	-	-	2	100 (40)			100

SEMESTER: SECOND

MCA- 201 Computer Oriented Optimization Techniques

Paper Code	Course Name	Course Type	Contact Hours	Credit	Examination Scheme					
					Internal Assessment	Theory	Practical	Seminar/ Viva Voce	Assignment	Total
201	MCA	CORE	4	4	25	75				100

UNIT-1

Optimization and Operations Research: Linear Simultaneous Equations, Solution of Simultaneous Equations by Gauss-Jordan method, Linear Programming: Introduction, Formulation of LP Problems, Assumptions and Applications of linear programming.

UNIT-2

Graphical Solution of LP Problems, Important geometric properties of LP Problems, Principles of simplex methods, Computational Procedure of Simplex Methods, Two Phase Method.

UNIT-3

Duality in Linear Programming: Concepts of duality, Definition of Primal-Dual Problems, General rules for Converting Primal into It's Dual, Duality Theorems, Dual simplex method, sensitivity analysis.

UNIT-4

Special types of Linear programming problems- Transportation and Assignment problems.

UNIT-5

Integer Linear Programming: Introduction, Importance of Integer Programming Problems, Definitions, Branch and Bound techniques, Computational demonstration of Branch and Bound Method.

Reference Books:

1. Hiller, F.S. & Liberman,G.J. : Introduction to Operations Research ,2nd Edn. Holdewn Day Inc. London, 1974.
2. Tara, H.A. : Operation Research,3rd Edn. McMillan Publishing Company, 1982.
3. Bightler, C.S. & Phillips ,D.T. : Foundation of Optimization, 2nd Edn. Prentice-Hall,1979.
4. McMillan Claude Jr. : Mathematical programming ,2nd Edn. Wiley series ,1979

MCA -202 Data Base Management System

Paper Code	Course Name	Course Type	Contact Hours	Credit	Examination Scheme					
					Internal Assessment	Theory	Practical	Seminar/ Viva Voce	Assignment	Total
202	MCA	CORE	4	4	25	75				100

UNIT-1
Introduction to data base system concepts : An overview of a data base system , basic data base system terminology.

UNIT-2
Entity relationship model, E.R. diagram, data independence, data definition and manipulation languages . an architecture for a data base system.

UNIT-3
Data models, relational model hierarchical model, network model.

UNIT-4
Storage structure, relational algebra, relational calculus, relational query language and manipulation.

UNIT-5
Functional dependencies, normal forms, decomposition, integrity, protection ,security, concurrency, distributed data base.

Reference Books:
1. Ullman J.D. : Data base management systems
2. Date C.J. : Data base management systems vol. 1.
3. Korth : data base management systems.

MCA 203 Computer System Architecture and Parallel Processing

Paper Code	Course Name	Course Type	Contact Hours	Credit	Examination Scheme					
					Internal Assessment	Theory	Practical	Seminar/ Viva Voce	Assignment	Total
203	MCA	CORE	4	4	25	75				100

UNIT-1
Programming and language: Relationship between Electronics & Programming. Flow Chart, Programming Language, assembly Language.

UNIT-2

Computer Architecture, Microprocessor Architecture, Microprocessor Families, 6502 family, 6800/6808 family.

UNIT-3.

Addressing Modes, Arithmetic Instruction, Logical Instructions, 8086/8088 family.

UNIT-4.

Parallel Processing : Mechanism, Parallelism in uni-processor system, Parallel Computer Structure, Architecture Classification Scheme.

UNIT-5

Pipeline and Vector Processing : Instruction and arithmetic Pipeline, SIMD Computers.

Reference Books:
1. Hawang K., Briggs, F.A. : Computer Architecture and Parallel processing, Mcgraw Hill,1985.
2. Kogg, H.: The Architecture of pipelined computers Mcgraw Hill,1981.
3. Bear, J.L.: Computer system architecture,computer sci.Press,1980.
4. Evans,D.J.: Parallel processing System, Cambridge Univ.1982.
5. Hockney,R.W.,Jesshope, C.R.:Parallel computers : Architecture progrmming and Algorithm, Adam.Hilger,1981.
6. Malvino , Brown : Digital Computer Electronics

MCA-204 Data and File Structure

Paper Code	Course Name	Course Type	Contact Hours	Credit	Examination Scheme					
					Internal Assessment	Theory	Practical	Seminar/ Viva Voce	Assignment	Total
204	MCA	CORE	4	4	25	75				100
206	MCA	CORE	6	3	25		75			100

UNIT-1
Basic concepts of data structure : Primitive and composite data types, data object, data structure. Sequential Representation : arrays, stacks, queues.

UNIT-2
Non-Sequential Representation : Linked Lists, Singly and Doubly linked lists, circular list, dynamic storage management, Garbage collection and compaction, Strings representation and strings manipulation.

UNIT-3
Non-linear data representation : trees, binary trees, tree traversal algorithms.

UNIT-4
Searching, Sorting and Merging Algorithms. Symbol Tables : Static Tree Tables, Dynamic Tree Tables, Hash Tables, Hashing Functions, Overflow Handing, Chaining.

UNIT-5
Fields, records, files, index techniques, cylinder-surface indexing, tree indexing-B-trees, trie indexing, file organizations.

Reference Books:
1. Kernigtran & plaugher : The Elements of Programming style.
2. Thomas A. Standish. : Data structure techniques, Addison Wesleyl, 1980.
3. Bhagat Singh : Introduction to Data Structures (THM, 1986). & Thomas Naps.
4. Robert Ksruse : Data Structures and Program Design (PHI, 1987).
5. Horowitz, Sahni : Data structures in pascal.
6. Tanenbaum : Data structures using c.

MCA-205 Systems Analysis and Design

Paper Code	Course Name	Course Type	Contact Hours	Credit	Examination Scheme					
					Internal Assessment	Theory	Practical	Seminar/ Viva Voce	Assignment	Total
205	MCA	CORE	4	4	25	75				100

UNIT-1
Overview of system analysis and design, system development life cycle, project selection, feasibility analysis,design, implementation, testing and evaluation.

UNIT-2
Feasibility study- Technical and economical feasibility, cost and benefit analysis.

UNIT-3
System requirement specification and analysis: Fact finding techniques, Data flow diagrams, Data dictionaries, process organization and interactions, decision analysis, decision trees and tables.

UNIT-4
Detailed design- Modularization, module specification, file design, system development involving data bases.

UNIT-5
System Control and Quality Assurance- reliability and maintenance, Software design and documentation tools, top-down, bottom-up and variants. Units and integration testing, testing practices and plans. System controls, Audit trails.

Reference Books:
1. James,A.S.: Analysis of design of Information systems,Mcgraw Hill 1986.
2. Ludeberg, M., Golkuhl, G. and hilsson,A. : Information systems development, Asystematis approach, Prentice Hall international 1981.
3. lesson,M.: System analysis and design, science research associates,1985
4. Sempriv,P.C.: System analysis-Definition Process and Design,1982
5. Richard,D.: System analysis design,Irwin Inc.1979.
6. Awad,E. Homewood : System analysis and design,Awad,Irwin 1979.
7. Lee, B.S. : Introducing System analysis and design 2 vols.Manchester United Kingdom, National computer centre,1978.
8. Learn Youself : Systems analysis and design, Reston Publishing company,1975.
9. Daniels : Practical System Design, Galgotia publ. Pvt. Ltd.

MCA-206 Practical – I (Based on 204)

Paper Code	Course Name	Course Type	Contact Hours	Credit	Examination Scheme					
					Internal Assessment	Theory	Practical	Seminar/ Viva Voce	Assignment	Total
204	MCA	CORE	4	4	25	75				100
206	MCA	CORE	6	3	25		75			100

MCA-207 Comprehensive Viva-Voce (Based on papers of II Semester)

Course No.	Course Name	C/E/S	L	T	P	Credits	Examination Scheme			
							Internal Assessment M.M.(Min)	Theory Semester Exam M.M. (Min)	Practical Semester Exam M.M.(Min)	Total
MCA 207	Comprehensive Viva-voce (based on papers of II semester.)	Core	-	-	-	2	100 (40)			100

SEMESTER : THIRD

MCA – 301 Data Communication and Computer Networks

Paper Code	Course Name	Course Type	Contact Hours	Credit	Examination Scheme					
					Internal Assessment	Theory	Practical	Seminar/ Viva Voce	Assignment	Total
301	MCA	CORE	4	4	25	75				100

UNIT - 1
Network goals and application, Network structure, Network services, Example of networks and Network Standardization, Networking models : centralized, distributed and collaborative. Network Topologies : Bus, Star, Ring, Tree, Hybrid : Selection and Evaluation factors.

UNIT -2
Theoretical Basis for Data communication, Transmission media, Twisted pair (UTP, STP), Coaxial Cable, Fiber optics : Selection and Evaluation factors. Line of Sight Transmission, Communication Satellites. Analog and Digital transmission. Transmission and switching, frequency division and time division multiplexing , STDM, Circuit switching, packet switching and message switching,

UNIT - 3
Brief Overview of LAN (Local Area Network) : Classification. Brief overview of Wide Area Network (WAN) . Salient features and differences of LAN with emphasis on : Media, Topology, Speed of Transmission, Distance, Cost. Terminal Handling, Polling, Token passing, Contention. IEEE Standards : their need and developments.

UNIT - 4
Open System : What is an Open System ? Network Architectures, ISO-OSI Reference Model, Layers : Application, Presentation, Session, Transport, Network, Data Link & Physical . Physical Layer - Transmission, Bandwidth, Signaling devices used, media type. Data Link Layer - : Addressing, Media Access Methods, Logical link Control, Basic algorithms/protocols.

UNIT - 5
Network Layer : Routing : Fewest-Hops routing, Type of Service routing, Updating Gateway routing information. Brief overview of Gateways, Bridges and Routers, Gateway protocols, routing daemons. OSI and TCP/IP model. TCP/IP and Ethernet. The Internet : The structure of the Internet, the internet layers, Internetwork problems. Internet Standards.

Reference Books:
1. Tannanbaum, A.S.: Computer Networks, Prentice Hall, 1985.processing, Prentice Hall,1983.
2. Black : Computer Networks : Protocols, standords and Interfaces, Prentice Hall International

MCA –302 Theory of Compiler Design

Paper Code	Course Name	Course Type	Contact Hours	Credit	Examination Scheme					
					Internal Assessment	Theory	Practical	Seminar/ Viva Voce	Assignment	Total
302	MCA	CORE	4	4	25	75				100

UNIT-1
Structure of a compiler, cross compiler, finite automata and lexical analysis : The roll of lexical analyzer ,design of lexical analyzer.

UNIT-2
Regular expressions, finite automata, definite finite automata minimizing the no. of states of a DFA ,context free, grammers.

UNIT-3
Derivations and parse trees , basic parsing techniques, parses, shift -reduce parsing , operator precedence ,parsing, top-down parsing.

UNIT-4
Run-time Storage administrations, implementation of a simple stack, allocation scheme.

UNIT-5
Implementation of block structured languages, storage allocation in block, structued languages, code generator.

Reference Books:
1   Aho, Ullman :   Principles of compiler design.

MCA- 303 Computer Graphics

Paper Code	Course Name	Course Type	Contact Hours	Credit	Examination Scheme					
					Internal Assessment	Theory	Practical	Seminar/ Viva Voce	Assignment	Total
303	MCA	CORE	4	4	25	75				100

UNIT -1
Graphics Hardware: Basic of Computer Graphics, display technology, Raster Scan & Random scan display systems, Input devices.

UNIT -2
Basic Raster Graphics for drawing 2_D primitives: Scan converting lines, circles, ellipse; filling rectangles, polygons, generating characters; antialiasing. Matrix representation and Homogeneous coordinates, two dimensional transformations, 2Dline clipping, polygon clipping algorithms, window to viewport transformation.

UNIT -3
Viewing in 3D: Three dimensional transformation, Projections : Parallel, prospective, view points.

UNIT -4
Representation of curves & surfaces, Besier method, B-spline methods. Visible surface determination: Z-buffer, Algos, List priority algorithms, Scan line algorithms. Light and shading models: Illumination models, shading models for polygons, shading algorithms, Gouraud & Phong, color models like RGB, YIU, copy, HSV etc.

UNIT -5
Introduction to multimedia, multimedia components; multimedia hardware, SCSI, IDE, MCI, Multimedia data and file formats, RTF, TIFF, MIDI, JPEG, DIB, MPEG, Multimedia tools, presentations tools, Authoring tools, presentations. Graphics animation : Tweeking, Morphing simulating accelerator, motion specification.

Reference Books:
1. Giloi, W.K. : Inter active Computer Graphics , Prentice Hall 1978.
2. Newman, W., Sproul, R.F : Principles of interactive computer graphics. Mcgraw Hill, 1980.
3. Roggers, D.F. : Procedural Elements for computer Graphics , Mcgraw Hill,1985.
4. Harrington, S. : Computer Graphics : A programming approach, Tata Mcgraw Hill
5. Foley, J.D., Van Dom A. : Fundamentals of Interactive computer Graphics, Addison-wesley, 1982.
6. Hearn D., Baker P.M. : Computer Graphics, Prentice Hall,1986.

MCA 304 Programming with Visual Basic.Net

Paper Code	Course Name	Course Type	Contact Hours	Credit	Examination Scheme					
					Internal Assessment	Theory	Practical	Seminar/ Viva Voce	Assignment	Total
304	MCA	CORE	4	4	25	75				100
306	MCA	CORE	6	3	25		75			100

UNIT–1

Introduction to .NET, .NET Framework features & architecture, CLR, Common Type System, MSIL, Assemblies and class libraries. Introduction to visual studio, Project basics, types of project in .Net, IDE of VB.NET- Menu bar, Toolbar, Solution Explorer, Toolbox, Properties Window, Form Designer, Output Window, Object Browser.

UNIT–2

The VB.NET Language- Variables -Declaring variables, Data Type of variables, Forcing variables declarations, Scope & lifetime of a variable, Constants, Arrays, types of array, control array, Collections, Subroutines, Functions, Passing variable, Number of Argument, Optional Argument, Returning value from function. Control flow statements: conditional statement, loop statement. Msgbox & Inputbox.

UNIT–3

Working with Forms : Loading, showing and hiding forms, controlling One form within another. Using MDI form. Windows Form Control (with Properties, Methods and events): Textbox, Rich Text Boxes, Label, Link Label, Button, Checkbox, Radio Button, Panel, Group Box, Picture Box, Listbox, Combobox, Check Listbox, scroll bar, Timer. Advance Controls: Menus, Context Menus , Built-in Dialog Box: OpenFileDilog, SaveFileDialog, FontDialog, ColorDialog, PrintDialog, Printing. ListView, TreeView, toolbar, StatusBar.

UNIT–4

Object oriented Programming: Classes & objects, constructor, destructor, inheritance. Access Specifiers, Interfaces, Polymorphism. Exception Handling: using Try, Catch, Finally, Throw Keywords. Graphics Handling: Using Graphics & Pen classes for drawing colors and figures. File Handling: Opening or Creating a File, Writing & Reading Text.

UNIT–5

Database programming with ADO.NET – Overview of ADO, from ADO to ADO.NET, Accessing Data using Server Explorer. Creating Connection, Command, Data Adapter and Data Set with OLEDB and SQLDB. Display Data on data bound controls, display data on data grid.

Generate Reports Using CrystalReportViwer.

Reference Books:
1. VB.NET Programming Black Book by steven holzner –dreamtech publications
2. Mastering VB.NET by Evangelos petroutsos- BPB publications
3. Introduction to .NET framework-Worx publication

MCA-305 Software Engineering (E1)

Paper Code	Course Name	Course Type	Contact Hours	Credit	Examination Scheme					
					Internal Assessment	Theory	Practical	Seminar/ Viva Voce	Assignment	Total
305 E1	MCA	ELECTIVE	4	4	25	75				100

UNIT-1

Introduction to Software Engineering : Software development, and life cycle; Project size and its categories; Planning a software project.

UNIT- 2

Project control & Project team standards; Design of solution strategies; Software cost estimation and evaluation techniques.

UNIT-3

Software Design : Various Design concepts and notations; Modern design techniques; Verification and validation methods; Documentation & implementation procedures; Performance of software systems; Software metrics and models. Documentation of Project-systems, manuals and implementation.

UNIT-4

Software Reliability : Definition and concept of software reliability; software errors, faults, repair and availability; Re-availability & availability models; Use of database as a study tool.

UNIT- 5

Modern Programming Language Features Relevant to Software Engineering: data abstraction, exception handling, concurrency mechanism, etc; Software development environments.

Reference Books:

1. Fairley, B.E. : Software Engineering concepts, Mcgraw- Hill 1985.
2. Lewis, T.G. : Software Engineering concepts, Mcgraw Hill,1982.
3. Kernighan,B., Plauger, P. : software tools, Addison Wesley ,1976.
4. Meyers,G. : The Art of software testing, Wiley-inter- science,1979.
5. Gehani,N : Introduction of ADA, Mcgraw Hill, 1983.
6. Chatree : Software engineering concepts.
7. Hiborard : Constructing Quality software.
7. Shere : Software Engineering & Managment,Prentice Hall,1988.
8. Deutsch,Williis : Software Quality Engineering; A total Technical and Managment Approach, Prentice Hall,1989.

MCA-305 Simulation and Modeling (E2)

Paper Code	Course Name	Course Type	Contact Hours	Credit	Examination Scheme					
					Internal Assessment	Theory	Practical	Seminar/ Viva Voce	Assignment	Total
305 E2	MCA	ELECTIVE	4	4	25	75				100

UNIT-1

Definition of Simulation: Type of Simulation (Continuous and Discrete), Definition of Models, Types of Model, Comparing model data with real system data. Why to use Simulation? Simulation is used for solving real life problem.

UNIT-2

Limitation of Simulation techniques, phases of simulation model, Data Generation, Book keeping, Events types simulation (Numerical Problem), Generation of Random Number, Monte Carlo Simulation (Numerical Problem).

UNIT-3

Continuous system simulation: Continuous system models, Differential equations, Hybrid computer, Continuous System simulation Languages, Simulation of an Auto pilot, real time simulation. Probability concept of simulation: numerical evaluation of continuous probability function, continuous uniformly distributed random numbers. the rejection method, discrete simulation language, simulation of telephone system.

UNIT-4

Simulation Application to inventory control, Queuing Problem, Capital Budgeting, Financial Planning, Advantages and disadvantages of Simulation, Scope of Simulation Techniques.

UNIT-5

Introduction to Simulation Tools: NS2, OPNET, QUALNET and NETSIM, Overview of OPNET, Characteristics of OPNET, Installation of OPNET simulator, Designing of Simulation Setup using OPNET etc.

Reference Books:
1. System Simulation , G. Gordan, PH
2. Introduction to Simulation, T.A. Payer, Mcgraw Hill

MCA-306 Practical – I (Based on 304)

Paper Code	Course Name	Course Type	Contact Hours	Credit	Examination Scheme					
					Internal Assessment	Theory	Practical	Seminar/ Viva Voce	Assignment	Total
304	MCA	CORE	4	4	25	75				100
306	MCA	CORE	6	3	25		75			100

MCA-307 Comprehensive Viva-Voce (Based on papers of III Semester)

Course No.	Course Name	C/E/S	L	T	P	Credits	Examination Scheme			
							Internal Assessment M.M.(Min)	Theory Semester Exam M.M. (Min)	Practical Semester Exam M.M.(Min)	Total
MCA 307	Comprehensive Viva-voce (based on papers of III semester.)	Core	-	-	-	2	100 (40)			100

SEMESTER : FOURTH

MCA-401 Introduction to Web Technology

Paper Code	Course Name	Course Type	Contact Hours	Credit	Examination Scheme					
					Internal Assessment	Theory	Practical	Seminar/ Viva Voce	Assignment	Total
401	MCA	CORE	4	4	25	75				100
406	MCA	CORE	6	3	25		75			100

UNIT-1

HTML : WWW, Web page , URL, HTML : HTML elements, HTML Source. JAVA : Java features : Java vs. C and C++, Java and Internet, Java & www, Java Environment, Java Tools, Java-Enabled Browsers. Java language : Constants, Variables and Data Types , Program Structure, tokens, statements. Implementing Java program, operators and expression : Arithmetic, Relational, Assignment, logical, Bit wise, Special, operator precedence.

UNIT-2

Decision making and branching: If - else, nested if, else-if ladder , switch statement. Decision making and looping : while , do, for. Classes and Object : defining, adding, creating , accessing, overriding. Arrays, strings and vectors. Interfaces, packages.

UNIT-3

Multithreaded programming : Creating, extending, stopping & blocking a thread. Thread life cycle. Exception handling : Error types, Exception syntax, using exception for debugging.

UNIT-4

Applet Programming : Applets vs. applications, building applet code, applet life cycle. executable applet, web page designing, adding applet to HTML file. Running parameter passing to applets.

UNIT-5

Introductory Graphics Programming: class, Lines , Rectangle, Circles, Ellipes, Arcs, Polygons, Line Graphs. I/O in Java : Streams, stream classes, Byte and Character stream classes. I/O exceptions, Interactive I/O

Reference Books :

1. Programming With JAVA : A Primer : Tata McGraw Hill : E. Balagurusamy
2. Java Complete Reference : Herbert Schieldt

MCA-402 Artificial Intelligence

Paper Code	Course Name	Course Type	Contact Hours	Credit	Examination Scheme					
					Internal Assessment	Theory	Practical	Seminar/ Viva Voce	Assignment	Total
402	MCA	CORE	4	4	25	75				100

UNIT-1

Introduction of Artificial Intelligence: What is AI ? The Importance of AI. AI and related fields. Introduction to Natural Language Processing . Basic Problem solving methods: Production systems-state space search, control strategies, Breadth first search, Depth first search, Heuristic search, Hill Climbing techniques: Best First search, forward and backward reasoning.

UNIT-2

Knowledge : General Concepts, Definition and Importance of Knowledge, Knowledge based system, representation of Knowledge, Knowledge Organization , Knowledge Manipulation , Acquisition of Knowledge. Introduction to Expert System: Definition, Characteristics, Importance and Applications of Expert System, structure of Expert System. Case study of MYCIN & DENDRAL.

UNIT-3

LISP AND AI PROGRAMMING LANGUAGES : Introduction to LISP : Syntax and Numeric Functions, Basic List Manipulation Functions in LISP , Functions, Predicates, and Conditionals, Input, Output, and Local Variables, Iteration and Recursion, Property List and arrays, PROGLOG and Other AI Programming Languages.

UNIT-4

FORMALIZED SYMBOLIC LOGICS : Introduction , Syntax and Semantics for Propositional Logic , Syntax and Semantics for FOPL , Properties of Wffs , Conversion to Clausal Form, Inference Rules , The Resolution Principle , Representations Using Rules.

UNIT-5

Neural Network: Basic structure of neuron, perception, feed forward and back propagation, Hopfield network.

Reference Books :

1. Dan W. Patterson: Introduction to Artificial Intelligence and Expert System, Prentice Hall.
2. Stuart Russell, Peter Norvig: Artificial Intelligence: A Modern Approach, Pearson New International Edition
3. Elaine Rich and Kevin Knight: Artificial Intelligence
4. Charniak, E. : Introduction of Artificial Intellegence, Narosa publ. House.
5. Winston,P.H. : LISP, NArosa publ. House.
6. clark, K.L. : Micro Prolog , Prentice Hall india.1987.

MCA-403 Object Oriented Modeling Technique

Paper Code	Course Name	Course Type	Contact Hours	Credit	Examination Scheme					
					Internal Assessment	Theory	Practical	Seminar/ Viva Voce	Assignment	Total
403	MCA	CORE	4	4	25	75				100

UNIT 1

Modeling, objects and classes, Relationships, Inheritance, Association, aggregation, Containers, Delegation, Metadata, Abstract methods and Classes.

UNIT 2

Object modeling, Dynamic modeling, Events, Status, Scenarios, Event hate diagrams, Operations, State diagrams, Functional Models, Dataflow diagrams, Constraints specification, Relation of object, Functional and Dynamic models.

UNIT 3

OMT methodology, Analysis, Overview of system design, Subsystem, concurrency, Common architectural frameworks designing algorithm, Design optimization, Implementation of control, Design of Associations, Object design, Class design, Comparison of design methodology with SASD, JSD and others.

UNIT 4

Programming style, Reusability, Extensibility, Programming in the large, Translating a design into an Implementation class definition, Object oriented Language features, Survey of object-oriented languages, Object storage and relation with database.

UNIT 5

Distributed objects, Components development, Introduction to Distributed object system like CORBA, EJB, COM+, DCOM, and other design architectures.

Reference Books:
1. G. Booch, Object-Oriented Analysis and Design, Pearson Education.
2. J. Rumbaugh, Object-Oriented Modeling and Design, Pearson Education.

MCA-404 Data Mining

Paper Code	Course Name	Course Type	Contact Hours	Credit	Examination Scheme					
					Internal Assessment	Theory	Practical	Seminar/ Viva Voce	Assignment	Total
404	MCA	CORE	4	4	25	75				100

UNIT 1

Introduction : Data Mining: Definitions, KDD v/s Data Mining, DBMS v/s Data Mining , DM techniques, Mining problems, Issues and Challenges in DM, DM Application areas. Association Rules & Clustering Techniques: Introduction, Various association algorithms like A Priori, Partition, Pincer search etc., Generalized association rules.

UNIT 2

Clustering paradigms; Partitioning algorithms like K-Medioid, CLARA,CLARANS; Hierarchical clustering, DBSCAN, BIRCH, CURE; categorical clustering algorithms, STIRR, ROCK, CACTUS. Other DM techniques & Web Mining: Application of Neural Network, AI, Fuzzy logic and Genetic algorithm, Decision tree in DM. Web Mining, Web content mining, Web structure Mining, Web Usage Mining.

UNIT 3

Temporal and spatial DM: Temporal association rules, Sequence Mining, GSP, SPADE, SPIRIT, and WUM algorithms, Episode Discovery, Event prediction, Time series analysis. Spatial Mining, Spatial Mining tasks, Spatial clustering, Spatial Trends.

UNIT 4

Data Mining of Image and Video : A case study. Image and Video representation techniques, feature extraction, motion analysis, content based image and video retrieval, clustering and association paradigm, knowledge discovery.

UNIT 5

The vicious cycle of Data mining, data mining methodology, measuring the effectiveness of data mining data mining techniques. Market baskets analysis, memory based reasoning, automatic cluster detection, link analysis, artificial neural networks, generic algorithms, data mining and corporate data warehouse, OLA

Reference Books :

1. Data Mining Techniques ; Arun K.Pujari ; University Press.
2. Data Mining; Adriaans & Zantinge; Pearson education.
3. Mastering Data Mining; Berry Linoff; Wiley.
4. Data Mining; Dunham; Pearson education.

MCA – 405 ASP. NET TECHNOLOGY USING C# (E3)

Paper Code	Course Name	Course Type	Contact Hours	Credit	Examination Scheme					
					Internal Assessment	Theory	Practical	Seminar/ Viva Voce	Assignment	Total
405 E3	MCA	ELECTIVE	4	4	25	75				100

UNIT 1

Software quality and reliability, software project management, project planning, measurement and metrics, cost estimation. Scheduling and tracking, team management, risk analysis, project management tools and techniques, PERT, CPM. Software Quality Assurance: factors and components. Configuration management, software maintenance issues and techniques, software reuse, client-sever software development

UNIT 2

Overview of ASP.NET framework, Understanding ASP.NET Controls, Applications, Web servers, installation of IIS. Web forms, web form controls -server controls, client controls, web forms & HTML, Adding controls to a web form ,Buttons, Text Box , Labels, Checkbox, Radio Buttons, List Box, etc. Running a web Application, creating a multiform web project.

UNIT 3

Form Validation: Client side validation, server Side validation, Validation Controls : Required Field Comparison Range. Calendar control, Ad rotator Control, Internet Explorer Control. State management- View state, Session state, Application state,

UNIT 4

Architecture of ADO.NET, Connected and Disconnected Database, Create Connection using ADO.NET Object Model, Connection Class, Command Class, DataAdapter Class, Dataset Class. Display data on data bound Controls and Data Grid. Database Accessing on web applications: Data Binding concept with web, creating data grid, Binding standard web server controls. Display data on web form using Data bound controls.

UNIT 5

Writing datasets to XML, Reading datasets with XML. Web services: Introduction, Remote method call using XML, SOAP, web service description language, building & consuming a web service, Web Application deployment. Overview of C#, C# and .NET, similarities & differences from JAVA, Structure of C# program Language features: Type system, boxing and unboxing, flow controls, classes, interfaces, Serialization, Delegates, Reflection.

Reference Books:

1. Pressman R.S. Sofware Engineering: A Practitioner's Approach, MGH
2. Pankaj Jalote. An Intergrated Approach to Software Engineering, Narosa
3. VB.NET Black Book by steven holzner –dreamtech
4. ASP.NET Unleashed
5. C# programming – wrox publication
6. C# programming Black Book by Matt telles.

MCA–405 Distributed Computing (E4)

Paper Code	Course Name	Course Type	Contact Hours	Credit	Examination Scheme					
					Internal Assessment	Theory	Practical	Seminar/ Viva Voce	Assignment	Total
405 E4	MCA	ELECTIVE	4	4	25	75				100

UNIT 1

Introduction to Distributed Systems: Goal of Distributed Systems, Hardware and Software concepts, the client server model, Remote procedure call, remote object invocation, message and stream oriented communications.

UNIT 2

Process and synchronization in distributed system: Threads, Client Server codes, migration, clock synchronization, mutual exclusion, Bully and Ring algorithm, Distributed transactions.

UNIT 3

Consistency, Replication, fault tolerance and security: Object replication, data centric, consistency model, client centric consistency models, introduction to fault tolerance, process resilience, recovery, distributed security architecture, security management, KERBEROS, secure socket layer, cryptography.

UNIT 4

Distributed Object based and file systems: CORBA, Distributed COM, Goals and Design Issues of Distributed file system, types of distributed file system, sun network file system.

UNIT 5

Distributed shared memory, DSM servers, shared memory consistency model, distributed document based systems, the World Wide Web, distributed coordination based system: JNI.

Reference Books:

1. Andrew S Tannebaum, " Distributed System Principles and Paradigms" Pearson Education.
2. Robert J. " Distributed Processing System", Prentice Hall.

MCA-406 Practical – I (Based on 401)

Paper Code	Course Name	Course Type	Contact Hours	Credit	Examination Scheme					
					Internal Assessment	Theory	Practical	Seminar/ Viva Voce	Assignment	Total
401	MCA	CORE	4	4	25	75				100
406	MCA	CORE	6	3	25		75			100

MCA-407 Comprehensive Viva-Voce (Based on papers of IV Semester)

Course No.	Course Name	C/E/S	L	T	P	Credits	Internal Assessment M.M.(Min)	Theory Semester Exam M.M. (Min)	Practical Semester Exam M.M.(Min)	Total
							Examination Scheme			
MCA 407	Comprehensive Viva-voce (based on papers of IV semester.)	Core	-	-	-	2	100 (40)			100

SEMESTER : FIFTH

MCA – 501 Design and Analysis of Algorithms

Paper Code	Course Name	Course Type	Contact Hours	Credit	Examination Scheme					
					Internal Assessment	Theory	Practical	Seminar/ Viva Voce	Assignment	Total
501	MCA	CORE	4	4	25	75				100
506	MCA	CORE	6	3	25		75			100

UNIT 1

Introduction and Review: What is an Algorithm, Algorithm's Performance, order architecture: Θ-Notation, O-Notation, Ω-Notation, Algorithm Analysis: time space complexities, Worst-case Complexity, Average-case Complexity.

UNIT 2

Divide and conquer: Structure of divide-and –conquer algorithms: examples, Binary search, quick sort, Analysis of divide and conquer, run time recurrence relations.

UNIT 3

Graph Searching and Traversal: Overview, Traversal methods: depth first and breadth first search.Greedy Method: Overview of the greedy method, Minimum spanning trees, Single source shortest paths.

UNIT 4

Dynamic programming: The general method, principle of optimality, difference between dynamic programming and greedy method, Applications: optimal binary search trees, Back tracking: The general method, 8-queens problem.

UNIT 5

Branch and Bound Algorithm: The Branch and bound method, FIFO and LIFO branch and bound, LC (Least Cost) search, Traveling Salesman Problem, LCBB on Traveling Salesman Problem.

Reference Books:
1. Fundamentals of Computer Algorithms By Ellis Horowittz and Sartaj Sahni, Galgotia Publications.
2. Ullman "Analysis and Design of Algorithm" TMH
3. Goodman " Introduction to the Design & Analysis of Algorithms, TMH-2002
4. Sara Basse, A.V. Gelder, " Computer Algorithms, " Addison Wesley
5. T.H. Cormen, Leiserson, Rivert and stein, " Introduction of Computer algorithm, " PHI
6. E. Horowitz, S. Sahni, and S. Rajsekaran, "Fundamentals of Computer Algorithms, " Galgotia Publication.

MCA – 502 Network Security

Paper Code	Course Name	Course Type	Contact Hours	Credit	Examination Scheme					
					Internal Assessment	Theory	Practical	Seminar/ Viva Voce	Assignment	Total
502	MCA	CORE	4	4	25	75				100

UNIT 1

Convention Encryption : Conventional Encryption Model , Stenography , Classical Encryption Techniques, Simplified DES , Block Cipher Principles , The Data Encryption Standard, The Strength of DES , Differential and Linear Cryptanalysis, Block Cipher Design Principles, Block Cipher Modes of operation, Conventional

UNIT 2

Encryption algorithms: Public Key Encryption And Hash Functions Public Key Cryptography , Principles of Public Key Cryptosystems , The RSA Algorithm , Key Management , Diffie Hellman Key Exchange , Elliptic Curve Cryptography.

UNIT 3

Message Authentication and Hash Functions Authentication Requirements, Authentication Functions, Message Authentication Codes , Hash Functions , Security of Hash Functions

UNIT 4

Hash And Mac Algorithms MD5 Message Digest Algorithm , Secure Hash Algorithm (SHA-I) , RIPEMD, HMAC

UNIT 5

Digital Signatures and Authentication Protocols Digital Signatures , Authentication Protocols - Digital Signature Standard Authentication Applications , IP Security , Web Security Intruders, Viruses and Worms Intruders , Viruses and Related Threats Firewalls Firewall Design Principles , Trusted Systems

Reference Books :

1. William Stallings, "Cryptography and Network Security", Second edition, Prentice Hall, 1999.
2. Atul Kahate, "Cryptography and Network Security," TMH
3. William Stallings, "Cryptography and Network Security",Third Edition, Pearson Ed
4. Introduction to network security, Krawetz, Cengage

MCA – 503 Minor Project

Paper Code	Course Name	Course Type	Contact Hours	Credit	Examination Scheme					
					Internal Assessment	Theory	Practical	Seminar/ Viva Voce	Assignment	Total
503	MCA	CORE	4	4	25		75			100

Each Student of MCA fifth semester has to do a minor project in the institute under the guidance project guide decided by the departmental committee. Student will have to prepare a project report in three copies and have to submit before the theory examination. The valuation will be done on the basis of report seminar and viva conducted by the institute.

MCA–504 Project Management with JAVA (E5)

Paper Code	Course Name	Course Type	Contact Hours	Credit	Examination Scheme					
					Internal Assessment	Theory	Practical	Seminar/ Viva Voce	Assignment	Total
504 E-5	MCA	ELECTIVE	4	4	25	75				100

UNIT 1

The Java Environment: History of Java: Comparison of Java and C++; Java as an object oriented language: Java buzzwords; A simple program, its compilation and execution; the concept of CLASSPATH; Basic idea of application and applet; Basics: Data types; Operators- precedence and associativity; Type conversion; The decision making – if, if..else, switch; loops – for, while, do…while; special statements–return, break, continue, labeled break, labeled continue; Modular programming methods; arrays; memory allocation and garbage collection in java keywords. Object Oriented Programming in Java: Class; Packages; scope and lifetime; Access specifies; Constructors; Copy constructor; this pointer; finalize () method; arrays; Memory allocation and garbage collection in java keywords Inheritance : Inheritance basics, method overriding, dynamics method dispatch, abstract classes.

UNIT 2

Interfaces : defining an interface, implementing & applying interfaces, variables in interfaces, extending interfaces. Multithreading and Exception Handling: Basic idea of multithreaded programming; The lifecycle of a thread; Creating thread with the thread class and runnable interface; Thread synchronization; Thread scheduling; Producer-consumer relationship; Daemon thread, Selfish threads; Basic idea of exception handling; The try, catch and throw; throws Constructor and finalizers in exception handling; Exception Handling.

UNIT 3

Applets: Applet security restrictions; the class hierarchy for applets; Life cycle of applet; HTML Tags for applet.The AWT: The class hierarchy of window fundamentals; The basic user interface components Label, Button, Check Box, Radio Button, Choice menu, Text area, Scroll list, Scroll bar; Frame; Layout managers flow layout, Grid layout, Border layout, Card layout. The Java Event Handling Model: Java's event delegation model – Ignoring the event, Self contained events, Delegating. Events: The event class hierarchy; The relationship between interface, methods called, parameters and event source; Adapter classes; Event classes action Event, Adjustment Event, Container Event, Focus Event, Item Event, Key Event, Mouse Event, Text Event, Window Event.

UNIT 4

Input/Output : Exploring Java i.o., Directories, stream classes The Byte stream : Input stream, output stream, file input stream, file output stream, print stream, Random access file, the character streams, Buffered reader, buffered writer, print writer, serialization. JDBC: JDBC-ODBC bridge; The connectivity model; The driver manager; Navigating the result set object contents; java.sql Package; The JDBC exception classes; Connecting to Remote database.

UNIT 5

Networking & RMI: Java Networking : Networking Basics : Socket, Client server, reserved sockets, proxy servers, Inet address, TCP sockets, UDP sockets. ; RMI for distributed computing; RMI registry services; Steps of creating RMI Application and an example. Collections: The collections framework, collection interfaces, collection classes.

Reference Books:

1. Naughton & Schildt "The Complete Reference Java 2", Tata McGraw Hill
2. Deitel "Java- How to Program:" Pearson Education, Asia

MCA–504 Cloud Computing (E6)

Paper Code	Course Name	Course Type	Contact Hours	Credit	Examination Scheme					
					Internal Assessment	Theory	Practical	Seminar/ Viva Voce	Assignment	Total
504 E-6	MCA	ELECTIVE	4	4	25	75				100

UNIT 1

Historical development, Vision of Cloud Computing, Characteristic of Cloud Computing As Per NIST, Cloud Computing Reference Model, Cloud computing Environments, Cloud service requirements, cloud and dynamic infrastructure, cloud adaptation and rudiments. Overview of cloud application: ECG Analysis in the cloud, Protein Structure prediction, Gene Expression Data Analysis, Satellites Image Processing, CRM and ERP, Social networking.

UNIT 2

Cloud Computing Architecture: Cloud Reference model types of cloud, cloud interpretability and standards, scalability and fault tolerance, cloud solutions, cloud eco- system, cloud business process management, cloud service management, cloud offerings, cloud analytics, testing under control, virtual desktop infrastructure.

UNIT 3

Cloud Management and virtualization and technology Resilliency, Provisioning, Asset Management, Concepts of MAP reduce, Cloud governance, High availability and disaster recovery, virtualization, fundamentals concepts of compute storage, networking, desktop and application virtualization, virtualization benefits, sever virtualization, block and file level storage virtualization, hypervisor management software, infrastructure requirements, virtual LAN (VLAN), and virtual SAN (VSAN) and their benefits.

UNIT 4

Cloud security: Cloud information security fundamentals, cloud security services, design principles, Secure cloud software requirements, policy implementations, cloud computing security challenges, virtualization security management, cloud computing security architecture.

UNIT 5

Market based Management of clouds, federated clouds/ inter cloud: Characterization and definition, Cloud federation status, third party cloud services. Case study: Google App Engine, Hadoop, Amazon, Aneka.

Reference Books:

1. Tomar Saurabh, Cloud Computing, Wiley Pub.
2. Selvi : Mastermind Cloud Computing, TMH, Pub.

MCA–505 Internetwork Application (E7)

Paper Code	Course Name	Course Type	Contact Hours	Credit	Examination Scheme					
					Internal Assessment	Theory	Practical	Seminar/ Viva Voce	Assignment	Total
505 E7	MCA	ELECTIVE	4	4	25	75				100

UNIT 1
TCP/IP Model: Comparison with ISO -OSI reference model. TCP/IP Protocol Family: Transport : Transmission Control Protocol, TCP Header Format, UDP Routing : IP Addressing , limitations , Brief overview of IPV6 i.e. the next generation IP, IP header format. Network Addresses: ARP, Domain Name System (DNS), RARP.

UNIT 2
User Services /Applications : File Transfer Protocol (FTP) : Channel Connection, Command : internal & Users, Connections, debugging option with FTP, third party transfer, anonymous FTP, FTP Servers, TFTP, Telnet, BOOTP, Gateway Protocols : brief overview of EGP, CGP & IGP, Other protocols : NFS, NIS, RPC, SMTP, SNMP.

UNIT 3
Internet : Uses, Goals/advantages, WWW, Intranet : Goals, benefits, how TCP/IP, bridges, routers, E-mail works in an intranet, Intranet and WWW : IP Networks, HTTP, Commands, Intranet applications : Overview of Web-Servers : essential & desirable features of a web server : authentication , authorization and encryption ; proxy services ; Subnetting an intranet.

UNIT 4
Overview of an intranet security system : Security and access policies, Server Security, Firewalls, General Security. WAN : overview of DDS, T-1, T-3 , Frame Relay, Sonet, SMDS, ATM Services, WAN implementation, Connecting the LANs : Bridges, routers, Accessing WAN, Message handling system : X.400 & X.500 , Message Transfer Agents (MTA), Mailbox.

UNIT 5
Development of the Socket Programming Interface : Socket Services, Creating a Socket , Binding the Socket , Connecting to the Destination , open Command , Sending Data , Receiving Data , Server Listening , Closing a Connection , Aborting a Connection , UNIX Forks. Network services - file servers, message servers , Directory servers, print servers, application servers.

Reference Books:
1. Douglas J. Comer : Internetworking with TCP/IP (Vol I)
2. Richard Stevens : Unix Networking

MCA 505 Mobile Computing (E8)

Paper Code	Course Name	Course Type	Contact Hours	Credit	Examination Scheme					
					Internal Assessment	Theory	Practical	Seminar/ Viva Voce	Assignment	Total
505 E8	MCA	ELECTIVE	4	4	25	75				100

UNIT 1

Overview of the emerging fields of mobile computing; Historical perspectives (mainly from the perspective of radio), Mobile applications, Limitations, Health Concerns, Cordless phone, Land mobile vs. Satellite vs. In-building communications systems, Frequencies for radio transmission. Characteristics of Cellular Systems, Mobility support in cellular telephone networks, Personal Communications Systems/Personal Communications Networks, Wireless Personal Area Network, Wireless Local Area Network and Internet Access.

UNIT 2

Mobile communication: Fiber or wire based transmission, Wireless Transmission - Frequencies, Signals, Antennas and Signal Propagation, Modulation Techniques, Multiplexing techniques, Coding techniques. Cellular structure, Voice Oriented Data Communication GSM, CDMA. GSM Architecture, Authentication & security, frequency hopping.

UNIT 3

Satellite Systems: History, Application, and Basics of Satellite Systems: LEO, MEO, GEO, Routing, Handover, VSAT, installation & Configuration. Cyclic repetition of data, Digital Audio Video Broadcasting, Multimedia object transfer Protocol, Wireless LAN topologies, requirements. Physical layer, MAC sub-layer, IEEE802.11.HIPERLAN: Protocol architecture, layers, Information bases and networking, Bluetooth.

UNIT 4

Basics of Discrete Event Simulation, Application and Experimentation, Simulation models. Case Study on Performance Evolution of IEEE 802.11 WLAN configuration using Simulation, Mobile IP, goals, assumptions requirements, entities and terminology, IP packet delivery, tunneling and encapsulation, Feature and format of IPv6, DHCP, TCP over Wireless. Characteristic of Ad Hoc networks, Applications, need for routing, routing classification, Wireless sensor networks, classification and Fundamentals of MAC protocol for wireless sensor networks.

UNIT 5

Economical Benefits of Wireless Networks, Wireless Data Forecast, Charging issues, Role of Government, Infrastructure manufacturer, Enabling Applications Mobile operating System, HTTP versus HTML. WML,XML application for wireless handheld devices. UWB systems Characteristics, Current approaches for security.

Reference Books:

1. Mobile Communications author Jochen Schiller, publication John Willy & Sons, Ltd.
2. Wireless And Mobile Systems, D. P. Agrawal,Qing-An zeng, Thomson publication.

MCA-506 Practical – I (Based on 501)

Paper Code	Course Name	Course Type	Contact Hours	Credit	Examination Scheme					
					Internal Assessment	Theory	Practical	Seminar/ Viva Voce	Assignment	Total
501	MCA	CORE	4	4	25	75				100
506	MCA	CORE	6	3	25		75			100

MCA-507 Comprehensive Viva-Voce (Based on papers of V Semester)

Course No.	Course Name	C/E/S	L	T	P	Credits	Internal Assessment M.M.(Min)	Theory Semester Exam M.M. (Min)	Practical Semester Exam M.M.(Min)	Total
							Examination Scheme			
MCA 507	Comprehensive Viva-voce (based on papers of V semester.)	Core	-	-	-	2	100 (40)			100

Vikram University, Ujjain –M.C.A. Syllabus
(As per CBCS pattern) w. e. f. 2016-17 and onwards

SEMESTER: SIXTH

Paper Code	Course Name	Course Type	Contact Hours	Credit	Examination Scheme						
					Internal	External					
					Internal Assessment/ Seminar	Thesis/ Presentation	Practical	Seminar/ Viva Voce	Assignment	Total
601	MCA	Skill	12	12	200	100	-	100	-	400
602	MCA	Core	3	3	100	-	-	-	-	100

System Development Project (Here student is required to undertake six months system development project in the Industry or in a computer Organization and submit a detailed project report).

Course No.	Course Name	C/E/S	Credits	Examination Scheme					Total
				Internal Assessment			External Assessment		
				Progress Report- I M.M (Min)	Progress Report- II M.M (Min)	Seminar M.M (Min)	Thesis & Presentation M.M. (Min)	Viva- Voce M.M.(Min)	M.M.(Min)
MCA 601	Major Project	Skill	12	50 (20)	50 (20)	100 (40)	100 (40)	100 (40)	400 (160)
MCA 602	Comprehensive Viva-voce (based on all papers of MCA syllabus)	Core	3			100 (40)			100 (40)
	Total		15	50 (20)	50 (20)	200 (80)	100 (40)	100 (40)	500 (200)

Total Credits = First Sem 25 + Second Sem 25 + Third Sem 25 + Fourth Sem 25 +Fifth Sem 25 + Sixth Sem 15 =140 Credits