

**UNIVERSITY OF RAJASTHAN**

**JAIPUR**

**SYLLABUS**

**Master of Computer Applications**

**(M.C.A.)**

**Semester Scheme**

<b>I/II Semester Examination</b>	<b>2019-20</b>
<b>III/IV Semester Examination</b>	<b>2020-21</b>
<b>V/VI Semester Examination</b>	<b>2021-22</b>

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## Eligibility:

### (a) MCA Semester I :

All the graduate (with 10+2+3) with at least 50% marks or CGPA of 3.0 in the UGC Seven Point Scale (45% marks or CGPA 2.5 in the UGC Seven Point Scale for SC/ST/Non-Creamy layer OBC) in aggregate with **Mathematics either at XII level or graduation level or BCA/B.Sc.(CS)/B.Sc.(IT) or B.E./BTech.** from recognized university in Rajasthan and minimum 60% marks for non-Rajasthan candidate. Reservation as per the University Rules.

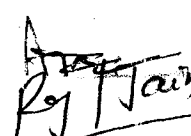
(b) In addition to above qualification, a candidates has to qualify the URATIG (University of Rajasthan Admission To Post-Graduate) Examination for admission to MCA Course I semester.

## Scheme of Examination

MCA (Master of Computer Applications) Syllabus as per new scheme : credit based semester system (Six Semesters in three years) with Continuous Assessment (30% with non-inclusion in cumulative Grade point average(CGPA)).

### Part-I (Course and Internal Assessment)

- To obtain a Professional Master's Degree MCA, a candidate is required to earn 180 credits in SIX semesters (Three years) , out of total 216 credit points (36 credits per semester), with grade E or higher. Each student has to earn minimum 30 credit per semester (i.e. 180 credits in six semesters for MCA degree) with Grade E or higher.
- Each semester of MCA courses shall have 36 credits. There will be three core papers and three elective papers (4 credits each) and one core laboratory and one elective laboratory (6 credits each).
- To earn credits for a paper (Theory and Practical), a candidate shall be required to obtain grade E or higher (or equivalent marks percentage) in the theory/practical examination (EoSE)
- Core papers (Theory and Practical) are compulsory papers for the students of MCA
- Each semester will have continuous assessment (CA). The continuous assessment (CA) consists of two parts, namely (i) Internal Assessment and (ii) Sessional Test(s) in the ratio 30:70. The Internal Assessment component comprises of assessment of student's performance on the basis of factors like Attendance, Class Room Participation, Quiz, Home Assignment etc.
- To earn the credits for a paper (Theory and Practical) a candidate has to qualify in the Continuous Assessment (Internal) Exam along with EoSE of that paper separately.
- However the grade point/marks obtained in the continuous assessment will not be included in Semester Grade Point Average(CGPA). In Continuous Assessment and End of Semester Examination (EoSE) separate grades will be awarded. The candidate will not be permitted to appear in EoSE of a particular credit (i) if he/she does not meet or 75% attendance requirement, or (ii) he/she fails to secure a Semester Grade Point Average (CGPA) of 1.5 in the continuous assessment.
- A course is identified by a course code designated by a string of six alphanumeric characters and a course title. In a course code the first three characters of the string indicate the degree/course name in short and the later three alphanumeric characters designate a particular course. In the case of compulsory core course (CCC) the fourth character identifies the semester numeric digit and in case of the elective core courses (ECC) the fourth character indicates the cluster of specialization. For compulsory or elective theory core courses the fifth is '0', for laboratory core course it is '1' and for project/seminar course it is 2 and the sixth digit indicates number of the course in that category.
  - Compulsory Core Courses (CCC)
  - Elective Core Courses(ECC)

  
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## Part II (Examination Paper Scheme):

1. Each Theory paper (CCC & ECC) of EoSE shall carry 100 marks The EoSE will be of 3 hours duration.
  - (i) Candidate has to attempt five questions in all. All questions carry equal marks.
  - (ii) **Question No. 1 (Compulsory)** covering whole syllabus will consists of 10 short answer questions carrying 2 marks each, based on Knowledge, Understanding and Applications of the topics/ texts covered in the syllabus.
  - (iii) **Question No. 2 to 5**, each of 20 marks, will be framed by taking one question from each unit (may have sub-parts). There will be an internal choice within the unit.
2. Each **Practical paper (CCC & ECC)** shall be of 4 hours duration on one day and carry 100 marks for the practical examination. The practical examination will involve 3 exercises, each of 20 marks, practical record of 15 marks and viva-voce examination of 25 marks.

## Abbreviations Used

### Course Category

CCC: Compulsory Core Course  
ECC: Elective Core Course  
OEC: Open Elective Course  
SC: Supportive Course  
SSC: Self Study Core Course  
SEM: Seminar  
PRJ: Project Work  
RP: Research Publication

### Contact Hours

L: Lecture  
T: Tutorial  
P: Practical or Other  
S: Self Study

### Relative Weights

IA: Internal Assessment (Attendance/  
Classroom Participation/Quiz/Home  
Assignment etc.)  
ST: Sessional Test  
EoSE: End of Semester Examination

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### MCA-First Semester 2019-20


S.No.	Subject Code	Subject Title	Course category	Credit	Contact Hours per Week			EoSE * Duration (Hr)	
					L	T	P	Thy	P
1	MCA 101	Programming in C	CCC	4	3	1	0	3	0
2	MCA 102	Database Management Systems	CCC	4	3	1	0	3	0
3	MCA 103	Operating System Fundamentals	CCC	4	3	1	0	3	0
4	MCA 104	Computer Architecture	ECC	4	3	1	0	3	0
5	MCA 105	E-Commerce	ECC	4	3	1	0	3	0
6	MCA 106	Discrete Mathematics	ECC	4	3	1	0	3	0
7	MCA 111	Programming in C & DS Lab	CCC	4	0	0	6	0	4
8	MCA 112	DBMS Lab	CCC	4	0	0	6	0	4
9	MCA 113	Advanced Office Management Lab	ECC	4	0	0	6	0	4
<b>Total Credit</b>				<b>36</b>					

\*EoSE- End of Semester Examination

### MCA-Second Semester 2019-20

S. No.	Subject Code	Subject Title	Course category	Credit	Contact Hours per Week			EoSE * Duration (Hr)	
					L	T	P	Thy	P
1	MCA 201	Object Oriented Programming Using C++	CCC	4	3	1	0	3	0
2	MCA 202	Data Communication and Computer Networks	CCC	4	3	1	0	3	0
3	MCA 203	Web Design and Development	CCC	4	3	1	0	3	0
4	MCA 204	Algorithms and Data Structures	ECC	4	3	1	0	3	0
5	MCA 205	Computer Oriented Numerical Methods	ECC	4	3	1	0	3	0
6	MCA 206	Progg. In Java	ECC	4	3	1	0	3	0
7	MCA 211	Programming in C++ & DS Lab	CCC	4	0	0	6	0	4
8	MCA 212	Web Design & Development Lab	CCC	4	0	0	6	0	4
9	MCA 213	Java Progg. Lab	ECC	4	0	0	6	0	4
<b>Total Credit</b>				<b>36</b>					

\*EoSE- End of Semester Examination

  
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### MCA-Third Semester 2020-21

S. No.	Subject Code	Subject Title	Course category	Credit	Contact Hours per Week			EoSE * Duration(Hrs)	
					L	T	P	Thy	P
1	MCA 301	Data Warehousing & Data Mining	CCC	4	3	1	0	3	0
2	MCA 302	Application Development Using .NET Frame Work	CCC	4	3	1	0	3	0
3	MCA 303	Linux OS & Shell Programming	CCC	4	3	1	0	3	0
4	MCA 304	System Analysis & Designing Concepts	ECC	4	3	1	0	3	0
5	MCA 305	Computer Graphics	ECC	4	3	1	0	3	0
6	MCA 306	Theory of Computation	ECC	4	3	1	0	3	0
7	MCA 311	Linux OS & Shell Progg. Lab	CCC	4	0	0	6	0	4
8	MCA 312	.NET Lab	CCC	4	0	0	6	0	4
9	MCA 313	Programming in R lab	ECC	4	0	0	6	0	4
Total Credit				36					

\*EoSE- End of Semester Examination

### MCA-Fourth Semester 2020-21

S.No.	Subject Code	Subject Title	Course category	Credit	Contact Hours per Week			EoSE * Duration(Hrs)	
					L	T	P	Thy	P
1	MCA 401	Advanced Java Programming & Technology	CCC	4	3	1	0	3	0
2	MCA 402	Advanced Database Systems	CCC	4	3	1	0	3	0
3	MCA 403	Software Engineering	CCC	4	3	1	0	3	0
4	MCA 404	Cloud Computing	ECC	4	3	1	0	3	0
5	MCA 405	Artificial Intelligence	ECC	4	3	1	0	3	0
6	MCA **	Elective-1 ( Any One in Elective Group -1 )	ECC	4	3	1	0	3	0
7	MCA 411	Advanced Java Lab	CCC	4	0	0	6	0	4
8	MCA 412	Advanced DBMS Lab (Oracle/DB2/MySQL)	CCC	4	0	0	6	0	4
9	MCA 413	Programming in Python	ECC	4	0	0	6	0	4
Total Credit				36					

\*EoSE- End of Semester Examination , \*\* : Please see the List of Elective papers (Elective-1)

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## MCA-Fifth Semester 2021-22

S.No.	Subject Code	Subject Title	Course Category	Credit	Contact Hours per Week			EoSE * Duration(Hr)	
					L	T	P	Thy	P
1	MCA 501	Information Security & Cryptography	CCC	4	3	1	0	3	0
2	MCA 502	Analysis and Design of Algorithms	CCC	4	3	1	0	3	0
3	MCA 503	Wireless Technology	CCC	4	3	1	0	3	0
4	MCA 504	Simulation & Modeling	ECC	4	3	1	0	3	0
5	MCA **	Elective - 2( Any One in Elective Group -2 )	ECC	4	3	1	0	3	0
6	MCA ***	Elective - 3( Any One in Elective Group -3 )	ECC	4	3	1	0	3	0
7	MCA 511	ADA Lab	CCC	4	0	0	6	0	4
8	MCA 512	Wireless Technology lab	CCC	4	0	0	6	0	4
9	MCA 513	Mini Project	ECC	4	0	0	6	0	4
Total Credit				36					

\*EoSE- End of Semester Examination. \*\*/\*\*\*: Please see the List of Elective papers ( Elective-2/Elective-3)


## MCA-Sixth Semester 2021-22

S. No.	Subject Code	Subject Title	Course Category	Credit	Contact Hours per Week			EoSE* Duration (Hrs)	
					L	T	P	Thy	P
1	MCA MF5	Major Project : Minimum Four Months in an Organization approved by the Director/Head of the Centre/Department	CCC	36	0	0	12	0	4

\*EoSE- End of Semester Examination

### Elective Papers:

Elective Course Code	Course Category	Subject Title	Prerequisite	Semester
<b>Elective-1 (Any one)</b>				
MCA A01	ECC	Compiler Design	-	IV
MCA A02	ECC	Network Management	-	IV
MCA A03	ECC	Computer Based Optimization Techniques	-	IV
MCA A04	ECC	Multimedia Systems	-	IV
<b>Elective-2 (Any one)</b>				
MCA B01	ECC	Statistical Techniques	-	V
MCA B02	ECC	Natural Language Processing	-	V
MCA B03	ECC	ERP Systems	-	V
MCA B04	ECC	Embedded Systems	-	V
MCA B05	ECC	Big Data System	-	V
<b>Elective-3 (Any one)</b>				
MCA C01	ECC	Mobile Communication & Network	-	V
MCA C02	ECC	Object Oriented Software Engineering	-	V
MCA C03	ECC	Web Information System	-	V
MCA C04	ECC	Automata Theory	-	V
MCA C05	ECC	Parallel & Distributed System	-	V

  
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## Course Contents in Detail - MCA I Semester (2019-2020)

### Note :

1. Papers MCA 701, MCA 702, MCA 703, MCA 711 and MCA 712 are compulsory (CCC) and Papers MCA 704, MCA 705, MCA 706 and MCA 713 are elective(ECC).
2. Continuous Assessment (CA) will be conducted by the concerned teacher on the basis of test papers, regularity in the class and performance of the student. Maximum marks in continuous assessment of each paper, is 100.

### MCA 101 : Programming in C

#### Unit-I

Problem solving with computers, Flow charts, Basic concepts of programming languages, programming domains. C Character set, variables and constants, keywords, Type checking, Scope and lifetime data types. Operators, Instructions, assignment statements, arithmetic expression, comment statements, simple input and output, Boolean expressions.

#### Unit-II

Control structures, decision control structure, loop control structure, case control structure. String and character handling, arrays and string processing, data validation examples. Functions, function prototype, subroutines, scope and lifetime of identifiers parameter passing mechanism, recursion.

#### Unit-III

User defined data types, enumerated data types, unions, structures, array of structures,

Unions of structures. Storage class specifies, Pre processors header files and standard lib, Functions. Pointer : Definition and uses of pointers, arithmetic , pointers and arrays, pointers and function, pointer to pointer, pointer to structures. Dynamic memory allocation.

#### Unit-IV

Console Input and Output functions, data files, operations on data files, text and binary files, formatted data files. Implementation of simple data structures : Stacks, Queues, Linked Lists, trees, searching and sorting algorithms. Interaction with hardware, system calls, command line arguments, operations on bits, Bit-fields. Graphics in C

#### Recommended reference books:

1. Gottfried B; Programming with C; Schaum Outlines; Mc Graw Hill Edition.
2. Kalagurusamy E; Programming in ANSI C(Fifth Edn); Mc Graw Hill,2011.
3. Kanetkar Y.; LE1 US C; X Edition, BPB,2010
4. Deitel HM & Deitel JP; C How to program; 5th Edn; Pearson Pub.

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## MCA 102: Database Management Systems

### Unit-I

**Overview of DBMS:** Basic concepts, Database system architecture, Schemas, Instances, Components, Database users, Three-tier architecture, Centralized, Distributed and Client/Server architecture, Data independence. Database models: Entity relationship model, hierarchical model, relational model, network model, Object-Oriented data model.

**Data Modeling using ER Model:** ER model concepts, ER diagram, mapping constraints, Keys, Generalization, aggregation, reduction of ER diagrams to tables, extended ER model, Relationship of higher degree. Enhanced ER Model : Concepts, Specialization, Generalization, Data abstraction, Knowledge representation and University EER Model as example.

### Unit-II

**Relational Model :** Concepts, Constraints, Languages, Relational database design by ER & EER mapping, Relational algebra relational calculus.

**Normalization :** Functional dependencies, Normal forms – First, second, third and BCNF, inclusion dependencies, loss join & decompositions, normalization using FD, MVD and JDs, Alternative approach to database design.

### Unit-III

**Data storage :** Magnetic disk and flash storage, RAID technology, tertiary storage, Indexing structure, Single and multiple level. Transaction processing : Transactions atomicity, durability, serializability and isolation. Concurrency control techniques – Two phase locking, timestamp ordering, multiversion, Granularity locking techniques, Database recovery techniques based on deferred & immediate updates and shadow paging.

### Unit-IV

**SQL:** Characteristics of SQL, advantages, data types in SQL, SQL Operators, types of SQL commands, Tables indexes, Views Nulls, Aggregate Functions, Select statement, Sub queries, Insert, Update and Delete operations, Joins, Unions. Introduction to Embedded SQL, Dynamic SQL & SQLJ, Data security, Integrity and concurrency, Backup and recovery, numeric and text data in SQL dealing with dates, Synonyms, Snapshots, Programming with SQL.

### Reference Books:

1. Korth H F and Silberschataz A, System Concepts, Sixth Edition; McGraw Hill, 2006
2. Leon, and Leon, SQL Tata McGraw Hill Pub. Co. Ltd.
3. Ivan Bayross; SQL/PL 4th Edn: BPB, 2009
4. Navathe S.B. Elmasri R.; Fundamentals of Database Systems, Fifth Edition, Pearson 2009.
5. Ramakrishnan and Gharke, Database Management Systems, 3rd Ed, Tata McGraw Hill. 2003.
6. Data C J Database Management Systems, Pearson Education Asia.
7. Singh S.K.; Database Systems; I Edition; Pearson, 2006.

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## MCA 103 : Operating System Fundamentals

### Unit-I

Necessity of an Operating System, Operating system structure, Evolution of Operating System (multiprogramming systems, batch systems, timesharing system, distributed systems and Real Time system), Operating system structure, Operating system components and services, system calls, system programs, Virtual machines.

### Unit-II

Process management: process concept, process scheduling, cooperating processes, Threads, Inter-process communication, CPU scheduling criteria, Scheduling algorithms, Multiple-processor scheduling, Real time scheduling and Algorithm evaluation.

Process Synchronization and Deadlocks: The Critical section problem, synchronization hardware semaphores, Classical problems of synchronization, Critical regions, Monitors, Deadlocks-System model, Characterization, Deadlock prevention, Avoidance and Detection, Recovery from deadlock, Combined approach to deadlock handling.

### Unit-III

Storage Management · Memory management- Logical and Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation with paging, Virtual Memory, Demand paging and its performance, page replacement algorithms, Allocation of frames, Thrashing, Page Size and other considerations, Demand segmentation, File systems, secondary storage Structure, File concept access methods, directory implementation, Efficiency and performance recovery, Disk structure, Disk scheduling methods, Disk management , Recovery Disk structure, disk structure, disk scheduling methods, disk management, Swap-Space management, Disk reliability.

### Unit-IV

Goals of Protection, Domain of protection, The Security problem. Program threats, Authentication, One Time passwords, program threats, System threats Threat Monitoring, Encryptions. Computer Security techniques.

Case Study: Windows NT – Design principles, System components, Environments subsystems, File system, Networking and program interface.

### Reference Books:

- [1] Galvin P.B, Silberschatz; Operating System Principles; ( Seventh Edition),J. Wiley 2008
- [2] Tanenbaum A.S, Modern Operating Systems, 2nd Edn. PHI Publ,2003
- [3] William Stalling: Operating Systems, Internal & Design Principles, Sixth Edn; Pearson. 2009.
- [4] Gary Nutt: Operating Systems-A Modern Perspective (Second Edition) , Pearson Education, 2008.
- [5] D.M. Dhamdhare: Systems Programming and Operating Systems ( Second Edition), TMH.
- [6] Harvey M. Deitel, Operating Systems, Pearson Education.

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## MCA-104: Computer Architecture

### Unit-I

Logic gates, basic combinational logic, Boolean functions & Expressions, multiplexer, decoders, encoders, comparators, adder and subtractors, BCD to 7 segment decoder, sequential circuits, RS, JK, D and T flip flops, counter and shift register, Clock and Timing events.

### Unit-II

Addressing methods and machine program sequencing memory location addresses, encoding of information, instructions types, Instruction format and instructions sequencing addressing modes, paging, relative, indirect and indexed addressing.

Basic of Computer organization: System buses and instruction cycles, memory subsystem organization and interfacing, I/O subsystem organization and interfacing, Register transfer languages.

### Unit-III

CPU design: Specifying a CPU, design and implementation of a simple CPU (fetching instructions from memory decoding and executing instructions, establishing required data paths, design of ALU, Number representation, Arithmetic operations, floating point arithmetic. Design of the control unit and design verification), design and implementation of a simple micro-sequencer.

### Unit-IV

Memory Organization: Main memory concepts, Auxiliary memory, Associative memory, virtual memory & paging and cache memory organization.

Input and Output organization: Asynchronous data transfer, programmed I/O Interrupts (types, processing of interrupts implementing interrupts inside CPU) Direct memory access, I/O processors, serial communication.

### Reference/Text Books:

1. John D. Carpinelli: Computer Systems Organization & Architecture; 3rd Edition; Person Education Asia, 2008
2. M. Morris Mano; Computer System Architectures; III Edition, Prentice Hall of India, 2008
3. Malvino B; Digital Computer Electronics III Edition; TMHL
4. John P. Hayes, Computer Architecture and Organization, McGraw Hill, International Edition.
5. Vincent J P Heuring and Harry f Jordan: Computer Systems Design & Architecture . Addison Wesley, Person Education Asia.

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## MCA 106: Discrete Mathematics

### Unit-I

Set Theory : Ordered set, Cartesian product of sets, partition of set, countable and uncountable sets, Russell's paradox, principle of inclusion-exclusion, mathematical induction. Relations and Function: Binary relation, n-ary relation, representation of a relation by a directed graph and matrix, equivalence relation, partially order relation, partially ordered set, total order relation, dual of partial order relation, hasse-diagram, chains and anti-chains. Modules function, greatest integer function, hash function, composition of function, pigeonhole principle.

### Unit-II

Logic & Proofs: Propositions, Basic Logical operations, truth tables, Logical equivalence, Algebra of Propositions, conditional and Bi-conditional propositions, de Morgan laws for logic, Tautologies & contradiction, Quantifiers, Arguments, Logic Inference, Direct Proof by contradiction.

Lattices and examples of lattices, elementary properties of lattices, distributive lattice, Bounded lattice, Complemented lattice, Dual of lattice.

Boolean Algebra, Boundaries laws, absorption laws, Idempotent laws, Involution Laws, cancellation laws, associative laws, De' Morgan's laws, Boolean expressions and functions, Disjunctive normal form, conjunctive normal form.

### Unit-III

Graph Theory : Simple and multi-graph, Types of simple graph ( Regular graph, complete graph, Bipartite graph, cycle, wheel, planar graph, complementary graph) directed graph, Connectedness, in graph, Euler graph, Hamiltonian graph, weighted graph, shortest path problems, traveling salesman problems, Euler formula, operations on graphs, sub graph colouring of graph, chromatic number.

Trees: Properties of Trees, eccentricity of vertex, centre of graph, Radius & diameter of graph, sub tree, Rooted tree, Binary tree, M-ary tree, Height of Binary tree, Spanning tree, Kruskal's Algorithm, Minimal spanning tree.

### Unit-IV

Recurrence Relation & Generating Function: Discrete numeric function, generating function, Recurrence relations, Homogeneous linear Recurrence relation with constant coefficients.

Finite State Machine : Finite state machines as models of physical systems, equivalent machine, finite state machine as language recognizes, finite state language of type-3 languages.

### Recommended Books:

1. C.L. Liu "Elements of Discrete Mathematics"; 12th Edition, Tata McGraw Hill Pub. Comp. Ltd., 2000.
2. John Truss " Discrete Mathematics for Computer Scientists" – Pearson Education, Asia.
3. Kenneth H. Rosen " Discrete Mathematics & its Applications", 6th Edition, Tata McGraw-Hill pub. 2007.
4. Seymour Lipschutz, Mare Lars Lipson and Varsha H. Patil " Discrete Mathematics" 2nd Edition Tata Mc Graw-Hill Pub Comp. Ltd., India. 2008.
5. Chaurasia VBL, Srivastava A.; Discrete Mathematics; 5th Edition; Genius; 2010.
6. Johnson Baugh, Discrete Mathematics; 5th Edition Pearson; 2002.
7. Bernard Kolman, Robert C. Busby and Sharon Culter Ross " Discrete Mathematical Structures" Prentice Hall of Indian New- Delhi.

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## MCA105: E-Commerce

### Unit-I

Basic Concepts: Introduction, Definition, Objectives, Advantages and disadvantages, Forces driving E-Commerce, Traditional commerce Vs, E-Commerce, E-Commerce opportunities for industries, Growth of E-Commerce.

Electronic Data Interchange : Concepts of EDI and Limitation, Application of EDI, Disadvantages of EDI, EDI model; EDI Implementation, MIME and Value- Added Network, Internet-based EDI.

### Unit-II

E-Commerce Models: B2C, B2B, C2C, C2B other models- Brokerage Model aggregator Model, Info-mediary Model, Community Model and value chain model Advertise Model.

Electronic Payment Systems: Special features required in payment systems, types of E-payment systems, E Cash, E-cheque, credit card, Smart Card, Electronic purses, e-billing, E-e-Micro payments, point of Sales System ( POS) – meaning uses structures.

### Unit-III

Customer Relationship Management & Technologies : E-Transition Challenges in Indian Corporate, E-Commerce and WWW, E-Marketing, E-Customer Relationship Management, ECRM Problems and Solutions, CRM Capabilities and Customer life cycle, E-Supply Chain Management, E-Strategy- Planning the E-Commerce Project, E-Commerce Strategy and Knowledge Management, E-Business Strategy and Data Warehousing & Mining. ERP for E-Commerce, Customer effective Web Design – Requirement Strategy and Model.

### Unit-IV

m-Commerce : Overview of mobile-commerce, Mobile delivery Technology & Switching Methods, Attributes of m-Commerce, Drivers of m-Commerce, m-Commerce Security issues, model ATM(ICICI Bank Case Study), Application of m-Commerce, Mobile Financial Applications, m-wallet, Mobile Shopping, Advertising and Content provision. Case-Study

Security Issues in E-Commerce: Security risk of E-Commerce, Type of Threats, Security tools and risk management approach, Cyber laws, Business Ethics, IT Acts.

### Reference/Text Books:

1. Bharat Bhaskar, Electronic Commerce – Framework Technologies and Application Text McGraw Hill.
2. Ravi Kalakota & A.B. Whinston, Frontiers of electronic Commerce Pearson Education,
3. Ravi Kalakota & A.B. Whinston, electronic Commerce: A Manager's Guide, Pearson Education,
4. Agarwal Kamlesh, N and Agarwal Deeksha, Business on the Net, introduction to the E-com., Macmillan India.
5. P. T. Joseph, E-Commerce: A Managerial Perspective, PHI, 2002.

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## Practical Papers MCA Semester I (2019-20)

### Practical Examinations :

Each practical paper shall be of 4 hours duration on one day and carry 100 marks for the practical examination. The practical examination will involve 3 exercises, each of 20 marks, practical record of 15 marks and viva-voce examination of 25 marks.

#### (CCC): Paper MCA 111: Programming in C & DS Lab

##### Practical Lab

Examination : Practical Examination

Lab Exercise on Theory Paper MCA 101

#### (CCC): Paper MCA 112: DBMS Lab

##### Practical Lab

Examination : Practical Examination

Lab Exercise on Theory Paper MCA 102

#### (ECC): Paper MCA 113: Advanced Office Management Lab

##### Practical Lab

Examination : Practical Examination

Practical based of Advanced features of Word Processing, Spread Sheet, Data Processing, Presentation Program, Web Surfing and other Internet services like E-commerce and M-Commerce .

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## Syllabus of MCA II Semester:(2019-2020)

### Note :

1. Papers MCA 801, MCA 802, MCA 803, MCA 811 and MCA 812 are compulsory(CCC) and Papers MCA 804, MCA 805, MCA 806 and MCA 813 are elective(ECC).
2. Continuous assessment(Internal) will be done by the concerned teacher on the basis of test papers, regularity in the class and performance of the student. Maximum marks in continuous assessment of each paper is 100.

### MCA-201: Object Oriented Programming Using C++

#### Unit-I

Need of object Oriented Programming, Advantages of OOP, Comparison of Functional Programming and OOP approach, Essentials of OOP ( Objects, Classes, Encapsulation, Data abstraction, Inheritance, Reusability, Polymorphism, Delegation, Message Communication).  
C++ Basics : Preprocessors, comments, Data types, Operators, Expressions, Loops and Decisions, Arrays and String handling, Modular programming with Functions, Structure and Unions.

#### Unit II

Pointers and Run time binding, Dynamic memory allocation, Storage class specifies. Classes, Member functions, Objects, Arrays of objects. Pointers : Addresses and pointers, pointer & arrays, pointer & functions, use of pointers in strings and pointers to objects. and Classes, Nested classes, Constructors, Destructors, Inline member functions, Friend Functions, Static member function.

Inheritance, Single Inheritance, types of base classes, types of derivations, multiple inheritance, container classes, member access control.

#### Unit- III

Functions Overloading, Operator Overloading, polymorphism, early binding polymorphism with pointers, Unary and Binary Operator Overloading, Overload Assignment Operator, Copy Constructor, Data Conversion between Objects of different classes. C++ Free Store.

Virtual Function : Virtual Function, late binding, pure virtual functions, abstract classes, Generic Programming with Templates, Friend function, Overloaded Function Templates, Multiple Arguments function Template.

#### Unit-IV

Stream Computation with Console, Stream Computation with Files, opening and closing of file stream state member function binary file operations structures and file operations, classes and file operations, random access file processing. Exception handling: Exception handling mechanism throwing mechanism, Catching mechanism. Implementation of basic data structures in C++ such as arrays, stack, queues, linked list and sequential representation.

#### Recommended Books

1. Herbert Schildt; C++ : The Complete Reference 4th Edn; TMH, 2003.
2. Robert Lafore; Object Oriented Programming in C++ 4th Edition; Techmedia.
3. Balagurusamy ; Object Oriented Programming in C++; 4th Edition TMH,2009.
4. Venugopal, Rajkumar, Mastering C++; Tata Mcgrow Hill, 2006.
5. Kanetkar Y.: LET US C++; BPB; 2009.
6. Deitel and deitel; How to program C++, Addison Wesley, Pearson Education Aisa
7. John R. Hubbard, Programming with C++, McGraw Hill International.

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## MCA 202: Data Communication and Computer Network

### Unit-I

Overview of Data Communication and Network: Basic concept –Computer communication methods, Data Transmission modes, Signals, Modulation – Principles of Modulation, AM and FM Modulator Circuits, pulse Code Modulation, signaling and decoding Digital Band-pass Modulation, Demodulation – detection, signals and Noise, Detection of Binary Signal in Gaussian Noise, Demodulation of shaped Pulses, Digital Band Pass demodulation.

Network Models : Internet model, OSI seven layer network model, Functions of OSI layers, LAN technologies – protocols and standards, LAN hardware, TCP/IP ( Protocols, architecture, layers, services).

### Unit-II

Data transmission: Data Communication Systems, DTE-DCE interface, Modems, Transmission media( Guided & Unguided), Multiplexing – FDM, WDM, TDM, Digital Subscriber Line ( Operation, Layers, Traffic control), FTTC, Error detection and correction; Microwave-Electromagnetic spectrum, Characteristics, use of MIW in communications; PM Microwave Radio Repeaters, Satellite- Artificial Satellite, Geosynchronous Satellites, Orbital classification, Spacing and Frequency allocation, Multiple accessing.

Optical fiber communication : Basic concept of light propagation, Fiber Cables, Light sources, Optical Detectors, Fiber cable losses, wave division multiplexing, fiber distributed data interface, the fiber channel

### Unit-III

Internet: Internet Architecture, Internet protocol and datagram, Routing protocols, UDP, Internet standard services, DNS.

Networking Technology, ISDN ( Services, Channels, Layers, Broadband ISDN), Cable Modem System, SMDS, Frame relay, fast Ethernet, 100VG-any LAN and Gigabit Ethernet, FDDI and CDDI, Asynchronous Transfer, SONET ( architecture, Layers, frame, Applications), DWDM Switching and Virtual LAN, Non-ATM Virtual LANs IEEE 802.1Q VLAN standard, X.25 protocols, ATM ( Architecture, layers, classes, services).

Networking and Internetworking Devices : Repeaters, Bridges, routers, Gateways and roles of these devices in communication.

### Unit-IV

Network Performance, Analytical approaches, simulation, traffic monitoring, Network Management- SNMP, RMON and RMONv2, TMN, Directory services and network management.

Issue related to network reliability and security, SSL and VPN, Introduction only to firewalls and Kerberos, Cyber Laws.

### Recommended Books:

1. Behrouz A Foruzan, Data Communication and Networking, 3rd Edition; Tata McGraw Hill., 2004
2. Behrouz A Foruzan, TCP/IP Protocol Suite; 2nd Edition; Tata McGraw Hill., 2003.
3. Stallings William; Data and Computer Communication; 8th Edition Pearson, 2009.
4. Tanenbaum; Computer Networks; 4th edition, PHI 2003.
5. Wylie tomasim electronic Communications Systems, Pearson, Education Asia.
6. M.A. Miller, Data and Network Communications, Thomson Kearing
7. Gilbert Held, Understanding Data Communication, Techmedia.
8. Fred Harshal, Data Communications Communications, Networks, Pearson Education Asia.

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## MCA 202: Data Communication and Computer Network

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### Recommended Books:

1. Behrouz A Foruzan, Data Communication and Networking, 3rd Edition; Tata McGraw Hill, 2004
2. Behrouz A Foruzan, TCP/IP Protocol Suite; 2nd Edition; Tata McGraw Hill, 2003.
3. Stallings William; Data and Computer Communication; 8th Edition Pearson, 2009.
4. Tanenbaum; Computer Networks; 4th edition, PHI 2008.
5. Wayne tomassim electronic Communications Systems, Pearson, Education Asia.
6. M.A. Miller, Data and Network Communications, Thomson Kearning
7. Gilbert Held, Understanding Data Communication, Techmedia.
8. Fred Harshal, Data Communications Communications, Networks, Pearson Education Asia.

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## MCA 203: Web Design and Development

### Unit-I

Creating and Maintaining Web Sites; Planning, Navigation and Themes, Site types and Architecture, Elements of a Web page( Pages & Layout, Text, colour, Images, GUI Forms & GUI Features), steps of creating a site, Web site Planning, Web Site Designing Process, publishing and publicizing site/structuring web site. The Web Medium, Web Searching, Adding Search facility, Optimizing for Search Engines, Site Maps and other Navigation Aid, Site Delivery and Management.

### Unit-II

Introduction of HTML and XHTML : introduction markup language, editing HTML & XHTML: Common tags, headers, text styles linking, images, formatting text, horizontal rules and more line breaks unordered lists nested and ordered lists, basic HTML/XHTML tables: intermediate tables and formatting, forms, more complex forms, internal linking, creating and using image maps.

### Unit-III

Java script- introduction to scripting language, memory concepts, arithmetic decision making. Java script control structures, Java script functions, program modules in java script, function definitions duration of identifiers, scope rules, recursion java script global functions. Java script arrays: introduction, array declaring and allocating memory, passing arrays to functions, multiple subscripted arrays. java script objects-introduction, math, string, data, Boolean and number objects etc.

Introduction to PHP: Advantages of PHP, functions, Data types, Arrays, SQL, Connecting Databases using ODBC, Files, Forms, Images, IMap objects.

### Unit-IV

Dynamic HTML : CSS : introduction- inline styles, creating style sheets with the style element, conflicting styles, linking external style sheets, positioning elements, background element dimensions, text flow and the box model, user style sheets.

Dynamic HTML; object model and collections; introduction object referencing collections all and children, dynamic style, dynamic positioning using the frame: collection, navigator object.

Dynamic HTML; event model : introduction, event ON CLICK, event ON LOAD – error handling with ON ERROR, tracking the mouse with event more DHTML, events. Filters and Transitions; Dynamical HTML: Client side scripting with VB script. Introduction – Operators-Data Types and control structures – VB Script functions-arrays- string manipulation classes and objects.

### Recommended Books:

1. M.L. Young; Complete Reference b: Internet; 2nd Edition; Tata McGraw Hill, 2006
2. Thomas A; Powell: Web Design; C.R. : Second Edition TMH,2009.
3. Thomas A. Powell : HTML & XHTML : C.R. Fourth Edition; TMH. 2008
4. Harely Hahn: the Internet, Tata Mc Graw Hill.
5. G. Roverston; Hands on HTML., BPE Publication
6. D.A. Fauver, B. Kienan; Microsoft From Page 2000, BPB Publications.
7. Joel Skler Principles of Web Design BPE Publication

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## MCA 204: Algorithm and Data Structure

### Unit-I

Algorithms, pseudo code, efficiency of algorithms, analyzing algorithms and problems, complexity measures, basic time analysis of an algorithm, space complexity. Data abstraction and basic data structures, data types and abstract data types. Basic data structure – Arrays, Stack, Queues and their applications, linked and sequential representation of arrays, stacks & queue.

### Unit-II

Linked lists, representation of linked list in memory. insertion, deletion and searching of linked list, two way lists. Arithmetic expressions, Polish notations, dequeue and priority queues. Trees: Basic concepts, linked representation, representation in continuous memory. Binary and N-ary trees, Searching, insertion and deletion in binary search tree, traversing algorithms using stacks, header nodes threads.

### Unit-III

Graphs and their representations, sequential representation- Adjacent matrix, linked representation of graphs, operations on graph, traversing a graph. DFS and BFS algorithms. Heap structures, heap sort algorithm .

### Unit-IV

Sorting and Searching: Use various data structures for searching and sorting, Internal and external sorting techniques, linear and binary search, Hash tables & Hashed searching, Bubble sort, Insertion sort, Selection sort, Merge sort, Radix sort, quick sort.

### Reference books

1. S. Lipschutz: Data Structures; Mc Graw Hill International Edition, 2008.
  2. A.V. Aho, J.E. Hopcroft, and J.D. Ullman, Data Structures and Algorithms, 3rd Edition; Pearson Education Asia, 2008
  3. Salaria R.S.: Data Structure and Algorithms Using C/C++; 4th Edition; Khanna
  4. Jean-Paul Tremblay and Paul G. Sorenson, An Introduction to Data structures with applications TMH Publishing Co.Ltd.
  5. Michael Berman: Data Structures via C++ Oxford University Press.
  6. Jean-Paul Tremblay and Paul G. Sorenson, An Introduction to Data Structures with application, TMH Publishing Co. Ltd.
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## MCA-205 – Computer Oriented Numerical Methods

### Unit-I

Floating Point Arithmetic-Representation, Operation, Normalization, Pitfalls of Floating – point Representation, Errors in Numerical computation, Measures of Accuracy. Locating Roots of Equations: Bisection Method, Newton's Method, Secant Method, Muller's Method.

### Unit-II

Interpolation and Numerical differentiation: Newton's Forward Difference Interpolation, Newton's Backward Difference Interpolation, Lagrange's Interpolation Formula. Numerical Integration Definite Integral, Trapezoid Rule, Simpson's Rule, Romberg Algorithm, Adaptive Simpson's Scheme, Gaussian Quadrature Formulas.

### Unit-III

Solution of Linear Equations: Gaussian Elimination, Gaussian Elimination with Scaled Partial Pivoting, Iterative Solution of Linear Systems, Gauss-Seidel Iteration Method, Power Methods, Eigenvalues and Eigenvectors. Ordinary differential Equations Initial-Value Problem: Analytical vs. Numerical Solution, Taylor Series Methods, Runge-Kutta Methods, Euler method.

### Unit-IV

Smoothing of Data and the Method of Least squares, Least Squares curve fitting, Straight line and non Linear curve fitting, Cubic splines, Chebyshev polynomials. Random Numbers, Estimation of Areas and Volumes by Monte Carlo Techniques.

### Reference/Text Books:

- [1] Rajaraman V : Computer Oriented Numerical Methods; 3rd Edition; PHI,2005.
- [2] R.S. Salaria; Computer Oriented Numerical Methods; 4th Edition; Khanna Pub.
- [3] Balagurusamy E; Numerical Methods; 1 Edition; vic Gray Hill.,2010
- [4] Sastre; Introductory methods of Numerical Analysis; 3rd Edition; PHI,2001.
- [5] K. Sankara Rao, Numerical Methods for scientists and Engineers, Prentice Hall India.
- [6] Cheney and David Kincaid, Numerical Methods and Computing, Brooks/Ie, 2004
- [7] Krishnamurthy E. V., Sen S.K. Computer Based Numerical Algorithms, East-West Press

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# MCA-206: Programming in Java

## Unit-I

**Introduction to OOP:** Paradigms of Programming Languages – Basic concepts of Object Oriented Programming, Objects and Classes, Data abstraction and Encapsulation, Inheritance, Polymorphism, Dynamic binding, Message communication: Benefits of OOP; application of OOPs.

**Introduction to Java :** History, Java features, Java Environment- JDK, API. Types of Java program, Creating and Executing a Java program; Java tokens: Keywords, Character set, Identifiers, Literals, Separator; Java Virtual Machine (JVM); Command Line Arguments; Comments in Java program.

**Elements:** Constants Variables, Data types, Scope of variables, Type casting. Operators-Arithmetic, Logical, Bit wise operator, Increment and Decrement, Relational, Assignment, Conditional, Special operator, Expressions, Evaluation of expressions.

## Unit-II

**Decision Making and Branching:** If statement and its types, switch statement; Decision making and looping -while loop, do While, for loop, break labeled loop, continue statement.

**Arrays:** One Dimensional Array, Multidimensional Array, Vectors, Wrapper classes; String Array, String Methods, String Buffer Class.

**Class and Objects :** Defining a class, Methods, Creating objects, Accessing class members, Constructors, Method overloading, Static members, Nesting of Methods, this keyword, command line input.

**Inheritance :** Define a subclass, deriving a sub class, Single Inheritance, Multilevel Inheritance, Hierarchical Inheritance, Overriding methods, Final variables and methods, final classes, Finalizer methods, Abstract methods and classes, Visibility Control- Public access. Private access, friend, protected. Interface-Multiple Inheritance, Defining interface, Extending interface, Implementing Interface, Accessing interface variables.

## Unit-III

**Packages:** Java API Packages-System Packages, Naming Conventions, Creating & Accessing a Packages, Finding Packages and CLASSPATH, Adding Class to a Packages, Hiding Classes.

**JAVA Streams :** Data Flow with Java Streams, Input Streams, Output Streams.

**Exception Handling:** Limitations of Error handling, Advantages of Exception Handling, Types of Errors, Basics of Exception Handling, try blocks, throwing an exception, catching an exception, finally statement. declaring and throwing custom Exceptions.

**Multithreading:** creating threads, life of a thread, defining & running thread, thread methods, thread priority, synchronization, implementing run-able interface, thread scheduling.

## Unit-IV

**Collections:** The Collection Framework, The Collection Classes, implementation of List, Set and Map interface, Accessing a Collection via an Iterator, object Ordering, The SortedSet and SortedMap Interface, Comparators.

**GUI in Java applet and its uses:** Abstract window tool kit, Event Handlers, Event Listeners, AWT Controls and Event Handling- Labels, Text Component, ActionEvent, Buttons, CheckBoxes, ItemEvent, Choice, Scrollbars, Layout Managers, Input Events, Menus; Introduction to Swing

**Networking:** Java utility for networking, Manipulating URLs, reading a file on a Web server. Establishing simple Client Server.

### Reference/ Text Books:

- [1] Patrick Naughton, Herbert Schildt: Java: The Complete Reference, 7th Edition
- [2] E. Balagurusamy: Programming with Java- Tata McGrawHill Publishers, 11 Edition.
- [3] Kavio A. Mughal, Rolf W. Rasmussen; A Programmer's Guide to Java Certification (2nd Edn.).
- [4] Shorttmann, Gary Cornell; Core Java: Vol I & II; The Sun Micro Systems Press.
- [5] Ken Arnold, James Gosling: Core Java Fundamentals( Volume I and Volume 2) 2nd Edition-, Addison Wesley.
- [6] Kathy Sierra, Head first Java, 2nd Edition, Orielly.

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## Practical Papers MCA Semester II (2019-20)

Each practical paper shall be of 4 hours duration on one day and carry 100 marks for the practical examination. The practical examination will involve 3 exercises, each of 20 marks, practical record of 15 marks and viva-voce examination of 25 marks.

**CCC: Paper MCA 211: Programming in C++ Lab**  
Practical Lab

Examination: Practical Examination-

- Exercises based on the Theory paper MCA 201.

**CCC: Paper MCA 212: Web Design and Development Lab**  
Practical Lab :

Examination: Practical Examination-

- Exercises based on the Theory paper MCA 203.

**ECC: Paper MCA 213: Programming in Java Lab**  
Practical Lab

Examination: Practical Examination

- Exercises based on the Theory paper MCA 206.

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## Syllabus of MCA III Semester (2020-2021)

### Note :

1. Papers MCA 901, MCA 902, MCA 903, MCA 911 and MCA 912 are compulsory(CCC) and Papers MCA 904, MCA 905, MCA 906 and MCA 913 are elective (ECC).
2. Continuous assessment(Internal) will be done by the concerned teacher on the basis of test papers, regularity in the class and performance of the student. Maximum marks in continuous assessment of each paper is 100.

### MCA-301 : Data Warehousing & Data Mining

#### Unit-I

**Introduction to Data Warehousing:** Introduction, Data Warehouse importance and functions, Multidimensional Data Model, Data Marting and it's usage, Cost of data marting, Metadata, Data warehouse Architecture, Building a Data warehouse, Implementation, Further Development, Planning and Project Management of Data Warehouse.

#### Unit-II

**Data Mining:** Data Warehousing to Data Mining, Evolution Analysis, Classification of Data Mining Systems, Architecture of data mining system, Major Issues in Data Mining.  
**Data preprocessing:** Needs preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation; Analysis of Attributes Relevance. Discriminating between Different Classes. Data Warehouse and OLAP Technology for Data Mining.

#### Unit-III

**Association Rules:** Association Rule Mining, Single- Dimensional Boolean Association Rules from Transactional Databases. Multi-Level Association Rules from Transaction Databases. Issues regarding classification & prediction. Different Classification Methods, Prediction.

#### Unit-IV

**Clustering and Applications of Data Mining:** Cluster Analysis, Types of Data Categorization of Major Clustering Methods, Kmeans, Partitioning Methods, Hierarchical Methods, Density Based Methods, Grid Based Methods, Model-Based Clustering Methods, Clustering High Dimensional Data, Constraint Based Cluster Analysis, Outlier Analysis, Data Mining Applications.

**Feature Trends:** Multidimensional Analysis and Descriptive Mining of Complex Data Objects, Spatial Databases, Multimedia Databases, Time Series and Sequence Data, Text Databases, Web Mining, Spatial mining, Temporal Mining, Applications and Trends in Data Mining.

#### Reference/Text Books :

- [1] Data Warehousing in the Real World- S. Anshory & D.Murray, Pearson Education India/ Addison-Wisley.
- [2] Data Warehousing Fundamentals- P.Ponnaiah , Wiley Student Edn.
- [3] Data Warehousing- Reema Thareja, Oxford
- [4] Building the Data Warehouse- W. H. Inmon, 3rd Edition, Wiley, 2003
- [5] Data Mining – Concepts and Techniques- J.Han & M.Kamber, Morgan Kaufmann Publisher (Elsevier)..
- [6] Data Mining Introductory and advanced topics- M.H.Dunham , Pearson Education.
- [7] Data Mining Techniques- A.K.Pujari, University Press.

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## MCA 302 : Application Development Using .NET Frame Work

### Unit-I

**Introduction to .Net framework:** Managed Code and the CLR, Intermediate Language, Metadata and JIT Compilation, Automatic Memory Management

**Language Concepts and the CLR:** Visual Studies .Net, Using the .Net Framework

**The Framework Class Library:** .Net objects- ASP .NET, .NET web services, Windows Forms.

**Elements :** Variable and constants, data types, declaration. Operators, types, precedence, Expressions. Program flow, Decision statements, if...then..else,select..case, Loop statements, while... and while, do...loop, for...next, for...each...next.

**Types:** Value data types, Structures, Enumerations, Reference data types. Single-dimensional, Multi-dimensional arrays, jagged arrays and dynamic arrays.

### Unit-II

**Windows Programming:** Creating windows forms, windows controls, Button, Check box, Combo box, Label, List box, Radio Button, Text box, Events, Click, close deactivate, Load, mousemove, mousedown, mouseup.

**Menus and Dialog Boxes :** Creating menus, menu items, context menu, Using dialog boxes, show dialog() method.

**ADO.NET :** Architecture of ADO.NET, ADO.NET providers, Connection, Command, Data Adapter, Dataset, Connecting to Data Source, Accessing Data with Data set and Data reader, Create an ADO.NET application, Using Stored Procedures.

### Unit-III

**ASP.NET Features:** Application of States and Structure; Change the Home Directory in IIS- Add a Virtual Directory in IIS- Set a Default Document for IIS – Change Log File Properties for IIS-Stop, Start, or Pause a Web Site.

**Creating Web Controls:** Web Controls, HTML Controls, Using Internist Control, Using Input Validation Controls, Selecting Controls for Applications, Data Controls and Adding web controls to a page. **Creating Web Forms:** Server Controls, Types of Server Controls, Adding ASP.NET Code to a page.

### Unit-IV

**Overview of XML :** XML Serialization in the .NET Framework-SOAP Fundamental-Using SOAP with the .NET Framework.

**Web Services and WCF :** Web Services protocol and standards – WSDL Documents-Overview of UDDI – Calling a Web Service from a Browser-Calling a Web Service by Using a proxy – Creating a simple web service – Creating and Calling a Web Service by Using Visual Studio.NET Architecture of WCF, WCF Client

### Reference/Text Books:

- [1] Ma,new Mac Donald: Beginning ASP.NET 4.0 in C# 2010, 3rd Edition, A Pres.
- [2] Bill Evjen Scott Hanselman, Devin Rader: Professional ASP.NET4, 2010, Willey.
- [3] George Shepherd: Microsoft ASP.NET Step by step, 2010 Microsoft Press.
- [4] Imar Spaanjaars: Beginning ASP.NET 4: in C# and VB (Wrox Programming to Programmer),2010 Wiley Publishing.
- [5] Steven Holzner; ASP.NET 4.0 (Cover C# & VB ) Black Book; Dreamtech Press.
- [6] Steven Holzner; .NET Programming Black Book; Dreamtech Press.

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## MCA 303 : Linux OS and Shell Programming

### Unit-I

The Operating System: Linux history, Linux features, Linux distributions, Linux's relationship to Unix, Overview of Linux architecture,, Installation, Booting, Login and Shutdown Process, Start up scripts, controlling processes, system processes ( an overview), Linux Security, Networking on Linux User Management: Types of users, the powers of Root, managing users (adding and deleting); using the command line, shell scripts and GUI tools.

### Unit-II

The Linux File System : Basic Principals, Pathnames, Mounting and Un-mounting File Systems, Different File Types, File permissions, Disk Usage Limits, Directory Structure, Check and Repair File Systems Security and file permissions. Shell in Linux; Available shells under Linux, different.

### Unit-III

Filter-The grep family, advanced filters-sed and awk vi editor: General startup of vi editor and it modes, Creating and editing files, features of vi, screen movement, cursor movement insertion, deletion searching, submitting operations, yank put, delete commands reading & writing files, advance editing techniques vim (improved vi).

Shell: meaning and purpose of shell, introduction to types of shell. the command line, standard input and standard output, redirection pipes, filters special characters for searching files and pathnames.

### Unit-IV

Shell programming shell Meta character local and global shell variables- interactive shell scripts – shell script arguments- looping and making choice- for loop, case, while and until, shell functions eval.

Networking : Networking tools, E-mail Remote login, FTP, Network and Server setup LAN, Connection with Internet Setting-up routers, Proxy Servers, Print Server, File server, mail Server, Web server and Database server.

### Reference/Text Books:

- [1] Beginning Linux Programming N, Mathew, R. Stones, Wrox, Wiley India Ed
- [2] Peterson Richard, " The Complete Reference Linux " Tata McGraw Hill.
- [3] Simitabha Das, "Unix/Linux: Concepts & Applications". Tata McGraw Hill
- [4] Yshavant P, Kanetkar, Shell Programming
- [5] Linux System Programming, Robert Love, O" Reilly SPD.
- [6] Vijay Shekhar; Red hat Linux study guide firewall media.
- [7] Richard Petersen: The Complete Reference ; Linux; TMH

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## **MCA-304: System Analysis and Design Concepts**

### **Unit-I**

System Concepts and the information systems Environment: The System concept Definition, System Central Objectives, Elements of a system, Environment, Boundaries and interfaces. Types of systems- Physical or Abstract systems, Open or Closed systems, Role, Need and Responsibility of System Analyst, Introduction to system Development approaches- Data Oriented and Object Oriented.

System Development Life Cycle : Linear or Waterfall Cycle, Linear cycle, phases of SW Development Life Cycle. System planning and Analysis : Strategies for determining information requirement, Problem definition & Project initiation, Background analysis, Data and Fact Gathering Techniques, Feasibility Studies-Technical, Operational, economic, cost benefit analysis, Interface design tools, user interface evaluations.

### **Unit-II**

System Design: Process modeling, Physical and logical design. Conceptual Data modeling, Entity Relationship analysis, ER modeling, Context diagram. Tools of structured analysis ( DFD, Data dictionary, Decision Tree, Decision tables, Structured English). Structure Charts, Modules, Parameter passing. Execution sequence, Structured Design, Conversion from Data Flow Diagrams to Structure Charts.

Input/Output Forms Design : Requirement of forms design, User Interface Design, Input design, CRT Screen forms design, Output design.

Files organization and Database Design : Designing to Fields, Physical records, Physical files, Database design, Data Structures, Normalization, Introduction to CASE Tools. Features, advantages, and limitations of CASE tools.

System Implementation, Maintenance and documentation, testing, evaluation, maintenance Activities, Documentation, Document configuration, maintaining a configuration.

### **Unit-III**

Introduction to MIS : Meaning and Role of MIS, Definition of MIS, System Approach to MIS, MIS Organization within a company. Concept of Balanced MIS, effectiveness and efficiency criteria.

MIS Planning : MIS structure and components, MIS features, problem and Derivation of MIS Plans, Prioration and development strategies.

Conceptual Design of MIS : Definition of problem, system objectives and system constraints, Analysis of information source, alternative system design and selection optimal system.

Detailed System Design and Implementation: Application of basic design concepts of MIS, Involvement of end-user and role of MIS department and System Analyst, Role of Top Management during design and implementation.

### **Unit-IV**

System Evaluation : System evaluation review and update, Management and control of MIS function, Advanced MIS concept, Pitfalls in MIS development.

Decision Support System:- DSS Definition, Characteristics, Application Case Study. Expert System : Concept Structure, Application and Case Study.

Applications of MIS : Applications of MIS to E-Business, Applications in Manufacturing sector, Service sector, DSS, Decision Support System, Enterprise Management Systems.

#### **References/Text Books:**

- [1] Awad E.M.; System Analysis and Design; Second Edition; Galgotia Publication.
- [2] Igor Hawryzkiewycz, Introduction to System Analysis and Design, 4th edition. Prentice-Hall
- [3] Jain Md hulika, Jain Satish; Structured system Analysis and Design; 2nd Edition, 2007.
- [4] Jeffrey L. Whittren, and Lonnie D. Bentley, Systems analysis and Design Methods 4th edition, Tata McGraw-Hill.
- [5] Philip L. Weaver, Practical SSADM ver 4+A Complete Tutorial Guider, Pitman Publishing.
- [6] Don Yeates, Maura Shields and David Helmy. System Analysis and Design Longman group limited.
- [7] Robert Mudrick; Management Information System; PHI.
- [8] W.S. Jawedkar; Management Information System; McGraw-Hill.

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# MCA 305 : Computer Graphics

## Unit-I

**Introduction:** Elements of graphics workstation , Video Display Devices. Raster Scan Systems. Random Scan systems. Input devices, Graphics Software Coordinate Representations.

**Algorithms:** Line drawing algorithms- DDA Algorithm. Bresenham's Line Algorithm. Frame buffers. Midpoint Circle Algorithm. Midpoint Ellipse Algorithm, Scan-Line polygon fill algorithm. Inside-Outside tests Scan-Line fill of curved Boundary Areas. Boundary fill algorithms. Flood fill Algorithm.

## Unit-II

**Graphics Primitives:** Primitive Operations, The display file interpreter, Normalized Device Coordinates. Attributes of output primitives: Line attributes, Color and gray scale levels. Color tables. Gray scale. Area-Fill Attributes, Fill styles. Pattern fill. Soft fill. Character Attributes.

**Geometric Transformations:** Matrices. Scaling Transformations. Sin and Cos Rotation. Homogeneous Co-ordinates and Translation. Co-ordinate Translations. Rotation about an arbitrary point. Inverse Transformations, Scaling Transformation, Reflection and Shear transformations, Transformations Routines.

## Unit-III

**2-D Viewing** – The viewing pipeline, Viewing co-ordinate, Reference Frame. Windows to view ports. Co-ordinate transformation 2-D Viewing functions. Clipping operations point clipping. Line clipping. Cohen-Sutherland. Line Clipping. Polygon clipping. Sutherland Hodge man clipping.

**3-D concepts:** Three dimensional Display Methods, Parallel projection. Perspective projection, Visible line and surface identification. Surface rendering. Three Dimensional Object representations. Bezier curves and surfaces. B-Spline curves and surfaces. Visibility, Image and Object Precision Z-buffer algorithm.

## Unit-IV

**Computer Animation:** Design of Animation Sequence, General computer Animation Function-Raster animations, Key Frame system, Morphing, Simulating Accelerations, Motion Specifications, Kinematics and Dynamics.

### Recommended Reference/Text Books:

- [1] Hearn D., Baker P.D.: Computer Graphics; 2<sup>nd</sup> editions; Pearson.2003.
- [2] Foley J.D.; Van D.A. : Fundamentals of Interactive Computer Graphics; 2<sup>nd</sup> Edition; Addison-Wiley,2000
- [3] Ronger D.F. ; Elements of Computer Graphics;
- [4] Giloi W.K. ; Interactive Computer Graphics; PHI
- [5] Mewman W, Sproul R.F. ; Principles of Interactive Computer Graphics; Mc Graw Hill.

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# MCA 306 : THEORY OF COMPUTATION

## UNIT-I

Introduction of automata, computability, and complexity; mathematical notations and terminology; finding proofs and types of proofs. Automata and Languages: Regular languages, finite automata, formal definition of a finite automaton, formal definition of computation, designing finite automata.

## UNIT-II

Non-deterministic finite automata: Equivalence of NFAs and DFAs, closure under the regular operations, Regular Expressions: formal definition of a regular expression, equivalence with finite automata, nonregular languages: pumping lemma for regular languages.

## UNIT-III

Push down Automata and Context free languages: Context free grammars, designing context free grammar, ambiguity in CFG and its removal, Chomsky normal form push down automata: formal definition, graphical notations, Languages accepted by PDA, Equivalence of PDA and CFG, Non-context free languages.

## UNIT-IV

Turing Machines and Computability: Formal definition of turing machines with examples, graphical notations, variants of turing machines, church-turing thesis, Hubert's problem. Decidability, undecidability and reducibility: Decidable languages; decidable problems concerning regular languages and context free languages, the halting problem, undecidable problems, mapping reducibility, decidability of logical theories, turning reducibility.

### Text/Reference Books:

- [1] Michael Sipser, "Introduction to the Theory of Computation", Second Edition, 2007, CENGAGE learning India Pvt. Ltd., New Delhi.
- [2] John E. Hopcroft, Rajeev Motwani & Jeffrey D. Ullman, "Introduction to Automata Theory, Languages, and Computation", Third Edition, 2007, Pearson Education Inc

### Practical Papers of MCA Semester -III (2020-2021)

Each practical paper shall be of 4 hours duration on one day and carry 100 marks for the practical examination. The practical examination will involve 3 exercises, each of 20 marks, practical record of 15 marks and viva-voce examination of 25 marks.

#### CCC: MCA 311 : . NET Lab

Practical Lab : Examination : Practical Examination  
- Lab Exercise based on Theory Paper MCA 302.

#### CCC: MCA 312 : Linux OS and Shell Programming Lab.

Practical Lab : Examination : Practical Examination  
- Lab Exercise based on Theory Paper MCA 303

#### ECC: MCA 313 : Programming in R language

Practical Lab :  
Examination : Practical Examination  
- Lab Exercise based on features of R Programming language- various data input modes. Control structures, looping structure, List, factors, user defined function. Mathematical and Statistical Functions. Statistical Tests. Simulation. Plotting Graphs. Data Input modes. Problems of linear algebra (Vectors, Matrices Manipulations etc.), Numerical Optimization (Roots of a Non-Linear equations, Built in functions), LPP Problems.

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# MCA 404: Cloud Computing

## Unit-I

**Introduction** - Objectives, From collaborative to the Cloud – A short history Client – Server Computing, Peer-to-Peer Computing, Distributed Computing, Collaborative Computing, Cloud Computing, Functioning of Cloud Computing, Cloud Architecture, Cloud Storage, Cloud Services, Industrial Applications. Service Modeling, Infrastructure Services, Platform Services, Software Services - Software as service modes- Massively scaled software as a service- Scale of Economy, Management and Administration.

## Unit-II

**Cloud Service Administration**- Service Level Agreements and Monitoring-Support Services- Accounting Services, Resource Management- IT Security- Performance Management- Provisioning- Service Management, Untangling Software Dependencies. Feeling Sensational about Organization, Making Strategy Decisions- Governance Issues- Monitoring Business Processes- IT Cost Management,

## Unit-III

**Cloud Architecture, Services and Storage**- Layered Cloud Architecture Design – NIST Cloud Computing Reference Architecture – Public, Private and Hybrid Clouds – IaaS – PaaS – SaaS – Architectural Design Challenges – Cloud Storage – Storage-as-a-Service – Advantages of Cloud Storage – Cloud Storage Providers – S3. Platforms- Web Application Framework- Web Hosting Services- Proprietary Methods, Web Applications- API's in Cloud Computing, Browsers for Cloud Computing- Internet Explorer- Mozilla Firefox- Safari- Chrome.

## Unit-IV

**Data Management**- Introduction- Objectives, Data Security- Data Location- Data Control- Securing data for transport, Scalability and Cloud Services- Large Scale Data Processing- Databases and Data Stores- Data Archival.  
Need for Privacy- Defining a private cloud- Public, Private, and Hybrid Clouds – A Comparison, Examining the Economics of the private cloud- Assessing capital expenditures- Vendor Private Cloud Offerings, The Up Key Vendors- Service Oriented- Systems Integrators- Technology Enablers.

### Recommended Reference/Text Books:

- [1] Cloud Computing: Concepts, Technology and Architecture" by Thomas Erl and Ricardo Puttini
- [2] Cloud Computing: SaaS, PaaS, IaaS, Virtualization, Business Models, Mobile, Security and More" by Kris Jamsa
- [3] Cloud Security: A Comprehensive Guide to Secure Cloud Computing" by Ronald L. Krutz and Russell Dean Vines
- [4] Cloud Computing: by A. Srinivasan, Publisher: Pearson India

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## MCA 403 : Software Engineering

### Unit-I

Systems concepts and definitions: System's theory, Definition of System, System Characteristics/ features, System Components, System, Thinking Introduction to Software Engineering. Information System – Types of information Systems, Information Systems Development Methodologies; System Project Planning, Management; Application of Engineering Approach to Computer Software Design and Development.

### Unit-II

Information systems Models and Planning : Brief Evolution of Software engineering; Role of Software Engineer; Software Life Cycle ; Types of Software Life Cycle Activities: Typical Documents; Software Life Cycle.Life Cycle Model, Boehm's Spiral Model.

Software equipments and specifications-Object models, Data Flow Model, Behavioral Modeling, Data Dictionary, System Diagram, IEEE standards for Software Requirement specifications (SRS).

Software Planning and Cost Estimation- Project Planning; WBS – Work Break Down Structure; PERT; Software Cost Estimation .

### Unit-III

Software Design Methodologies : Software Design Methodologies – Phase of the Design Process, Design Concept, Measuring Cohesion, Measuring Coupling, Requirement Traceability, Structured Analysis and modeling techniques; Process modeling; Logic modeling; Data modeling etc. User Interface and Database Design; Principal of User Interface Design. Object Oriented design process and evaluation.

Validation and Verification- Verification and validation; Software testing- Strategic approach to software testing , System testing, Component testing, Test case design, Critical system validation.

### Unit-IV

Software Project Management, Quality assurance and Maintenance: Software Project Management – Management Approach, Team Approach, Critical Practices, Capability Maturity Model; Metrics for Process and Project – Metrics for process, Project, software measurement , software Quality and Integrity. Earned Value Analysis, Error Tracking, Postmortem Review. Software Quality Assurance -- Formal Inspection and Technical Review, Software reliability, Statistical Quality assurance; Risk management Maintenance and configuration; Documentation of System and Project using structured Approaches, Emerging technologies- Introduction to Security engineering, Service- Oriented s/w engineering, Aspect-Oriented s/w engineering and S/W Reengineering. CMM level-5(concept and advantages).

### Text/Reference Books :

- [1] Jalote, Pankaj (1997) :An integrated Approach to Software Engineering 2nd Ed.
- [2] Pressman, Roger (2001): Software Engineering; A Practitioner's Approach, 5th ed. M Graw-Hill
- [3] Sommerville Ian; Software Engineering, 8th Ed. Pearson Education
- [4] Schach, Stephen R.(2002) : Classical and Object Oriented Software Engineering , 5th ed. IRWIN.
- [5] Hoffer, Jefferey A. Joey F. George; and Joseph S. Valacich (1999): Modern Systems Analysis and Design. Massachusetts: Addison-Wesley.

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## Syllabus of MCA Semester- IV (2020-21)

### Note :

1. Papers MCA X01, MCA X02, MCA X03, MCA X11 and MCA X12 are compulsory(CCC) and Papers MCA X04, MCA X05, Elective-I and MCA X23 are elective(ECC).
2. Continuous assessment(Internal) will be done by the concerned teacher on the basis of test papers, regularity in the class and performance of the student. Maximum marks in continuous assessment of each paper is 100.

### MCA 401: Advanced Java Programming & Technology

#### Unit-I

Introduction to Advance Java Application: Networking with Java- Networking basics, Socket, port, Proxy servers, Internet addressing and URL, java.net-networking classes and interfaces, Implementing TCP/IP based Server and Client. Classes to be covered Socket, Server-Socket, IP Address, URL connections.

Java Applets: Introduction Applet Architecture: The java applet. Applet Class; The Five Stages of an Applet's Life Cycle, Methods for Adding UI Components, Methods for Drawing and Event Handling.

#### Unit-II

Application in distributed environment: Remote method invocation-activation models- RMI custom sockets- Object Serialization-RMI-IIOP implementation- CORBA IDL. Technology- Naming Services- CORBA programming Models- JAR file creation.

Database Application: the JDBC Connectivity Model, Database Programming, Connecting to the Database Types of JDBC Drivers, Writing JDBC applications using select, insert, delete, update; Types of Statement objects ( Statement, Prepared-Statement and Callable-Statement); Resultset, ResultsetMetaData; Inserting and updating records, Connection Pooling.

#### Unit-III

Introduction to J2EE: J2EE Overview, Need of J2EE; J2EE Architecture, J2EE APIs, J2EE Containers, Overview of J2ME and its Features-Building MIDlets, User Interface, Event Handling, Screens, List and Forms, J2ME-Overview, MIDlets, Create User Interface, Event Handling with Command Tickers, Screen, Text Box, List and Forms.

**Servlet** : Web Application Basics, Architecture and challenges of Web Application, servlet life cycle, Development and Deploying Servlets, Exploring Deployment Descriptor (web.xml), Handling Request and Response, Initializing a Servlet, Accessing Database, Servlet Chaining Session Tracking & Management Dealing with cookies, Transferring Request, Accessing Web Context, Passing INT and CONTEXT Parameter, Sharing information using scope object, Controlling concurrent access, user Authentication, Filtering Request and Response- Programming filter, Filter Mapping, Servlet Listeners.

Java Server Pages Technology; Basic JSP Architecture, Life Cycle of JSP ( Translation, Compilation), JSP Tags and Expressions, Role of JSP in MVC-2, JSP with Database, JSP Implicit Objects, Tag Libraries, JSP Expression Language ( EL). Using Custom Tag, JSP Capabilities – Exception Handling, Session Management, Directives, JSP with Java Bean.

#### Unit-IV

Java Beans : Introduction to Java Bean, Rules for writing a Simple Bean, Java Naming Directory Interface API, Java Naming Directory Interface concept.

Enterprise JAVA Beans ; Enterprise Bean overview, Types of enterprise beans, Advantages of enterprise beans, The Life Cycles of Enterprise Beans, Working with Session Beans, Stateful vs. Stateless Session Beans, Working with Entity Beans, Message Driven Beans.

Introduction to Struts : ( A Web Application Framework) Struts-config.xml; Understanding MVC architecture; Action Servlet, Action Form, Action Mapping, Action classes.

#### Reference Text Books

- [1] Guy S. Houtsman and Gary Cornell " Java Java 1, Volume I, II – fundamentals" Pearson Education, USA, 2005.
- [2] Kathy Sierra and Bryan Basham, "Head First Servlets and JSP", Shroff publishers and Distributors, Mumbai, 2007.
- [3] Marty Hall and Larry Brown, "Core Servlets and java server pages: volume I,II: core technologies ", Pearson Education, USA, 2008.
- [4] Enterprise JavaBeans (3rd edition), O'Reilly' by Richard Monson-Haefel.

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## MCA 402 : Advance Database Systems

### Unit-I

Transaction Management and Concurrency Control : Transaction-Evaluating Transaction Results, Transaction properties, transaction Management with SQL, the Transaction Log ; Concurrency Controls; with Locking Methods; Concurrency Control with Time Stamping Methods-Wait/Die and Wound/Wait Schemes, Concurrency Control with Optimistic Methods, Database Recovery Management.

Parallel database Systems: Concepts, Architecture of Parallel Databases, Inter-Query and Intra-Query Parallelism, Inter-Operational and Intra-Operational Parallelism, Design of Parallel Database Systems.

### Unit-II

Introduction to Object-Based Databases : Object Oriented Database concepts, Advantages, OODBMS Features, Groups and Languages; Object Relational Database Concepts and Design.

Database Performance Tuning and Query Optimization: Database Performance and tuning; Statistics; Query Processing; Indexes and Query Optimization; Optimizer Choices; SQL Performance Tuning.

PL/SQL : Concepts of Embedded SQL, Dynamic SQL, SQLJ. PL/SQL Concepts, Elements, Structures, Cursors, Triggers, Database Stored Procedures and SQL/PSM.

### Unit-III

Distributed Database Management Systems : Evolution Characteristics, DDBMS Components; Levels of Data and Process Distribution ( i.e. SPSD, MPSD, MPMD); Distributed Database Transparency Features; DDBMS Design-Data Fragmentation, Data Replication Data Allocation; Client/Server vs. DDBMS.

Introductions to Data Warehousing and Data Mining: Data Warehouse- Decision Support Architectural Styles; Twelve Rules that Define a Data Warehouse; Data Mining Concepts . OLAP-Concepts, Architecture relation, OLAP V/s OLTP, Star V/s Clouding Architecture.

### Unit-IV

Database Connectivity and Web Technologies : Database Connectivity – Native SQL Connectivity, ODBC, DAO, and RDO. OLE-DB, ADO.NET, Java Database Connectivity (JDBC); Internet Databases – Web-to-Database Middleware; Server-Side Extensions, Web Server Interfaces, the Web Browser, Client-Side Extensions, Web Application Servers.

Database Administration and Security : the Need for and Role of a Database in an Organizations; The Evolution of the Database Administration Function; The Database Environment's Human Component-The DBA's Managerial Role, The DBA's Technical Role; Security – Security Policies, Security Vulnerabilities, Database Security; Database Administration Tools-the Data Dictionary; Developing a Data Administration Strategy.

### Text/Reference Books :

- [1] Prescribed : Hoffer, J.A. Prescott, M. & Topi, H. (2008) Modern database management ( 9th ed.). NJ; Prentice Hall.
- [2] Silberschatz A, Korath H. Sudarshan S. : Database System Concepts; McGraw Hill.
- [3] Recommended: Date, C.J. (2003) An introduction to database systems. (8th ed.). NJ: Addison Wesley.
- [4] Shah, N. (2004) Database systems using oracle (2nd ed.). NJ.: prentice Hall.
- [5] Elmasri R., Navathe S.B; Fundamentals of Database Systems; Pearson edu.
- [6] Singh S.K; Database Systems; Pearson Education.
- [7] Lemon A. I Leon M; Database Management Systems; Leao Press.
- [8] Thomas M. Colnolly, Begg C.E.; Database Systems; Pearson.

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# MCA 405 : Artificial Intelligence

## Unit-I

Basic Concept: Foundations of AI, scope problems and approaches of AI Intelligent agents, reactive, deliberative, goal-driven, utility driven, and learning agents, Artificial Intelligence programming techniques

Problem-solving through Search : forward and backward state space, blind heuristic, problem-reduction A, A\*, AO\*, minimax ,constraint propagation ,neural stochastic and evolutionary search algorithms, sample applications .

## Unit-II

Knowledge Representation and Reasoning: Ontologies, foundations of knowledge representation and reasoning, representing and reasoning about objects, relations ,events, actions, time, and space; predicate logic, situation calculus, description logics, reasoning with defaults, reasoning about knowledge, sample applications.

Planning : planning as search, partial order planning ,construction and use of planning graphs.

## Unit-III

Representing and Reasoning with Uncertain Knowledge : probability, connection to logic. Independence ,bypass rule ,Bayesian networks, probabilistic inference, sample applications.

Decision-Making: basics of utility theory, decision theory, sequential decision problems ,elementary game theory, sample application. Expert System-need ,components, Categories, Stages of Expert System Development.

## Unit-IV

Machine Learning and Knowledge Acquisition : learning from memorization examples, explanation and exploration. learning nearest neighbor, naïve Bayes, and decision tree classifiers, Q-learning for learning action policies applications.

Brief Survey of selected additional topics: Perception, communication, Interaction, and action; multi-agent systems, Sample Applications of AI, student project presentations.

### Text/Reference Books :

- [1] Artificial Intelligence: A Modern Approach, 3rd Edition, By Stuart Russell And Peter Norvig.
- [2] Artificial Intelligence, Rich & Knight, TMH.
- [3] Introduction to AI & Expert Systems, Patterson, PHI.
- [4] Neural Networks, Fuzzy Logic & Genetic Algorithms, Rajsekharan, PHI.

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# Elective Papers for MCA Semester IV

## MCA A01: Compiler Design

### Unit — I

**Overview of Compilation :** Phases of Compilation — Lexical Analysis, Regular Grammar and regular expression for common programming language features, pass and Phases of translation, interpretation, bootstrapping, data structures in compilation — LEX lexical analyzer generator.

### Unit—II

**Parsing :** Context free grammars, Top down parsing — Backtracking, LL (I), recursive descent parsing, Predictive parsing, Pre-processing steps required for predictive parsing. Shift Reduce parsing, LR and LALR parsing, Error recovery in parsing , handling ambiguous grammar, YACC-Automatic parser generator.

### Unit—III

**Symbol Tables** Symbol table format, organization for block structures languages, hashin tree structures representation of scope information. Block structures and non block structure storage allocation: static, Runtime stack and heap storage allocation, storage allocation, for arrays, strings and records

### Unit—IV

**Code optimization & Generation :** Consideration for Optimization, Scope of Optimization, local optimization, loop optimization, frequency reduction, folding, DAG representation. Flow graph, data flow equation, global optimization, redundant sub expression elimination, Induction variable elements, Live variable analysis, Copy propagation. Object code forms. machine dependent code optimization, register allocation and assignment generic code generation algorithms, DAG for register allocation.

### Recommended reference/text books:

- [1] Principles of compiler design -A.V. Aho . J.D.Ullman; Pearson Education.
  - [2] Holub, Compiler Design in C, P
  - [3] Engineering a Compiler-Cooper & Linda, Elsevier.
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## **MCA A02: Network Management**

### **Unit I**

**Basic Concepts:** Data Communications and Network Management Overview, Basic Foundations, Standards, Models, and Language of Network Management. Network Management Technologies: SGMP, CMIP, SNMP Network Implementation and Management Strategies, Review of Computer Network Technology, SNMP, Broadband, and TMN Management, Performance Management, Fault Management, Configuration Management, Security Managements, Accounting Managements. Network Management Configuration: Centralized Configuration, Distributed Configuration. Selected Management Strategy. SONET-introduction.

### **Unit II**

**Management Information Base (MIB):** Structure of Management Information, NMS Presentation of the SMI, NMS Meter-ware Network View. Remote Monitoring (RMON), RMON Group. Desktop Management: Desktop Management Interface (DMI), DMI Architecture, DMI Browser, DMI/SNMP Mapping, Desktop SNMP Extension Agents. Setting up LAN Access, SNMP Configuration.

**SNMP Technology:** SNMPv1 Network Management - Organization and Information Models. SNMPv1 Network Management- Communication and Functional Models. SNMPv2, SNMPv3, RMON SNMP Management.

### **Unit III**

**Delivery and Routing of IP Packets:** Routing Methods, Routing Module, Classless, Interi and Exterior Routing, Routing information protocol (RIP), Open shortest path first protocol (OSPF), BGP, GGP, Private Networks, Virtual Private Network (VPN), Network Address Translation. Internet Control Message Protocols (ICMP): ICMP Package, Messaging, Transmission Operations and Protocols; Services.

### **Unit IV**

**Management Tools, Systems, and Applications:** Network Management Tools and Systems Network Management Applications, Web-Based Management. Security Management: Secure Network Management and Network Security Management, Organizational Facilities, Protocol Capabilities, Tool Capabilities, Security Management Design Options, Network Security Management, Firewalls, Trusted systems, IT act and cyber laws.

### **Text/Reference Books :**

1. Mani Subramanian, "Network Management: Principles and Practice" Addison Wesley.

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# MCA A03 : Computer based Optimization Technique

## Unit-I

**Linear Programming Problems (LPP):** Formulation of an LPP, Solution of an LPP using graphics method and simplex method, Slack, Surplus & Artificial Variables, Two-phase and Big-M method. **Special cases in LPP:** Alternate optimum solution, an unbounded solution, infeasible Solution, Duality in LPP, Revised Simplex method.

## Unit-II

**Transportation Problem:** Definition, methods for finding initial basic feasible solutions – North West corner rule, least cost cell entry method, Vogel's approximation method, methods for finding optional solution – MODI Method.

**Assignment Problems:** Definition & concept, solution of an assignment problem for optimum solution – Hungarian Method.

**Sequencing: Job:** problems for processing N Jobs on 2 machines, processing N jobs on 3 machines, processing N jobs on processing M machines, 2 jobs on m machines (Graphic Method).

## Unit-III

**Inventory Models:** Introduction, Need, Types of Inventories, Inventory Decisions, Cost involved in inventory problems, Controlled & Uncontrolled variables, deterministic inventory control system, concept of an average inventories, concept of economic order quantity (EOQ) . (In short Model-I, II and Model III).

**Replacement Models;** Introduction – The replacement problem, replacement of items that deteriorate (with money value), replacement of items that fail completely (Mortality theorem).

## Unit-IV

**Project Management by PERT & CPM:** Introduction – Historical Development of CPM/PERT, Application of PERT-CPM techniques, network diagram representation, rules for drawing network, time estimation & critical path in network analysis

**Queuing theory:** Introduction queuing system, queering problem, transient & steady states, traffic intensity, distribution of queuing system (Birth & Death Process), Queuing Models - I,II & III.

### Text/Reference Books :

- [1] Gillette B.E.: Introduction to Operations Research – A Computer Oriented Algorithmic approach, TMH, New Delhi.
- [2] Taha Hatndy: A Operation Research- An Introduction, Fifth Edn. PHI, New Delhi.
- [3] Mittal K.V. & Mohan C: Optimization Methods in Operations Research and system Analysis, 3rd Edn. New Age International Publishers, New Delhi.
- [4] Hiller, F.S. & Limrman, G.L. : Introduction to Operations research, 2nd Edn. Holden day inc , London, 1974.
- [5] Sharma S.D. Operations Research, Kedar Nat R. & Com. Meerut, 2005
- [6] Kapoor V.K.: Operations Research, Sultan Chand & Sons, 1999.
- [7] P.K. Gupta & D.S. Hira : Operation Research, S.Chand & Company Ltd. New Delhi 2000

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# MCA A04 : Multimedia Systems

## Unit—I

Multimedia System Basics : Multimedia System Elements; Multimedia System Architecture; Multimedia technologies; Video/Audio Fundamentals, Multimedia Authoring, and Tools raphics and Image Data Representations, Color in Image and Video, Fundamental Concepts in Video, Basics of Digital Audio. Multimedia I/O Technologies- Key Technology Issues, Standard Multimedia Devices, Multimedia Output Devices.

## Unit—II

Compression and Decompression: Type of Compressions, Binary Image Compression Schemes, Image Compression, Video image Compression, Audio Compression, Lossless Compression Algorithms, Lossy Compression Algorithms, Image Compression Standards, Basic Video Compression Techniques, MPEG Video Coding I - MPEG-I and 2, MPEG Video Coding II - MPEG-4, DVI and Beyond.

## Unit—III

Audio Compression : Audio Compression Techniques, MIDI, MPEG Audio Compression, Speech Reorganization and Generation, Video Images and Animation. File Formats and Standards — Rich Text, TIFF, RIFF, MIDI, JPEG, A VI, MPEG, TWAIN formats and its uses.  
Multimedia Communication Multimedia Communication and Retrieval, Multimedia Network Fundamentals, Multimedia Protocols for the Internet, Multimedia Network Communications and Applications, Multimedia Networking Services, Multimedia OS design and Implementation.

## Unit— IV

Trends in Multimedia — Multimedia in Wireless Networks; Content-Based Retrieval in Digital Libraries; Multimedia Storage Systems, User Interface; Multimedia Synchronization, Multimedia Presentation and Web Technologies(Documents, Hypertext, MHEG), Multimedia Databases, P2P Multimedia Systems.

Multimedia Applications : Media Preparation, Media Composition, Image Processing & Image Reorganization, Animation, Media Integration, Media Communication, Media Consumption; Education & Training, Media Entertainment and Full Motion Digital Video Applications.

## Reference/Text Books:

1. Prabhat K. Adrleigh, Kiran Thakrar; Multimedia System Design; P1-It
2. RalfSteinmetz, Klara Nahrstedt; Multimedia : Computing, Communication & Applications; Pearson Education;
3. Fundamentals of Multimedia, Ze-Nian Li, and Mark S. Drew, Pearson Prentice Halt, 2003.
4. Multimedia Communication Systems, K. Rammohanarao, Z. S. Bolzkovic, D. A. Milanovic, 1st Edn. PHI , 2002.
5. Video Processing and Communications, Yao Wang, Joem Ostermann, and YaQin Zhang, Prentice Hall, 2002.
6. Web Caching and Replication, M. Rabinovich and Oliver Spatscheck, Addison-Wesley, 2002.
7. Fred Hatsall : Multimedia Communications: Applications, Networks, Protocols & Standards, Addison-Wesley, 2001.

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## **Practical papers for MCA Semester –IV (2020-2021)**

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**Note:**

**Each practical paper shall be of 4 hours duration on one day and carry 100 marks for the practical examination. The practical examination will involve 3 exercises, each of 20 marks, practical record of 15 marks and viva-voce examination of 25 marks.**

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**CCC: Paper MCA 411: Advanced Java Lab**

Practical Lab:

Examination : Practical Examination

- Lab Exercise based on Theory paper MCA 401

**CCC: MCA 412: Advanced DBMS Lab.(Oracle/DB2/MySQL)**

Practical Lab:

Examination : Practical Examination

- Lab Exercise based on Theory paper MCA 402.

**ECC: MCA 413: Programming in Python Lab.**

Practical Lab:

Examination : Practical Examination

- **Practical Lab based on Python Programming**

Contents: introduction to Python, Installing Python, Using IDLE Environment, File .py extension. Variable Declaration, Python single & Multiline Statements, print function, Getting User Input, Calculating Expressions, Data Types. Operators, Conditional Statements, Looping, Functions In Python, Classes And Objects In Python, Multithreading, Working With String, Containers, Working With Files, Regular Expressions, Database Connections, Modules, Web Scrapping, Socket Programming, Exception Handling.

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## Syllabus of MCA Semester-V (2021-22)

### Note :

1. Papers MCA 501, MCA 502, MCA 503, MCA 511 and MCA 512 are compulsory (CCC) and Papers MCA 504, Elective-II, Elective-III and MCA 513 are elective(ECC).
2. Continuous assessment (Internal) will be done by the concerned teacher on the basis of test papers, regularity in the class and performance of the student. Maximum marks in continuous assessment of each paper are 100.

### MCA 501: Information Security and Cryptography

#### Unit I

**Introduction** to Computer Security and Cryptography, Security Attacks, Security Services and Mechanism. **Classical Encryption Techniques:** Classical Techniques, Conventional Encryption Model, Classical Encryption Techniques. **Modern Techniques:** Simplified DES, Block Ciphers Principles, DES Standards, DES Strength, Differential & Linear Cryptanalysis, Block Cipher Design Principles, Block cipher Modes of Operation.

#### Unit II

**Conventional Encryption Algorithms:** Triples DES, International Data Encryption Algorithm, RC5, RC2 placement & Encryption Function, Key Distribution, Random Number generation, Placement of Encryption Function.

**Public Key Encryption:** Public Key Cryptography: Principle of Public key Cryptosystems, RSA Algorithm, Key Management, Fermat's Theorem & Euler's Theorem, The Chinese remainder theorem.

#### Unit III

**Hash Functions:** Message Authentication & Hash Function: Authentication Requirements, Authentication Function, Message Authentication Codes, Hash Function, Birthday Attacks, Security of Hash Function & MAC's, MD5 Message Digest algorithm, Secure Hash Algorithm (SHA).

**Digital Signatures:** Digital Signature, Authentication Protocol, Digital Signature Standard(DSS), Proof of digital signature algorithm.

#### Unit IV

**Network and System Security:** Authentication Application- Kerberos x.509, Dictionary Authentication Services, Electronic Mail Security, Pretty Good Privacy (PGP), S/mime. **Security:** Architecture, Authentication Header, Encapsulation security payloads, combining security association, Key Management. **Web Security:** Secure socket layer & Transport layer security, Secure electronic transaction (SET). **System Security:** Intruders, viruses, Firewall Design Principle, Trusted Systems.

#### Reference/Text Books:

1. William Stallings; Cryptography and Network Security, Fifth Edn, Pearson.;
2. Atul Kahate; Cryptography and Network Security; Tata McGraw Hill.
3. V.K. Pachghare; Cryptography and Information Security; PHI.
4. Matt Bishop, Sathya Narayana; Introduction to Computer Security, Pearson.
5. Trappe & Washington, Introduction to Cryptography, Pearson (2nd edition)

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## MCA 502: Analysis and Design of Algorithms

### Unit I

**Introduction:** Algorithm Definition and Specifications, Design of Algorithms and Complexity of Algorithms, Asymptotic Notations, Growth function, Recurrences and Performance Analysis. **Divide and Conquer Algorithms:** General method, Binary search, Merge sort, Quick Sort.

### Unit II

**Greedy Methods:** General method, Knapsack Problem, Activity Selection problem, A task scheduling problem, Minimum Cost Spanning Tree, Single Source Shortest Path.

**Dynamic Programming:** General method, Multistage graphs, All Pair Shortest Path, Optimal Binary Search trees, 0/1 Knapsack, Travel Salesman Problem, Flow Shop Scheduling.

### Unit III

**Advanced data structure:** B-trees, Fibonacci Heaps, Data Structure for Disjoint Sets.

**Backtracking:** General method, 8 Queens Problem, Sum of Subsets, Graph Colouring, Hamiltonian Cycles, Knapsack Problem.

### Unit IV

**Branch and Bound:** 0/1 Knapsack Problem, Travel Salesman Problem.

**Parallel Models:** Basic concepts, Performance measures, Parallel algorithms, Parallel Complexity, Analysis of Parallel Addition, Multiplications and Divisions, Parallel Evaluation of Arithmetic Expressions.

### Reference/Text Books:

- [1] Thomas H Cormen, C.E. Leiserson, R.L. Rivest, C. Stein; Introduction to Algorithms, 3 edn, PHI.
- [2] E. Horowitz, S. Sahni, S. Raja Sekaran; Fundamentals of Computer Algorithms;

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# MCA 503: Wireless Technology

## Unit I

**Introduction of wireless communication:** Overview, Frequencies for Radio transmission, Evolution of Cellular System, Cellular System Architecture & Operation, Performance criteria. Multiple access schemes for wireless communication- TDMA, FDMA, CDMA, CSMA, SDMA.

## Unit II

**Wireless Network Planning And Operation:** Frequencies Management, Channel assignments, Frequency reuse, System Capacity & its improvement, Handoffs & its types, roaming, Co-Channel & Adjacent Channel Interference.

**Digital Cellular Networks:** GSM Architecture & Interfac Signal Processing in GSM, Frame Structure of GSM, Channels used in GSM.

## Unit III

**Wireless LAN Technology:** Overview, WLAN Technologies, Infrared LANs, Spread Spectrum LANs Narrowband, Microwave LANs IEEE 802.11- Architecture, Protocols, MAC layer, MAC frame, MAC Management.

**Bluetooth :** Overview, Architecture of Bluetooth Systems, Radio Specifications, Base Band Specification, Link Manager specification, Logical Link Control & Adaptation Protocol.

## Unit IV

**Mobile Data Networks:** Introduction, Data oriented CDPD Networks, GPRS.

**Wireless Access Protocol:** WAP Architecture, Wireless Datagram, Wireless Transport Layer Security, Wireless Transaction, Wireless Session, Wireless Application Environment, WML.

### Reference/ Text Books:

- [1] Mobile communication Engg- Lee W.C.Y
- [2] Wireless Communication, Principles & Practice-T.S.Rappaport
- [3] Mobile Communication, Pearson Education- Schiller
- [4] Wireless Communication & Networking-William Stalling
- [5] Mobile communication -Rampantly
- [6] Wireless digital communication", PHI, 1999- KamiloFeher
- [7] Principles of Wireless Networks-Kaveshpahlavan &P.Krishna Murthy

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# MCA 504 : SIMULATION & MODELING

## Unit I

**System Models:** Concept, Environment, Continuous and Discrete systems, Types of Models; Subsystems, System Analysis, System design; System Simulation Technique, Monte Carlo method, Types of System Simulation.

## Unit II

Continuous System Simulation – Continuous System Models, Methods, Digital-Analog Simulators and Feedback systems.

Dynamic System – Concepts, Elements of System Dynamic Modeling; Exponential Growth, Decay & Modified models; Generalization of Growth models. System Dynamic Diagrams, Multi-Segment Models; Feedback in Socio-Economic System; Dynamo Language.

## Unit III

Probability concepts in simulation: Stochastic variables and probability functions; Discrete system simulation; fixed time step v/s event-to-event model, Generation of Random numbers, Monte Carlo Computation V/S Stochastic simulation. Simulation of Queuing system, Simulation of single and two server queue, Network Model of a project.

## Unit IV

Introduction to GPSS- Elements, Events; Control Statements , Programs Case study: Simulation of an autopilot, Telephone system, Inventory system & Supermarket.

### Reference/Text Books:

- [1] G.Gordon "System Simulation" PHI.
  - [2] Narsingh Deo "System Simulation with Digital Computers" PHI.
  - [3] Mahapatra P.K.J, Mandal P, Bora M.C.; Introduction to System Dynamics Modeling ;Univ. Press.
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# Elective Theory Papers for Semester-V

## MCA B01: Statistical Methods

### Unit I

Probability Theory: Axiomatic Approach of probability, Conditional probability, Bayes Theorem, Naïve Bayes, Numerical examples. Random variables, probability distribution function, Joint distribution for two dimensional random variables - marginal distributions. Binomial, Poisson, Geometric, Hyper geometric, Normal (Gaussian) distributions with their properties (without proof) and applications. Normal approximation to Binomial distribution. Uniform distribution, Log-Normal Distribution.

### Unit II

Theory of Estimation: Problem of point estimation, criteria of point estimator (unbiasedness, consistency, sufficiency, efficiency), Method of Estimation: Method of maximum Likelihood. Sampling Distributions: Definition, Z, t, Chi-Square and F distributions and their applications. Interval Estimation: Confidence limits, Confidence Coefficients, Confidence Interval for Mean (variance known and unknown), Variance (mean known and unknown), difference of Means, Variances of Normal Population.

### Unit III

Tests of Hypotheses, Hypothesis and types of hypothesis, procedure for testing of hypothesis. Testing for Mean(s) and Variances(s) of Normal Population(s). Analysis of Variance- Definition, Basic Assumptions- analysis of one-way and two-ways classified data. Design of Experiments- Definition, Principles, Uniformity Trials, Types- Completely Randomized Designs, Randomized Block diagram, Latin Square design. Their advantages and disadvantages.

### Unit IV

Non-Parametric Tests: Chi Square Test for Goodness of Fit and Independence of Attributes. Run Test, Median Test, Wilcoxon Test, Mann-Whitney Test, Kruskal Wallis Test. Large Sample tests:

Correlation Analysis: Definition, Graphical method, Karl-Pearson and Spearman's Rank methods of Correlation. Regression Analysis- Meaning, Linear and Non-Linear Regressions, Fitting of regression Equations based on Least Square method. Residual Analysis.

#### Text/Reference Books:

- [1] Kapoor, V.K. & Gupta, S.C., "Fundamentals of Mathematical Statistics", Sultan Chand & Sons, 2014
- [2] Kapoor, V.K. & Gupta, S.C., "Fundamentals of Applied Statistics", Sultan Chand & Sons, 2014
- [3] Kapoor, V.K. & Gupta, S.P., "Statistical Methods", Sultan Chand & Sons, 2014
- [4] Douglas C Montgomery and George C Runger, "Applied Statistics and Probability for Engineers", John Wiley, 2010.
- [5] Ronald E Walpole, Raymond H. Myers, Sharon L Myers and Keying Ye, "Probability & Statistics for Engineers & Scientists", Pearson Education, 2011.
- [6] Johnson, R.A., "Miller and Freund's Probability and Statistics for Engineers". PHI, 2010.

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# MCA B02: Natural Language Processing

## Unit I

Natural language Processing (NLP), Brief history of NLP research, key issues Word Boundary Detection; Argmax based computations; Human languages, models, processing paradigms; Phases in natural language processing, applications. Text representation in computers, encoding schemes.

## Unit II

**Morphology Paradigms;** Morphological Diversity of Languages; Finite State Machine Based Morphology; Automatic Morphology Learning; Shallow Parsing; Named Entities; Maximum Entropy Models; Random Fields. **Part of Speech tagging-** Stochastic POS tagging, HMM, bidirectionality, Transformation based tagging (TBL). Syntax and Grammar: From words to phrases, Classes of phrases, defining phrases using context-free grammars, Some context-free grammars for English,

## Unit III

**Theories of Parsing:** Introduction, scope. Robust and Scalable Parsing on Noisy Text as in Web documents. Syntactic Parsing – Top-down and bottom up parsing and Probabilistic Parsing. Wordnet Theory, Indian Language Wordnets and Multilingual Dictionaries. Unification, probabilistic parsing, TreeBank.

## Unit IV

**Semantics-** Meaning representation, semantic analysis, lexical semantics. WordNet, Word Sense Disambiguation(WSD), Knowledge-based and Machine Learning Approaches to WSD. State of the art techniques in WSD. Multilinguality; Metaphors; Coreferences. Sentiment Analysis; Text Entailment; Robust and Scalable Machine Translation; Question Answering in Multilingual Setting. **NLP Applications;** Text summarization, Information Extraction, Machine Translation, spoken dialogue systems.

### Text/Reference Books:

- [1] C.D. Manning, "Foundation of Statistical Natural language Processing", MIT Press, 1999
- [2] A. James, "Introduction to Natural Language Understanding", 2<sup>nd</sup> Edn., Pearson, 2001
- [3] Daniel Jurafsky and James H Martin. Speech and Language Processing, 2e, Pearson Education, 2009
- [4] Bharati A., Sangal R., Chaitanya V.. Natural Language processing: A Paninian perspective, PHI, 2000
- [5] Siddiqui T., Tiwary U. S.. Natural language processing and Information retrieval, Oxford University Press, 2008

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## MCA B03 : ERP Systems

### Unit I

**Introduction:** Enterprise wide information system, Custom built and packaged approaches, Needs and Evolution of ERP System, Common myths and evolving realities.

**ERP Technologies :** ERP and Related Technologies, Business Process Reengineering and Information Technology, Supply Chain Management, Relevance to Data Warehousing, Data Mining and OLAP, ERP Drivers, Decision support system.

### Unit II

**ERP System :** ERP Domain, ERP Benefits classification, Present global and Indian market scenario, milestones and pitfalls, Forecast, Market players and profiles, Evaluation criterion for ERP products.

**ERP Life Cycle:** Adoption decision, Acquisition, Implementation, Use & Maintenance, Evaluation and Retirement phases, ERP Modules.

### Unit III

**ERP Framework :** Framework for evaluating ERP, Analytical Hierarchy Processes (AHP), Applications of AHP in evaluating ERP, Selection of Weights, Role of consultants, vendors and users in ERP implementation; Implementation strategies, ERP Customization, ERP-A manufacturing Perspective.

**Evaluation of ERP System :** Critical success and failure factors for implementation, Model for improving ERP effectiveness, ROI of ERP implementation, Hidden costs ERP success inhibitors and accelerators, Management concern for ERP success, Strategic Grid- Useful guidelines for ERP Implementations.

### Unit IV

**Analysis of ERP Implementations:** Technologies in ERP System and Extended ERP, Case Studies Development and Analysis of ERP Implementations in focusing the various issues discussed in above units through Soft System approaches or qualitative Analysis tools, Learning and Emerging Issues, ERP and E-Commerce.

**Concept of E-governance :** Concept, E- Governance frame work, area of application like public sector, service industry.

### Reference Books :

- [1] Lexis Leon; Enterprise Resource Planning; TMF
- [2] Brady, Manu, Wegner; Enterprise Resource Planning; TMH
- [3] N. K. Venkitakrishnan, Vinod Kumar Garg; Enterprise Resource Planning : Concepts and Practice; PHI Learning.
- [4] Dimpi Srivastava, Arti batra; ERP Systems; I K International Publishing House

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# MCA B04 : Embedded Systems

## Unit I

Introduction : An Overview of Embedded system, Requirement, Challenges issues, and trends software development. Applications of Embedded Systems : Application market segments, control system and industrial automation, Data communication, Networked Information Appliances, Telecommunications.

## Unit II

Hardware Architecture: Processor, Memory, Latches and Buffers, ADC and DAC, Application specific control, Display units, Keypads, DSP. Microcontroller and their applications, Communication interfaces: Serial interface, IEEE 1394, USB Infra red, Ethernet and PCI bus.

## Unit III

Embedded system development process: requirement, system architecture, opening system and processes: Development platform and tools, HLL support Cross compilers, Linux and Windows CE based development Tools. Mobile/handheld systems.

## Unit IV

Basic idea of embedded system applications : mobile networks, GPS , Real time system, Database application, Networked and JAVA – enabled information appliances, Mobile JAVA applications.

### Reference Text Books :

- [1] Frank Vahid, Tony Givargis; Embedded System Design, 2006; John Wiley.
- [2] David E. Simon : An Embedded Software Primer; 4th 2007; Pearson Education.
- [3] MalVano: Thomson; Embedded Microcomputer Systems.
- [4] Elecia White: Making Embedded Systems, , O'Rielly

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# MCA B05 : Big Data System

## UNIT I

Introduction to big data: Types of Digital Data, Introduction to Big Data and its importance, definition and taxonomy, Drivers of Big data, Big Data and Big Data Analytics, Overview of big data analytics, IBM Big Data, Classification of Analytics, Top Challenges Facing Big Data, Responsibilities of data scientists, Big data value for the enterprise, Big data applications in healthcare, medicine, advertising etc.

## UNIT II

Technologies and tools for big data analytics, Introduction to MapReduce/Hadoop, Data analytics using MapReduce/Hadoop, Data visualization techniques, Spark, Hadoop Architecture, Big Data – Apache Hadoop & Hadoop EcoSystem, Moving Data in and out of Hadoop, Understanding inputs and outputs of MapReduce, Data Serialization, Querying big data with Hive, Introduction to the SQL Language - From SQL to HiveQL, using Hive to query Hadoop files

## UNIT III

Hadoop Storage: Hadoop Versus SQL, HDFS (Hadoop Distributed File System), Design of HDFS, HDFS Concepts, Command Line Interface, Hadoop file system interfaces, Data flow, Data Ingest with Flume and Scoop and Hadoop archives, Hadoop I/O: Compression, Serialization, Avro and File-Based Data structures. Common Hadoop Shell commands, Anatomy of File Write and Read, NameNode, Secondary NameNode, and DataNode, Hadoop MapReduce paradigm, Map and Reduce tasks, Job, Task trackers, Cluster Setup, SSH & Hadoop Configuration, HDFS Administering, Monitoring & Maintenance, Managing Resources and Applications with Hadoop YARN, Interacting with Hadoop Ecosystem., Features of Hadoop, Hadoop Versions. Hadoop Distributions,

## UNIT IV

Theory and methods for big data analytics Selected machine learning and data mining methods (such as support vector machine and logistic regression), Statistical analysis techniques (such as conjoint analysis and correlation analysis), Time series analysis, Big data graph analytics Types of Analytics & Techniques, Open source technology for Big Data Analytics, Intelligence and Big Data, Data Base for the Modern Web, Predictive Analytics, Supervised, Unsupervised learning, Clustering Techniques, Predictive Analysis.

### Text/Reference Books :

- [1] Seema Acharya, Subhashini Chellappan "Big Data and Analytics (WINDY)", Wiley 2015
- [2] Boris Lublinsky, Kevin T. Smith, Alexey Yakubovich, "Professional Hadoop Solutions", Wiley, 2015.
- [3] Chris Eaton, Dirk deRoos et al., "Understanding Big data", McGraw Hill, 2012.
- [4] Alberto Cordoba, "Understanding the Predictive Analytics Lifecycle", Wiley, 2014.
- [5] Vignesh Pragaspati, "Big Data Analytics with R and Hadoop", Packet Publishing 2013.
- [6] Jay Liebowitz, "Big Data and Business Analytics", CRC press, 2013.
- [7] Frank J. Ohlhorst, Big Data Analytics: Turning Big Data into Big Money, Wiley, 2012.
- [8] Arvind Sathi, Big Data Analytics: Disruptive Technologies for Changing the Game, MC Press, 2012
- [9] Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.
- [9] Michael Mineli, Michele Chambers, Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley Publications, 2013.
- [10] Paul Zikopoulos, Dirk DeRoos, Krishnan Parasuraman, Thomas Deutsch, James Giles, David Corigan, "Harness the Power of Big Data The IBM Big Data Platform", Tata McGraw Hill Publications, 2012.

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# MCA C01 : Mobile Communication & Networks

## Unit I

Wireless communication :Cellular systems- Frequency Management and Channel Assignment-Types of Handoff and their characteristics, dropped call rates & their evaluation; MAC, SDMA, FDMA, TDMA, CDMA, Cellular Wireless Networks.

## Unit II

Wireless Networks: Wireless Sensor Networks- Principles and Characteristics, Constraints, Distributed Processing, Wireless LAN, IEEE 802.11 Standards, Architecture, Services, Mobile Adhoc Networks- WiFi and WiMAX, Wireless Local Loop.

## Unit III

Mobile Communication Systems : GSM-Architecture-Location Tracking and Call setup, Mobility Management, Handover-Security; GSM & SMS, International Roaming for GSM, Call Recording functions, Subscriber and Service Data Management; Mobile Number Portability; VoIP Service for Mobile Networks; GPRS -Architecture, GPRS Procedures-attach and detach Procedures-PDP Context Procedure-Combined RA/LA update procedures-Billing.

## Unit IV

Mobile Network and Transport Layers: Mobile IP, Dynamic Host Configuration Protocol, Mobile Ad Hoc Routing Protocols, Multicast routing, TCP over Wireless Networks, Indirect TCP, Snooping TCP, MobileTCP, Fast Retransmit / Fast Recovery, Transmission/Timeout Freezing, Selective Retransmission, Transaction Oriented TCP, TCP over 2.5 / 3G wireless Networks.

Application Layer :WAP Model, Mobile Location based services, WAP Gateway, WAP protocols, WAP User Agent Profile, Caching Model, Wireless Bearers for WAP, WML - WMLScripts- WTA- iMode- SyncML.

## TEXT/ REFERENCES BOOKS:

- [1] Jochen Schiller, "Mobile Communications", Second Edition, Pearson Education, 2003.
- [2] William Stallings, "Wireless Communications and Networks", Pearson Education, 2002.
- [3] Kaveh Pahlavan, Prasanth Krishnamoorthy, "Principles of Wireless Networks", 1st Edn., Pearson Education, 2003.
- [4] U. Hansmann, L. Merk, M.S. Nicklons & T. Stober, "Principles of Mobile Computing", Springer, 2003.
- [5] CSR Prabhu : "Mobile Computing- A Book of Readings"; Univ. Press.
- [6] C.K. Toh, "AdHoc Mobile Wireless Networks", 1st Edn., Pearson Education, 2002.

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## MCA C02 : Object Oriented Software Engineering

### Unit I

Introduction: Scope and Need of OO Software Engineering, Evaluation of Object Model, Elements of Objects Model. Unified Modeling Language, Basic Structures and Modeling Classes, Common Modeling Techniques, Relationship, Common Mechanism, Class Diagrams.

### Unit II

Advanced Structured Modeling, Advanced Classes and Relationship, Interfaces Types and Roles, Instance and Object Diagram. Basic Idea of Behavioral Modeling. Object-Oriented Concepts and Principles, Identifying Elements of Object Model. Object Oriented Projects Metrics and Estimation.

### Unit III

Design for Object-Oriented SYSTEMS, The System Design Process. Object Oriented Testing : Testing of OOA and OOD models, Object-Oriented testing Strategies, Inter class testing. Technical Metrics for OO Systems, Class Oriented Metrics, Metrics for OO Projects.

### Unit IV

Advanced Topics in Software Engineering : Software Reuse, Component based Software Engineering and Development. Classifying and Retrieving Components. Introduction to Distributed Software Engineering, Service Oriented Architecture, Aspect Oriented Software Engineering

#### Reference/Text Books :

- [1] Designing Flexible Object Oriented Systems with UML. By Charls Richter Techmedia.
- [2] UML users guide by Booch, Rumbaugh, Jacobson - Addison Wesley
- [3] Object Oriented Modeling and Design by Rumbaugh.
- [4] Object Oriented Analysis & Design - Practical Applications By Booch - Addison Wesley.

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## MCA C03 : Web Information Systems

### Unit I

Internet foundations: Fundamentals of network and hardware architecture for the Internet. Network protocols for the web, HTTP, DNS, and DHCP, client - server and peer to- peer architectures. Introduction to Web esigning: Hypertext Markup Language (HTML), Cascading Style Sheet(CSS), forms, and tables. XML and JavaScript.

### Unit II

Advanced Web Application Development: Development of web application using JDBC, Triggers, stored procedures, Use of Oracle DBMS through JDBC, Java servelets, Java Server Pages, and Java Database Connectivity (JDBC). Client-side scripting with JavaScript, Packaging and deployment of web applications.

### Unit III

Search and Design: Web Wide Search, Web Searching Overview, How Users Search, Search Engine Promotion, Optimizing Search Engine, The need for Local Search, The process of adding a search facility, Designing the search Interface, Advance Search-Form Design, Result-Page Design.

### Unit IV

Site Maps and Indexes: Site Map, Designing Site Map showing Scope and Destination Choice, Producing Site Map. Benefits of Geographical Navigation: Site Indexes, Tours. The Features of Web Design: The Near Feature, Rise Of Broadband, Effects of Community, Contents Overloads Issue, The Web Life Style.

#### Reference/Text Books :

- [1] Thomas A. Powell, "The Complete Reference Web Designing", TMH.
- [2] Jamel Jawarski, " Java 2 Unlimited".
- [3] Alumarai, " Professional Java Server Programming".

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# MCA C04 : Automata Theory

## UNIT I

Review of Mathematical Background Sets, Functions, Logical statements Proofs, Relations, Languages, Principle of Mathematical induction, Recursive definitions, Structural Induction, Graphs, Trees, Strings, finite State Machine, types of languages and Grammars. Overview of Theoretical Computer Science (including computationally intractable problems), Introduction to System software including various phases / Modules in the design of a typical compiler, Chomsky Classification.

## UNIT II

Finite Automata Regular expressions, Regular languages, Memory required to recognize a language, Finite automata, Deterministic Finite Automata (DFA), Distinguishable strings, Union, intersection and complement of regular languages, Non-Deterministic Finite Automata (NFA), statement of Kleen's Theorem, Regular Expressions, Equivalence of DFAs, NFAs and Regular Expressions, Closure properties of Regular Language, Non-Regular Languages, Finite State Machines: m/c with output Moore and Mealy machines. M/c as translators. Melay and Moore m/c conversion, Applications of Automata

## UNIT III

Context-Free Languages and Push-Down Automata, Parse Trees, Regular Grammars, Closure properties of CFLs, Derivation tree and ambiguity, An Unambiguous CFG, Simplified and Normal forms, Chomsky normal form Pushdown Automata and CFL Push -Down Automata, Definition and examples, Deterministic (single stack) PDA, Equivalence between PDA and CFG, Deterministic PDA, Types of acceptances and their equivalence, Introduction to parsing, Top-down and bottom-up parsing, Non-CFL and CFL, Pumping Lemma for CFL, Intersection and Complement of CFL, Context Free Language, Leftmost and Rightmost derivations, Ambiguity, Simplification and Normalization (CNF) and Chomsky Hierarchy (Types 0 to 3)

## UNIT IV

Turing Machine:, Turing Machines and Computability Theory, Definition of Turing Machine, Extensions of Turing machines, Turing Machine Models of computation, TM definition, Combining TMs, Computing a function with TMs, Variations on Turing Machines, Doubly infinite and more than one Tapes, Deterministic TM, Non-deterministic and Universal TM, Equivalence of various Turing Machine Formalisms, Church - Turing Thesis, Decidability, issues and concept of Halting Problem, Reducibility, Recursion Theorem, Multi-track and Multi-tape TMs, concept of UTM and idea of system program.

### Text/Reference Books :

- [1] John C. Martin, "Introduction to Languages and the Theory of Computation", McGraw-Hill, 2003
- [2] Dexter C. Kozen, "Theory of Computation: Classical and Contemporary Approaches", Springer, 2006
- [3] J. Hopcroft, R. Motwani, and J. Ullman, "Introduction to Automata Theory, Language and Computation", Pearson, 2008.
- [4] K. L. Mishra and N. Chandrasekharan, "Theory of Computer Science Automata Language Computation", PHI, 2006
- [5] J.C.Martin, "Introduction to languages and the Theory of Computation", TMH.
- [6] Kavi Mahesh, "Theory of Computation A Problem Solving Approach", Wiley India
- [7] John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, "Introduction to Automata Theory.
- [8] Languages and Computation", Pearson Education.
- [9] Daniel I.A. Cohen, "Introduction to Computer Theory", John Wiley & Sons.
- [10] Theory of Computation - By Vivek Kulkarni from Oxford University.

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# MCA C05: Parallel and Distributed System

## Unit-I

Introduction to parallel Computing, Solving problems in parallel, Structures of parallel computers, Parallel Models (SIMD, MIMD, PRAMs, Interconnection Networks); Performance Measures (Time, Processors, Space, Work); Interconnection Architectures (Linear Array, Meshes, Trees, Mesh of Trees, Hypercubes, Butterfly Networks, Cube Connected Cycles, Benes Networks).

## Unit-II

Parallel Algorithms, Parallel programming, Operating Systems for parallel computers. Instruction-level parallelism: Concepts of instruction-level parallelism (ILP), Techniques for increasing ILP; Pipelining: Basic concepts, instruction and arithmetic pipeline, data hazards, control hazards, and structural hazards, techniques for handling hazards.

## Unit-III

Basic concepts of Distributed System, Models of Distributed computation: shared memory and message passing systems, synchronous and asynchronous systems. Logical time and event ordering. Global state and snapshot algorithms, mutual exclusion, clock synchronization, leader election, deadlock detection, termination detection, spanning tree construction. Programming models: remote procedure calls, distributed shared memory.

## Unit-IV

Fault tolerance and recovery in Distributed Systems: basic concepts, fault models, agreement problems and its applications, commit protocols, voting protocols, check-pointing and recovery, reliable communication. Security and Authentication in Distributed Systems: basic concepts, Kerberos. Resource sharing and load balancing. Special topics: distributed objects, distributed databases, directory services, web services.

## Recommended References/Text Books

- [1] G. Coulouris, J. Dollimore & T. Kindberg, *Distributed Systems: Concepts and Design*, Addison-Wesley, 3rd ed, 2001.
- [2] M. Singhal & N. G. Shivaratri, *Advanced Concepts in Operating Systems*, McGraw Hill, 1994.
- [3] H. F. Jordan, *Fundamentals of Parallel Processing*, Pearson, 2004.
- [4] W. Buchanan, *Distributed Systems and Networks*, Tata McGraw Hill, 2004.
- [5] M. J. Flynn, *Computer Architecture: Pipelined and Parallel Processor Design*, Narosa Publishing House.
- [6] Kai Hwang, *Advanced Computer Architecture: Parallelism, Scalability, Programmability*, McGraw-Hill.
- [7] Mukesh Singhal and Niranjana Shivarami, *Advanced Concepts in Operating Systems*, McGraw-Hill.
- [8] Nancy Lynch, *Distributed Algorithms*, Morgan Kaufmann.
- [9] Andrew S. Tanenbaum, *Distributed Operating Systems*, ACM Press.
- [10] Jie Wu, *Distributed Systems*, CRC Press.
- [11] Hagit Attiya, Jennifer Welch, *Distributed Computing: Fundamentals, Simulations and Advanced Topics*, McGraw-Hill.
- [12] Sape Mullender (ed.), *Distributed Systems*, Addison-Wesley.

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## Practical Papers for MCA Semester-V (2021-2022)

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**Note:**

Each practical paper shall be of 4 hours duration on one day and carry 100 marks for the practical examination. The practical examination will involve 3 exercises, each of 20 marks, practical record of 15 marks and viva-voce examination of 25 marks.

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**Paper MCA 511 : ADA Lab**

Practical Lab : 6 Hours per Week (4 Credits)

Examination : Practical examination : 4 Hours

- Lab Exercise based on Theory Paper MCA 502

**Paper MCA 512: Wireless Technology Lab**

Practical Lab : 6 Hours per Week (4 Credits)

Examination : Practical examination : 4 Hours

- Lab Exercise based on Theory Paper MCA 503

**Note:** Each candidate have to give a Seminar (Power Point Presentation and its Report) on any topic related to latest IT/Computer Sc. /Mobile Technology in the presence of Assessment Committee of Internal and external examiners.

**Paper MCA 513: Mini Project**

Practical Lab : 6 Hours per Week (4 Credits)

Examination : Practical examination : 4 Hours

Technology : Use .NET/JAVA/JSP/PHP/Android/Web Technology.

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### Details MCA Vth Semester (2021-22)

Paper: Major Project

Maximum Marks : 100

#### Guidelines for preparing the Project Report

**I. Objective:** Student should able to develop a small real time application using any Programming Languages which is part of their course curriculum or any new upcoming Programming Language.

**II. Guidelines regarding project:**

1. Students should work in group. Minimum number of students in one group can be 2. Maximum number of students in one group can be 4.
2. Students will be working under supervision of one teacher.
3. Students will submit a synopsis of the project.
4. Two copies of the report should be submitted.
5. The reports should be spiral bound along with the soft copy of the project
6. The reports should be submitted with the following guidelines in the prescribed format.
  - a. Paper size : A4
  - b. Margins : Left 1.5, Right, Top and Bottom 1 inch
  - c. Font: Times New Roman
  - d. Chapter Heading : 16pt
  - e. Sub Heading : 14, Sub-Sub Headings: 12 Bold

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- Running Matter : 12 pt
- All topics should be numbered accordingly.
- Paragraph Gap : 6 Pt Maximum
- Line Spacing : 1.5

**III: Top Page**

<Title of Project Work>

Project report submitted in partial fulfillment of the requirement for the award of the Degree of Bachelor of Computer Application

By  
<Name of the Candidate>  
Roll No.  
Enrollment No. :  
Session: <Session>

<University Logo>

< Name of the Constituent/ Affiliated College>  
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**Second Page**

**Certificate**

This is to certify that the project report entitled ..... being submitted by Mr/Mrs..... in partial fulfillment for the award of the Degree of Bachelor of Computer Application to the University of Rajasthan is a record of bonafied work carried out by himself/herself under my guidance and supervision.

The results embodied in this project report have not been submitted to any other University or Institute for the award of any Degree or Diploma.

(HOD/Director)

Guide Name  
Designation

**Third Page**

The third page may include the Certificate given by Organization or Company where candidate has done his/her project.

**Fourth Page**

The fourth page should contain the declaration by the students (see the sample format)

**DECLARATION**

This is to certify that the work reported in the present project entitled "**Title Of The Project Work**" is a record of work done by me in the <Department Name>, <Name of the College/ Organization>. The reports are based on the project work done entirely by us and not copied from any other source.

Signature of Candidate  
<Mr. / Ms. Name of the Student >  
Class:  
Roll No.  
Enrollment No.  
Session:

*Raj / Tai*  
Dy. Registrar  
(Academic)  
University of Rajasthan  
JAIPUR

### **Fifth Page**

The fifth page may include the Acknowledgement.

### **Sixth and Seventh Page**

In this page, a table of contents, list of tables, list of figures must be provided.

### **Eighth Page**

The eighth page should contain an abstract of the Project report. The candidate may emphasize here his/her contributions in the project.

**NOTE: All the above pages are to be numbered in Roman numerals of lower case. Ex. i, ii, iii, iv, ... except the top page.**

The following is suggested format for arranging the project report matter into various chapters:

1. Introduction  
This chapter must describe introduction about your project.
2. Literature Survey/Review of Literature
3. Define the problem.  
Define the modules and their functionalities  
Hardware / Software requirements
4. System Design and Implementation  
/\* Actual Implementation of the problem should be described in this chapter. \*/

The design part must include the following items

- DFDs in case of Database projects
- UML diagrams. This UML diagrams must include the following
- Class Diagrams
- Interaction diagrams-Sequence and Collaboration diagrams
- Object Diagrams
- Use case diagrams
- Control Flow diagrams
- Database Design

In Case of a database projects, the report must include the following items.

- E-R Diagrams
5. Results and Discussions.
  6. Conclusions & Future Enhancements/Recommendations.
  7. References / Bibliography.
  8. Appendices (if any)

*fej / Vas*

Dy. Registrar .  
(Academic)

University of Rajasthan  
JAIPUR

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