UNIVERSITY OF RAJASTHAN
JAIPUR
SYLLABUS

Master of Computer Applications
(M.C.A.)
Semester Scheme

I/II Semester Examination 2019-20
III/IV Semester Examination 2020-21
V/VI Semester Examination 2021-22
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.(TT) or B.E./B'Tech. 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 candidate has to qualify the URATI G (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 points/marks obtained in the continuous assessment will not be included in the 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 a 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 'O', 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)
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

<table>
<thead>
<tr>
<th>Course Category</th>
<th>Contact Hours</th>
<th>Relative Weights</th>
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<tbody>
<tr>
<td>CCC: Compulsory Core Course</td>
<td>L: Lecture</td>
<td>IA: Internal Assessment (Attendance/</td>
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<tr>
<td>ECC: Elective Core Course</td>
<td>T: Tutorial</td>
<td>Classroom Participation/Quiz/Home</td>
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<tr>
<td>OEC: Open Elective Course</td>
<td>P: Practical or Other</td>
<td>Assignment etc.)</td>
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<tr>
<td>SC: Supportive Course</td>
<td>S: Self Study</td>
<td>EoSE: End of Semester Examination</td>
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<td>SSC: Self Study Core Course</td>
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<td>SEM: Seminar</td>
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<td>PRJ: Project Work</td>
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<td>RP: Research Publication</td>
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## MCA-First Semester 2019-20

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<tr>
<th>S.No.</th>
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<th>Subject Title</th>
<th>Course Category</th>
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<th>EoSE Duration (Hr)</th>
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<td>Database Management Systems</td>
<td>CCC</td>
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<td></td>
<td>MCA 103</td>
<td>Operating System Fundamentals</td>
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<td></td>
<td>MCA 104</td>
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<td>E-Commerce</td>
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<td></td>
<td>MCA 106</td>
<td>Discrete Mathematics</td>
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<td></td>
<td>MCA 111</td>
<td>Programming in C &amp; DS Lab</td>
<td>CCC</td>
<td>4</td>
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<td>MCA 112</td>
<td>DBMS Lab</td>
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Total Credit 36

*EoSE- End of Semester Examination

## MCA-Second Semester 2019-20

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<th>S. No.</th>
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<td>Object Oriented Programming</td>
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<td>2</td>
<td>MCA 202</td>
<td>Using C++</td>
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<td>3</td>
<td>MCA 203</td>
<td>Data Communication and</td>
<td>CCC</td>
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<td></td>
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<td>Computer Networks</td>
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<td>4</td>
<td>MCA 204</td>
<td>Web Design and Development</td>
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<td>5</td>
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<td>Methods</td>
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<td>7</td>
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<td>8</td>
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<td>CCC</td>
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<td>9</td>
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</table>

Total Credit 36

*EoSE- End of Semester Examination

[Signature]

Dy. Registrar
(Academic)
University of Rajasthan
Jaipur
### MCA-Third Semester 2020-21

<table>
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<tr>
<th>S. No.</th>
<th>Subject Code</th>
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<td>MCA 301</td>
<td>Data Warehousing &amp; Data Mining</td>
<td>CCC</td>
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<tr>
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<td>Application Development Using .NET Frame Work</td>
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<td>2</td>
<td>MCA 303</td>
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*EoSE- End of Semester Examination*

### MCA-Fourth Semester 2020-21

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<tbody>
<tr>
<td>1</td>
<td>MCA 401</td>
<td>Advanced Java Programming &amp; Technology</td>
<td>CCC</td>
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<tr>
<td>2</td>
<td>MCA 402</td>
<td>Advanced Database Systems</td>
<td>CCC</td>
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<td>Elective-1 (Any One in Elective Group-1)</td>
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<td>8</td>
<td>MCA 412</td>
<td>Advanced DBMS Lab (Oracle/DB2/MySQL)</td>
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*EoSE- End of Semester Examination,  **: Please see the List of Elective papers (Elective-1)*

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Dy. Registrar (Academic)
University of Rajasthan, Jaipur
### MCA-Fifth Semester 2021-22

<table>
<thead>
<tr>
<th>S.No</th>
<th>Subject Code</th>
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<tbody>
<tr>
<td></td>
<td>MCA 501</td>
<td>Information Security &amp; Cryptography</td>
<td>CCC</td>
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<td>MCA 502</td>
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<td></td>
<td>MCA 503</td>
<td>Wireless Technology</td>
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<td>MCA 504</td>
<td>Simulation &amp; Modeling</td>
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Total Credit: 36

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

### MCA-Sixth Semester 2021-22

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<th>S. No</th>
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<tr>
<td>1</td>
<td>MCA 6P3</td>
<td>Major Project: Minimum Four Months in an Organization approved by the Director/Head of the Centre/Department</td>
<td>CCC</td>
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*EoSE: End of Semester Examination

### Elective Papers

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<th>Elective Course Code</th>
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<th>Subject Title</th>
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<td>MCA A01</td>
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<td>Compiler Design</td>
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<td>MCA A02</td>
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<td>Network Management</td>
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<td>MCA A03</td>
<td>ECC</td>
<td>Computer Based Optimization Techniques</td>
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<td>MCA A04</td>
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<td>Multimedia Systems</td>
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<td>Elective-2 (Any one)</td>
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<td>ECC</td>
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<td>MCA B02</td>
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<td>Natural Language Processing</td>
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<td>ERP Systems</td>
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<td>MCA B04</td>
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<td>Embedded Systems</td>
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<td>MCA C02</td>
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<td>MCA C03</td>
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<td>Web Information System</td>
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<td>MCA C06</td>
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<td>Parallel &amp; Distributed System</td>
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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:
4. Deitel HM & Deitel JP; C How to program; 5th Edn; Pearson Pub.
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:
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.

Unit-III

Unit-IV


Reference Books:
MCA-104: Computer Architecture

Unit-I
Logic gates, basic combinational logic, Boolean functions & Expressions, multiplexer, decoders, encoders, comparators, adder and substructures, 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:
3. Melvin B.; Digital Computer Electronics (II Edition; TMHL
MCA 106: Discrete Mathematics

Unit-I

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, planner 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:
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
Electronic Payment Systems: Special features required in payment systems, tapes 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

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

Reference/Text Books:
2. Devi Ramchand, A.B. Whinston, Frontiers of electronic Commerce Pearson Education,

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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.
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
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, contained 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
6. Deitel and deitel; How to program C++, Addison Wesley, Pearson Education Aisa

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MCA 202: Data Communication and Computer Network

Unit-I
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 RMNv2, 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:
6. M.A. Miller, Data and Network Communications, Thronmen Learning
7. Glitenfeld, Understanding Data Communication, Technedia.
8. Fred Harshall, Data Communications Communications, Networks, Pearson Education Asia.
MCA 202: Data Communication and Computer Network

Unit-I
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 MW in communications; PM Microwave Radio Repeaters, Satellite- Artificial Satellite, Geosynchronous Satellites, Orbit 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).
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Issue related to network reliability and security, SSL and VPN, Introduction only to firewalls and Kerberos, Cyber Laws.

Recommended Books:
5. Wayne Thomas, Data Communications Systems, Pearson, Education Asia.
6. M.A. Miller, Data and Network Communications, Thomson Learning
7. Gilbert Held, Understanding Data Communication, Technedia.
8. Fred Halsh, Data Communications Communications, Networks, Pearson Education Asia.
MCA 203: Web Design and Development

Unit-I

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 Curation 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 to Internet; 2nd Edition; Tata McGraw Hill, 2006
4. Harley Hahn: the Internet, Tau Nic Crrow Hill.
5. C. Kerinson; Hands on HTML., BPE Publication
7. Joel Sklar Principles of Web Design BPB 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
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.
MCA-205 – Computer Oriented Numerical Methods

Unit-I

Unit-II

Unit-III

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:
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.


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 runnable interface, thread scheduling.

Unit-IV


Reference Text Books:

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.
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 Matting 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, Dieselization and Concept Hierarchy Generation; Analysis of Attributes Relevance. Discriminating between Different Classes. Data Warehouse and OLAP Technology for Data Mining.

Unit-III


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:
[6] Data Mining Introductory and advanced topics- M.H.Dunham, Pearson Education.

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Page 21
MCA 302 : Application Development Using .NET Frame Work

Unit-I


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.


Unit-IV


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:

[5] Steven Holzner: ASP.NET 4.0 (Cover C# & VB ) Black Book; Dreamtech Press.
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

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, P. Stottc, Wrox, Wiley India Ed
[5] Linux System Programming, Robert Love, O’Reilly SPD.
MCA-304: System Analysis and Design Concepts

Unit-I

Unit-II

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

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.


References/Text Books:
[7] Robert McDick; Management Information System; PHI.
MCA 305 : Computer Graphics

Unit-I

Unit-II

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 clipper 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:
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:

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 75 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
MCA 404: Cloud Computing

Unit-I

Unit-II

Unit-III

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:
MCA 403 : Software Engineering

Unit-I

Unit-II
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

Text/Reference Books :
[3] Sommerville Ian; Software Engineering, 8th Ed. Pearson Education
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.

Unit-II
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 Interfaces, Event Handling, Screens, List and Forms, J2ME-Overview, MIDlets, Create User Interface, Event Handling with Command Tickers, Screen, Text Box, List and Forms.
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 Tags, JSP Capabilities - Exception Handling, Session Management, Directives, JSP with JavaBean.

Unit-IV

Reference Text Books:

Dy. Registrar
(Academic)
University of Rajasthan
JAIPUR
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.

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.

Text/Reference Books :
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*, A0*, 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.

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:
[3] Introduction to AI & Expert Systems, Patterson, 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 (1), 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

Recommended reference/text books:
MCA A02: Network Management

Unit I

Unit II


Unit III

Unit IV

Text/Reference Books:

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MCA A03: Computer Based Optimization Technique

Unit-I


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


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

Text/Reference Books:

MCA A04 : Multimedia Systems

Unit—I

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-1 and 2, MPEG Video Coding II - MPEG-4, DVI and Beyond.

Unit—III

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. Prabhuk K. Adileigh, Kirit Thakrar; Multimedia System Design; PHI
2. Ralf Steinmetz, Klaus Nahrstedt; Multimedia : Computing, Communication & Applications; Pearson Education

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Practical papers for MCA Semester -IV (2020-2021)

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.

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
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

Unit II

Unit III

Unit IV

Reference/Text Books:
1. Willium Stallings; Cryptography and Network Security. Fifth Edn, Pearson;
3. V.K. Pragahara; Cryptography and Information Security; PHI.
MCA 502: Analysis and Design of Algorithms

Unit I

Unit II
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:
MCA 503: Wireless Technology

Unit I

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 & Interface Signal Processing in GSM, Frame Structure of GSM, Channels used in GSM.

Unit III
Wireless LAN Technology: Overview, WLAN Technologies, Infrared LANs, Spread Spectrum LANsNarrowband, Microwave LANsIEEE 802.11- Architecture, Protocols, MAC layer, MAC frame, MAC Management.

Unit IV
Mobile Data Networks: Introduction, Data oriented CDPD Networks, GPRS.

Reference/Text Books:
MCA 504: SIMULATION & MODELING

Unit I
System Models: Concept, Environment, Continues 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.

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 Assembly, Telephone system, Inventory system & Supermarket.

Reference/Text Books:
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:


Text/Reference Books:
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

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:

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

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
MCA B04: Embedded Systems

Unit I

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.

References/Text Books:
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 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 :

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

Unit III

Unit IV

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:
MCA C02 : Object Oriented Software Engineering

Unit I

Unit II

Unit III

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 :
[2] UML user's guide by Booch, Rumbaugh, Jacobson –Addison Wesley

MCA C03 : Web Information Systems

Unit I

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

Unit IV

Reference/Text Books :

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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 finite 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:
[8] Languages and Computation", Pearson Education.
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
Practical Papers for MCA Semester-V (2021-2022)

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.

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.

Details MCA VIth 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: 1.4, Sub-Sub headings: 12 Bold
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>

University of Rajasthan

Jaipur

Second Page

Certificate

This is to certify that the project report entitled .......... being submitted by Mr/Mrs........ in partial fulfilment 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:

Dy. Registrar

(Academic)

University of Rajasthan

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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.
7. References / Bibliography.
8. Appendices (if any)