University of Rajasthan Jaipur

SYLLABUS

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

(Two Year Course)

(Semester Scheme)

I & II Semester Examination   2020-21

III & IV Semester Examination   2021-22

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Eligibility:

(a) MCA Semester I :

Passed BCA/Bachelor Degree in Computer Science/Engineering or equivalent Degree.

OR

Passed B.Sc./B.Com./B.A. with Mathematics at 10+2 Level or at Graduation Level (with additional Bridge Courses as per the norms of the concerned University).

Obtained at least 50% marks (45% marks in case of candidates belonging to reserved category) in the qualifying Examination.
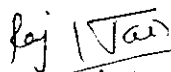
(b) Bridge Course [For students other than BCA/Bachelor Degree in Computer Science/Engineering or equivalent Degree] : It is an additional and compulsory course for Non Computer Graduates. No Marks of Bridge Course will be added in calculation of CGPA and percentile. It is mandatory for the student to pass this Course in order to have basic knowledge of computer science and secure the degree.

(c) In addition to the above qualification, a candidate has to qualify the URATPG (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 (Four Semesters in two 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 MCA Degree, a candidate is required to earn 120 credits in FOUR semesters (Two Years) , out of total 144 credit points (36 credits per semester), with grade E or higher. Each student has to earn minimum 30 credits per semester (i.e. 120 credits in four semesters for MCA degree) with grade E or higher.

➤ Each semester of MCA course shall have 36 credits. There will be three core papers, three elective papers (4 credits each), two core laboratory and one elective laboratory (4 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 (SGPA). 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 fulfill 75% of attendance requirement, or (ii) he/she fails to secure a Semester Grade Point Average (SGPA) of 1.5 in the continuous assessment.

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> 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 digit 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)

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) with internal choice within the unit.

2. Each **Practical paper** (CCC & ECC) shall be of 3 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.
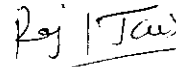
Abbreviations Used :

Course Category
CCC: Compulsory Core Course
ECC: Elective Core Course
OEC: Open Elective Course
SSC: Self Study Core Course
SEM: Seminar
PRJ: Project Work

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

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

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MCA-First 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 101	Object Oriented Programming Through Java	CCC	4	3	1	0	3	0
2	MCA 102	Operating Systems	CCC	4	3	1	0	3	0
3	MCA 103	Database Management Systems	CCC	4	3	1	0	3	0
4	MCA 104	Computer Architecture	ECC	4	3	1	0	3	0
5	MCA 105	Web Application Development	ECC	4	3	1	0	3	0
6	MCA 106	Discrete Mathematics	ECC	4	3	1	0	3	0
7	MCA 111	Java Lab	CCC	4	0	0	6	0	3
8	MCA 112	DBMS Lab	CCC	4	0	0	6	0	3
9	MCA 113	Web Application Development Lab	ECC	4	0	0	6	0	3
		Total Credit		36					

Bridge Course [For students other than BCA/Bachelor Degree in Computer Science/Engineering or equivalent Degree] : It is an additional and compulsory course for Non Computer Graduates. No Marks of Bridge Course will be added in calculation of CGPA and percentile. It is mandatory for the student to pass this Course in order to have basic knowledge of computer science and secure the degree.
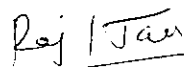
1	MCA BC1	Computer Fundamentals	CCC	-	3	-	-	3	
2	MCA BC2	Programming Through C&C++	CCC	-	3	-	-	3	
3	MCA BC3	Office Automation & Programming Lab	CCC	-	-	-	6	-	3

*EoSE- End of Semester Examination

MCA-Second 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 201	Programming in Python	CCC	4	3	1	0	3	0
2	MCA 202	Advanced Java Programming	CCC	4	3	1	0	3	0
3	MCA 203	Data Communication and Computer Networks	CCC	4	3	1	0	3	0
4	MCA 204	Algorithms and Data Structures	ECC	4	3	1	0	3	0
5	MCA 205	Software Engineering	ECC	4	3	1	0	3	0
6	MCA 206	Data Warehousing & Data Mining	ECC	4	3	1	0	3	0
7	MCA 211	Python Lab	CCC	4	0	0	6	0	3
8	MCA 212	Advanced Java Lab	CCC	4	0	0	6	0	3
9	MCA 213	Data Structures Lab	ECC	4	0	0	6	0	3
		Total Credit		36					

*EoSE- End of Semester Examination .

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MCA-Third 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 301	Cloud Computing	CCC	4	3	1	0	3	0
2	MCA 302	.NET Frame Work and ASP.NET	CCC	4	3	1	0	3	0
3	MCA 303	Mobile Application Development	CCC	4	3	1	0	3	0
4	MCA 304	Artificial Intelligence	ECC	4	3	1	0	3	0
5	MCA **	Elective - 1(Any One in Elective Group –1)	ECC	4	3	1	0	3	0
6	MCA ***	Elective - 2(Any One in Elective Group –2)	ECC	4	3	1	0	3	0
7	MCA 311	.NET Lab	CCC	4	0	0	6	0	3
8	MCA 312	Mobile Application Development Lab	CCC	4	0	0	6	0	3
9	MCA 313	Communication and Soft Skill Lab	ECC	4	0	0	6	0	3
		Total Credit		36					

*EoSE- End of Semester Examination.
/*: Please see the List of Elective papers (Elective-1 and Elective-2 corresponding)

MCA-Fourth Semester 2021-22

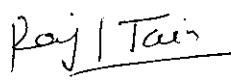| S. No.	Subject Code	Subject Title	Course Category	Credit	Contact Hours per Week			EoSE* Duration (Hrs)	
					L	T	P	Thy	P
1	MCA 401	Analysis and Design of Algorithms	CCC	4	3	1	0	3	0
2	MCA **	Elective - 3(Any One in Elective Group –3)	ECC	4	3	1	0	3	0
3	MCA 411	ADA Lab	CCC	4	0	0	6	0	3
4	MCA ***	Elective - 4(Any One in Elective Group –4)	ECC	4	0	0	6	0	3
5	MCA 413	Industrial Project : Minimum Two Months in an Organization approved by the Director/Head of the Centre/Department	CCC	20	0	0	30	0	3
		Total Credit		36					

*EoSE- End of Semester Examination
/*: Please see the List of Elective papers (Elective-3 and Elective-4 corresponding)

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Elective Papers

Elective Course Code	Course Category	Subject Title	Prerequisite	Semester
Elective-1 (Any one)				
MCA A01	ECC	Big Data Analytics	-	III
MCA A02	ECC	E-Commerce	-	III
MCA A03	ECC	Computer Graphics	-	III
MCA A04	ECC	Computer Oriented Numerical Methods	-	III
Elective-2 (Any one)				
MCA B01	ECC	Theory of Computation	-	III
MCA B02	ECC	Soft Computing	-	III
MCA B03	ECC	Computer Based Optimization Techniques	-	III
MCA B04	ECC	Cryptography & Network Security	-	III
Elective-3 (Any one)				
MCA C01	ECC	Data Science with R	-	IV
MCA C02	ECC	Machine Learning	-	IV
MCA C03	ECC	Digital Marketing	-	IV
MCA C04	ECC	Open Source Operating System	-	IV
Elective-4 (Any one)				
MCA D01	ECC	Data Science with R Lab	-	IV
MCA D02	ECC	Machine Learning Lab	-	IV
MCA D03	ECC	Digital Marketing Lab	-	IV
MCA D04	ECC	Open Source Operating System Lab	-	IV

Note: Student have to take any one subject in Elective Group-3 and also have to take one elective lab of same subject from the Elective Group-4.

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Bridge Course Syllabus

MCA BC1 : Computer Fundamentals

Theory & Tutorial: 4 hours per week
Examination: Theory Paper – 3 hours; Max. Marks – 100, Passing Marks - 40
Note:
1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question(may have sub parts) from each unit. There will be an internal choice within the unit.

UNIT- I

Introduction to Computer: Characteristics of computers, Evolution of computer, generation of computers, classification of computers, applications of computers.

Input and Output Devices: Keyboard, pointing devices, speech recognition, digital camera, scanners, optical scanners(OMR,OCR,MICR). Output devices - printers, plotters, microfilm, monitors, audio output, projectors, and terminals.

Computer System: Central processing unit (CPU), Memory, instruction format, instruction set.

Primary and Secondary Memory: Memory hierarchy, Random access memory (RAM), types of RAM, Read only memory (ROM), types of ROM. Classification of secondary storage devices, magnetic tape, magnetic disk, optical disk.

UNIT- II

Number Systems: Introduction to number system, Decimal, Binary, Octal, Hexadecimal, conversion between number bases, Arithmetic operations on binary numbers, Codes-BCD, EBCDIC, ASCII and Unicode.

Computer Software: Software definition, relationship between software and hardware, software categories, system software, application software, utility software.

Computer Languages: Introduction, classification of programming languages, generations of programming languages, features of a good programming language, Translators/ Language processors.

UNIT- III

Operating System: Introduction of operating system, types of operating system, functions of an operating system, modern operating systems.

Data Communication and Computer Network: Introduction, data communication, transmission media, multiplexing, switching, Types of Network- LAN,MAN & WAN, network topologies, communication protocols, network devices.

Internet Basics: Introduction, evolution of Internet, basic Internet terms, getting connected to Internet, Internet applications, electronic mail and other Internet Services, searching the web (search engines), languages of Internet, viruses. Use of Anti-Virus software.

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UNIT-IV

Office Management Tools:

MS-Word: Creating and Editing documents, Page formatting, Finding and replacing text, Spell & Grammar checking, Indexing, Tables and feature there in, Inserting (Objects, picture, files etc.), Using Graphics, using Mail Merge.

MS Excel: Spreadsheet terminology, organization of the worksheet area, editing cells using commands and functions, formatting worksheet, creating & editing charts, naming range and using statistical, mathematical and financial functions, multiple worksheets and Macros.

MS Power Point: Anatomy of a power Point Presentation, Creating and Viewing a presentation, Managing Slide Shows, Using hyperlinks, advanced navigation with action setting and action buttons, organizing formats with Master Slides, adding graphics, multimedia and special effects, creating presentation for the web.

MS Access: Planning a database (tables, queries, forms, reports), Creating and editing database, customizing tables, linking tables, designing and using forms, modifying database structure, maintaining database, Sorting and Indexing database, Querying a database and generating Reports.

Recommended Text / Reference Books:

1. Computer Fundamentals by P.K. Sinha, BPB Publication.
2. Fundamental of Computers Anita Goel, PearsonEducation.
3. Rajaraman V.–FundamentalofComputers,PrenticeHallofIndiaPvt.Ltd.
4. Computer Fundamentals and Programming in C,Reema Thareja,OXFORD University Press.
5. Introduction to Computer,Peter Norton's, Tata McGraw Hill Publication.
6. MS-Office , Dr. S.S. Shrivastava, Published by Laxmi Publication.
7. Office 2019:In Easy Steps,Michal Price ,BPB Publication.

MCA BC2: Programming Through C & C++

Theory & Tutorial: 4 hours per week
Examination: Theory Paper – 3 hours; Max. Marks – 100, Passing Marks - 40
Note:
1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question(may have sub parts) from each unit. There will be an internal choice within the unit.

UNIT- I

Computer Program: Introduction, developing a program, algorithm, flowchart, pseudo code.
Basics of C: C Character set, tokens, variables and constants, keywords, Type casting, Scope and lifetime of variables, data types. Operators, Instructions, comment statements, simple input and output.

Control and Looping Structures : decision control structure, loop control structure, switch-case control structure,
Arrays: Introduction, types of arrays and String Handling Functions.

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Functions : Functions, function prototype, subroutines, scope and lifetime of identifiers parameter passing mechanism, recursion.

User defined data types: typedef, enumerated data types, union, structure, array of structures, Pre-processors, header files and standard library functions.

Pointer: Definition and uses of pointer, pointer arithmetic, pointers and arrays, pointers and function.

Input/Output: Console Input and Output functions, data files, operations on data files, text and binary files.

Unit- III

Introduction to OOP: Essentials of OOP : Objects, Classes, Encapsulation, Data abstraction, Inheritance, Reusability, Polymorphism, Delegation, Message Communication.

Basics : Preprocessors, comments, Data types, Operators, Control and Loops Structures, Arrays and String handling, Modular programming with Functions, Structure and Unions.

Class and Object : Pointer and Run time binding, Dynamic memory allocation, Storage class, access specifiers, Class, Member functions, member data, Objects, Constructors, Destructors, Inline member functions, Friend Functions, Static member function, Arrays of objects, Pointers and their uses.

Inheritance: Definition, Types of inheritances, types of derivations and their implementations, container classes, member access control.

Unit-IV

Polymorphism: Functions Overloading, Operator Overloading, early binding polymorphism with pointers, Unary and Binary Operator Overloading, Overload Assignment Operator.

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

Exception handling: Exception handling mechanism- try, throw & Catch.

Recommended Text / Reference Books:

1. Balagurusamy E; Programming in ANSI C;Fifth Edn; Mc Graw Hill.
2. Kanetkar Y.; LET US C; X Edition, BPB.
3. Gottfried B; Programming with C: Schaum Outlines; Mc Graw Hill Edition.
4. Deitel HM & Deitel JP; C/C++ How to program; 5th Edn; Pearson Pub.
5. Balagurusamy ; Object Oriented Programming in C++; 4th Edition TMH,2009.
6. Venugopal, Rajkumar; Mastering C++; Tata Mcgrow Hill, 2006.
7. Kanetkar Y.; LET US C++; BPB; 2009.

Practical Examination :

Each practical paper shall be of 3 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.

MCA BC3: Office Automation and Programming Lab
Practical Lab
Examination: Practical Examination
Lab Exercise on Theory Paper MCA B01 and MCA B02

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Course Contents in Detail - MCA I Semester   2020 -21

Note :

1. Papers MCA 101, MCA 102, MCA 103, MCA 111 and MCA 112 are compulsory(CCC) and Papers MCA 104, MCA 105, MCA 106 and MCA 113 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 101 : Object Oriented Programming Through Java

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100
Note:

1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question(may have sub parts) from each unit. There will be an internal choice within the unit.

Unit-I

Introduction to OOP : Basic concepts of Object Oriented Programming , Objects and Classes, Data abstraction and Encapsulation, Inheritance, Polymorphism, Dynamic binding, Message communication: Benefits & applications of OOP.

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.

Inheritance : Define a subclass, deriving a sub class, Single Inheritance, Multilevel Inheritance, Hierarchical Inheritance, Overriding methods, Final variables and methods, final classes, Finalize 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.

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

Exception 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 treads, life cycle 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 it uses, Applet life cycle, 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.

Recommende Books:

1. Herbert Schildt, "Java: The Complete Reference", 11th Edition, McGraw-Hill, 2019.
2. E. Balagurusamy, "Programming with Java: A Primer", 6th Edition, Tata McGraw-Hill, 2019.
3. H.M.Deitel, P.J.Deitel, "Java: how to program", Fifth edition, Prentice Hall of India.
4. Cay Horstmann, Gary Cornell; Core Java Fundamentals – Volume I and II;; Pearson Education.
5. Khalid A. Mughal, Rolf W. Rasmussen; A Programmer's Guide to Java Certification (2nd Edn.).

MCA 102 : Operating Systems

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:
1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

Basic Concepts : 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, Threshing, Page Size and other considerations, Demand segmentation, File systems, secondary storage Structure, File concept access methods, directory implementation, Efficiency and performance recovery.

Disk Structure and Scheduling : Disk structure, Disk scheduling methods, Disk management , Recovery Disk structure, disk structure, disk scheduling methods, disk management, Swap-Space management, Disk reliability.

Unit-IV

Protection and Security :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.

Recommended Text / Reference Books:

1. Galvin P.B, Silberschatz; Operating System Principles; (Seventh Edition),J Wiley 2018
2. Tanenbaum A.S, Modern Operating Systems, 2nd Edn. PHI Publ,2006
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. Dhamdhere: Systems Programming and Operating Systems (Second Edition), Tata McGraw Hill Publishing company Limited.
6. Harvey M. Deitel, Operating Systems, Pearson Education.

MCA 103: Database Management System

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note: 1.

1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

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Unit-I

Overview of DBMS: Basic concepts, DBMS v/s File system, Database system architecture, Schemas, Instances, Components, Database users, Three-tier architecture, Client/Server architecture, Data independence, Database models.

Data modeling using the Entity Relationship Model :Data Modeling using ER Model, ER diagram, mapping constraints, Keys, Types of Keys, Generalization, aggregation, reduction of ER diagrams to tables, Integrity Rules, Dependency and its types, Data Dictionary, Normalization (1NF, 2 NF, 3NF, BCNF), inclusion dependencies, loss less join decompositions, Dr. E.F. Codd's Rules.

Unit-II

Transaction Management : Transactions: Concepts, ACID Properties, States Of Transaction, Serializaibility, Isolation, conflict & View Serializable Schedule, Checkpoints, Deadlock Handling.

Database Querying: Relational Algebra, Set Operations, Relational Calculus, Steps In Query Processing, Algorithms For Selection, Sorting And Join Operations, Understanding Cost Issues In Queries, Query Optimization, Transformation Of Relational Expressions, Query Evaluation Plans.

Unit-III

SQL and PL/SQL : Introduction to SQL: Characteristics of SQL, Advantages of SQL, SQL data types and literals, Types of SQL commands, SQL operators, Tables, views and indexes, Constraints, Group By and Having Clause, Order By Clause, Queries and sub queries, Functions-string, date, numeric, aggregate, Join, **PL/SQL** basics, blocks, architecture, variables, constants, attributes, character set, PL/SQL control structure, data types, conditional and sequential control statements, cursors, exceptions, triggers, functions, procedures and packages.
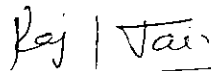
Unit-IV

Concurrency Control: Locks Based Protocols, Time Stamp Based Protocols, Validation Based Protocol, Multiple Granularity, Multi-version Schemes.

Recovery System & Security : Failure Classifications, Recovery & Atomicity, Log Base Recovery, Recovery with Concurrent Transactions, Shadow Paging, Failure with Loss of Non-Volatile Storage, Backup, Introduction to Security & Authorization.

Emerging Databases: Introduction to emerging Databases-OODBMS, ORDBMS, Distributed database, Multimedia database ,Special database-limitations of conventional databases, advantages of emerging databases.

Recommended Text / Reference Books:

1. Korth H F and Silberschataz A, System Concepts, Sixth Edition; McGraw Hill,2010
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 2011.
5. Ramakrishan and Gharke, Database Management Systems, 3rd Ed, Tata McGraw Hill, 2007.
6. Data C J Database Management Systems, 8th Edn,Pearson Education Asia.
7. Singh S.K.; Database Systems; I Edition; Pearson, 2006.
8. Thomas Connolly and Carolyn Begg, "Database Systems: A Practical Approach to Design, Implementation, and Management, Addison Wesley, 6th Edition, 2014.

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MCA-104: Computer Architecture

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:
1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

Basic Building Blocks :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.

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

Unit-II

Instruction and Addressing : 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.

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-III

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.

Unit-IV

Vector and Array Processing: Shared-Memory, Multiprocessing, Distributed Multi Computing.

Microprocessor Concepts: Pin Diagram of 8085, Architecture of 8085, Addressing Mode of 8085, functional block diagram of 8085 assembly language, instruction set of 8085.

Recommended Text / Reference 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,2017
3. Malvino B ; Digital Computer Electronics III Edition; TMHL

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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.
6. David A. Patterson and John L. Hennessy, Computer Organization and Design: The Hardware/Software Interface, Fifth Edition, Morgan Kaufmann / Elsevier, 2014.
7. William Stallings, Computer Organization and Architecture – Designing for Performance, 8th Edition, Pearson Education, 2010.

MCA 105: Web Application Development

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:
1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

Introduction to Web Concepts and WWW : 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 and Web site Planning.

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, ordered lists and unordered lists, basic HTML/XHTML tables: intermediate tables and formatting, forms, more complex forms, internal linking, creating and using image maps.

Unit-II

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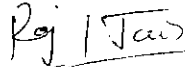
Java script arrays: introduction, array declaring and allocating memory, passing arrays to functions, multiple subscripted arrays. java script objects-introduction, math, string, data, Boolean and number objects etc.

Unit-III

CSS: introduction – inline styles, creating style sheets with the style element, conflicting styles, linking external style sheets, positioning elements, backgrounds, element dimensions, text flow and the CSS box model, user style sheets, Filter and Transitions, HTML DOM, Browser BOM.

Event model : introduction, event ON CLICK, event ON LOAD – error handling with ON ERROR, tracking the mouse with event, more DHTML events.

Introduction to PHP &Web Server Architecture : Overview of PHP Capabilities, PHP HTML embedding tags & syntax, Simple script examples, PHP & HTTP Environment variables. PHP Language Core-Variables, Constants, Data Types, PHP: Operators, Flow Control & Loops,

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Unit-IV

PHP &Web Server Architecture : Arrays, String, Functions Include & require statements, Simple File & Directory Access Operations, Error handling, Processing HTML form using GET, POST, REQUEST, SESSION, COOKIE variables, Sending E-mail, Database Operations with PHP, Connecting to My-SQL (or any other database), Selecting a db, building & Sending Query, retrieving, updating & inserting data, CMS: Wordpress. Note: XAMMP is used for PHP. WordPress: Introduction & Installations.

Recommended Text / Reference Books:

1. Jennifer Robbins , "Learning Web Design: A Beginner's Guide to HTML, CSS, JavaScript, and Web graphics", O'reilly, 2018
2. Adrian W. West ," Practical Web Design for Absolute Beginners", 2016
3. Harvey M. Dietel, Paul Dietel& Tem R. Nieto, ", Internet& World Wide Web How to Program", Pearson, 2011
4. Ivan Bayross. "Web enabled commercial application development using HTML, DHTML, JavaScript, PERL-CGI", BPB Publications, 2010
5. Thomas A; Powel: Web Design ; C.R. : Second Edition TMH,2009.
6. Thomas A. Powel : HTML & XHTML : C.R. Fourth Edition; TMH, 2008
7. M.L. Young; Complete Reference b: Internet; 2nd Edition; Tata McGraw Hill, 2006
8. PHP and MySQL Web Development (Developer's Library) 5th Edition, Luke Welling Laura Thomson,2016
9. Mike McGrath, "PHP & MySQL in easy Steps", Tata McGraw Hill, 2012.

MCA 106: Discrete Mathematics

Theory & Tutorial: 4 hours per week (4 Credits)
Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:
1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

Matrices : Introduction, Rank of Matrix, Solving System of Equations, Inverse of a Matrix, Set theory, Principle of inclusion and exclusion, partitions, Relations, Properties of relations, Matrices of relations, Closure operations on relations, Functions- injective, subjective and objective functions.

Unit-II

Permutation and Combination: Permutation, Combination with and without repetition.
Probability: Probability Classical, relative frequency and axiomatic definitions of probability, addition rule and conditional probability, multiplication rule, total probability, Bayes' Theorem and independence problems.

Unit-III

Proposition Calculus : Propositions and logical operators, Truth table, Propositions generated by a set, Equivalence and implication, Basic laws, Functionally complete set of connectives, Normal forms, Proofs in Propositional calculus, Predicate calculus.

Graphs & Trees : Basic Concepts of Graphs, Sub graphs, Matrix Representation of Graphs: Adjacency Matrices, Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs, Multigraphs, Planar Graphs, Euler's Formula, Spanning Trees.

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. Kenneth H.Rosen, "Discrete Mathematics and Its Applications", Tata McGraw Hill, 7th Edition, 2017.
2. Seymour Lipschutz, Marc Laras Lipson, Varsha H. Patil, " Discrete Mathematics (Schaum's Outlines) (SIE)", Revised 3rd Edition, 2017
3. Murray Spiegel John Schiller, R. Alu Srinivasan, DebasreeGoswami, " Probability and Statistics", 3rd Edition, 2017
4. Salaria, R.S.: "Computer Oriented Numerical Methods", Khanna Book Publishing Co. (P.) Ltd., New Delhi. 5th Edition, 2012
5. C.L. Liu "Elements of Discrete Mathematics" ; 12th Edition, Tata McGraw Hill Pub. Comp. Ltd., 2000.
6. John Truss " Discrete Mathematics for Computer Scientists" – Pearson Education, Asia
7. Hopcroft John E. ET. AL., "Introduction to Automata Theory, Languages and Computation", Pearson Education; 3rd edition, 2011.

Practical Examination :

Each practical paper shall be of 3 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.
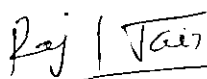
MCA 111: Java Lab
Practical Lab
Examination : Practical Examination
Lab Exercise on Theory Paper MCA 101
List of experiments:

1. Simple java applications for understanding references to an instant of a class
2. Handling Arrays in JAVA
3. Handling strings in JAVA
4. Implementation polymorphism
5. Package creation
6. Developing user defined packages in java
7. Use of Inheritances
8. Use of Interfaces
9. Threads, Multithreading
10. Collection handling
11. GUI/Swings applications
12. I/O Stream handling
13. Exception Handling

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MCA 112: DBMS Lab
Practical Lab
Examination : Practical Examination
Lab Exercise on Theory Paper MCA 103

List of experiments:

1. SQL data types, Operators, Literals, Constraints
2. Assignment on Queries: Select / From / Where/ Group By/Having Clause/ Order By Clause/ SQL Operators/ Joins/ Built-in Functions
3. PL/SQL Block Structure
4. Conditional Statements
5. Iterations: Simple Loops, For Loop, While Loop, Nested Loops
6. Exception Handling
7. Database Programming with Record Variables
8. Database Programming with Cursors, Cursor-For Loop
9. Procedures & Functions
10. Triggers
11. Packages

MCA 113: Web Application Development Lab
Practical Lab
Examination : Practical Examination
Lab Exercise on Theory Paper MCA 105
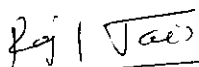
List of experiments:

HTML:
- Basics Elements & Attributes, HTML Formatting tags, Links,
- Images, Tables, Forms Elements
- HTML5 Audio and Video, HTML5 Input Types & Attributes
- CSS Syntax, CSS Attribute Selectors
- CSS properties: Fonts, Background, Colors, Links, Lists,
- CSS Box Model, Display, Opacity, Float, Clear
- CSS Layout, CSS Navigation Bar,
- CSS Rounded Corners, CSS Border Images, CSS Animations

JavaScript:
- Displaying Output, DeclaringVariables, Operators, Arithmetic, Data Types,Assignment,
- JavaScript Functions, Booleans, Comparisons, Conditional ,
- JavaScript Switch, Loops, Break, Type,
- JavaScript Objects, Scope,
- Strings and String Methods
- Numbers and Number Methods, Math, JavaScript Dates: Formats and Methods
- JavaScript Events, JavaScript, JavaScript Forms (API and Validation), Objects,
- JavaScript Functions, JavaScript DOM, JavaScript Validation, Browser BOM

PHP:
- Installing XAMMP
- Variables, Data Types, Constants, Operators, Programming Loops,
- PHP Functions,
- Arrays
- Strings Functions
- PHP Form Handling, Require & Include
- PHP with MySQL

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