Shivaji University, Kolhapur

Master of Computer Applications (MCA)

(Under faculty of Science and Technology)

(Under LOCF – CBCS)

Program Outcomes

Upon successful completion of the MCA, the student should have met the following Student Learning Outcomes:

1. Nurture knowledgeable and skilled human resources, employable in Information and Communication Technology (ICT) and Information Technology Enable Services (ITES).
2. Ability to apply knowledge of Mathematical Foundations in computing problems.
3. Impart knowledge required for planning, designing and building complex Application Software Systems as well as provide support to automated systems or application.
4. Produce entrepreneurs who can develop customized software solutions for small to large Enterprises.
5. Ability to apply modern IT tools and computational knowledge for developing solutions in context to societal, environmental and sustainable development with ethical and professional responsibility.
6. Ability to function as an effective communicator and team member through essential skills in multidisciplinary projects.

1. Introduction

1. The name of the programme shall be Master of Computer Applications (**MCA**).
2. The knowledge and skills required planning; designing and to build Complex Application Software Systems which are highly valued in all industry sectors including business, health, education and the arts. The basic objective of the education in Masters Programme as Computer Application (MCA) is to provide to the country a steady stream of the necessary knowledge, skills and foundation for acquiring a wide range of rewarding careers into the rapidly expanding world of the Information Technology.
3. Job Opportunities: The program addresses the job requirements in many upcoming domains such as cyber security, mobile computing, cloud computing, IoT, Robotics, ERP and the one involving assortment of hardware and software. Many graduates begin their career as a junior programmer and, after some experience, are promoted as system analysts. Other seek entrepreneurial role in the Information Technology world as

independent business owners, software authors, consultants, or suppliers of systems and equipment. Career opportunities exist in such areas as management software and hardware sales, technical writing, training others on computer, consulting, software development and technical support. Application areas in the Information Technology world as independent business owners, software authors, consultants, or suppliers of systems and equipment's. Career opportunities exist in such areas as management software and hardware sales, technical writing, training others on computer, consulting, software development and technical support. Application areas include transaction processing, accounting functions, sales analysis, games, forecasting and simulation, database management, decision support and data communications.

4. Specific elective courses to be offered in functional areas depend on student preferences and needs of the user systems in the region in which the educational institution is located. The University Department/affiliated institute offering MCA program shall decide the number of electives based on considerations such as infrastructure including laboratory resources, students intake and faculty availability. Decision of the University Department/affiliated institute shall be final in this regard.
5. The MCA programme is a mixture of computer-related and general business courses. The computer related courses includes standard techniques of programming, the use of software packages, databases and system analysis and design tools. The general business courses include the functional areas of management like accounting, sales, purchase, inventory, and production. The course would emphasis the study and creation of business applications. Inclusion of projects in MCA program in with the intention to improve student's technical orientation, understanding of IT environment and domain knowledge. It will build right platform for students to become a successful Software professional. This would emphasize on domain knowledge of various areas, which would help the students to build software applications on it. The students are exposed to system development in the information-processing environment with special emphasis on Management Information Systems and Software Engineering for small and medium computer systems. Inclusion of Business Management Labs will help students to acquire thorough knowledge of management practices in organization. Subjects such as ERP, Information Security and Business Intelligence will work as new application domains. Major focus is also given on Mobile technologies so that student can choose Mobile Technologies as their career options. Also, exposure to microcomputer technology, micro-based systems design and micro applications software, including network and graphical user interface systems is also provided. Advanced Internet and Web technology includes variety of new

technologies. Soft skills techniques are covered in first four semesters, which will lead to overall personality development of the student and that will help them in their placement activities and to sustain in the organization successfully. The projects shall also address the upcoming fields such as Mobile app development, IoT, cloud computing and ERP.

6. The present curricula focus on learning aspect from three dimensions viz. Conceptual Learning, Skills Learning and Practical / Hands on.
7. The inclusion of projects at second year ensures the focus on applying the skills learnt at respective levels. It will enhance student's capability to work on various technologies. It will make appropriate platform for students to work in IT Industry. It will also improve documentation, Coding and Design standards in students. Inclusion of project for subject such as Data Science and IoT will definitely improve student's innovativeness and creativity. Student's technical orientation, eagerness will be enhanced.

2. Duration of the Course:

The MCA programme will be a full-time TWO years i.e. 4 semesters. Pattern of examination will be Semester System.

3. Medium of Instruction:

The medium of Instruction will be English only.

4. Admission Procedure

1. Eligibility: Passed minimum three year duration Bachelor's Degree awarded by HEI recognized by University Grants Commission or Association of Indian Universities in any discipline with at least 50% marks in aggregate or equivalent (at least 45% in case of candidates of backward class categories belonging to Maharashtra state only. 45% is also applicable to differently abled students)
2. Reservation of Seats As per rules of Government of Maharashtra.

5. Course Structure:

Lectures and Practical should be conducted as per the scheme of lectures and practical indicated in the course structure.

6. Teaching and Practical Scheme

1. Each contact session for teaching or practical should be of 60 minutes each.
2. Minimum 45 periods should be conducted for each subject of 80 Marks.

3. One Practical Batch should be of 30 students.
4. Practical evaluation should be conducted before the commencement of University examination

7. Project Work:

1. Project work may be done individually or in groups in case of bigger projects. However if project is done in groups, each student must be given a responsibility for a distinct module and care should be taken to see the progress of individual modules is independent of others.
2. Students should take guidance from assigned guide and prepare a Project Report on "Project Work" in two copies to be submitted to the Director of the Institute/Head of the Department.
3. The Project Report should contain an Introduction to Project, which should clearly explain the project scope in detail. Also DFDs, ERDs, UML diagrams, Database designs and a list of output reports should be included.
4. The project Work should be of such a nature that it could prove useful or should be relevant from the commercial/Societal angle.
5. The project report will be duly accessed by the assigned guide and internal marks will be communicated by the Director of the Institute/Head of the Department.
6. The project report should be prepared in a format prescribed by the University, which also specifies the contents and methods of presentation. IEEE Computer Society templates are recommended in this regard.
7. The external viva shall be conducted by a panel of minimum two examiners out of which one will be external and other will be internal examiner.

OR

The student shall be allowed to formulate a proposal for startup and the same shall be rated equivalent to project. A detailed problem statement showing innovation along with marketability, business plan and cash flow shall be part of the evaluation criteria.

8. Assessment:

1. The final total assessment of the candidate is made in terms of an internal assessment and an external assessment for each course.
    1) For each theory paper, 20% marks will be based on internal assessment and 80% marks for semester examination (external assessment), unless otherwise stated.
    2) The division of the 20 marks allotted to internal assessment of theory papers is as

follows.

Two tests should be conducted of MCQ type questions. Each test will be of 10 marks

2. The project will be evaluated by the university appointed examiners both internal as well as external.
3. The final practical examination will be conducted by the university appointed examiners both internal as well as external at the end of semester for each lab course and marks will be submitted to the university by the panel. The pattern of final Practical Examination will be as follows;

1	Coding and Execution of Program	60 Marks
2	Viva-voce	20 Marks
3	Journal	20 Marks
4	Total	100 Marks

The practical examination will be conducted semester wise in order to maintain the relevance of the respective theory course with laboratory course.

4. The internal marks will be communicated to the University at the end of each semester, but before the semester end examinations. These marks will be considered for the declaration of the results.
5. The final Examinations shall be conducted at the end of the semester.
6. Nature of question paper:

   Nature of question paper is as follows for University end semester examination

   a. **Theory Examination:**
      1. There will be seven (7) questions of 16 Marks and out of which four (4) to be attempted from question no 2 to 6.
      2. Question No.1 is compulsory and is of multiple choice questions. There will be 8 multiple choice question each carries 2 marks
      3. Question No.2 to Question No. 6 should consist 2 sub question each carries 8 marks
      4. Question No. 7 should be a short note, where 4 questions will be given, out of which two questions should be attempted
   b. **Practical Examination:**
      1. Duration of Practical Examination: 3 Hrs

2. Nature of Question paper: There will be three questions out of which any two questions to be attempted and each question carries 30 Marks.

9. Standard of Passing:

Internal as well as external examination will be held at the end of semester. The candidate must score 40% marks in each head of internal as well as external Examination

10. Backlog

Student should not have more than 5 backlogs for 2nd year admission

11. Board of Paper Setters /Examiners:

For each Semester end examination there will be a board of Paper setters and examiners for every course. While appointing paper setter /examiners, care should be taken to see that there is at least one person specialized in each unit of the course.

12. Award of Class:

There will be numerical marking on each question. At the time of declaration of the result the marks obtained by the candidate is converted into grade point as shown below;

Grade Point Table

Range of Marks obtained out of 100 or any fractions	Grade Points
0	0 To 5
1	6 To 10
1.5	11 To 15
2	16 To 20
2.5	21 To 25
3	26 To 30
3.5	31 To 35
4	36 To 40
4.5	41 To 45
5	46 To 50
5.5	51 To 55
6	56 To 60
6.5	61 To 65
7	66 To 70

7.5	71 To 75
8	76 To 80
8.5	81 To 85
9	86 To 90
9.5	91 To 95
10	96 To 100

Grading: Shivaji University has introduced a Seven-point grading system as follows:

Grades	CGPA Credit Points
O	8.60 To 10
A+	7.00 To 8.59
A	6.00 To 6.99
B+	5.50 To 5.99
B	4.50 To 5.49
C	4.00 To 4.49
D	0.00 To 3.99

Overall Final Grades	Class		Grade
8.60 To 10	Higher Distinction Level	Extraordinary	O
7.00 To 8.59	Distinction Level	Excellent	A+
6.00 To 6.99	First Class	Very Good	A
5.50 To 5.99	Higher Second Class	Good	B+
4.50 To 5.49	Second Class	Satisfactory	B
4.00 To 4.49	Pass	Fair	C
0.00 To 3.99	Fail	Unsatisfactory	D

13. Credit system implementation:

As per the University norms

14. Clarification of Syllabus:

The syllabus Committee should meet at least once in a year to study and clarify any difficulties from the Institutes. The Workshop on syllabi should be organized at the beginning of every semester.

15. Eligibility of Faculty:

MCA(from any faculty) with first class or equivalent with two years relevant experience.

16. Revision of Syllabus:

As the computer technology experience rapid rate of obsolescence of knowledge , revision of the syllabus should be considered every two/three years.

Master of Computer Applications(MCA)

(Choice Based Credit System) (Under Faculty of Science)

(Introduced from June 2020 and Onwards)

To be implemented from the academic year 2020-21

MCA I SEMESTER I

Sr. No.	Course type	Course code	Course title	Theory contact hours per week	Practical hours per week	Credits	University exam	Internal continuous assessment	Total
1	Core	MCA-C01	Computer Organization	4	-	4	80	20	100
2	Core	MCA-C02	Operating System	4		4	80	20	100
3	Core	MCA-C03	Python Programming	4	-	4	80	20	100
4	Core	MCA-C04	Database Management System	4	-	4	80	20	100
5	Basic Science	MCA-B01	Mathematical Foundations	4	-	4	80	20	100
6	Management	MCA-M01	Communication Skills	2	-	2	-	50	50
7	Core	MCA-L01	Python Lab	-	6	4	80	20	100
8	Core	MCA-	Database Lab	-	6	4	80	20	100

		L02							
			Total	22	12	30	560	190	750

MCA I SEMESTER II

Sr. No	Course type	Course code	Course title	Theory contact hours per week	Practical hours per week	Credits	University exam	Internal continuous assessment	Total
1	Core	MCA-C05	Design and Analysis of Algorithms	4	-	4	80	20	100
2	Core	MCA-C06	Web Technology	4		4	80	20	100
3	Core	MCA-C07	Software Engineering	4	-	4	80	20	100
4	Core	MCA-C08	Java Programming	4	-	4	80	20	100
5	Basic Science	MCA-B02	Computer Oriented Numerical Methods	4	-	4	80	20	100
6	Management	MCA-M02	Business Communication	2	-	2	-	50	50
7	Core	MCA-L03	Web Technology Lab	-	6	4	80	20	100
8	Core	MCA-L04	Java Programming Lab	-	6	4	80	20	100
			Total	22	12	30			750

MCA II SEMESTER III

Sr. No	Course type	Course code	Course title	Theory contact hours per week	Practical hours per week	Credits	University exam	Internal continuous assessment	Total
1	Core	MCA-C09	Artificial Intelligence	4	-	4	80	20	100
2	Core	MCA-C10	PHP	4	-	4	80	20	100
3	Core	MCA-C11	Computer Networks	4	-	4	80	20	100
4	Core Elective	MCA-CE01	1. Cyber Security 2. Natural Language Processing 3. Computer Graphics 4. Machine Learning 5. Theory of Computation 6. Cloud Computing	4	-	4	80	20	100
5	Management Elective	MCA-ME01	1. Management Information System 2. Supply Chain Management 3. Knowledge Management 4. Business Process Management 5. E-Commerce 6. Semantic web	4	-	4	80	20	100
6	Core	MCA-L05	PHP Lab	-	6	4	80	20	100
7	Core	MCA-P01	Project	-	6	4	80	20	100
			Total	20	12	28	560	140	700

MCA II SEMESTER IV

Sr. No	Course type	Course code	Course title	Theory contact hours per week	Practical hours per week	Credits	University exam	Internal continuous assessment	Total
1	Core	MCA-C12	Data Science	4	-	4	80	20	100
2	Core	MCA-C13	Advanced Web Technology	4		4	80	20	100
3	Core	MCA-C14	Mobile Technology	4	-	4	80	20	100
4	Core Elective	MCA-CE02	1. Block chain Technology 2. Deep Learning 3. Network Security 4. Optimization Techniques 5. Robotics 6. Internet of Things (IoT)	4	-	4	80	20	100
5	Management Elective	MCA-ME02	1. Business Intelligence 2. Enterprise Resource Planning 3. Human Resource Management 4. Big Data Analytics 5. Social Media Management 6. Web Mining	4	-	4	80	20	100
6	Core	MCA-L06	Advanced Web technology & Mobile Technology Lab	-	6	4	80	20	100

7	Core	MCA-P02	Project	-	6	4	80	20	100
			Total	20	12	28	560	140	700

Master of Computer Applications (MCA)

Under Faculty of Science and Technology

Introduced from June 2020 and Onwards

To be implemented from the academic year 2020-2021

Part I Semester I

MCA-C01: Computer Organization

Internal Marks: 20 External Marks: 80 Theory: 04 hours/week

Course Outcomes:

1. To understand the structure and components of computer.
2. To familiarize a student with number systems and logic gates.
3. To understand the combinational and sequential circuits.
4. To familiarize a student with control unit.
5. To understand the memory subsystems.

UNIT 1 **(15 HOURS)**

Function and structure of a computer, Functional components of a computer, Interconnection of components, Performance of a computer, Introduction to Computer Organization, CPU Organization Memory subsystem Organization, and Interfacing, I/O Subsystem Organization and Interfacing, a relative Simple Computer, Software, hardware interaction, layers in computer architecture, Central processing and machine language , instructions, addressing modes, instruction types, instruction set selection, Instruction and execution cycle.

UNIT 2 **(15 HOURS)**

Data Representation: Introduction to Digital Computer, Number Systems- Binary, Octal and Hexadecimal, Inter-conversion between number systems, Coding Schemes. Boolean Algebra: Binary Logic, Logic Gates, Boolean Algebra, Postulates of Boolean Algebra, Boolean Function, Algebraic Simplification, Karnaugh Maps, Boolean Circuits.

UNIT 3 **(15 HOURS)**

Combinational Circuits: Introduction, Design Procedure, Half Adder, Full Adder, Decoder, Encoder, Multiplexer, Demultiplexer. Sequential Circuits: Introduction Flip Flops ,Clocked SR Flip flop, D flip flop ,T flip flop , JK and JK master-slave flip flop , Registers, Shift Registers, Counters, Ripple Counters, and Synchronous Counter

UNIT 4 **(15 HOURS)**

Control Unit: Data path and control path design, microprogramming v/s hardwired control, Pipelining in CPU designing, RISC v/s CISC, Superscalar processors. Memory Subsystems: Storage technologies, memory array organization, memory hierarchy, interleaving, cache memory, Auxiliary memory, Associative Memory and virtual memory

References:

1. C. Hamacher, Z. Vranesic and S. Zaky, "Computer Organization", McGrawHill, 2002.
2. W. Stallings, "Computer Organization and Architecture - Designing for Performance", Prentice Hall of India, 2002.
3. Computer System Architecture, M. Morris Mano, Third Edition, Pearson Education, 2007
4. D. A. Patterson and J. L. Hennessy, "Computer Organization and Design - The Hardware/Software Interface", Morgan Kaufmann,1998.
5. Digital Computer Electronics Malvino TMH 3rd Edition.
6. Computer Architecture & Organization J. P. Hayes MGH 3rd Edition

Master of Computer Applications (MCA)

Under Faculty of Science and Technology

Introduced from June 2020 and Onwards

To be implemented from the academic year 2020-2021

Part I Semester I

MCA-C02: Operating System

Internal Marks: 20 External Marks: 80 Theory: 04 hours/week

Course Outcomes:

1. To understand the basic concepts and functions of operating systems.
2. To understand Processes and Threads
3. To analyze Scheduling algorithms.
4. To understand the concept of Deadlocks.
5. To analyze various memory management schemes.
6. To understand I/O management and File systems.
7. To be familiar with the basics of Distributed Operating System

UNIT 1 **(15 HOURS)**

Introduction: Operating system definition, Functions of Operating System, Logical View, System View, Types of operating System, System Calls, System Programs, Interrupt Concept, Concept of Virtual Machine, **Processes**: Process Concept, Thread Concept, Difference between Process and Thread, Process Control Block, Process operations, Inter-process Communication, Communication in Client-Server .

UNIT 2 **(15 HOURS)**

CPU Scheduling : Scheduling Concept, Scheduling Criteria, Scheduling algorithms, Scheduling Evaluation, Simulation Concept, Numerical Exercises Based on CPU Scheduling Algorithms.

Process Synchronization: Synchronization concept, Need for Synchronization, Critical Section Problem, Semaphore, Monitor. **Deadlock**: Deadlock concepts, Necessary Conditions for Deadlock, Deadlock Prevention, Deadlock Avoidance, Bankers Algorithm, Deadlock Detection, Deadlock Detection Algorithm for Single and Multiple Instance of Resources, Deadlock Recovery, Numerical Exercises Based on Bankers Algorithm and Deadlock Detection Algorithm.

UNIT 3 **(15 HOURS)**

Memory Management: Concept, Memory Management Techniques, Contiguous &Non Contiguous allocation, Relocation, Compaction, Logical & Physical Memory, Conversion of Logical to Physical address, Paging, Segmentation, Segment with paging, Virtual Memory Concept, Demand paging, Page fault, Need for Page Replacement, Page Replacement algorithms, Thrashing, Numerical Exercises Based on Page Replacement Algorithms. **File Management**: File Structure, Protection, FILE system, Implementation, Directory structure, Free Space Management, File Access Methods, File Allocation Methods, Recovery.

UNIT 4 **(15 HOURS)**

Disk Management: Disk Structure, Disk Scheduling algorithm, Disk management, Swap Space concept and Management, RAID structure, Disk performance issues, Numerical Exercises Based on Disk Scheduling Algorithms. **Distributed Operating System**: Difference between Distributed & Centralized OS, Advantages of Distributed OS, Types of Distributed OS

References:

1. Operating System Silberschatz, Galvin , Gagne, Wiley publication
2. Operating System Concepts and Design , Milan Milenkovic, MGH
3. Distributed Operating System P.K. Sinha, PHI
4. Operating system AchyutGodbole
5. Operating System In Depth Doeppner Wiley India
6. Operating System Rohit KhuranaVikas pub.

Master of Computer Applications (MCA)

Under Faculty of Science and Technology

Introduced from June 2020 and Onwards

To be implemented from the academic year 2020-2021

Part I Semester I

MCA-C03: Python Programming

Internal Marks: 20 External Marks: 80 Theory: 04 hours/week

Course Outcomes:

1. To Learn Basic Syntax of Python Programming.
2. To understand and implement concepts of object oriented methodology using Python.
3. To Learn collections in Python.
4. To develop problem solving skills and their implementation through Python .

UNIT 1 **(15 HOURS)**

Introduction to Python- an interpreted high level language, interactive mode and script mode. Variables, Expressions and Statements , Variables and Types-mutable and Immutable variable and Keywords. ,Operators and Operands in Python. (Arithmetic, relational and logical operators), Operator precedence .Expressions and Statements (Assignment statement); Taking input (using raw_input() and input()) and displaying output - print statement , Comments in Python. Conditional and Looping Construct if - else statement and nested if – else while, for, use of range function in for, Nested loops , break, continue.

UNIT 2 **(15 HOURS)**

Functions :Built-In Function, invoking built in functions , Functions from math, random, time & date,User Define Function . Strings:, Creating, initializing and accessing the elements; String operators: +, *, in, not in, range, slice [n:m] , String built in functions & methods ,Strings constants defined in string module, Regular Expression and Pattern Matching.

UNIT 3 **(15 HOURS)**

Lists : Concept of mutable lists, creating, initializing and accessing the elements of list ,List operations. Tuples : Immutable concept, creating, initializing and accessing the elements in a tuple; Tuple functions: cmp(), len(), max(), min(), tuple() .Sets :Concept of Sets , creating, initializing and accessing the elements of ,Sets operation(Membership, union, intersection,

difference, and symmetric difference. Dictionaries :Concept of key-value pair, creating, initializing and accessing the elements in a dictionary, Traversing, Dictionary functions & Methods.

UNIT 4 **(15 HOURS)**

Modules: Executing modules as scripts, The Module Search Path, "Compiled" Python files Standard Modules , The dir( ) Function ,Packages Importing * From a Package. I/O and File Handling:,Output Formatting ,Reading and Writing Files(text and binary mode).Errors and Exceptions : Syntax Errors, Exceptions, Handling Exceptions, Raising Exceptions. Introduction to Object Oriented concepts in Python .

References:

1. Learning Python By Mark Lutz,O'Reilly Publication
2. Programming with python, A users Book, Michael Dawson, Cengage Learning
3. Python Essential Reference, David Beazley, Third Edition 5. Python Bible
4. Practical Programming: An introduction to Computer Science Using Python, second edition, Paul Gries, Jennifer Campbell, Jason Montojo, The Pragmatic Bookshelf.
5. Python for Informatics: Exploring Information, Charles Severance
6. John V Guttag. "Introduction to Computation and Programming Using Python", Prentice Hall of India
7. R. Nageswara Rao, "Core Python Programming", Dreamtech
8. Python Learning Guide (BPB publications)

Master of Computer Applications (MCA)

Under Faculty of Science and Technology

Introduced from June 2020 and Onwards

To be implemented from the academic year 2020-2021

Part I Semester I

MCA-C04: Database Management System

Internal Marks: 20 External Marks: 80 Theory: 04 hours/week

Course Outcomes:

1. Learn and practice data modelling using the entity-relationship and developing database designs.
2. Understand the use of Structured Query Language (SQL) and learn SQL syntax.
3. Apply normalization techniques to normalize the database
4. Understand the needs of database processing and learn techniques for controlling the consequences of concurrent data access.

UNIT 1 (15 HOURS)

Basics Of DBMS: Database Concept, Characteristics and architecture of DBMS, Database users, 3-tier architecture of DBMS-its advantages over 2-tier, Introduction of Parallel, Distributed Databases, Mobile databases and Cloud databases. Data independence. Physical data organization, Indexing-introduction and types of indexing.

UNIT 2 (15 HOURS)

Introduction to RDBMS:-Entity introduction, characteristics, Comparison between DBMS, RDBMS, Generalization and Aggregation Normalization- Functional dependency, types of normalization(1NF,2NF,3NF,BCNF),Data constraint- primary key, foreign key, unique key, null, not null, default key etc. **Relational Algebra Concepts**; introduction, Unary Relational Operations: SELECT and PROJECT; Relational Algebra Operations from Set Theory; Binary Relational Operations : JOIN and DIVISION; Additional Relational Operations; Examples of Queries in Relational Algebra;

UNIT 3 (15 HOURS)

SQL: Introduction to SQL, Features of SQL, Basic data types, SQL statements/commands, Set operations in SQL, order by and group by clause, like between, in, like, create index , view and join command Nested queries, GRANT and REVOKE, Commit, Rollback, Save point. Join concept: Simple, Equi, non-equi, Self, Outer join. View. **Introduction to PL /SQL:** Introduction,

Difference between SQL AND PL/SQL, Block definition structure and Data types, Block Functions, cursor, trigger, procedures, exception handling. **No SQL Database** - Introduction, Need& Advantages ,Types of No SQL Database , No SQL database vs RDBMS

UNIT 4 **(15 HOURS)**

Concurrency Control and Transaction Management: Transaction processing and Concurrency - Concept of transaction processing, ACID properties, States of transaction ,Serializibility, Concurrency control, schemes , Locking techniques , Timestamp based protocols , Granularity of data items ,Deadlocks. Database recovery and Backup.

References:

1. Introduction to database systems C. J. Date Pearsons Education 8th
2. Database system concept Korth, Silberschatz and Sudarshan MGH 5th
3. Fundamentals of Database Systems Elmasri Navathe PearsonEducation5th
4. SQL /PL SQL For Oracle 11G BlackBook Dr.Deshpande WileyDreamtech2012
5. ORACLE PL/SQL Programming Scott Ulman TMH 9th
6. SQL, PL/SQL the programming language of Oracle Ivan Bayross BPB 4th
7. Advance Database Management System hakrabharati/DasguptaWileyDreamtech2011
8. NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence Martin Fowler
9. Database Management systems Ramakrishnan&Gehrke, McGraw-Hill,3rd Ed.

Master of Computer Applications (MCA)

Under Faculty of Science and Technology

Introduced from June 2020 and Onwards

To be implemented from the academic year 2020-2021

Part I Semester I

MCA-B01: Mathematical Foundations

Internal Marks: 20 External Marks: 80 Theory: 04 hours/week

Course Outcomes:

1. Students completing this course will be able to express a logic sentence in terms of predicates, quantifiers, and logical connectives.
2. Students completing this course will be able to apply the rules of inference and methods of proof including direct and indirect proof forms, proof by contradiction, and mathematical induction.
3. Students completing this course will be able to use tree and graph algorithms to solve problems.
4. Students completing this course will be able to evaluate Boolean functions and simplify expressions using the properties of Boolean algebra

UNIT 1 **(15 HOURS)**

Set theory and Relations: (a) Elementary set theory: universal set, subset, representation of sets, operations, distributive and De Morgans laws, characteristic function, computer representation of sets, product sets (b) Relations and digraphs: Relation, matrix representation, digraph, paths in relation, Properties, equivalence relation, operations on relation, related algorithm, closures, Computer representation of sets.

UNIT 2 **(15 HOURS)**

Functions and recurrence relations: (a) Functions: Types of function, functions for computer science, permutation, functions and their manipulations. b) Recurrence Relations and Solutions: Linear relations with two indices, Principles of inclusions & exclusions, Formula derangement, Restrictions on relative positions

UNIT 3 **(15 HOURS)**

Lattice and Boolean algebra (a) Order relations and structures : Partially ordered sets, Externals element of poset, Lattices and their properties, (b) Finite Boolean algebras, properties, Function on Boolean algebras.

UNIT 4 **(15 HOURS)**

Mathematical logic and Theory of inference (a) Mathematical Logic: Statements and notations, Connectives, Normal forms, Theory of inference for Statement calculus, Predicate calculus, Inference theory of the predicate calculus

References:

1. A.Doerr, Discrete Mathematics for Computer Science,(Galgotia-86).
2. Kolman B. Busby, Ross S.C.: Discrete Mathematical Structures for Computer Science, (Prentice Hall).
3. Olympia Nicodimi : Discrete Mathematics, (CBS publications and distributors)
4. Joshi K.D., Discrete Mathematics, (Wiely Eastern).
5. Liu C.L: Elements of Discrete Mathematics,(TMH).
6. S. Sahni, Concepts in Discrete Mathematics,(Camclot Publisher,USA).
7. Tremblay J.P. and Manohar, R:Discrete Mathematical Structures with applications to Computer Science.(McGraw-Hill book company)
8. Schaums series: Discrete Mathematics. Isaac, A Somasundaram

Master of Computer Applications (MCA)

Under Faculty of Science and Technology

Introduced from June 2020 and Onwards

To be implemented from the academic year 2020-2021

Part I Semester-I

MCA-M01: Communication Skills

Internal Marks: 50 External Marks: 00 Theory: 02 hours/week

Course Outcomes: The objectives of this course is to introduce communication techniques, professional correspondence techniques and enhance writing skills of the students.

UNIT 1 **(15 HOURS)**

Communication: Nature and Importance of Communication, Objectives of Communication, Importance of Communication, Process and barriers to Communication, Elements of Communication, Forms of Communication Verbal Communication Techniques: Art of Speaking, Speech Styles. Oral Presentation- Preparation of Formal Speech, Meetings, Interviews, Group Discussion, Debate, Elocution, Extempore

UNIT 2 **(15 HOURS)**

Non-verbal Communication- Meaning, Characteristics & classification of Non-verbal Communication, Body Language, Gestures, Postures. Listening & observation skills. Rapid review of Grammar:- Corrections of common errors, Verb and its subject, forms of verb, Use of phrases and idioms, Use of infinitive Gerund and Participle, Errors & Use of Adjective and adverb , Punctuation and capitalisation

References:

1. R.K. Chaddha Communication Techniques and skills – DhanpalRai Publication, NewDelhi.
2. Pravil S. R. Bhatia, Professional Communication Skills- S. Chand and Co.,NewDelhi.
3. J.D.O'Connor, Better English pronounciation.
4. Wren and Martin, Highschool English Grammer and Composition – Chand and Co.,New Delhi.

5. Sunita Mishra, C.Muralikrishna, Communication Skills for Engineers – Pearson Education.
6. Aspi Doctor, Principles and Practice of Business Communication Rhoda Doctor, Sheth Publication, Mumbai.
7. John Collin, “Perfect Presentation”, Video Arts MARSHAL
8. Jenny Rogers “ Effective Interviews”, Video Arts MARSHAL
9. Raman Sharma, “ Technical Communications”, OXFORD

Master of Computer Applications (MCA)

Under Faculty of Science and Technology

Introduced from June 2020 and Onwards

To be implemented from the academic year 2020-2021

Part I Semester-I

MCA-L01 Python Lab

Internal Marks: 20 External Marks: 80 Theory: 06 hours/week

This laboratory course should consist of 10 to 12 programming exercises with focus on covering the hands-on aspects covered in theory course.

Master of Computer Applications (MCA)

Under Faculty of Science and Technology

Introduced from June 2020 and Onwards

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Part I Semester-I

MCA-L02 Database Lab

Internal Marks: 20 External Marks: 80 Theory: 06 hours/week

This laboratory course should consist of 10 to 12 programming exercises with focus on covering the hands-on aspects covered in theory course.

Master of Computer Applications (MCA)

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Introduced from June 2020 and Onwards

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Part I Semester-II

MCA-C05: Design and Analysis of Algorithms

Internal Marks: 20 External Marks: 80 Theory: 04 hours/week

Course Outcomes:

1. Analyse the asymptotic performance of algorithms.
2. Compare algorithms based on time & space complexity.
3. To learn how data structure concepts are useful in problem solving..
4. To implement different ways of data structures such as stacks, linked lists and trees
5. Understand different algorithm design approaches.

UNIT 1 **(15 HOURS)**

Algorithm Analysis: Introduction to algorithms, analysing and designing algorithms, Growth functions, asymptotic notations, Recursive algorithm complexity, solving recurrences: Substitution method, recursion tree method, master method. **Searching**: Binary search, **Hashing**: Hashing, Hash tables, Hash functions, collision resolution techniques. **Sorting**: Quick sort, Counting sort, Radix sort, Merge sort, Heap sort, Insertion sort and selection sort.

UNIT 2 **(15 HOURS)**

Linear Data Structures: Linked Lists: Linked Representation in memory, traversing and searching a linked list, insertion and deletion from a linked list, singly, doubly and circular linked list. Stack:Definition, array and linked representation of stacks, arithmetic expression: polish notation, application of stack, Queue: Definition, array and linked representation of Queue, priority queues.

UNIT 3 **(15 HOURS)**

Non-Linear Data Structures:

Trees, General tree, Binary tree, binary search tree, operations on binary search tree, AVL tree, Red-Black Trees, B-trees. **Graphs**: Representations of graph, Traversing Graphs, Breadth-first search, Depth-First Search, topological sort, Minimum Spanning trees, Single source Shortest path , All pairs shortest path.

UNIT 4 **(15 HOURS)**

Algorithm design approaches:

Greedy Algorithm: General Characteristics of greedy algorithms, Elements of Greedy Strategy, Huffman code, Job Scheduling Problem **Branch and Bound** – Introduction**,** 0/1 Knapsack, Travelling Salesman problem **Backtracking:** Introduction, N Queen Problem, Subset Sum, Hamiltonian Cycle

References:

1. Introduction to algorithms, Third Edition. by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, PHI
2. Fundamentals of Computer Algorithms, Second edition. By Ellis Horowitz, SartajSahani, SanguthevarRajasekaran, University Press.
3. Data structures and algorithm analysis in C, Second edition. By Mark Allen weiss
4. Fundamental algorithms by Donald E. Knuth, Pearson Education.
5. Data and file structure by A. Tanenbaum by PHI

Master of Computer Applications (MCA)

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Part I Semester-II

MCA-C06: Web Technology

Internal Marks: 20 External Marks: 80 Theory: 04 hours/week

Course Outcomes:

1. To familiarize a student with Client-side and Server-side Programming
2. To understand the website development using ASP.NET
3. To inculcate skills pertaining to data access technology geared to facilitate the development of disconnected systems using .NET platform.
4. To familiarize the student with the development of N-tier web-based application

UNIT 1 **(15 HOURS)**

Overview of HTML, Structure of HTML document. Formatting text with HTML, adding local and remote links, adding graphics, creating lists in HTML, creating tables in HTML, Dividing the window with frames, Building interactivity with forms, Formatting site with cascading style sheets. Image maps – creating client-side and server-side image maps, Various HTML Editors

JavaScript Overview, Data types, variables, scope of variables, casting, data type conversion rules, Expressions and operators. Arrays. Built-in functions, and Built-in objects- String, Date, Math, Types of dialog boxes-alert, prompt, confirm. Custom Functions. Working with Frames, Forms, Form elements and Form validation

UNIT 2 **(15 HOURS)**

Comparison between ADO and ADO.NET and benefits offered by ADO.NET, ADO.NET managed providers, SQL managed providers, Accessing XML through ADO.NET , OLEDB managed providers, creating, Data binding in ADO.NET. Introduction to SQL Server, Creating tables, Views and stored procedure.

UNIT 3 **(15 HOURS)**

Architecture of ASP.NET web application. Understanding ASP.NET page structure. Page level events. Using standard controls, validation controls, Rich controls. Designing web sites with master pages and themes. ASP.NET folder structure, Validation process. Validation controls. Validation Groups and Custom Validation, Performing data access – Using SqlDataSource

control, using List controls, GridView control, FormView, Repeater, DataList, ListView and DataPager controls. Developing 3-tier application using ObjectDatasource.

UNIT 4 **(15 HOURS)**

State management, Caching, AJAX, AJAX Extenders. Building and understanding web services, anatomy of a web service, overview of web service namespaces, building a simple web service, Web Service Description Language (WSDL). Introduction to CSS, Types of CSS, Applying CSS to Master pages in ASP.NET, Language Integrated Queries

References:

1. The Complete Reference HTML- Thomas A.Powell
2. The ABC's of JavaScript – Lee Purcell & May Jane Mara
3. ASP.NET Unleashed – Stephen Walther - Sams Publishing
4. The Complete Reference ASP.NET - Matthew Macdonald
5. Designing Microsoft ASP.Net Applications (Microsoft Press) – Jonathan Goodyear, Brian Peek, Brad Fox.
6. Microsoft ASP.NET – Step by Step (Microsoft Press) - G. Andrew Duthie
7. Programming ASP .NET - Jesse Liberty, Dan Hurwitz, Publisher: O'Reilly Media

Master of Computer Applications (MCA)

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Part I Semester-II

MCA-C07: Software Engineering

Internal Marks: 20 External Marks: 80 Theory: 04 hours/week

Course Outcomes:

1. Students will get foundation of software engineering, various process models and can apply the new models in development process.
2. Students will have effective communication and interaction skills for requirement engineering tasks.
3. Students can apply design principles for various types of software and designing object oriented software using UML tools.
4. Students can implement testing strategies thoroughly using testing tools.
5. Students will understand the need of lifelong learning and adapt to new software engineering concepts.

UNIT 1 **(15 HOURS)**

Introduction to Software Engineering: Software definition, characteristics, software application domains, unique nature of web apps, seven principles of software engineering, software development process, Waterfall Model, prototyping, spiral model, Concurrent Models, The Formal Methods Model, 12 Principles of Agility, Extreme Programming (XP), Scrum process flow, Selection of Software Process models.

UNIT 2 **(15 HOURS)**

Requirements Engineering and Design Concepts: Seven tasks of requirement engineering, Eliciting Requirements, Types of requirement, fundamental problem in defining requirements, SRS template.Translating the requirement model into the design model, software design concepts-abstraction, architecture, pattern, separation of concerns, modularity, information hiding, functional independence-cohesion, coupling, refinement, aspects, refactoring.

UNIT 3 **(15 HOURS)**

Introduction to UML: The design model: Developing use cases, Relationships, class diagrams, associations, generalizations, object diagram, Dynamic modeling – State diagrams, Sequence diagrams, Collaboration diagrams, Activity diagrams etc. Logical and physical architecture – Component diagram, Deployment diagrams etc. Case Studies: Courseware management system, ATM, Airline reservation System

UNIT 4 **(15 HOURS)**

Introduction to Testing: A Strategic Approach to Software Testing, Strategic Issues, Unit testing, Integration testing, Validation Testing, System Testing, Black box testing and white box testing, The Art of Debugging. Testing web applications- testing strategy, testing process, content testing, user interface testing, navigation testing, configuration testing, security testing, performance testing. Study of software testing tool.

References:

1. Software Engineering by Roger Pressman. 7th edition.
2. Software Engineering for students: A Programming Approach by Douglas Bell, Pearson publication.
3. Software Engineering Sommerville 8th edition.
4. The unified modeling language user guide Grady Booch, James Rumbaugh, Ivar Jacobson AddisonWesley 2005.
5. UML A Beginners Guide Jason T. Roff McGraw Hill Professional.
6. Learning UML 2. 0 Kim Hamilton, Russ Miles O'Reilly Media 2006.
7. Software Quality Engineering by Jeff Tian.
8. Software Testing And Quality Assurance Theory And Practice By Kshirasagar Naik, Priyadarshi Tripathy.
9. The art of software testing by GJ Myers, Wiley
10. Software Testing: Principles and Practices by Srinivasan D and Gopalswamy R, PearsonEd, 2006
11. Software Testing Foundations, Andreas Spillner, Tilo Linz, Hans Schaefer, Shoff Publishers and Distributors

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Part I Semester-II

MCA-C08: Java Programming

Internal Marks: 20 External Marks: 80 Theory: 04 hours/week

Course Outcomes:

1. To become familiar with the features of Java Language.
2. To become comfortable with concepts such as Classes, Objects, Inheritance, Polymorphism and Interfaces.
3. To understand Database connectivity using JDBC Drivers.
4. To design application using JSP, Servlet and RMI
5. To familiar with hibernate, struts and spring framework

UNIT 1 **(15 HOURS)**

Features of Java; Java Magic: Byte Code, OOP in Java ,Objects and classes, Inheritance, Polymorphism ,Interfaces, inner classes, Constructor, Garbage collector , Method Overloading Method Overriding, Packages. Understanding Class path, Introduction to Java Utility classes and collection classes - Date, DateFormat and Gregorian calendar classes. A Simple Java Program, Object Creation, Using Java.lang. Object class in program, programs using inheritance, using packages in java program

UNIT 2 **(15 HOURS)**

Java Database Connectivity: JDBC overview , Architecture , Steps to create JDBC Application, Drivers, database connection statements , Resultsets, transaction, Metadata and Aggregate functions , callable statements. Connection pooling, Java Servlets: Servlet vs CGI, Servlet life cycle , servlet basics , Generic servlet, HTTPServlet, The Servlets API, request server side – Cookies , session tracking , databases and non-HTML content , request dispatching , shared attributes, resource abstraction

UNIT 3 **(15 HOURS)**

RMI: Introduction & Architecture of RMI, Stubs & skeleton,Java RMI classes and interfaces ,Writing simple RMI application , Parameter passing in remote methods (marshalling and unmarshalling) Java Beans: Java Beans Introduction, design pattern, Beans persistence &

introspection, writing simple bean. JSP(Java Server Pages: Introduction to JSP, Use of JSP, JSP Architecture, JSP tags, Implicit and Explicitobjects, Request forward, Request –time include ,use of Beans in JSP and their scopes. JSF(Java Server Faces):Introduction of JSF, components of JSF, Benefits of JSF

UNIT 4 **(15 HOURS)**

Hibernate framework application, Introduction Working on Hibernate framework, Introduction Hibernate framework , its advantage and disadvantage, Introduction Using Hibernate framework in a live application. Struts framework Architecture and details, Struts frameworks Components. Overview of the Spring Framework, Spring MVC Architecture Hibernate with Spring, Benefits of using Spring with Hibernate, Working with Hibernate objects.

References:

1. The complete Reference Java- 5th edition – Herbert Schildt- Tata McGraw Hill
2. Java 8 Programming Black Book
3. Inside Java 2 Virtual Machine by Venners Bill, Mcgraw Hill Education
4. Developing Java Servlets James Goodwill, Techmedia Pub.
5. Professional JSP Wrox press
6. JDBC, Servlet and JSP, Black Book, Santosh Kumar K. Dremtech publication
7. Spring and Hibernate, Santosh Kumar K. Mc.Graw Hill Education
8. Spring Persistence with Hibernate, Ahmad Seddighi
9. Java unleashed,; Micheal Morrison

Master of Computer Applications (MCA)

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Part I Semester-II

MCA-B02: Computer Oriented Numerical Methods

Internal Marks: 20 External Marks: 80 Theory: 04 hours/week

Course Outcomes:

1. Demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions to otherwise intractable mathematical problems.
2. Apply numerical methods to obtain approximate solutions to mathematical problems.
3. Derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and non-linear equations and the solution of differential equations
4. Analyse and evaluate the accuracy of common numerical methods.
5. Implement numerical methods using any suitable language

UNIT 1 **(15 HOURS)**

Computer arithmetic: Floating point number operations, normalization and their consequences, Iterative methods, Zero of a single transcendental equation and zeros of polynomials using bisection, false position, secant and Newton-Raphson method, Convergence of solution. **Finite differences:** Difference operators, forward, backward and central difference operator, other difference operators.

UNIT 2 **(15 HOURS)**

Interpolation: Introduction and approximation, Newton-Gregory Forward and backward difference formula, Newton's divided difference formula, Lagrange's formula for interpolation, Hermite interpolation formula, Central difference interpolation formulae – Gauss forward and backward interpolation formula.

UNIT 3 **(15 HOURS)**

Numerical differentiation: Numerical differentiation using forward, backward & central difference formula. **Solution of system of linear algebraic equations:** Gauss-elimination method

and pivoting, Gauss-Jordan method, Ill condition equations and refinements, LU decomposition, Doo-Little reduction, Newton Crouts method, Gauss-Siedel and Jacobi method.

UNIT 4 **(15 HOURS)**

Numerical integration: Newton Cotes quadrature formula, Romberg integration, Gaussian quadrature formula Legendre polynomial. **Solution of Differential equations:** Taylor series method, Euler's method, Graphical representation of Euler's method, Modified Euler's method, Improved Euler's method, Runge-Kutta second and fourth order method, Heun's method, Predictor and corrector methods---Milne's and Adams-Bashforth method.

References:

1. Theory and Problems in Numerical Methods by T Veerarajan, T Ramachandran
2. Numerical Methods by S Balachandra Rao, C K Shantha
3. Introductory Methods of Numerical Analysis by S S Sastry
4. Computer Oriented Numerical Analysis by R Roychoudhury
5. Computers and Numerical Methods by Balgurusamy
6. Computer Oriented Numerical Methods by V Rajaraman
7. Computer Based Numerical Algorithms by Krishnmoorthy E V and S K Senn
8. Operations Research by Kanti Swaroop
9. Operations Research by Taha H A
10. A course in Computer Programming with Numerical Techniques by Motewar S N
11. Numerical Methods by S Arumugam, A Thangapandi Isaac, A Somasundaram

Master of Computer Applications (MCA)

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Part I Semester-II

MCA-M02 Business Communication

Internal Marks: 50 External Marks: 00 Theory: 02 hours/week

Course Outcome:

To empower the students towards general and technical writing, oral communications and listening skills: letter writing, technical report writing, and business communication.

Unit 1: Expression: Practical communication skill development, business presentation with multimedia, speaking skill, prepared speech, extempore speech (15)

Unit 2: Writing: Technical/business letter, Resume Preparation, organisation of writing material, poster presentation, writing technical document, preparing software user manual, preparing project documentation. (15)

Books:

1. Business Correspondence & Report Writing, Sharma, TMH
2. Business Communication Strategies, Monipally, TMH
3. English for Technical communication,Laxminarayanan,Scitech
4. Business Communication, Kaul,PHI
5. Communication Skill for Effective Mgmt., Ghanekar,EPH

Master of Computer Applications (MCA)

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Part I Semester-I

MCA-L03 Web Technology Lab

Internal Marks: 20 External Marks: 80 Theory: 06 hours/week

This laboratory course should consist of 10 to 12 programming exercises with focus on covering the hands-on aspects covered in theory course.

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Part I Semester-I

MCA-L04 Java Programming Lab

Internal Marks: 20 External Marks: 80 Theory: 06 hours/week

This laboratory course should consist of 10 to 12 programming exercises with focus on covering the hands-on aspects covered in theory course.