SCHEME OF TEACHING AND EXAMINATIONS   2019-2020
MASTER OF COMPUTER APPLICATIONS

FIRST SEMESTER

Subject Code	SUBJECTS	Teaching Load Per Week			Credit L+(T+P)/2	Examination Marks							
						Max. Marks				Min. Marks			
		L	T	P		Th	Ses	Pr	Total	Th	Ses	Pr	Total
MCA101	Object Oriented Programming With 'C++'	3	2	-	4	100	50	-	150	40	30	-	70
MCA102	RDBMS and SQL	3	2	-	4	100	50	-	150	40	30	-	70
MCA103	Mathematical Foundations of Computer Science	3	2	-	4	100	50	-	150	40	30	-	70
MCA104	Computer System Architecture	3	2	-	4	100	50	-	150	40	30	-	70
MCA105	Professional Communication in English	3	2	-	4	100	50	-	150	40	30	-	70
MCA106	Programming Lab	-	-	3x2	3	-	25	100	125	-	15	50	65
MCA107	Programming Practice	-	-	3x2	3	-	25	100	125	-	15	50	65
	TOTAL	15	10	12	26	500	300	200	**1000**	200	180	100	**480**

Object Oriented Programming with 'C++'
Subject Code - MCA-101

Max Marks : 100   **Min Marks : 40**

UNIT - I: Language Fundamental
Overview of OOP: The Object Oriented paradigm, Basic concepts of OOP, Benefits of OOP, Object oriented languages, Application of OOP **Overview of C++:** History of C++, **Data Types:** Built-in data types, User-defined data types, Derived data types. **Constants and Variables:** symbolic constants, Dynamic initialization of variable, Reference variable. Operators in C++. **Control Structures:** if-else, nested if-else, while, do-while, for, break, continue, switch, goto statement.

UNIT - II: Structure & Function
Structures: A Simple structure, defining a structure variable, Accessing structures member, Enumeration data type. **Function:** Function Declaration, Calling Function, Function Definition, **Passing Arguments to function:** Passing Constant, Passing Value, Reference Argument, Structure as argument, Default Argument. **Returning values from function:** return statement, Returning structure variable, Return by reference. Overloaded Functions, Inline Functions and Templates.

UNIT - III: Object Classes and Inheritance
Object and Class, Defining the class and its member, Making an outside function inline, nesting of member function, array as class member, structure and classes. **Memory allocation:** memory allocation for objects, new and delete operator, static data member, static member functions, object as function argument. **Constructor & Destructor:** Null and default constructor. Parameterized constructor, Constructor with default argument, copy constructor, class destructors, **Inheritance:** Introduction to inheritance, Types of inheritance, function overriding, Constructor in Derived class. **Access specifiers:** public, private, protected.

UNIT - IV: Pointers, Virtual Function and Operator Overloading
Pointers: Introduction, & and * operator, pointer to object, this pointer, pointer to derived class. **Dynamic polymorphism:** Virtual function, Pure Virtual Function, Abstract class. **Static Polymorphism:** Operator keyword, overloading unary operator (++(pre increment and post increment),--) using operator function, overloading binary operators (+,-,==,>=,<=, +=,<,>,[]), Friend function, Friend class, overloading binary operators using friend function.

UNIT - V: File & Stream
File and Stream: C++ Stream class, unformatted I/O operations, formatted console I/O, manipulators, opening and closing a file, detecting eof, file modes, get(), put(),reading and writing a class object, Updating a file random access.

RECOMMENDED BOOKS:

1. **C++: The Complete Reference,** *Herbert Schildt,* Tata McGraw-Hill
2. **Object Oriented Programming with C++,** *E. Balagurusamy,* Tata McGraw-Hill
3. **The C++ Programming Language,** *Bjarne Stroustrup,* Addison Wesley.
4. **Object Oriented Programming in C++,** *Robert Lafore,* Galgotia Publications.
5. **Introduction to Object Oriented Programming,** *K V Witt,* Galgotia Publications.
6. **Object Oriented Programming,** *G Blaschek,* Springer Verlag
7. **Object Data Management,** *R Cattel,* Addison Wesley.

RDBMS and SQL
Subject Code - MCA-102

Max Marks : 100   **Min Marks : 40**

UNIT - I: Overview of Database Management
Data, Information and knowledge, Increasing use of data as a corporate resource, data processing verses data management, file oriented approach verses database oriented approach to data management; data independence, database administration roles, DBMS architecture, different kinds of DBMS users, importance of data dictionary, contents of data dictionary, types of database languages. Data models: network, hierarchical, relational. Introduction to distributed databases, Client/Server databases, Object-oriented databases, Object-relational databases, Introduction to ODBC concept.

UNIT - II: Relational Model & Relational Algebra
Entity - Relationship model as a tool for conceptual design-entities, attributes and relationships. ER diagrams; Concept of keys; Case studies of ER modeling Generalization; specialization and aggregation. Converting an ER model into relational Schema. Extended ER features, Introduction to UML, Representation in UML diagram (Class Diagram etc.).
Relational Algebra: select, project, cross product different types of joins (inner join, outer joins, self-join); set operations, Tuple relational calculus, Domain relational calculus, Simple and complex queries using relational algebra, stand alone and embedded query languages.

UNIT - III: SQL and Relational Database Design
Introduction to SQL constructs (SELECT…FROM, WHERE… GROUP BY… HAVING… ORDERBY….), INSERT, DELETE, UPDATE, DROP, VIEW definition and use, Temporary tables, Nested queries, and correlated nested queries, Integrity constraints: Not null, unique, check, primary key, foreign key, references, Triggers. Embedded SQL and Application Programming Interfaces. Normalization concept in logical model; Pitfalls in database design, update anomalies: Functional dependencies, Join dependencies, Normal forms (1NF, 2NF, 3NF). Boyce-Codd Normal form, Decomposition, Multi-Valued Dependencies, 4NF, 5NF. Issues in physical design; Concepts of indexes, File organization for relational tables, Denormalization, Clustering of tables; Clustering indexes.

UNIT - IV: PL/SQL
Introduction to PL/SQL variables – literals – data types – advantages of PL/SQL; Control statements : if ; iterative control – loop, while, for , goto ; exit when; Cursors : Types – implicit, explicit – parameterized cursors – cursor attributes; Exceptions: Types – internal , user-defined , handling exceptions – raise statement; PL/SQL tables and records: Declaring PL/SQL tables - referring PL/SQL tables, inserting and fetching rows using PL/SQL table, deleting rows; records - declaration of records - deleting records; Sub programs: Functions - procedures - in, out, inout parameters; purity functions - packages - package specification - advantages of packages - private and public items - cursors in packages.

UNIT - V: Query Processing and Optimization
Query Processing, Protecting Database and Data Organization -Parsing, translation, optimization, evaluation and overview of Query Processing. Protecting the Data Base - Integrity, Security and Recovery. Domain Constraints, Referential Integrity, Assertion, Triggers, Security & Authorization in SQL. **Data Organization-File Organization:** Fixed length records, variable length records, Organization of records in files, **Indexing**: indexed files -B-tree, B+-tree, and Hashing Techniques.

BOOKS RECOMMENDED:

1. **Database System Concept**: *A. Silberschatz , H.F. Korth and S. Sudarshan*, TMH
2. **Fundamentals of Database Systems**: *Elmasri & Nawathe*, Pearson Education
3. **An Introduction to Database Systems**: *C. J. Date*, AWL Publishing Company
4. **SQL, PL/SQL**: *Ivan Bayross*, BPB Publication
5. **An Introduction to database systems**: *Bipin Desai*, Galgotia Publication.
6. **Database Management System**: *A. K. Majumdar & P. Bhattacharya*, TMH

Mathematical Foundations of Computer Science
Subject Code - MCA-103

Max Marks : 100   **Min Marks : 40**

UNIT – I: Mathematical Logic, Sets Relations and functions

Mathematical Logic: Notations, Algebra of Propositions & Propositional functions, logical connectives, Truth values & Truth table Tautologies & Contradictions, Normal Forms, Predicate Calculus, Quantifiers. **Set Theory:** Sets, Subsets, Power sets, Complement, Union and Intersection, De-Morgan's law Cardinality. **Relations:** Cartesian Products, relational Matrices, properties of relations. **Equivalence relation functions:** Injection, Surjection, Bijection, Composition, of Functions, Permutations, Cardinality, the characteristic functions recursive definitions, finite induction.

UNIT – II: Lattices & Boolean Algebra

Lattices: Lattices as Algebraic System, Sub lattices, some special Lattices (Complement, Distributive, Modular). **Boolean algebra:** Axiomatic definitions of Boolean algebra as algebraic structures with two Operations, Switching Circuits.

UNIT – III: Groups Fields & Ring

Groups: Groups, axioms, permutation groups, subgroups, co-sets, normal subgroups, free subgroups, grammars, language). **Fields & Rings:** Definition, Structure, Minimal Polynomials, Irreducible Polynomials, Polynomial roots & its Applications.

UNIT - IV: Graphs

Graphs: Simple Graph, Multigraph & Psuedograph, Degree of a Vertex, Types of Graphs, Sub Graphs and Isomorphic Graphs, Operations of Graphs, Path, Cycles and Connectivity, Euler and Hamilton Graph, Shortest Path Problems BFS(Breadth First Search, Dijkastra's Algorithm, Representation of Graphs, Planar Graphs, Applications of Graph Theory.

UNIT - V: Trees

Trees: Trees, Properties of trees, pendant vertices in a tree, center of tree, Spanning tree, Binary tree, Tree Traversal, Applications of trees in computer science.

BOOKS RECOMMENDED:

1. **A text book of Discrete Mathematics:** *Swapan Kumar Sarkar.* S.Chand & company Ltd.
2. **Discrete Mathematical structure with applications to computer science:** *J.P Trembly & R. Manohar.* TMH
3. **Discrete Mathematics:** *K.A Ross and C.R.B Writht.*
4. **Discrete Mathematics Structures for computer science:** *Bernard Kohman & Robert C. Bushy.*
5. **Discrete Mathematics:** *Seymour Lipschutz Mare Lipson.* TMH Edition.

Computer System Architecture
Subject Code - MCA-104

Max Marks : 100   **Min Marks : 40**

UNIT – I Representation of Information and H/w component:

Number system (decimal, BCD, octal, hexadecimal) and conversions, r and r-1's complement, Fixed and Floating point representation, Binary codes: Excess-3, ASCII, EBCDIC, Error detection codes. Boolean Algebra, Map simplification K-Map, Logic Gates, **Combinational Circuit:** Half and Full Adder, Decoder and Multiplexer; **Sequential Circuit:** Flip-Flop (SR, D, JK, Master-Slave, T), 4 bit Register, Register with parallel load, Shift register, Binary ripple Counter, Binary synchronous counter.

UNIT – II Register transfer language and micro operations

Register Transfer Language (RTL), Concepts of bus, Bus and Memory transfers, **Micro-operation:** Arithmetic, Logic and Shift micro operation, Instruction code, Computer registers, Computer instructions, Timing and control, Instruction Cycle and Interrupt Cycle, Memory reference instructions, Input-output and interrupt, Design of basic computer

UNIT – III Programming Computers and CPU

Machine Language, Assembly Language, Assembler, Program Loops, Input /Output, Programming, General register organization, Stack organization, Instruction format, Addressing modes, Data transfer and manipulation language, Micro-programmed and Hardwired control, RISC Vs. CISC, **Pipelining in CPU design:** , Parallel Processing ,Arithmetic and RISC pipelining.

UNIT – IV Computer Arithmetic and I/O Techniques: Addition, Subtraction, Division and Multiplication Algorithm, Input-Output Interface, asynchronous data transfer; **Modes of transfer:** Programmed I/O, Interrupt Mechanism, Direct Memory Access (DMA), I/O Processor.

UNIT – V Memory Organization

Memory hierarchy: Static and Dynamic RAM, ROM; Building large memory using chips, Associative Memory: associative mapping, Direct mapping, set associative mapping; Cache Memory Organization, Virtual Memory.

BOOKS RECOMMENDED:

1. **Computer System Architecture**, *Morris Mano*, PHI
2. **Computer Organization and Architecture**,*William Stalling*, PHI
3. **Computer organization and Architecture**, *J. P. Hayes*, TMH
4. **Digital Computer Logic Design**, *Morris Mano*, PHI
5. **Fundamentals of Microprocessors**, *B. Ram*
6. **Computer System Architecture and organization**, *Dr.M. Usha,T. S. Shrikant*, Wiley publication.
7. **Digital Computer Electronics**, *Malvino.*
8. **Structured Computer Organization**, *Andrew M. Tanenbanm*, PHI
9. **Modern Digital Electronics**, *R.P.Jain*, Tata McGraw Hill

Professional Communication in English
Subject Code - MCA-105

Max Marks : 100   **Min Marks : 40**

UNIT – I Grammar:
Comprehension of unseen passage, Determiners, Subject, Verb, Concord, Tenses, Question Tags, Voice, Narration, Preposition, Correction of sentences, Paragraph writing.

UNIT – II Communication:
Definition, Process, Elements, Objectives of Communication, Different Medias of Communication, Verbal and Non-verbal Communication, Principles of communication, Barriers to Communication and How to overcome them, Communication in an Organization : Listening-Introduction, Advantages and Importance, Barriers in effective listening, How to become a good listener.

UNIT – III Letter Writing:
Types of letters, Elements of letters, Styles of letter writing, Basics of official correspondence, Preparation of Resume and job application, Quotation, Orders, Sales letter, Tender, Handling correspondence, Advertising and job description.

UNIT – IV Report Writing:
Characteristics of report, Elements of report, Preparation and writing of report, Use of illustrations in reports, Technical report writing, Preparation of Bibliography and References, Note taking and Note making.

UNIT – V Precise writing:
Meetings (Notice, Agenda and Minutes writing techniques) Preparation for Presentation, Conferences and Seminars, Interviews, Techniques of effective speech and interpersonal communication, Business and Technical proposals.

BOOKS RECOMMENDED:

1. **Business Correspondence and Report Writing,** *RC Sharma and Krishna Mohan*, Tata McGraw-Hill
2. **Developing Communication Skills,** *Krishna Mohan and Meera Banerjee*, McMillan India Ltd.
3. **Essentials of Business Communication,** *Rajjendra Pal and J S Korlahalli*, S. Chand and Sons.
4. **Effective Technical Communication,** *M Ashraf Rizvi*, Tata McGraw-Hill
5. **Introduction to Communication Studies,** *John Fisk*, Rotledge London.
6. **Living English Structure,** *W.Stannard Allen*, Orient Longman London
7. **A Remedial English Grammar for Foreign Students,** *F T Wood*, McMillan India Ltd
8. **Writing Technical Papers,** *D H Menzel, H M Jonest*, McGraw Hill.
9. **Business Communication,** *Asha Kaul*, Prentice Hall

SCHEME OF TEACHING AND EXAMINATIONS   2019-2020
MASTER OF COMPUTER APPLICATIONS

SECOND SEMESTER

Subject Code	SUBJECTS	Teaching Load Per Week			Credit L+(T+P)/2	Examination Marks							
						Max. Marks				Min. Marks			
		L	T	P		Th	Ses	Pr	Total	Th	Ses	Pr	Total
MCA201	Programming in Python	3	2	-	4	100	25	-	125	40	15	-	55
MCA202	Data Structure and Algorithms	3	2	-	4	100	25	-	125	40	15	-	55
MCA203	Analysis of Numerical Methods	3	2	-	4	100	25	-	125	40	15	-	55
MCA204	Operating Systems	3	2	-	4	100	25	-	125	40	15	-	55
MCA205	Financial Management and Accountancy	3	2	-	4	100	25	-	125	40	15	-	55
MCA206	Programming Lab	-	-	3x2	3	-	50	100	150	-	30	50	80
MCA207	Programming Practice / Mini-Project	-	-	2	1	-	50	50	100	-	30	25	55
MCA208	Common Software / Mini-Project	-	-	2	1	-	50	50	100	-	30	25	55
MCA209	Personality Development / Mock Interviews	-	-	2	1	-	25	-	25	-	15	-	15
	TOTAL	15	10	12	26	500	300	200	1000	200	180	100	480

Programming in Python
Subject Code - MCA-201

Max. Marks: 100   **Min Marks : 40**

UNIT – I
Introduction to Python Programming: What is a Program, Formal and Natural Languages, Why use Python, Uses of python, Strengths & Drawbacks, The Python Interpreter, Running Python, The IDLE User Interface, The Interactive Prompt, Script Mode, Dynamic Typing , Debugging. **Types, Operators, Expressions & Statements**: Values and Types, Assignment Statement, Variable Names, Expressions & Statements, Order of Operations, String Operations, Comments.

UNIT – II
Conditionals: Boolean Expressions, Logical operators, Conditional & Alternative Execution, Chained and Nested Conditions. **Iterations**: Reassignment, Updating Variables, The "for" and "while" statements, break. **Strings**: String is a sequence, len, Traversal with a for loop, String Slices, Searching, Looping and Counting, String Methods, the "in" operator, String Comparison.

UNIT - III:
Lists: List is a Sequence, Traversing and other Operations, List Slices, List Methods, Map Filter and Reduce, Deleting Elements, Lists and Strings, Objects and Values, Aliasing, List Arguments. **Dictionaries:** A Mapping and as a Collection of Counters, Looping and Dictionaries, Reverse Lookup, Dictionaries and Lists, Memos, Global Variables. **Tuples:** Tuple Assignments, Tuples as Return Values, Variable Length Argument Tuples, Lists and Tuples, Dictionaries and Tuples, Sequence of Sequences.

UNIT - IV:
Functions: Function Calls, Math Functions, Composition, Adding New Functions, Definitions & Uses, Flow of Execution, Parameters and Arguments, Why Functions, Stack Diagrams, Void and Fruitful Functions, Return Values, Incremental Development, Composition, Boolean Functions, Checking Types. **Recursion**: Stack Diagram for Recursive Functions, Infinite Recursion, Taking Input from Keyboard, More Recursion.

UNIT - V:
Files: Files & Persistence, Reading and Writing, Format Operator, Filenames and Paths. **Miscellaneous Topics:** Catching Exceptions, Databases, Pickling, Pipes, Modules. **Object-Oriented Programming:** Programmer defined Types, Attributes, Instances as Return Values, Classes and Functions, Classes and Methods, Inheritance and Polymorphism.

BOOKS RECOMMENDED:

1. **Learning Python** 5th Edition, *Mark Lutz*, O'Reilly Publications
2. **Core Python Programming**, *R. Nageshwara Rao*, Dreamtech Publications
3. **Think Python** 2nd Edition, *Allen B. Downey*, O'Reilly Publications
4. **Beginning Python: Using Python 2.6 and Python 3.1**, *James Payne*, Wiley
5. **Python Essentials Reference**, 4th Edition, *David M. Beazley*, Addison – Wesley
6. **Practical Programming: An Introduction to Computer Science Using Python 3**, *Paul Gries et al.*, Pragmatic Programmers

Data Structure and Algorithms
Subject Code - MCA-202

Max. Marks: 100   **Min Marks : 40**

UNIT – I Array and Linked Lists

Introduction to data structure, Primitive data structure, Introduction to Algorithm analysis for time and space requirement, Rate of growth and Order notation, Basic time and space analysis of an algorithm. Linear Array, Representations of Array in Memory, Traversing, Insertion and Deletion in Linear Array, Multidimensional Array. Linked list, Representation of linked lists in memory, Traversing a linked list, Searching a linked list, Memory Allocation, Insertion into a linked List, Deletion from a Linked List, Header Linked List, Two- Way Linked Lists, Circular Linked List.

UNIT – II Stack and Queues

Stacks Definition, concepts, operation and application of Stacks, Recursion and Polish notations, Quick sort, tower of Hanoi, Queue, Priority Queue: definition concepts, operation and application of Queue, circular queue and Dequeue. Linked representation of stack and queue.

UNIT – III Trees and their Representations:

Terminologies related to trees, Binary Tree, complete binary tree, almost complete binary tree; Tree Traversals-preorder, in order and post order traversals, their recursive and non-recursive implementations, Expression tree-evaluation, Linked representations of binary tree, operations. Header nodes; threads, **Binary Search Tree:** searching, Inserting and deleting in BST, Heap; Path Lengths; Huffman's Algorithms. Basic idea of AVL Tree.

UNIT – IV Graphs:

Related definitions; Graph representations- adjacency matrix, adjacency list, adjacency multi-list; Traversal schemes - depth first search, breadth first search; Minimum spanning tree; Shortest path algorithm; Kruskal and Dijkstra's algorithms.

UNIT – V Searching, Hashing and Sorting:

Searching : Linear Search, Binary Search, Searching and data modification Hashing- Basics, methods, collision, resolution of collision, chaining; Internal Sorting, External sorting - Bubble Sort, Insertion Sort, Selection Sort, Merge sort, Radix sort, heap sort.

BOOKS RECOMMENDED:

1. **Data Structures and Program Design in C**, *Kruse R.L*, PHI.
2. **Data Structures using C and C++,** *Tanenbaum*, PHI.
3. **Fundamental of Data Structures**, *Horowitz and Sahani*, Galgotia Publishers.
4. **Data Structures**, Schaum Series.
5. **Data Structures**, *Bhagat Singh*.
6. **Data Structures**, *Trembley and Sorenson*.

Analysis of Numerical Methods
Subject Code - MCA-203

Max. Marks: 100   **Min Marks : 40**

Note: Simple/Scientific calculators are allowed.

UNIT – I: Solution of Algebraic and Transcendental Equations
Introduction: basic Properties of equations, Solution of Cubic & Biquadrate Equation, Complex roots of polynomial equations, Rate of convergence. **Bracketing Methods**: Bisection method, method of False-position. **Open Method**: Newton-Raphson method.

UNIT – II: Matrices and Solution of Simultaneous Algebraic Equations
Matrix: basics, characteristics equation, Eigen vectors, **Eigen values**: power method, **Inverse of a matrix**: Gauss-Jordan method, Partitioning method. **Direct Methods:** Cramer's rules, Matrix inversion method, Gauss Elimination method, Gauss-Jordan method, LU Decomposition, Cholesky's method. **Iterative Method:** Jacobi's iteration method, Gauss-Seidal iteration method.

UNIT - III: Empirical Laws and Curve-Fitting
Empirical Laws Basics: Laws reducible to the linear law, Laws containing three constants, **Polynomial curve-fitting**: Graphical method, Method of group averages, Method of Least Squares. **Interpolation**: Forward and Backward differential operators, **Finite Differences** for evenly spaced data, **Divided Differences** for unevenly spaced data, Newton's, Gauss and Langrage's form of interpolation and Divided Differences.

UNIT - IV: Numerical Differentiation and Integration
Numerical Differentiation: Newton's Forward & Backward Formulae for Derivatives **Newton-Cotes Quadrature Formula**: Trapezoidal Rule, Simpson's Rule (1/3rd and 3/8th rule), Boole's Rule, Weddle Rule. Gauss-Legendre's Integration Formula.

UNIT - V: Numerical Solution of Ordinary Differential Equations
Basics: Picard's method, Taylor's Series. **One Step Method:** Euler's Method, Runga-Kutta Method (3rd and 4th order). **Predictor-Corrector Method:** Milne's method.

BOOKS RECOMMENDED:

1. **Numerical methods**: *B. S. Garewal*, Khanna Publishers.
2. **Numerical methods for Engineers**: *Chapra and Canale*, McGraw Hill Education.
3. **Numerical Analysis**: *H. K. Pathak*, Shiksha.
4. **Numerical Methods**: *Gupta & Mallic*.
5. **Numerical methods for scientist & Engineers** *Hamming R.W.*, McGraw Hill.
6. **Elementary numerical analysis**: *Conle S.D., Carl De Boor*, International Book Company, London.
7. **Numerical methods for Science and Engineering Calculations**: *Jain M.K. Iyengar, S.R.K*, John Willey & Sons.

Operating Systems
Subject Code - MCA-204

Max. Marks: 100   **Min Marks : 40**

UNIT - I: Introduction

Defining operating system, History and Evolution of operating system, **Basic Concepts**: batch processing, spooling, multiprogramming, multiprocessor system, time sharing, real time systems, Functions and Goals of operating system, Operating system as resource manager, Operating system as an abstract machine.

UNIT - II: Process Management

Process concept, Process Control Block, **Process State**: State Transition Diagram, **Scheduling Queues**: Queuing Diagram, Types of schedulers-context switching and dispatcher, various types of CPU scheduling algorithms and their evaluation, multilevel queues and multilevel feedback queues, Thread life cycle, multithreading,

UNIT - III: IPC and Dead Locks

Inter Process Communication: competing and co-operating processes, Introduction to concurrent processing, Precedence graphs, Critical section problem, Semaphore concept, Study of classical process synchronization problems: Producer–Consumer, Dining Philosophers. **Deadlocks**: The dead lock problem, dead lock definition, **Deadlock Characterization**: necessary condition, resource allocation graph, **Deadlocks handling**: Deadlock prevention, Deadlock avoidance, Banker's algorithm, Deadlock detection, Recovery from Deadlock.

UNIT - IV: Memory Management

Preliminaries of memory management, Contiguous memory allocation, partitioned allocation MFT, fragmentation, MVT, partition allocation policies, compaction, Non-Contiguous memory allocation, Paging, Structure of page table, Segmentation, **Virtual Memory**: Concepts, demand paging, Swapping, **Page replacement policies**: FIFO, Optimal, LRU, MRU, Thrashing. **Secondary Storage**: Hierarchy, physical characteristics, evaluation of disk access time and data transfer rate, **Scheduling algorithms**: FCFS, SCAN etc.

UNIT – V: File and Device Management

File concept: file types, file directory maintenance, File sharing, Basic file system structure, access methods-sequential and direct access, free space management contiguous, linked allocation and indexed allocation and their performances. **Protection and Security**: principle of protection, domain structure, access matrix, access control, the security problems. **Distributed systems:** Introduction & Features, Types of distributed OS.

BOOKS RECOMMENDED:

1. **Operating System Concepts**, *Abraham Silberschatz, Peter B. Galvin and Greg Gagne*, Wiley India
2. **Modern Operating System**, *Andrew .S. Tanenbaum*, PHI
3. **Operating System Concepts**, *James L. Peterson and Abraham Silberschatz*, Addison-Wesley
4. **Operating System Concepts & Design**, *Milan Milenkovic*, MGH
5. **An Introduction to Operating Systems**, *Harvey M. Dietel*, Addison Wesley

SECOND SEMESTER
Financial Management & Accountancy
Subject Code - MCA-205

Max. Marks: 100   **Min Marks : 40**

UNIT - I
Financial Accounting
Meaning and Nature, Accounting Principles underlying the preparation of financial statements.
Preparation of Financial Statements
A Synoptic view-Profit and Loss account, Balance Sheet

UNIT - II
Financial statement Analysis
Ratio analysis (Liquidity, Solvency, Profitability, Efficiency), Statement of Changes in financial position-working capital basis.
Conceptual Framework of Cost Accounting
Meaning nature and need of cost accounting, Elements of cost, Preparation of cost – sheet, Cost concept –Fixed and variable costs, sunk costs, Out of pocket costs, Relevant and irrelevant costs, Opportunity and imputed costs.

UNIT - III
Cost – volume Profit (CVP) relationship
Break-even analysis; (single and multiple products), Determination of sales volume to attain desired profits, Cash break-even point. Graphic presentation of CVP relationship. Assumptions and limitation of break-even analysis.

UNIT - IV
Budgeting
Definition and objective. Preparation of various types of budgets including cash budget. Fixed and flexible budgets.

UNIT – V
Cost Accumulation System
Job and Process (simple treatment)
Variable and absorption costing systems
Comparison for income determination (simple treatment), Variable costing as a tool of decision-making

BOOKS RECOMMENDED :

1. **Accounting for Management,** *Bhattacharya S.K. and Deardan John*
2. **The essence of financial accounting**, *Chadwick*

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MASTER OF COMPUTER APPLICATIONS

THIRD SEMESTER

Subject Code	SUBJECTS	Teaching Load Per Week			Credit L+(T+P)/2	Examination Marks							
						Max. Marks				Min. Marks			
		L	T	P		Th	Ses	Pr	Total	Th	Ses	Pr	Total
MCA301	Programming in Java	3	2	-	4	100	25	-	125	40	15	-	55
MCA302	Computer Network & Data Communication	3	2	-	4	100	25	-	125	40	15	-	55
MCA303	Operation Research	3	2	-	4	100	25	-	125	40	15	-	55
MCA304	Computer Graphics	3	2	-	4	100	25	-	125	40	15	-	55
MCA305	Software Engineering and Project Management	3	2	-	4	100	25	-	125	40	15	-	55
MCA306	Programming Lab	-	-	3x2	3	-	50	100	150	-	30	50	80
MCA307	Programming Practice / Mini-Project	-	-	2	1	-	50	50	100	-	30	25	55
MCA308	Common Software / Mini-Project	-	-	2	1	-	50	50	100	-	30	25	55
MCA309	Seminar	-	-	2	1	-	25	-	25	-	15	-	15
	TOTAL	15	10	12	26	500	300	200	**1000**	200	180	100	**480**

Programming in JAVA
Subject Code - MCA-301

Max. Marks: 100   **Min Marks : 40**

UNIT - I: Introduction to Java Programming

An overview of Java: Object Oriented Programming, Features of Java, Java Virtual Machine, Java Environment: Java Development Kit, Java Standard Library, Data Types, **Variables:** Declaring a variable, Dynamic Initialization, The scope and life time of variable, Type conversion and Casting: Narrowing and Widening Conversions, Numeric Promotions, Type Conversion Contexts; **Operators**: Arithmetic Operators, Relational Operators, Logical Operators, Bit wise Operators, Conditional Operators, new operator, [ ] and instance of operator. **Control Statements:** Java's Selection statement, Iteration Statement, Jump Statement. **Arrays**: Declaring Array variables, constructing an Array, Initializing an Array, Multidimensional Arrays, Anonymous Arrays.

UNIT - II: Define the Class and interface

Introducing Classes: Class Fundamentals, Declaring Object, Assigning Object Reference Variables, Defining **Methods**: method overloading and overriding, Using objects as parameter, Constructors, Garbage collection, finalize () method. **Inheritance**: Inheritance basic, method overloading, object reference this and super, Chaining constructor using this () and super (), Member accessibility modifier: public, protected, default accessibility of member, private protected, private, **Package:** Define package, CLASSPATH, importing package, Interface: Define an interface, implementing interface, extending interface, variable in interface, **Overview of nested class:** Top level nested class and interface, Non static inner class, Local class, Anonymous class.

UNIT - III: Exception handling and Multithreading

Exception Handling: Exception types, Uncaught Exception, Using try and catch, multiple catch, nested try block, throw, throws, and finally. **Multithreading:** Creating Thread, Thread Priority, Synchronization, Thread Scheduler, Running & Yielding, Sleeping & Waking Up, Waiting & Notifying, Suspending & Resuming; miscellaneous methods in thread class.

UNIT - IV: Fundamental Library Classes of Java and Input / Output

Object class, String class, String Buffer class, Wrapper class, Math class, Collection: Collection interface, List interface, Set interface sorted interface, Array List class, Liked List class, Tree Set, Comparator, Vector, Stack. **I/O Classes and Interfaces:** File, Buffer Stream, Character Stream, and Random Access for files, Object Sterilization.

UNIT - V: Event Handling:

Overview of Event Handling, Event Hierarchy, The Delegation Event Model, Event Classes, KeyEventClass, Sources of Events, Event Listener Interfaces, Using the Delegation Event Model, Event Adapters. **GUI Programming:** Introduction to Swing, History, Features, Components and Containers, Swing Packages, Painting, Swing Component Classes: JLabel, JTextField, Swing Buttons, JTabbedPane, JScrollBar,JList, JComboBox, Trees, JTable, Swing Menus:< Main Menu, PopUp Menu, ToolBar. **JDBC:** Introduction to JDBC, JDBC Drivers Type, Connection, JDBC URLs, Driver Manager, Statement – Creating, Executing, Closing, Result Set – Data Types and Conversions. Prepared Statement, Callable Statement, Mapping SQL and Java Types.

BOOKS RECOMMENDED:

1. **Java: The Complete Reference,** *Herbert Schildt,* Oracle Press.
2. **Core Java: Volume-I & Volume 2,** *Cay S. Horstmann & Gary Cornell,* PEARSON
3. **Programming with Java,** *E. Balagurusamy,* McGraw Hill Education
4. **Core Java,** *R. Nageshwara Rao,* Dreamtech Press

Computer Network & Data Communication
MCA-302

Max Marks : 100   **Min Marks : 40**

UNIT – I: Introduction to Computer Networking
Data Communications: Characteristics, components, Data Representation, Data flow, **Networks:** Criteria, Physical structure (Types of Connections, Topologies), Categories of Networks-LAN, WAN, MAN, Protocol and standards. **The Layered Model**: Layers in The OSI model, TCP/IP protocol suite. **Addressing:** Physical, logical and Port.

UNIT – II: Physical Layer and Transmission Media
Analog & digital data, Analog & digital Signals, Periodic analog signals, **Digital Signals**: Bitrate, Bit length, Digital signal as composite analog signals, transmission of digital signals. Data Rate Limits, Performance. **Digital Transmission:** Digital to Digital Conversion, Analog to Digital Conversion **Transmission media**: Co-axial, UTP, Fiber optic and wireless. **Multiplexing:** FDM, TDM, and WDM. **Switching:** Circuiting, Message switching, Packet switching.

UNIT – III: Data Link Layer & Network Layer
Data Link Layer : Types of Errors **Block Coding**: Error Correction, Error Detection, Hamming Distance, CRC, Checksum, Framing , Flow and Error Control, Protocols, stop and wait protocol, stop and wait ARQ, Go-Back ARQ, Selective Repeat ARQ, **Multiple access protocols**: ALOHA, Slotted ALOHA, CSMA, CSMA/CD, CSMA/CA, **Channelization**: CDMA, FDMA, TDMA. **Network Layer:** The IPv4 and IPv6 protocol and its header, IP address classes, mask, subnetting, supernetting, ARP, ICMP**. Routing Algorithm:** Distance Vector Routing, Link State Routing, Connecting Devices,

UNIT – IV: Transport Layer & Application Layer
Transport Layer : Process to Process Delivery, Client- Sever Paradigm, Connection less versus Connection Oriented Service, User Datagram Protocol. Congestion Control, RSVP protocol. Quality of Services. Application Layer: Domain Name System: name space, Domain Name Space, Distribution of Name Space, Resolution, Electronic Mail, SMTP, FTP, Architecture of WWW, HTTP.
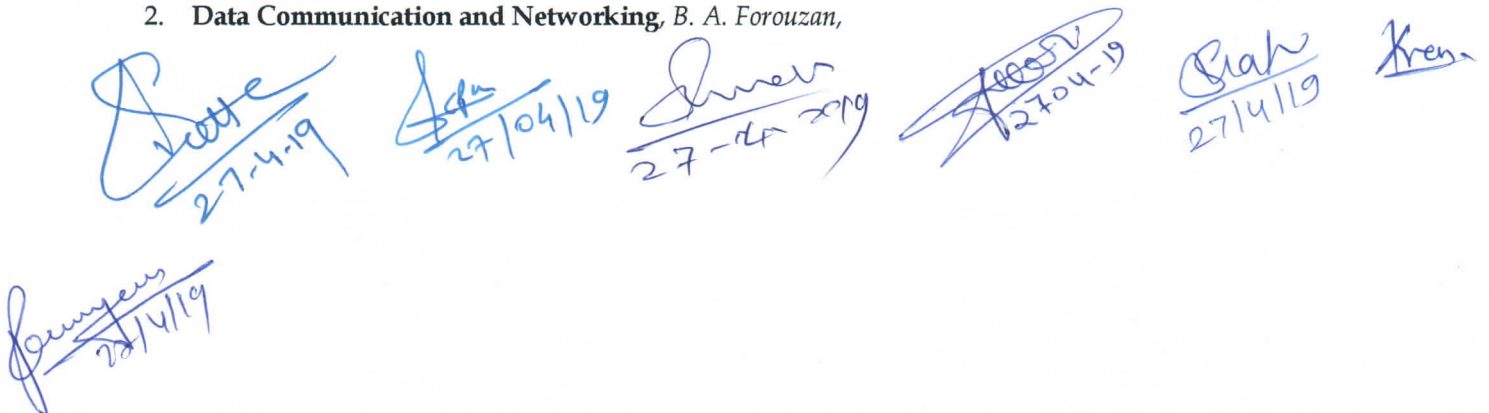
UNIT – V: Network Security
The Importance of Security in Networking. **Symmetric Key Cryptography:** Traditional Ciphers, Simple Modern Ciphers, Modern Round Ciphers, DES **Asymmetric Key Cryptography:** RSA algorithm, Deffie-Hellman, Security Services, Key Management.

BOOKS RECOMMENDED:

1. **Computer Networks,** *A.S. Tanenbaum,*
2. **Data Communication and Networking,** *B. A. Forouzan,*

Operation Research
MCA-303

Max Marks : 100   **Min Marks : 40**

UNIT – I: Linear Programming
L P formulations, Graphical method for solving LP's with 2 variables, Simplex method, Duality theory in linear programming and applications, Special Linear Programming Problems, Transportation Problem (Stepping Stone Method), Assignment problem (Hungarian Method)

UNIT – II: Network Analysis
Examples of network flow problems, Shortest –route problems, Dijkstras Algorithm, Applications of shortest – route problems, Max flow problem, Flow network, Labeling routine, Labeling algorithm for the max flow problems, Min-cut and max –cut theorem.

UNIT – III: Project Scheduling by PERT/CPM
Project management origin and the use of PERT origin and use of CPM, Application of Pert and cpm; Project network - Diagram representation, Critical path calculations by linear programs, Critical path calculations by network analysis and critical path method (cpm), Determinations of floats, Constructions of time chart and resource labeling, Project cost curve and crashing in project management, Program evaluation and Review technique (pert).

UNIT – IV: Dynamic Programming
Basic concepts - Bellman's optimality principles, Examples of D.P. models and computations. Examples to be taken from Different areas of allocations, replacement, sequencing, and scheduling, networks and other related O>R areas. **Queuing Models:** Notations and assumptions, Queuing models with Poisson input and Exponential Service,(M/M/1): (∞/FIFO), (M/M/1) : (∞/SIRO), (M/M/1):(N/FIFO), Birth-Death Model, (M/M/C) : (N/FIFO) (M/M/C) : (C/FIFO)), Power Supply Model.

UNIT – V: Sequencing Models
Sequencing Problem, Johnson's algorithm for processing n jobs through 2 machines, Johnson's Algorithm for processing n jobs through 3 machines, Processing 2 jobs through n machines, graphical solution. **Inventory Models:** Introduction to the inventory problem, Deterministic models - The classical EOQ (Economic Order Quantity) model, Non- zero lead time, The EOQ with shortages allowed.

BOOKS RECOMMENDED:

1. **Operation Research,** *Giltte.*
2. **Operation Research,** *Gupta and Kumar.*
3. **Operation Research,** *Gupta and Manmohan.*

Computer Graphics
MCA-304

Max Marks : 100   **Min Marks : 40**

UNIT - I: Display Devices

Refresh Cathode-Ray tubes, Random Scan and Raster Scan Display, Color CRT Monitors, Color display techniques: shadow masking and Beam penetration, Direct view storage tubes, Flat Panel display: plasma panel displays, LED & LCD devices. **Interactive Graphics:** Physical Input devices, logical classification, input function, interactive picture construction techniques.

UNIT - II: Output Primitives

Points and Lines, Line drawing Algorithms: DDA Algorithm and Bresenham's Line Algorithm, Antialiasing. Circle generating Algorithms: Bresenham's Circle Algorithms, Midpoint Circle Algorithm, Ellipse Generating Algorithm: Midpoint, Character generation and text display. Output command for various geometrical shapes, Filled Area Primitive: Scan line polygon fill algorithm, Boundary fill algorithm, Flood fill algorithm. Attribute of outputs primitives: line attribute, Area-fill Attribute, Text attribute, Bundled attributes, Area-Fill.

UNIT - III: Two Dimensional Transformation and Viewing

Transformation: Translation, Scaling, Rotation, Reflection, Shearing. Matrix representations of Transformation and Homogenous Coordinates, Composite Transformations and Concatenation of transformation. **Two-Dimensional Viewing Coordinate system:** World/user coordinates, Device coordinate, Normalized device coordinates, Viewing pipeline: windows and viewports, Viewing transformation pipeling, Window-to-Viewport coordinate transformation, Clipping algorithm: point, line clipping algorithm: Cohen-Sutherland, Liang Barsky, Nicholl-Lee-Nicholl, Line Clipping, polygon clipping algorithm : Sutherland-Hodgman, Weiler-Atherton, text clipping.

UNIT - IV: 3-D Transformation and Viewing

3-D Transformation: Translation, Scaling, Rotation about standard and arbitrary axis, Other Transformation: Reflections and shears, Transformation commands. **Viewing:** Viewing Pipeline, Viewing Coordinates: transformation from world to viewing coordinates.

UNIT - V: 3-D Projection

Projection: Parallel Projection, Perspective Projection, Normalized view volume, viewport Clipping, Clipping in Homogeneous Coordinate. **Visible-Surface detection algorithms**: Back-Face removal, Depth Buffer method, Scan line method, Depth sorting method, Area subdivision and Octree method.

RECOMMENDED BOOKS:

1. **Computer Graphics**, *Hearn D. & Baker P.M.*
2. **Computer Graphics**: A Programming Approach, *Harrington S.*
3. **Procedural Elements for Computer Graphics**, *Rogers D.F.*

Software Engineering and Project Management
MCA-305

Max Marks : 100   **Min Marks : 40**

UNIT – I Software Engineering Fundamentals:

Introduction to Software Engineering; Software Engineering Principles(Layers); Software Process – Process Framework, Umbrella Activities, Process Adaptation; Software Crisis; Process Models-Waterfall Model, Prototype Model, Incremental Model, Spiral Model, RAD Model; Agile Process.

UNIT – II Software Analysis and Design:

Requirement Engineering; Analysis Model-Data Flow Diagram, Data Dictionary, E-R Diagram, Decision Table; Software Requirements Specification(SRS), Structure of SRS; Pseudo code; Software Design; Design Process; Design Concepts-Abstraction, Partitioning, Modularity, Information Hiding, Refinement, Refactoring; Function Oriented Design; Object Oriented Design; Cohesion and Coupling.

UNIT – III Software Quality and Case Tools:

Software Metrics, Categories of Metrics, Function Point Metric; Software Quality; McCall's Quality Factors; Software Maturity Model-CMM,CMMI; Software Quality Assurance; ISO Standards-9000, 9001 and 9126; Software Reliability; Case Tools and its Scope; Case Objectives; Architecture of Case Tools; Case Classification.

UNIT – IV Coding and Testing:

Programming Style; Structured Programming; Coding Standard; Internal Documentation; Software Testing-Verification and Validation; Alpha and Beta Testing; Levels of Testing-Unit, Integration and System Testing; Testing Techniques- White Box, Black Box; Cyclomatic Complexity; Test Plan; Debugging-Debugging Process, Debugging Strategies(Approaches).

UNIT – V Software Maintenance and Project Management:

Risk Management – Software Risk, Risk Identification; Introduction to Software Maintenance, Categories of Maintenance; Belady and Lehman Model; Boehm Model; Project Management Concept – People, Product, Process, Project; Software Team; Software Project Planning; Software Project Estimation; Cost Estimation Model(COCOMO, COCOMO II, Putnam-SLIM, Walston and Felix); Software Reengineering.
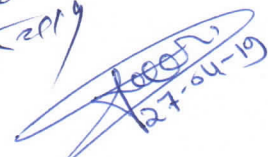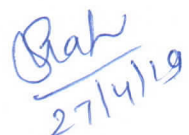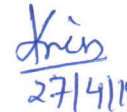
RECOMENDED BOOKS:
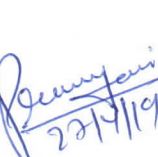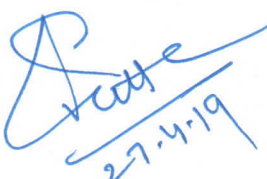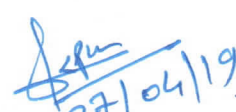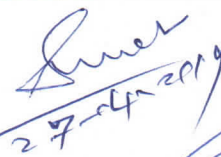
1. **Software Engineering: A Practitioner's Approach**, *Roger S. Pressman*, TMH
2. **An Integrated approach to Software Engineering**, *Pankaj Jalote*, Narosa Publications
3. **Software Engineering**, *Bharat Bhushan Agarwal*.

SCHEME OF TEACHING AND EXAMINATIONS   2019-2020
MASTER OF COMPUTER APPLICATIONS

FOURTH SEMESTER

Subject Code	SUBJECTS	Teaching Load Per Week			Credit L+(T+P)/2	Examination Marks							
						Max. Marks				Min. Marks			
		L	T	P		Th	Ses	Pr	Total	Th	Ses	Pr	Total
MCA401	Advanced Programming Tools	3	2	-	4	100	25	-	125	40	15	-	55
MCA402	Advanced Computer Architecture	3	2	-	4	100	25	-	125	40	15	-	55
MCA403	Wireless & Mobile Communication	3	2	-	4	100	25	-	125	40	15	-	55
MCA404	Open Source Software with Case Study of Linux	3	2	-	4	100	25	-	125	40	15	-	55
MCA405	Electives : 1. Data Warehousing and Mining 2. Theory of Computation 3. Analysis and Design of Algorithms	3	2	-	4	100	25	-	125	40	15	-	55
MCA406	Programming Lab	-	-	3x2	3	-	50	100	150	-	30	50	80
MCA407	Programming Practice / Mini-Project	-	-	2	1	-	50	50	100	-	30	25	55
MCA408	Common Software / Mini-Project	-	-	2	1	-	50	50	100	-	30	25	55
MCA409	Group Discussions	-	-	2	1	-	25	-	25	-	15	-	15
	TOTAL	15	10	12	26	500	300	200	**1000**	200	180	100	**480**

Advanced Programming Tools
MCA-401

Max. Marks: 100   **Min Marks : 40**

UNIT – I: Networking and RMI
Networking: Socket overview, Client/Server, Proxy Server, Network class and interface, TCP/IP client socket, TCP/IP Server socket, URL Connection, Datagrams, Datagram Packets. **RMI:** Distributed Applications, Introduction to RMI, Java RMI Architecture, Writing an RMI Server, Designing a Remote Interface, Implementing a Remote Interface, Creating a Client Program, Compiling the Programs, Running the Programs

UNIT – II: Servlets
Movement to Server Side JAVA, Overview of Servlets, Common Gateway Interface (CGI), The JAVA Servlet Architecture, Generic Servlet and HTTP Servlet, The Servlet Interface, Requests and Responses, The Life Cycle of a Servlet, Retrieving Form Data in a Servlet, Session Tracking, Cookies.

UNIT – III: Java Server Pages (JSP)
Overview of JSP, JSP Scripting elements, Compare and Contrast JSP with CGI and Servlet Technologies, List JSP directives, Integrate JSP with Java Beans Components, Handle JSP exceptions, Develop a basic Java Server Pages, Deploy Java Server Pages, Compare two-tier and multi-tier web application architectures, Database Connectivity.

UNIT – IV: GUI Programming in Python
The Tkinter module, Windows, Fonts and Colors, Containers, Canvas, Frame, Widgets: Buttons, Labels, Message, Text, Scrollbar, Checkbutton, Radiobutton, Entry Widget, Spinbox, Listbox, Menu, Tables. **Networking in Python:** Protocols, TCP/IP, UDP, Sockets, IP Addresses, URLs, TCP/IP Server, TCP/IP Client, UDP Server, UDP Client, File Server, File Client, Working with SMTP and HTTP
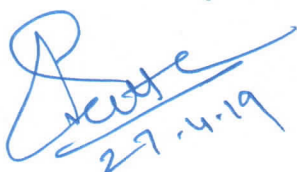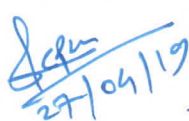
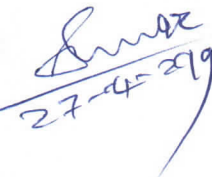### UNIT – V: Web Programming in Python
Web Frameworks and their features; Django: Introduction, Installation, Architecture, Project Setup, Views, Templates, Models; Web Applications and Services: REST and CGI; **Integrating Java and Python:** Introduction and Installation, Interactive and Script modes, Packaging Jython based applications, Using Java classes in Jython, Java Servlets in Jython.
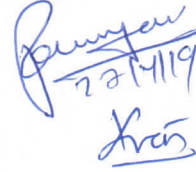
BOOKS RECOMMENDED:

1. **Java: The Complete Reference, 10th Edition,** *Herbert Schildt*, Oracle Press.
2. **Core Java: Volume 1 & Volume 2, 9th Edition,** *Cay S. Horstmann Gary Cornell*, PEARSON
3. **Thinking in Java,** *Bruce Echel*, PEARSON
4. **Core and Advanced Java: Black Book,** Dreamtech Press
5. **JSP: the Complete Reference,** *Philipl Hanna*, McGraw Hill Education
6. **Learning Python** 5th Edition, *Mark Lutz*, O'Reilly Publications
7. **Beginning Python: Using Python 2.6 and Python 3.1,** *James Payne*, Wiley
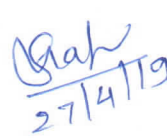8. **Python: The Complete Reference,** *Martin C. Brown*, McGraw Hill Education

Advanced Computer Architecture
MCA-402

Max. Marks: 100   **Min Marks : 40**

UNIT I:

Introduction - Feng's and Flynn's classification scheme, Multiprocessor and Multicomputer, UMA, NUMA, COMA, NORMA, memory models, parallel computer and its type. Applications of Parallel Computers.

UNIT II:

System Interconnect Architecture – Static and Dynamic, Hypercube Interconnection network, multistage interconnection networks-architecture and routin, design consideration, throughput delay, blocking and non-blocking properties. Performance Metrics and Benchmarks.

UNIT III:

Principle of pipelining-overlapped parallelism, Linear and non-linear pipelining, reservation table, calculation of MAL. Types of Instruction Pipeline. Arithmetic pipeline designs example –Floating point adder, pipelined multiplier.

UNIT IV:

Advanced processor Technology – RISC, CISC, VLIW architectures, Hazard detection and resolution, functional organization of instruction in IBM 360/91.

UNIT V:

Exploring parallelism in program- multidimensional arrays. Parallel Algorithm-Matrix addition, subtraction, multiplication –block and SIMD. Bitonic sort, sorting on linear array processors. Bernstein's condition, ISO efficiency concept.

BOOKS RECOMMENDED:

1. **Computer Architecture & Parallel Processing**, *Kai Hwang and F.A. Briggs*, McGraw Hill.
2. **Advanced Computer Architecture**, *Kai Hwang*, McGraw Hill.
3. **Parallel Computing**, *M.R. Bhujade*, New Age Publication.
4. **Parallel Computing Theory and Practice**, *Michael J. Quinn*, Tata McGraw Hill

Wireless & Mobile Communication
MCA-403

Max. Marks: 100   **Min Marks : 40**

UNIT I: Introduction

Introduction to Mobile Communication, Evolution of modern Mobile wireless communication systems, Applications of mobile communication, Need and Requirements of Mobile communication, satellite systems and Applications, Type of satellite systems, characteristics of satellite systems, Global Positioning system (GPS) and Applications, some open research topics in mobile communication.

UNIT II: Mobile Communication Systems

Introduction, Cellular System Infrastructure, Registration, Handoff Parameters and Underlying support, Roaming Support Using System Backbone, to Mobile IP, Functions of Mobile IP, Mobile Node, Corresponding Node, Home Network, Foreign Network, Home Agent , Foreign Agent, Care-of Address, IP Packet Delivery, Agent Discovery, Agent Solicitation , Registration, Tunneling , Dynamic host configuration protocol.

UNIT III: Mobility and Frequency Management

Mobility management in wireless Networks, Handoff Techniques, Handoff detection and Assignment, Types of Handoff, channel Reservation for Handoff calls, WLAN transmission technology, Frequency hopping, Direct Sequence Modulation, Frequency division, Orthogonal Frequency Division, Spectrum utilization.

UNIT IV: Wireless LANs and PANs

Introduction to IEEE 802.11, Ricochet, Ricochet Wireless Modem, Services Provided by Ricochet, Home RF, Home RF Technology, Hiper LAN, Bluetooth , Advantages and disadvantages of Wireless LAN, Infra red vs radio transmission , introduction to MAC. Technologies influence WLANs / WPANs in future.

UNIT V: Mobile Adhoc Network

Introduction to Mobile Adhoc Network (MANET), Characteristics of MANET, Applications of MANET, Routing, Need for Routing, Routing Classification, Table-Driven Routing Protocol – Destination Sequenced Distance Vector Routing Protocol, Cluster-Head Gateway Switch Routing, Wireless Routing Protocol. Source initiated On-demand Routing- Adhoc On Demand Distance Vector Routing, Dynamic Source Routing, Temporarily Ordered Routing Algorithms, Hybrib Protocol – Zone Routing Protocol.

RECOMMENDED BOOKS:

1. **Mobile Communication**: *Jochen H. Schiller*, Pearson Education Publication
2. **Introduction to Wireless and Mobile Systems**: *D.P. Agrawal, Qing-An Zing*, Vikas Publishing House.
3. **Wireless Communication and Networks**: *Iti Saha Misra*, McGraw Hill education.
4. **Wireless and mobile Communication**: *T.G. Palanivelu, R. Nakkeeran*, PHI Publication.
5. **Mobile Commerce**: *Karabi Bandyopadhyay*, PHI Publication.

Open Source Software with Case Study of Linux
MCA-404

Max. Marks: 100   **Min Marks : 40**

UNIT - I

Open Source Software: Introduction, History, Examples(Operating System GNU/Linux, Apache Web Server), Strengths and Advantages(Network effects, Lower cost, Availability, Maintainability), Challenges, System Structure, Kernel and its function. **File System :** Concept of i-node table, links, commonly used commands like who, pwd, cd, mkdir, rm, ls, mv, lp, chmod, cp, grep, sed, awk, make, etc. Getting started (login / logout), File system management, file operation, system calls, buffer cache. **Vi Editor :** command and edit mode, invoking vi, deleting and inserting line, deleting and replacing character, searching strings, yanking, running shell command, command macros, set windows, set auto indent, set number, intro to exrc file.

UNIT - II

Shell Programming: Introduction to shell feature, wild card characters, i/out redirections, standard error redirection, system and user created shell variables, profile files, pipes/tee, background processing, command line arguments, command substitution, read statement, conditional execution of commands, special shell variables $ #, #?, $* etc. Shift commands, loops and decision making- for, while and until, choice making using case…esac, decision making if ….fi, using test, string comparison, numerical comparison, logical operation, using expr.

UNIT - III

Introduction to Shell: Features, changing the login shell, cshrc, login, logout files, setting environment, variables, history and alias mechanism, command line arguments, redirection/appending safely, noclobber, noglob, ignore eof, directory stacks (pushd, popd). **Process Control:** Process management, process states and transition, regions and control of process, signals, system boot and init process, traps, setting process priorities.

UNIT - IV

Inter-process Communication: I/O Sub system, terminal drives, disk drives, messages, shared memory, semaphores, memory management, swapping, demand paging. **System Calls and Unix -C Interface :** File handling calls like - open() & close() with algorithm, read() & write() with algorithm, create(), access (), fseek(), process control system calls like kill(), exec(), fork(), wait(), signal(), exit().

UNIT - V

System Administration: Process and Scheduling, Security, Basic System Administration:-Adding a User, User Passwords, Delete of a User, Adding a Group, Deleting a Group, Super User, Startup and Shutdown. Advanced System Administration:-Managing Disk Space, Backup and Restore, Managing System Services.

BOOKS RECOMMENDED:

1. **Design of Unix Operating System;** *Maurice J. Bach*
2. **Advanced Unix,** *Stephan Pratta*
3. **Unix Concepts & Techniques,** *Sumitabha Das*
4. **The Unix Programming Environment,** *Kennighan and Pike*
5. **Unix Programmers Guide,** *P. P. Selvester*
6. **Introduction to Unix System,** *Rachell Morgan*
7. **Complete Reference Red Hat Linux,** *Richard Peterson*

Elective 1: Data Warehousing and Mining
MCA-405

Max. Marks: 100   **Min Marks : 40**

UNIT – I: Introduction to Data Warehousing and OLAP Technology for Data Mining

What is Data Mining?, Data Mining: On what kind of data?, KDD Process, Data Mining Functionality, Are all the patterns interesting?, Attribute Types, What is Data Warehouse?, Data Cube: A multi-dimensional data model, Data Warehouse Architecture, Data Warehouse Implementation, Data Warehouse Usage(Applications), OLAP Operations, Concept of Transaction, Transactional Database, Distributed Database, Commit Protocols.

UNIT - II: Data Preprocessing, Data Mining Primitive, Languages and System Architecture

Why preprocess the data?, Data Cleaning, Data Integration, Data Transformation, Data Reduction, Concept Hierachy Generation, Data Mining Primitive, Data Mining Query Language, Architecture of Data Mining System.

UNIT - III: Mining Association Rules in Large Databases

Association Rule Mining, Mining Single-dimensional Boolean Association Rules from Transactional Databases(Apiori algorithm, FP-Tree growth algorithm), Mining Multilevel Association Rules from Transactional Databases, Mining Multi-dimensional Association Rules from Transactional Databases and Data Warehouses, From Association Mining to Correlation Analysis, Constraint-based Association Mining.

UNIT - IV: Classification, Prediction and Cluster Analysis

What is Classification?, What is Prediction?, Classification by Decision Tree Induction, Bayesian Classification, Classification by Back Propagation, Classification based on Association, Other Classification Methods, Prediction, Classification Accuracy, What is Cluster Analysis?, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods, Model-Based Clustering Methods, Outlier Analysis.

UNIT - V: Mining Complex Types of Data & Applications and Trends in Data Mining

Mining Time-series and Sequence Data, Mining Spatial Databases, Mining Multimedia Databases, Mining Text Databases, Mining World Wide Web, Data Mining Applications, Social Impact of Data Mining, Trends in Data Mining.

RECOMENDED BOOKS:

1. **Data Mining: Concepts and Techniques,** *Jiawei Han and Micheline Kamber*
3. **Data Mining Techniques,** *Arun K Pujari,*
4. **Data Mining Introductory and Advanced Topics,** *Margaret H Dunham,* Pearson

Elective 2: Theory of Computation
MCA-405

Max. Marks: 100   **Min Marks : 40**

UNIT – I:

Alphabet, String and language, Finite state Machines, finite automata with ϵ-moves, Conversion of NDFA to DFA, Removal of ϵ-transition from NDFA, Two way finite automata, finite automata with output, Mealy & Moore machines, Applications of finite automata, minimization of finite automata.

UNIT – II:

Chomsky classification of Languages , Regular Expression and Language, Properties of Regular languages, Pumping lemma for regular sets, Closure properties of regular sets, Decision algorithms for Regular sets, Myhill-Nerode theorem.

UNIT – III:

Context free grammars and their properties, derivation tree, simplifying CFG, ambiguity in CFG, Chomsky Normal form, Greibach Normal form, Pumping lemma for CFL, Closure properties of CFL.

UNIT – IV:
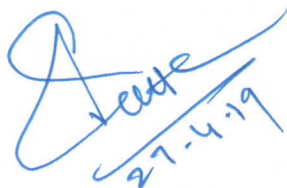
Pushdown automata: Informal description, Definition, Determinism and Non determinism in PDA, Equivalence of PDA's and CFL's. Two way PDA, Concept of Linear Bounded Automata, context sensitive grammars and their equivalence, Turning machine construction, determinism and non-determinism in TM, Multi tape, multi-track TM.
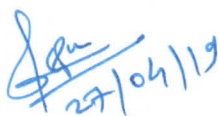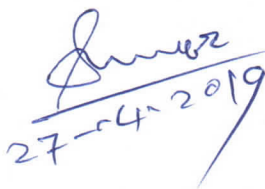
UNIT – V:

Undecidability, Universal turning machine and an undecidable problem, recursive function theory, Recursively enumerable sets, recursive sets, partial recursive sets, Church's hypothesis, post correspondence problem, Russell's paradox.
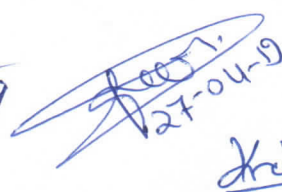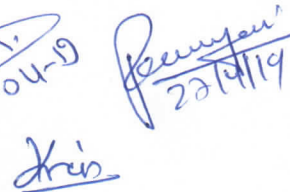
RECOMMENDED BOOKS:

1. **Theory of Computer Science, Automata Languages & computation**, *K.L.P. Mishra, N. Chandrashekharan, PHI.*
2. **Introduction to Automata Theory Language and Computation,** *John E. Hopcraft and Jeffary D. Ullman*, Narosa Publication house.
3. **Introduction to Formal Languages, Automata Theory and Computation**, *Kamala Krithivasan and Rama. R*, Pearson.
4. **Introduction to Automata Theory Languages and Computation**, *John E. Hopcraft, Jeffary, D. Ullman and Rajeev Motwani.*
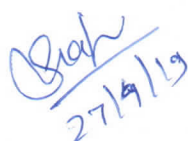
Elective 3: Analysis and Design of Algorithms
MCA-405

Max. Marks: 100   **Min Marks : 40**

UNIT – I: INTRODUCTION & ANALYSIS
Analyzing algorithms, Algorithm types, Recurrence Equations, Growth function: Asymptotic notation, Standard notation & common functions, Recurrence relation, different methods of solution of recurrence equations with examples.

UNIT – II: DYNAMIC PROGRAMMING & GREEDY PARADIGM
The basic dynamic programming paradigm, Dynamic programming solution to the optimal matrix chain multiplication and the longest common subsequence problems, Top down recursive algorithms, Greedy Paradigm: The basic greedy strategy & computing minimum spanning trees, Algorithms of Kruskal and Prim, Union to Find Algorithm & their applications, Disjoint Set, The relationship in Dijkstra's and Prim's algorithms, Use of greedy strategy in algorithms for the Knapsack problem and Huffman trees.

UNIT – III: DIVIDE AND CONQUER & BACKTRACKING PARADIGM
Introduction to Divide and Conquer paradigm, Quick and merge sorting techniques, Linear time selection algorithm, the basic divide and conquer algorithm for matrix multiplication, Backtracking & Recursive backtracking, Applications of backtracking paradigm. heaps, Representation of heaps, Red Black tree, Binary Search tree , heap sort, shell & bucket sort, Amortized Analysis.

UNIT – IV: GRAPH ALGORITHMS & STRING MATCHING ALGORITHMS
Representational issues in graphs, Depth first search & Breath first search on graphs, Computation of biconnected components and strongly connected components using DFS, Topological sorting of nodes of an acyclic graph & applications, Shortest Path Algorithms on Graphs: Bellman-Ford algorithm, Dijkstra's algorithm & Analysis of Dijkstra's algorithm using heaps, Floyd-Warshall's all pairs shortest path algorithm and its refinement for computing the transitive closure of a graph.

UNIT – V: NP-COMPLETE PROBLEMS
Solvable problems, Types of problems, The notion of a non-deterministic algorithm and its basic relationship to backtracking. Polynomial time non deterministic algorithms for problems like satisfiability, clique problem, Hamiltonian path problems, The definition of NP-hardness and NP-completeness, The notion of polynomial transformation and reductions, Reductions to show that the clique problem, vertex cover, subset sum and Hamiltonian cycle problems are NP-complete.

RECOMENDED BOOKS:

1. **Introduction to Algorithms**; *Cormen, Leiserson, Rivest, Stein*; PHI.
2. **Fundamentals of Algorithms**, Horowitz and Sahni; Galgotia.
3. **The Design & Analysis of Computer Algorithms**, *Hopcroft – Aho – Ullman*, AWL.
4. **Handbook of Algorithms & Data Structures**, *G.H.Gonnet*, AWL.
5. **Introduction to Design & Analysis of Algorithms**, *Levitin*, PE-LPE.

SCHEME OF TEACHING AND EXAMINATIONS   2019-2020
MASTER OF COMPUTER APPLICATIONS

FIFTH SEMESTER

Subject Code	SUBJECTS	Teaching Load Per Week			Credit L+(T+P)/2	Examination Marks							
						Max. Marks				Min. Marks			
		L	T	P		Th	Ses	Pr	Total	Th	Ses	Pr	Total
MCA501	Advanced Programming Tools - **Java**	3	2	-	4	100	25	-	125	40	15	-	55
MCA502	Introduction to .Net Technology & C#	3	2	-	4	100	25	-	125	40	15	-	55
MCA503	Data Mining and Data Warehouse	3	2	-	4	100	25	-	125	40	15	-	55
MCA504	**Electives** : 1. Soft Computing 2. Simulation & Modeling 3. OOAD 4. Introduction to ISO & CMM	3	2	-	4	100	25	-	125	40	15	-	55
MCA505	**Electives** : 1. Satellite & Mobile Communication 2. Embedded Programming 3. Robotics 4. Artificial Neural Network & fuzzy logic	3	2	-	4	100	25	-	125	40	15	-	55
MCA506	Programming Lab	-	-	3x2	3	-	50	100	150	-	30	50	80
MCA507	Programming Practice / Mini-Project	-	-	2	1	-	50	50	100	-	30	25	55
MCA508	Common Software/Mini-Project	-	-	2	1	-	50	50	100	-	30	25	55
MCA509	Seminar	-	-	2	1	-	25	-	25	-	15	-	15
	TOTAL	15	10	20	26	500	300	200	**1000**	200	180	100	**480**

Advanced Programming Tools – JAVA
MCA-501

Max. Marks: 100   **Min Marks : 40**

UNIT - I: JDBC
Introduction to JDBC, JDBC Drivers Type, Connection, JDBC URLs, Driver Manager, Statement – Creating, Executing, Closing, Result Set – Data Types and Conversions. Prepared Statement, Callable Statement, Mapping SQL and Java Types, JDBC-ODBC Bridge Driver

UNIT - II: RMI
Distributed Applications, Introduction to RMI, Java RMI Architecture, Writing an RMI Server, Designing a Remote Interface, Implementing a Remote Interface, Creating a Client Program, Compiling the Programs, Running the Programs

UNIT - III: Servlets
Movement to Server Side JAVA, Overview of Servlets, Common Gateway Interface (CGI), The JAVA Servlet Architecture, Generic Servlet and HTTP Servlet, The Servlet Interface, Requests and Responses, The Life Cycle of a Servlet, Retrieving Form Data in a Servlet, Session Tracking, Cookies.

UNIT - IV: Java Beans
Java Beans Concepts and the Beans Development Kit, Using the Bean Box, Writing a Simple Bean, Properties, Manipulating Events in the BeanBox, The BeanInfo Interface, Bean Customization, Bean Persistence.

UNIT - V: Java Server Pages (JSP) & J2ME
Overview of JSP, JSP Scripting elements, Compare and Contrast JSP with CGI and Servlet Technologies, List JSP directives, Integrate JSP with Java Beans Components, Handle JSP exceptions, Develop a basic Java Server Pages, Deploy Java Server Pages, Compare two-tier and multi-tier web application architectures, Database Connectivity. Introduction of J2ME, Variable declaration and syntax, Application, documentation and implementation of Java apps.

BOOKS RECOMMENDED:

1. **Java: The Complete Reference, 10th Edition,** *Herbert Schildt,* Oracle Press.
2. **Core Java: Volume-I & Volume 2, 9th Edition,** *Cay S. Horstmann Gary Cornell,* PEARSON
3. **Thinking in Java,** *Bruce Echel,* PEARSON
4. **Core and Advanced Java: Black Book,** Dreamtech Press
5. **JSP: the Complete Reference,** *Phillip Hanna,* McGraw Hill Education

Introduction to .NET Technology
MCA-502

Max. Marks: 100   **Min Marks : 40**

UNIT - I: Inside the .NET framework
Overview of .net framework, Managed Execution process, CLR, common language specification, JIT Compilation , MSIL, Namespaces, Assemblies, metadata, Common Type System, cross language, interoperability, Garbage collection.

UNIT - II: Programming with .NET Framework
Windows form: working with Visual Studio IDE, creating a .NET solution, MDI application, components and controls, Data types, variables, Type conversions, Operators, Control **Structures**: conditional statements, loops, arrays, types of methods, method data, Introduction to exception handling-exception statements.

UNIT - III: XML, Windows process and File Handling
Types, structures, Enumerations, classes, Interfaces, Working with files-Files and directories, streams, Readers and writers, Reading and writing XML files, XML serialization, processing Transaction, Monitoring and Managing Windows Process, retrieving information about process.

UNIT - IV: Building .NET Framework Applications
Introduction to ASP .NET, Differentiate classic ASP and ASP .NET, Web application, Web forms, Form validations – Client side, Server side, controls in web forms, Events in Web form.
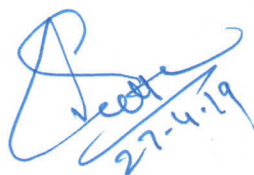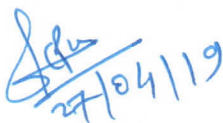
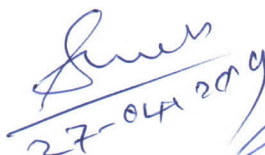### UNIT - V: Advanced concepts and Database Programming
Delegates, ADO .NET Architecture, .NET data provider, dataset components, creating database applications using Window forms and web forms (Database connectivity through ADO .NET), Introduction to web services, web services for Mobile application, Remote overview.
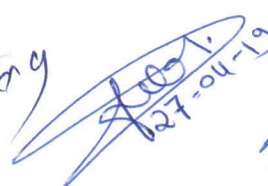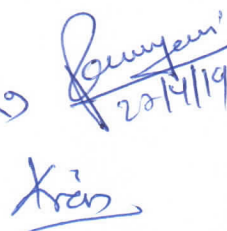
BOOKS RECOMMENDED

1. **MSDN online – Microsoft (Website)**
2. **The Complete Reference VB .NET,** *Jeffery R. Shapiro*, Tata Mcgraw Hill.
3. **Visual Basic .NET Programming: Black Book,** *Stephen Holzner***,** Dreamtech Publications.
4. **Professional VB .NET 2003,** *Bill Evjen & others*, Wiley Dreamtech India (P) Ltd.
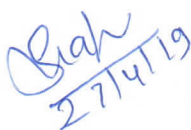5. **Visual Basic .NET Complete,** BPB Publications, New Delhi.

Data Mining & Data Warehousing
MCA-503

Max. Marks: 100   **Min Marks : 40**

UNIT – I: Introduction & Data Warehousing and OLAP Technology for Data Mining – What is data mining?, Data Mining: On what kind of data?, Data mining functionality, Are all the patterns interesting?, Classification of data mining systems, What is a data warehouse?, A multi-dimensional data model, Data warehouse architecture, Data warehouse implementation, Further development of data cube technology, From data warehousing to data mining. Concept of Transaction, Transactional database, Distributed Database, Commit Protocols.

UNIT - II: Data Preprocessing, Data Mining Primitive, Languages and System Architecture – Why preprocess the data?, Data cleaning ,Data integration and transformation, Data reduction, Discrimination and concept hierarchy generation, Data Mining Primitive, Data Mining Query Language, Architecture of data mining system.

UNIT - III: Mining Association Rules in Large Databases-
Association rule mining, Mining single-dimensional Boolean association rules from transactional databases, Mining multilevel association rules from transactional databases, Mining multidimensional association rules from transactional databases and data warehouse, From association mining to correlation analysis, Constraint-based association mining.

UNIT - IV: Classification and Prediction & Cluster Analysis –
What is classification? What is prediction? Issues regarding classification and prediction, Classification by decision tree induction, Bayesian Classification, Classification by back propagation, Classification based on concepts from association rule mining, Other Classification Methods ,Prediction, Classification accuracy, What is Cluster Analysis?, Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods, Model-Based Clustering Methods, Outlier Analysis.

UNIT - V: Mining Complex Types of Data & Applications and Trends in Data Mining -
Multidimensional analysis and descriptive mining of complex data objects, Mining spatial databases, Mining multimedia databases, Mining time-series and sequence data, Mining text databases, Mining the World-Wide Web, Data mining applications, Data mining system products and research prototypes, Additional themes on data mining, Social impact of data mining, Trends in data mining.

BOOKS RECOMMENDED:

1. **Data Mining: Concepts and Techniques**, *Jiawei Han and Micheline Kamber*
2. **Data Mining Concepts**, *H. Marget,*
3. **Introduction to Data Mining,** Pang – Ning Tan, Michael Steinbach, Vipin Kumar

Soft Computing
MCA-504

Max. Marks: 100   **Min Marks : 40**

UNIT - I: Introduction to Fuzzy Logic System
Fuzzy Sets Operation Of Fuzzy Sets, Properties Of Fuzzy Sets, Fuzzy Relations, Fuzzy Arithmetic, Membership Functions, Fuzzy To Crisp Conversion. Fuzzy Logic, Fuzzy Rule Based Systems, Fuzzy Decision Making, Fuzzy Database, Fuzzy Intelligent System.

UNIT - II: Introduction to Artificial Neural Networks
Introduction to Artificial Neural Network, Artificial Neuron, Classification of Artificial Neural Network, Architecture of a Artificial Neural Network, Activation Function, Training an Artificial Neural Network, Application of Artificial Neural Network.

UNIT - III: Perceptron and Associative Memories
Amari General Learning Rule, HEBB Learning Rule, ADLINE, Perceptron Layer Network, Associative memory: Auto associative Memory, Bi-directional memory, Back-propagation Network: Architecture, Training Algorithm Application of Back-propagation algorithm

UNIT - IV: Evolutionary Computing
Introduction, overview of evolutionary computing, Genetic algorithms and optimization, The schema theorem: the fundamental theorem of genetic algorithms, Genetic algorithm operators, Integration of genetic algorithms with neural networks, Integration of genetic algorithms with fuzzy logic, Known issues in GAs.

UNIT - V: Soft Computing Tools
Introduction to MATLAB, Features, Matrix Operations, Curve Plotting, Toolbox Introduction, Introduction to Simulink.

RECOMMENDED BOOKS:

1. **Soft Computing**, Saroj Kaushik, TMH Publications.
2. **Fuzzy systems and Fuzzy Logic**, *Klir and Uuna*, PHI Publications.
3. **Introduction to Artificial Neural Networks**, *S. N. Sivanandam and M. Paulraj*, Vikas publication.
4. **Soft Computing and Intelligent systems Design**, *Fakhreddine O. Karry and Clarence de Silva*
5. **Neural Network Design**, *Hagan & Demuth*, Vikas Pub. Comp.
6. **Fundamentals of Artificial Neural Networks**, *M.A.Hassaoun*.
7. **Fuzzy sets, uncertainty and information** *George J. Kir, & TA Folger*.
8. **Fuzzy sets, Decision making and Expert system**, *HJ Zimmerman*, Kluwer, Boston.
9. **Fuzzy set theory and its applications**, *H. J. Zimmerman*, Kluwer, Boston.

Satellite & Mobile Communication
MCA-505

Max. Marks: 100   **Min Marks : 40**

UNIT - I: Introduction.
Introduction to Mobile Communication, Short history of wireless communication, Applications, Vehicles, Emergency, Business, Replacement of wired network, Location dependent services, infotainment, Mobile and Wireless devices, A Simplified reference model, some open research topics in mobile communication.

UNIT - II: Satellite Systems
History of satellite system, Applications of satellite systems, Type of satellite systems, characteristics of satellite systems, satellite system infrastructure, satellite system architecture, Global Positioning system (GPS), Limitations of GPS. Beneficiaries of GPS, Applications of GPS

UNIT - III: Mobile Communication Systems
Introduction, Cellular System Infrastructure,, Registration, Handoff Parameters and Underlying support, Roaming Support Using System Backbone, to Mobile IP, Functions of Mobile IP, Mobile Node, Corresponding Node, Home Network, Foreign Network, Home Agent, Foreign Agent, Care-of Address, IP Packet Delivery, Agent Discovery, Agent Solicitation, Registration, Tunneling, Dynamic host configuration protocol.

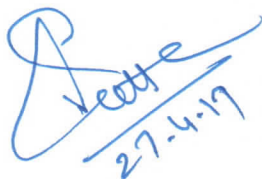### UNIT - IV: Wireless LANs and PANs
Introduction to IEEE 802.11, Ricochet, Ricochet Wireless Modem, Services Provided by Ricochet , Home RF, Home RF Technology, Hiper LAN, Blue tooth , Advantages and disadvantages of Wireless LAN, Infra red vs radio transmission , introduction to MAC. Technologies influence WLANs / WPANs in future.
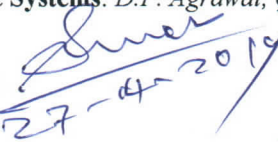
UNIT - V: Mobile Adhoc Network
Introduction to Mobile Adhoc Network(MANET), Characteristics of MANET, Applications of MANET, Routing, Need for Routing, Routing Classification, Table-Driven Routing Protocol – Destination Sequenced Distance Vector Routing Protocol, Cluster-Head Gateway Switch Routing, Wireless Routing Protocol. Source initiated On-demand Routing- Adhoc on Demand Distance Vector Routing, Dynamic Source Routing, Temporarily Ordered Routing Algorithms, Hybrib Protocol – Zone Routing Protocol.
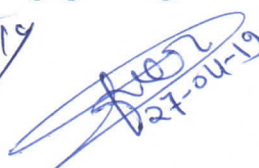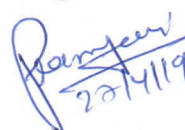
RECOMMENDED BOOKS:

1. **Mobile Communication**: *Jochen H. Schiller*, Pearson Education Publication
2. **Introduction to Wireless and Mobile Systems**: *D.P. Agrawal, Qing-An Zing*, Vikas Publishing House
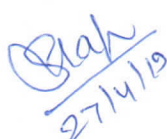
SCHEME OF TEACHING AND EXAMINATIONS   2019-2020
MASTER OF COMPUTER APPLICATIONS

SIXTH SEMESTER

Subject Code	SUBJECTS	Teaching Load Per Week			Credit L+(T+P)/2	Examination Marks							
						Max. Marks				Min. Marks			
		L	T	P		Sessional Marks of Project Work	Project Viva-Voce	Pr	Total	Sessional Marks of Project Work	Project Viva-Voce	Pr	Total
MCA601	System Development Project (System Design & Implementation)	5	-	30	20	200	200	-	400	120	100	-	220
	TOTAL	5	-	30	20	200	200	-	400	120	100	-	220