GOVT. NAGARJUNA PG COLLEGE OF SCIENCE RAIPUR

DEPARTMENT OF INFORMATION TECHNOLOGY

SYLLABUS

M. Sc.
(Semester System)

2019-2020

Department of Information Technology

Programme Specific outcome(PSO)

01- Appreciate and integrate new software and hardware technologies and extend their knowledge in specific areas of interest in academia and the industries.

02- Apply standard software Engineering practises and strategies in software project development using open source programming environment to deliver quality product for business success.

03- Provide to work in an IT or computing environment with the opportunity to enhance their career prospects by gaining additional knowledge and skills in selected areas of IT.

Programme outcome (POs)

01- Mainly focus on technological information systems apply the knowledge of technology, mathematics, networks and computing in core information technology.

02- Identify, design and analyse complex computer systems and implement and interpret the results form those systems.

03- Analyze the local and global impact of computing on individuals, organization and society.

Course Outcome (CO)	
Courses	Outcomes
Object oriented programming with C++	On successful compilation of this subjects the students have the programming ability in object oriented programming using C++
RDBMS and SQL	To inculcate knowledge on RDBMS concept and Programming with Oracle.
Mathematical Foundation of Computer Science	To inculcate knowledge on understand the notation of Mathematical thinking, Mathematical proofs and algorithmic thinking and able to apply them in problem solving.
Computer System Architecture	Students can understand digital circuit, microprocessor architecture and interfacing of various components.
Internet and Web technology	To understand the functioning the internet and learn the designing of website.
.NET Technology	On successful compilation of the course the students understood .NET framework, VB NET and ASP .NET
Data Structure	Enable the students to understand the abstract data type stack, queue, de-queue and list. To be able to Implement the ADTs stack, queue and de-queue.
Operating System	Enable the student to get sufficient knowledge on various system resources.
AI and Expert System	In this technology students understand to create technology that allows computers and machine to function in an intelligent manner.
Java Programming Language	To inculcate knowledge on Java Programming

	Concept.
Python Programming Language	To inculcate knowledge on Python Programming Concept.
Software Engineering	To introduce software project Management and to describe its distinctive characteristics and to discus project planning and the planning process.
Data mining and warehousing	On successful compilation of the course the students should have understood the Association rules, Clustering techniques and data warehousing.
Internet of Things	Students will be explored to the interconnection and integration of the physical world and the cyber space. They are also able to design and develop IOT device Network.

SCHEME OF TEACHING AND EXAMINATIONS 2019-2020
MASTER OF SCIENCE IN INFORMATION TECHNOLOGY

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
MSc(IT)101	Object Oriented Programming with C++	3	2	-	4	100	50	-	150	40	30	-	70
MSc(IT)102	RDBMS and SQL	3	2	-	4	100	50	-	150	40	30	-	70
MSc(IT)103	Mathematical Foundations of Computer Science	3	2	-	4	100	50	-	150	40	30	-	70
MSc(IT)104	Computer System Architecture	3	2	-	4	100	50	-	150	40	30	-	70
MSc(IT)105	Internet and Web Technology	3	2	-	4	100	50	-	150	40	30	-	70
MSc(IT)106	Programming Lab C++	-	-	3x2	3	-	25	100	125	-	15	50	65
MSc(IT)107	RDBMS & SQL Lab	-	-	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++ '
MSc(IT)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 Function, Inline Function, 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.

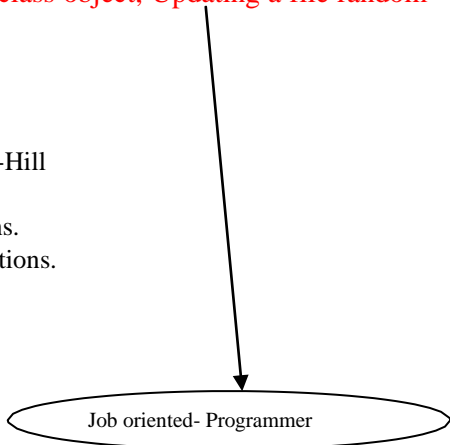### UNIT – IV: Pointers, Virtual Function and Operator Overloading
Pointers: Introduction, & and * operator, pointer to object, this pointer, pointer to derived class**. Dynamic polymorphism:** Virtual function, Pure Virtual Function, Abstract class. **Static Polymorphism:** Operator keyword, overloading 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:

- **Object Oriented Programming with C++** : *E. Balagurusamy*, The McGraw-Hill
- **The C++ Programming Language**: *Bjarne Stroustrup*, Addision Wasley.
- **Object Oriented Programming in C++**: *Robert Lafore*, Galgotia Publications.
- **Introduction to Object Oriented Programming**: *K V Witt*, Galgotia Publications.
- **Object Oriented Programming**: *G Blaschek*, Springer Verlag
- **Object Data Management**: *R Cattel*, Addison Wasley.

Job oriented- Programmer

RDBMS and SQL
MSc(IT)102

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

UNIT – I: Overview of Database Management

Data, Information and knowledge, 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.

UNIT – II: Relational Model & Relational Algebra

Entity - Relationship model as a tool for conceptual design-entities, attributes and relationships. ER diagrams; Extended ER features Generalization, specialization and aggregation; Case studies of ER modeling, Concept of keys; Converting an ER model into relational Schema.

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.

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. Denormalization.

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:** Issues in physical design;, File organization for relational tables. Fixed length records, variable length records, Organization of records in files, **Indexing**: Concepts of indexes, indexed files -B-tree, B+-tree, and Hashing Techniques.

BOOKS RECOMMENDED:

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

Database Administrator and software developer

Mathematical Foundations of Computer Science
MSc(IT)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:

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

Computer System Architecture
MSc(IT)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:

- **Computer System Architecture**, *Morris Mano*, PHI, 3rd Edition)
- **Computer Organization and Architecture**, *William Stalling,* PHI
- **Computer organization and Architecture**, *J.P.Hayes,* TMH.
- **Digital Computer Logic Design**, *Morris Mano* ,PHI
- **Computer System Architecture and organization**, *Dr. M. Usha,and T. S. Shrikant*, Wiley publication.
- **Digital Computer Electronics**, *Malvino.*
- **Structured Computer Organization**, *Andrew S. Tanenbanm,* PHI
- **Modern Digital Electronics**, *R.P.Jain*, TMH
- **Fundamental of microprocessors,** *B. Ram*

Microprocessor developer

Internet and Web Technology
MSc(IT)105

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

UNIT – I
Introduction to Computer and Hardware: Introduction of Information Technology, History of Computers, Organization of computers, Number Systems, Programming language and types, Public domain software, Applications of Information Technology in business, industry, entertainment, science, engineering and medicine.

UNIT – II
Internet and its Application: Evolution of internet, Internet applications, TCP/IP, Addressing in Internet (IP), Domains, Internet service providers, Connectivity such as dial up, leased line, VSAT. E-mail protocols (X-400, SMTP, UUCP), Description of E-Mail headers, Email routing, e-mail client, POP-3, IMAP- 4.

UNIT – III
FTP and Telnet: Introduction to File Transfer Protocol (FTP), Types of FTP servers (including anonymous), Telnet protocol, Telnet client, Terminal emulation. Usenet and Internet relay chat, Web publishing tool, Website planning, Website Hosting , Multiple sites on one server, Maintaining a web site, WWW servers, HTTP & URLs, Registration of website on search engines , maintenance of website.
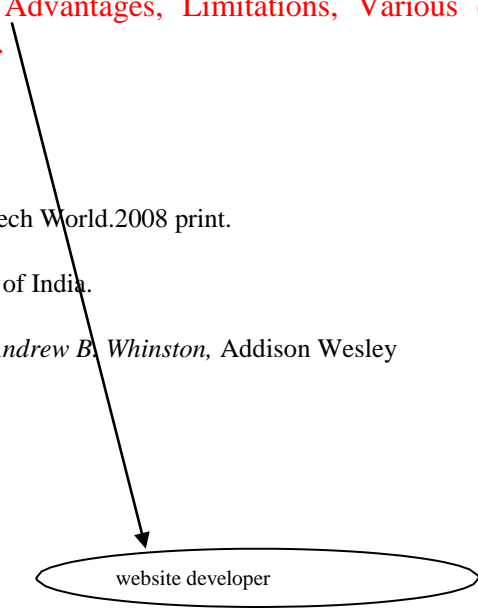
UNIT – IV
Dynamic HTML and Web Designing: HTML Basic concepts, Web designing issue, Structure of HTML documents, HTML Elements: Core attributes, Language attributes, Core Events, Block Level Events, Text Level Events, Linking Basics, Linking in HTML, Images and Anchors, Anchor Attributes, Image Maps, Semantic Linking Meta Information, Image Preliminaries, Image Download issues, Images as Buttons, Introduction to Layout: Backgrounds, Colors and Text, Fonts, Layout with Tables, Introduction to CSS.

UNIT – V
Internet Security: Internet security vulnerability and threats, Firewalls, Introduction to AAA, Malwares.
E-Commerce: Introduction, Concepts & technology, Advantages, Limitations, Various electronics payment system, Payment Gateways, Introduction to EDI.

BOOKS RECOMMENDED:

- **Computers Today**, *S.K.Basadra*, Galgotia Publication..
- **Internet for Every One**, *Alexis Leon and Mathews Leon*, Tech World.2008 print.
- **Introduction to Computers**, *P.K.Sinha*, BPB Publication.
- **Fundamentals of Computers**, V. Rajaraman, Prentice Hall of India.
- **HTML Complete Reference**, *Thomas A. Powell,* TMH
- **Frontiers of Electronics of Commerce** , *Ravi kalakota & Andrew B. Whinston,* Addison Wesley

website developer

SCHEME OF TEACHING AND EXAMINATIONS   2019-2020
MASTER OF SCIENCE IN INFORMATION TECHNOLOGY

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
MSc(IT)201	.NET Technology	3	2	-	4	100	25	-	125	40	15	-	55
MSc(IT)202	Data Structures	3	2	-	4	100	25	-	125	40	15	-	55
MSc(IT)203	Computer Networks & Data Communication	3	2	-	4	100	25		125	40	15	-	55
MSc(IT)204	Operating System (with Linux as case Study)	3	2	-	4	100	25	-	125	40	15	-	55
MSc(IT)205	AI & Expert Systems	3	2	-	4	100	25	-	125	40	15	-	55
MSc(IT)206	Programming Lab – Based on 201	-	-	3x2	3	-	50	100	150	-	30	50	80
MSc(IT)207	Programming Practice - Based on 202	-	-	2	1	-	50	50	100	-	30	25	55
MSc(IT)208	Common Software - Based on 203/204	-	-	2	1	-	50	50	100	-	30	25	55
MSc(IT)209	Personality Development / Group Discussion	-	-	2	1	-	25	-	25	-	15	-	15
	TOTAL	15	10	12	26	500	300	200	1000	200	180	100	480

.NET Technology
MSc(IT)201

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.

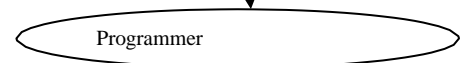### UNIT – IV: Building .NET Framework Applications
Introduction to ASP .NET, Differentiate classic ASP and ASP .NET, Web application, Web forms, Form validations – Client side, Server side, controls in web forms, Events in Web form.

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:

- **MSDN online – by Microsoft**
- **Visual Basic .NET Complete** - BPB Publications, New Delhi.
- **The Complete Reference VB .NET**, *Jeffery R. Shapiro*, Tata McGraw Hill.
- **Professional VB .NET 2003**, *Bill Evjen & others*, Wiley India (P) Ltd.

Programmer

Data Structures
MSc(IT)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 Its Representation:

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:

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

Computer Networks & Data Communication
MSc(IT)203

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

UNIT – I
Introduction to Computer Networking: The Concept of Networking, Data Communication, Required network elements, The role of Standards Organization. Line Configuration, Various Topologies, Transmission Mode, Categories of Networks- LAN, MAN, WAN. The benefits of a Computer Networks. **The OSI and TCP/IP Reference Model:** The Concept of Layered Architecture, Design Issues for the Layers. Interfaces and services, Detailed Functions of the Layers. Comparison between OSI and TCP/IP Reference model.

UNIT – II
Transmission of Digital Data: Shannon's and Nyquist theorems for maximum data rate of a channel. Transmission media- Co-axial, UTP, Fiber optic and wireless. Analog and digital data Transmission- parallel and serial transmission. DTE-DCE interface using RS-232C. Study of modems- 56k and Cable Modem. Modem standards. **Multiplexing and Switching:** The Concept of Multiplexing- FDM, TDM, WDM. The Concept of Switching- Circuiting, Message switching, Packet switching.

UNIT – III
Data Link Layer and Routing Algorithms: Line Discipline, Flow Control- stop and wait, sliding window, Go back N, Error Control- ARQ stop and wait, sliding window ARQ. HDLC, SLIP, PPP. Multiple access protocols- ALOHA, Slotted ALOHA, CSMA/CD. IEEE standards for LAN's and MAN's. The IP protocol, and its header. IP address classes and subnet mask. **The concept of ICMP, ARP, RARP, RSVP, CIDR and Ipv6:** Routing algorithms- shorted path first, Distance Vector, Link State. Congestion Control-The leaky bucket and Token bucket Algorithms.

UNIT – IV
Transport Layer: The Concept of client and Server in terms of Socket addressing in Transport layer. Two way and three-way handshaking. TCP header. Network Performance Issues. The Concept of Domain Name System, Various Resource Records. Architecture and services of E-mail (RFC-822 and MIME). The Concept of World Wide Web- server side and client side. **ATM:** The concept of ATM, ATM Adoption layers- AAL1, AAL2, AAL3/4, AAL5, Comparison of AAL protocols. Cell formats for UNI and NNI. Service Categories, Quality of service, Congestion Control in ATM.

UNIT – V
Comparative study of Networking Technologies: X.25, Frame Relay, ATM, SONET, SMDS, ISDN.
Network Security: The Importance of Security in Networking. Traditional Cryptography, Data Encryption Standards, RSA algorithm.

BOOKS RECOMMENDED:

- **Computer Networks** - A S Tanenbaum
- **Data Communication and Networking** - B A Forouzan

Operating Systems (with Linux as case study)
MSc(IT)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: Processor 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.
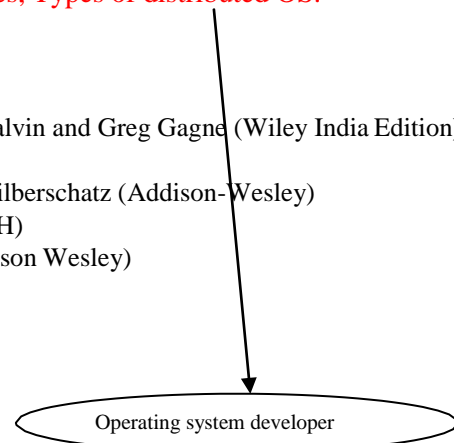
UNIT – IV: Memory Management
Preliminaries of memory management, Contiguous memory allocation, partitioned allocation MFT, fragmentation, MVT, partition allocation policies, compaction, Non-Contiguous memory allocation, Paging, Structure of page table, Segmentation, **Virtual Memory**: Concepts, demand 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:

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

Operating system developer

Artificial Intelligence & Expert Systems
MSc(IT)205

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

UNIT – I
Introduction to AI: Foundations of AI, Philosophy and History; AI problems, AI technique; The Turing Test. **Intelligent Agents:** Agents and Environments, the Concept of Rationality, the Nature of Environments and the Structure of Agents. **Problem solving & State Space Search:** General problem solving: defining problems as State Space Search, Problem Characteristics; Production Systems & their characteristics.

UNIT – II
Exhaustive Searches: Generate and Test, Breadth First Search, Depth First Search and DFID
Heuristic Search Techniques: Branch and Bound technique; Best first search; A* algorithm; Problem Reduction AND/OR Graphs and AO* algorithm. **Local Searches & Optimizations:** Hill climbing and its variants. **Constraint Satisfaction Problems:** Definition; Constraint Propagation and Backtracking. **Game Playing:** Mini-Max Search Procedure; Alpha-Beta Cutoffs; Additional Refinements.

UNIT – III
Knowledge Representation: Types of Knowledge; Knowledge Representation Issues; **Logic:** First order Predicate Logic; Representation of facts in FOL; Inference in FOL; Resolution Principle, Clausal Form and Unification; **Inference Mechanisms:** Forward and Backward Chaining; **Slot and Filler Structures:** Semantic Networks; Frame Systems and value inheritance; Conceptual Dependency; Scripts;

UNIT – IV
Reasoning under Uncertainty: Non-monotonic Reasoning, Probabilistic Reasoning and Uncertainty; Probability Theory; Bayes Theorem and Bayesian networks; Certainty Factor; Dempster-Shafer Theory. **Planning:** Overview; The Blocks Word; Component of a Planning System: Goal Stack Planning; Nonlinear Planning; **Natural Language Processing:** Introduction, Overview of Linguistics, Grammars and Languages: context sensitive and context free grammar; Chomsky Hierarchy, Parsing techniques: Recursive Transition Nets, Augmented Transition Nets, Semantic Analysis: Case, Logic and Semantic grammars;

UNIT – V
Expert Systems: Introduction, Characteristics, History and Applications of expert systems; Expert System Shells; Rule Based Systems Architectures, Non Production System Architectures; Knowledge Acquisition and Validation; Case Studies: MYCIN & DENDRAL. **Learning:** Rote learning; Learning by Taking Advise; Induction; Explanation based learning; Discovery; Analogy.

BOOKS RECOMMENDED:

- **Artificial Intelligence**, *Rich E., Knight K. and Nair S. B.,* McGraw Hill Education
- **Artificial Intelligence: A Modern Approach,** *Russell S. J. and Norvig P.*, Pearson Education
- **Introduction to Artificial Intelligence and Expert Systems**, *Patterson D. W.*, PHI
- **Principles Of Artificial Intelligence**, *Nilson N. J.*, Narosa Publications
- **Artificial Intelligence**, *Winston P. H.*, Pearson Education

Expert system developer- robot etc.

SCHEME OF TEACHING AND EXAMINATIONS   2019-2020
MASTER OF SCIENCE IN INFORMATION TECHNOLOGY

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
MSc(IT) 301	Java Programming Language	3	2	-	4	100	25	-	125	40	15	-	55
MSc(IT) 302	Python Programming Language	3	2	-	4	100	25	-	125	40	15	-	55
MSc(IT) 303	Software Engineering	3	2	-	4	100	25	-	125	40	15	-	55
MSc(IT) 304	**Electives :** 1. Advanced Computer Architecture 2. Data Mining & Warehousing 3. Cloud Computing 4. Digital Image Processing	3	2	-	4	100	25	-	125	40	15	-	55
MSc(IT) 305	**Electives :** 1. Mobile Communication 2. Theory of Computations 3. Internet of Things 4. Analysis and Design of Algorithms	3	2	-	4	100	25	-	125	40	15	-	55
MSc(IT) 306	Programming Lab - Based on 301	-	-	3x2	3	-	50	100	150	-	30	50	80
MSc(IT) 307	Programming Practice - Based on 302	-	-	2	1	-	50	50	100	-	30	25	55
MSc(IT) 308	Common Software/Mini-Project	-	-	2	1	-	50	50	100	-	30	25	55
MSc(IT) 309	Managerial Skills / Seminar	-	-	2	1	-	25	-	25	-	15	-	15
	TOTAL	15	10	12	26	500	300	200	**1000**	200	180	100	**480**

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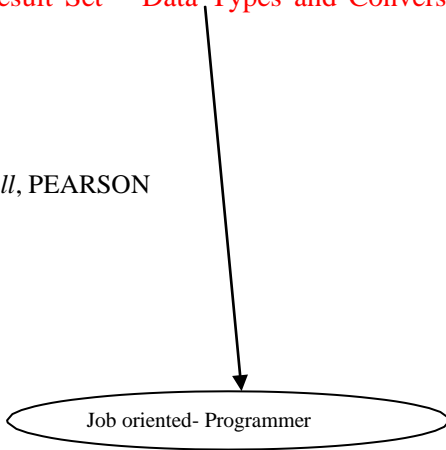Object class, String class, String Buffer class, Wrapper class, Math class, Collection: Collection interface, List interface, Set interface sorted interface, Array List class, Liked List class, Tree Set, Comparator, Vector, Stack. **I/O Classes and Interfaces:** File, Buffer Stream, Character Stream,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

UNIT – V: Events, GUI and JDBC
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; **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

Job oriented- Programmer

Python Programming Language
MSc(IT)302

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
7. **Python Complete Reference**, Tata McGraw Hill

Software Engineering
MSc(IT)303

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.
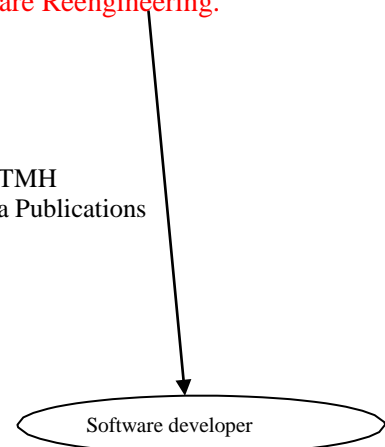
UNIT – IV: Coding and Testing:
Programming Style; Structured Programming; Coding Standard; Internal Documentation; Software Testing-Verification and Validation; Alpha and Beta Testing; Levels of Testing-Unit, Integration and System Testing; Testing Techniques- White Box, Black Box; Cyclomatic Complexity**;** 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.*

Software developer

Advanced Computer Architecture
MSc(IT)304- Elective 1

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

Data Mining & Warehousing
MSc(IT)304- Elective 2

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

UNIT – I
Introduction: KDD (Knowledge Discovery from Databases), Fundamentals of data mining, Data Mining Functionalities, Major issues in Data Mining, Data Warehouse and OLAP Technology, Multidimensional Data Model, Data Warehouse Architecture, OLAP operations, Warehouse schema.

UNIT – II
Data Preprocessing & Data Mining Languages: Need of Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation, Data Mining Primitives, Data Mining Query Languages, Architectures of Data Mining Systems, Concepts Description: Characterization and Comparison, Analytical Characterization.

UNIT – III
Association Rule Mining, Classification and Prediction: Association Rule Mining, Market Basket Analysis, Mining Single-Dimensional Boolean Association Rules from Transactional Databases, Apiori algorithm, FP-Tree growth algorithm, Mining Multilevel Association Rules from Transaction   Databases,   Mining Multidimensional Association Rules from Relational Databases and Data Warehouses, Issues Regarding Classification and Prediction, Classification by Decision Tree   Induction,   Bayesian   Classification, Classification by Back propagation.
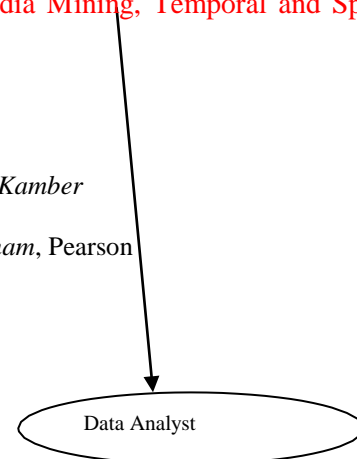
UNIT – IV
Cluster Analysis: Types of Data in Cluster Analysis, Outlier Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods, Model-Based Clustering Methods.

UNIT – V
Mining Complex Types of Data: Web Mining, Text Mining, Multimedia Mining, Temporal and Spatial Data Mining, Trends in Data Mining, Data Mining Applications.

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

Data Analyst

Cloud Computing
MSc(IT)304- Elective 3

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

Unit – I
Introduction: Cloud Computing: Vision, Definition, Reference Model, Characteristics, Benefits and Challenges, Historical Developments, Cloud Computing Environments, Cloud Platforms and Technologies; The Evolution of Cloud Computing: Parallel Computing vs. Distributed Computing, Elements of Parallel Computing, Elements of Distributed Computing, Technologies for Distributed Computing, Introduction of Grid Computing.

Unit – II
Virtualization: Introduction, Characteristics, Taxonomy of Virtualization, Levels of Virtualization, Structure and Mechanism of Virtualization, Virtualization and Cloud Computing, Advantages and Disadvantages, Virtualization Technology Examples: Xen, VMware, Microsoft Hyper-V.

Unit – III
Cloud Computing Architecture: Service Oriented Architecture**,** Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS), Software-as-a-Service (SaaS), Data Storage as a Service (DSaaS). Types of Clouds; Economics of the Cloud and Open Challenges; **Security and Organizational aspects**: Host Security and Data Security.
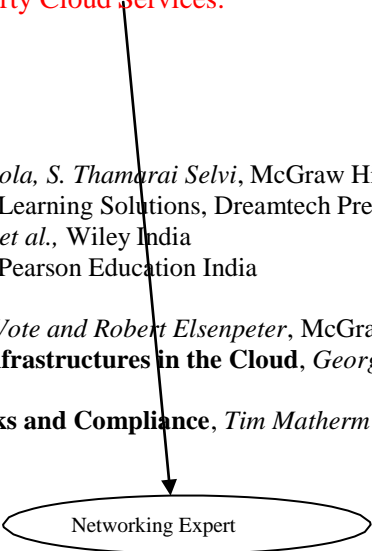
Unit – IV
Migration to the Cloud: Adoption and use of Cloud by Businesses (Small and Enterprise), Pace of Adoption, Benefits and Phases of Adoption, Cloud Service Provider's Capabilities and Liabilities, Success factors and Issues. **Migrating Applications**: Key Aspects, Migration Techniques, Phases of Migration. **Service Level Agreement (SLA)**: Aspects and Requirements, Availability and Outages, Credit Calculations, SLA Samples.

Unit – V
Industry Platforms: Amazon Web Services, Google AppEngine, Microsoft Azure; **Cloud Applications**: Scientific Applications, Business and Consumer Applications; Advanced Topics: Energy Efficiency in Clouds, Market Based Management, Federated Clouds / InterCloud, Third Party Cloud Services.

RECOMMENDED BOOKS:

1. **Mastering Cloud Computing**, *Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi*, McGraw Hill Education
2. **Cloud Computing: Black Book**, *Kailash Jayaswal et al.,* Kogent Learning Solutions, Dreamtech Press
3. **Cloud Computing: Principals and Paradigms**, *Rajkumar Buyya et al.,* Wiley India
4. **Cloud Computing: Concepts, Technology & Architecture**, *Erl*, Pearson Education India
5. **Cloud Computing Bible**, *Barrie Sosinsky*, O'Reilly Media
6. **Cloud Computing: A Practical Approach**, *Toby Velte, Anthony Vote and Robert Elsenpeter*, McGraw Hill
7. **Cloud Application Architectures: Building Applications and Infrastructures in the Cloud**, *George Reese*, O'Reilly Media.
8. **Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance**, *Tim Matherm Subra Kumaraswamy and Shahed Latif,* O'Reilly Media.

Networking Expert

Digital Image Processing
MSc(IT)304 - Elective 4

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

Unit – I
Introduction: Digital Image Fundamentals Origins of Digital Image Processing, examples, Fundamental Steps in Digital Image Processing, Components of an Image Processing System, Image Sensing and acquisition Basic Concepts in Sampling and Quantization, Representing Digital Images, Zooming and Shrinking Digital Images, Some Basic Relationships Between Pixels, Linear and Nonlinear Operations.

Unit – II
Image Enhancement Spatial Domain: Some Basic Gray Level Transformations, Histogram Processing, Enhancement Using Arithmetic/Logic Operations, Basics of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters, Combining Spatial Enhancement Methods, **Frequency Domain**: Background, Image Enhancement in the Frequency Domain, Introduction to the Fourier Transform and the Frequency, Domain, Smoothing Frequency-Domain Filters, Sharpening Frequency Domain Filters, Homomorphic Filtering

Unit – III
Image Restoration A Model of the Image degradation/Restoration process, Noise Models, Restoration in the Presence of Noise Only–Spatial Filtering, Periodic Noise Reduction by Frequency Domain Filtering, Linear, Position-Invariant Degradations, Estimating the Degradation Function, Inverse Filtering, Minimum Mean Square Error (Wiener) Filtering.

Unit – IV
Image Compression: Fundamentals, Image Compression Models, Error-Free Compression, Lossy Compression, Image Compression Standards. **Morphological Image Processing**: Dilation and Erosion, Opening and Closing, Hit-or-Miss Transformations, Some Morphological Algorithms.

Unit – V
Segmentation Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, Region-Based Segmentation. **Representation and Description:** Representation, Boundary Description and Regional Descriptor.

RECOMMENDED BOOKS:

1. **Digital Image Processing**, *Rafel C Gonzalez and Richard E. Woods*, Pearson
2. **Fundamentals of DIP**, *A.K. Jain*, PHI.
3. **Digital Image Processing Using MATLAB**, *Gonzalez, Woods and Eddins, McGraw Hill Education*

Mobile Communication
MSc(IT)305 - Elective 1

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.
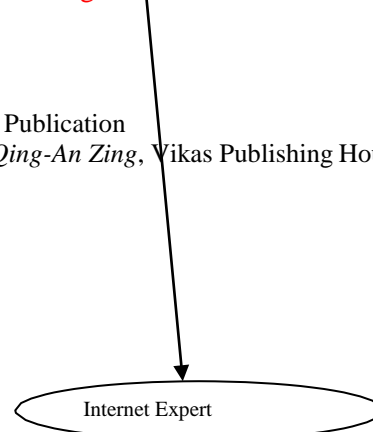
UNIT – IV: Wireless LANs and PANs
Introduction to IEEE 802.11, Ricochet, Ricochet Wireless Modem, Services Provided by Ricochet , Home RF, Home RF Technology, Hiper LAN, Blue tooth , Advantages and disadvantages of Wireless LAN, Infra red vs radio transmission , introduction to MAC. Technologies influence 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

Internet Expert

Theory of Computations
MSc(IT)305- Elective 2

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

UNIT – I

Alphabet, String and language, Finite state Machines, finite automata with Є-moves, Conversion of NDFA to DFA, Removal of Є-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

Decidability, Universal turning machine and decidable 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.
3. **Introduction to Formal Languages, Automata Theory and Computation**, *Kamala Krithivasan and Rama. R,* Pearson.
4. **Theory of Computation**, *Lewish Papadimitra,* PHI
5. **Introduction to Automata Theory Languages and Computation**, *John E. HopcraftJeffary, D. Ullman and Rajeev Motwani.*
6. **Introduction to languages and theory of computation**, *Matin, J.C*, McGraw-Hill
7. **Theory of Computation**, *Rajesh .K. Shukla*, Cenage Learning

Internet of Things
MSc(IT)305 - Elective 3

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

Unit – I OVERVIEW:
IoT-An Architectural Overview– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations. M2M and IoT Technology Fundamentals- Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service(XaaS), M2M and IoT Analytics, Knowledge Management

Unit – II REFERENCE ARCHITECTURE:
IoT Architecture – State of the Art – Introduction, State of the art, Reference Model and architecture, **IoT reference Model** – IoT Reference Architecture Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views. **Real-World Design Constraints** – Introduction, Technical Design constraints-hardware is popular again, Data representation and visualization, Interaction and remote control.

Unit – III IOT DATA LINK LAYER & NETWORK LAYER PROTOCOLS:
PHY/MAC Layer(3GPP MTC, IEEE 802.11, IEEE 802.15), Wireless HART, Z-Wave, Bluetooth Low Energy, Zigbee Smart Energy, DASH7 - Network Layer-IPv4, IPv6, 6LoWPAN, 6TiSCH,ND, DHCP, ICMP, RPL, CORPL, CARP

Unit – IV TRANSPORT & SESSION LAYER PROTOCOLS:
Transport Layer Transmission Control Protocol (TCP), Multipath Transmission Control Protocol (MPTCP), User Datagram Protocol (UDP), Datagram Congestion Control Protocol (DCCP) , Stream Control Transmission Protocol (SCTP), Transport Layer Security (TLS), Datagram Transport Layer Security (DTLS))
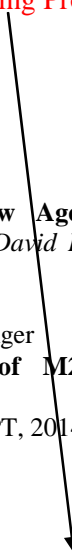**Session Layer**- Hyper Text Transfer Protocol (HTTP), Constrained Application Protocol (CoAP), Extensible Messaging and Presence Protocol (XMPP), Advanced Message Queuing Protocol (AMQP), Message Queue Telemetry Transport (MQTT)

Unit – V SERVICE LAYER PROTOCOLS & SECURITY:
Service Layer – oneM2M, European Telecommunications Standards Institute (ETSI) M2M (Machine-to-Machine), OMA, BBF – Security in IoT Protocols – MAC 802.15.4, 6LoWPAN, Routing Protocol for Low-Power and Lossy Networks (RPL), Application Layer

RECOMMENDED BOOKS:

1. **From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence**, *Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle,* Academic Press, 2014
2. **Learning Internet of Things**, *Peter Waher*, PACKT publishing
3. **Architecting the Internet of Things**, *Bernd Scholz-Reiter, Florian Michahelles,* Springer
4. **Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications**, *Daniel Minoli,* Willy Publications
5. **Internet of Things (A Hands-onApproach)**, *Vijay Madisetti and ArshdeepBahga*, VPT, 2014.

Networking Expert

Analysis and Design of Algorithms
MSc(IT)305 - Elective 4

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 SCIENCE   IN   INFORMATION   TECHNOLOGY

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
MSc(IT) 401	Cyber Security	3	2	-	4	100	50	-	150	40	30	-	70
MSc(IT) 402	Soft Computing	3	2	-	4	100	50	-	150	40	30	-	70
MSc(IT) 403	Big Data Analytics	3	2	-	4	100	50	-	150	40	30	-	70
MSc(IT) 404	Project Based Seminar	-	-	1x2	1	-	50	-	50	-	30	-	30
MSc(IT) 405	Major Project	-	-	5x2	5	-	100	200	300	-	60	100	160
Total					**18**	**300**	**300**	**200**	**800**	**120**	**180**	**100**	**400**

Note:
- Major Project may be a Research Project also.
- Participating in Workshops, Conferences and Seminars or publishing Research Papers will be given weightage in the research project.

Cyber Security
MSc(IT)401

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

UNIT – I: INTRODUCTION

Computer Security Concepts, The Challenges of Computer Security, The OSI Security Architecture, Security Attacks, Security Services, Security Mechanism, A model for network Security, **Symmetric Encryption Principal:** Cryptography, Crypt analysis, Feistel Cipher Structure, DES, Random and Pseudorandom Numbers, Symmetric Block Modes of Operation (ECB, CBC, CFB, CTR).

UNIT – II PUBLIC KEY CRYPTOGRAPHY

Approaches to Message Authentication, **Hash Functions**: Hash Functions Requirement, Security of Hash Functions, The SHA Secure Hash Function, **Public Key Cryptography:** Public –Key Encryption Structure, Applications for Public Key Cryptosystem, RSA, Attacks on RSA, OAEP.

UNIT – III MESSAGE INTEGRITY AND MESSAGE AUTHENTICATION

Message Integrity: Document and Finger Printing, Message and Message Digest, Cryptographic Hash Function Criteria Random Oracle Model, Birthday Problems and Summery of solutions, **Message Authentication:** Modification Detection Code, Message Authentication Code, Introduction of HMAC & CMAC, **Digital Signature:** Comparison, Process, Services, Attacks on Digital Signature.
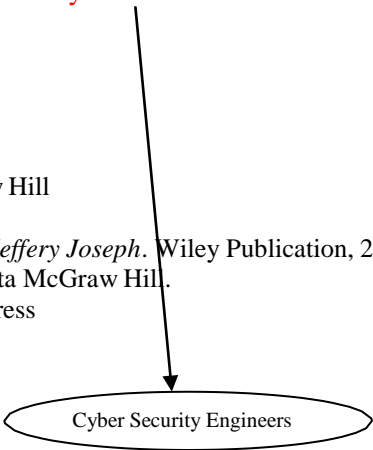
UNIT – IV MALICIOUS SOFTWARE

Intruders: Intruder Behavior Patterns, Intrusion Techniques, Intrusion Detection by Audit Records, Statistical Intrusion Detection, Distributed Intrusion Detection, Honeypots. Types of Malicious Software, Nature of Viruses, Virus Classification, Antivirus Approaches, Worms and its Propagation model, DDoS Attack.

UNIT – V FIREWALL & SECURITY TOOLS

Firewall: Need & Characteristics of Firewall, Types of Firewall, Firewall Basing, Firewall Location and Configuration, Introduction to Kali Linux ,Tools Available in Kali Linux and Its Usage. WireShark Packet Analyzer and Its Features. Cyber Security Policy, Domain of Cyber Security Policies.

RECOMMENDED BOOKS:

1. **Network Security Essentials**, *William Stallings*, PEARSON
2. **Cryptography and Network Security**, *William Stallings*, PHI.
3. **Cryptography and Network Security**, *Atul Kahate*, Tata McGraw Hill
4. **Cryptography and Network Security**, *B.A. FOROUZAN*, TMH
5. **Cyber Security policy Guidebook**, *Jennifer Jason Paul, Marcus Jeffery Joseph*. Wiley Publication, 2012.
6. **Network Security: The Complete Reference**, Robertra Bragg, Tata McGraw Hill.
7. **Cyber Security Essentials**, *James Graham, Richard Ryan*, CRC press

Cyber Security Engineers

Soft Computing
MSc(IT)402

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
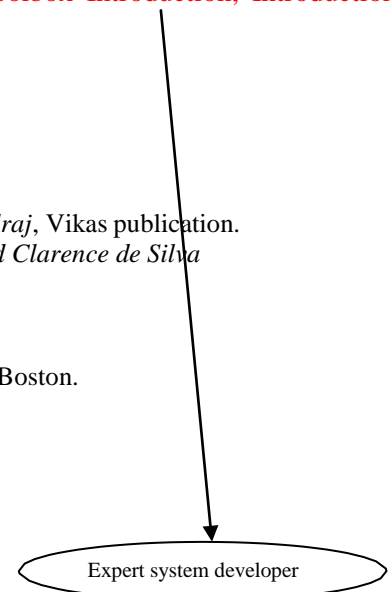
UNIT – IV: Evolutionary Computing
Introduction, overview of evolutionary computing, Genetic algorithms and optimization, The schema theorem: the fundamental theorem of genetic algorithms, Genetic algorithm operators, Integration of genetic algorithms with neural networks, Integration of genetic algorithms 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. **Fuzzy systems and Fuzzy Logic**, *Klir and Uuna*, PHI Publications.
2. **Introduction to Artificial Neural Networks**, *S. N. Sivanandam and M. Paulraj*, Vikas publication.
3. **Soft Computing and Intelligent systems Design**, *Fakhreddine O. Karry and Clarence de Silva*
4. **Neural Network Design**, *Hagan & Demuth*, Vikas Pub. Comp.
5. **Fundamentals of Artificial Neural Networks**, *M.A.Hassaoun*.
6. **Fuzzy sets, uncertainty and information** *George J. Kir, & TA Folger*.
7. **Fuzzy sets, Decision making and Expert system**, *HJ Zimmerman*, Kluwer, Boston.
8. **Fuzzy set theory and its applications**, *H. J. Zimmerman*, Kluwer, Boston.

Expert system developer

Big Data Analytics
MSc(IT)403

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

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

What is Data Mining?, KDD(Knowledge Discovery from Databases) Process, What Kinds of Data Can Be Mined?, Data Mining Functionality, Are all the patterns interesting?, Attribute Types, What is Data Warehouse?, Data Warehouse Architecture, Data Cube: A multi-dimensional data model, Schemas for Multidimensional Data Models, OLAP Operations, Data Warehouse Usage(Applications). , Data Mining Primitive, Architecture of Data Mining System.

UNIT – II: Introduction Concept of Big Data

Big Data- Define Data, Web Data, Classification of Data- Structured, Semi-Structured, and Unstructured. Big Data Definitions, Challenges of Conventional system, Why We Need Big Data, Difference between Big Data and Small Data, Importance of Big Data. Big Data Characteristics (4V's Volume, Velocity, Variety, and Veracity), Big Data Types, Big Data Handling Techniques. Complexity of Big Data, Big Data Processing Architectures, Big Data Technologies, Big Data Business Value. Big Data Analytics Application. Big Data Challenges and Future Scope.

UNIT – III: INTRODUCTION TO HADOOP AND HADOOP ARCHITECTURE

Big Data – Apache Hadoop & Hadoop EcoSystem: Hadoop Core Component, Features of Hadoop, The Hadoop Distributed File System: HDFS data Storage, Hadoop Physical Organization, HDFS Commands, MapReduce Framework, MapReduce Programming Model, MapReduce Map task,Reduce Task and MapReduce Execution, Hadoop YARN, Hadoop2 Execution Model, Hadoop Ecosystem Tools, Hadoop Ecosystem.

UNIT – IV: NoSQL Big Data Management, Mongo DB

NoSQL: What is it?, Where It is Used Types of NoSQL databases, Why NoSQL?, Advantages of NoSQL, Use of NoSQL in Industry, SQL vs NoSQL, NoSQL DataStore, NoSQL Data Architecture pattern, NOSQL to Manage Big Data. **Data Base for the Modern Web:** Introduction to MongoDB, features of MongoDB, Data Types,Mongo DB Query Language and Database Command.

UNIT – V: Hive and Pig:

Pig: Apache Pig, Application of Apache Pig, Feature, Pig Architecture, Pig- Grunt Shell, Installing Pig, Pig Latin Data Model, Pig Latin and Developing Pig Latin Scripts: Apache Pig Execution, Commands. **HIVE AND HIVEQL. Hive:** Introduction, Characteristics, limitation, Hive Architecture and Installation, Comparison with Traditional Database (RDBMS), Hive Datatype and File Formats, Hive Data Model, Hive Integration and Workflow Steps, Hive Built-in Functions, HiveQL.

RECOMMENDED BOOKS:

1. **Big Data Analytics**, *Raj Kamal and Preeti Saxena*, McGraw Hill Education
2. **Big Data: Black Book**, *DT Educational Services*, Dreamtech Press
3. **Big Data Analytics**, *Seema Acharya & Shubhashini Chellappan*, Wiley India
4. **Big Data Analytics**, *M. Vijayalakshmi & Radha Shankarmani*, Wiley India

Data Analyst