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			SEMESTER - I					
S. No	Course	Code	Title of the Course	H/W	C	SEE	IA	Total Marks
1	CC	101	Computer Organization – 101	4	4	70	30	100
2		102	Mathematical Foundations for Computer Science - 102 (A)	4	3	50	25	75
			Discrete Mathematical Structure- 102 (B)					
3		103	Operating Systems – 103 (A)	4	3	50	25	75
			System Programming - 103 (B)					
4	P	104	Practical I (related to CC 102 & 103)	6	2	35	15	50
5	SOC	105	Java Programming and Data Structures – 105 (A)	4	3	50	25	75
			Data Structure and Algorithms using Java – 105 (B)					
6		106	Computer Networks – 106 (A)	4	3	50	25	75
			Data Communication and Computer Networks – 106 (B)					
7	P	107	Practical II (related to SOC 105 & 106)	6	2	35	15	50
9	Audit Course	109	Indian Knowledge Systems – AC 1		4	0	0	0
			Total	**36**	**20**	**340**	**160**	**500**

			SEMESTER – II					
S. No	Course	Code	Title of the Course	H/W	C	SEE	IA	Total Marks
1	CC	201	Advanced Data Base Management System – 201	4	4	70	30	100
2		202	Computer Graphics – 202 (A)	4	3	50	25	75
			Image Processing – 202 (B)					
3		203	Cryptography and Network Security – 203 (A)	4	3	50	25	75
			Cyber Security – 203 (B)					
4	P	204	Practical III (related to CC 202 & 203)	6	2	35	15	50
5	SOC	205	Computer Algorithms – 205 (A)	4	3	50	25	75
			Compiler design– 205 (B)					
6		206	Fundamentals of Machine Learning – 206 (A)	4	3	50	25	75
			Fundamentals of Deep Learning – 206 (B)					
7	P	207	Practical IV (related to SOC 205 & 206)	6	2	35	15	50
8	OOTC	208	Open Online Transdisciplinary Course – 1	-	2	-	-	-
9	Audit Course	209	Indian Knowledge Systems – AC 2		4	0	0	0
			Total	**32**	**36**	**22**	**360**	**160**

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colspan center
SEMESTER – III

S. No	Course	Code	Title of the Course	H/W	C	SEE	IA	Total Marks
1	CC	301	Data Warehousing and Data Mining – 301	4	4	70	30	100
2		302	Software Engineering – 302 (A) Software Testing – 302 (B)	4	3	50	25	75
3		303	Web Technologies – 303 (A) PHP & MY SQL Web Development – 303 (B)	4	3	50	25	75
4	P	304	Practical V (related to CC 302 & 303)	6	2	35	15	50
5	SOC	305	Big Data Analytics – 305 (A) Real World Hadoop – 305 (B)	4	3	50	25	75
6		306	Artificial Intelligence – 306 (A) Neural Networks – 306 (B)	4	3	40	25	75
7	P	307	Practical VI (related to SOC 5 & 6)	6	2	35	15	50
8	OOTC	108	Open Online Transdisciplinary Course – 2	-	2	-	-	-
*	Seminar and Quiz			4	-	-	-	-
			Total	**36**	**22**	**340**	**160**	**500**

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SEMESTER – IV

S. No	Course	Code	Title of the Course	H/W	C	SEE	IA	Total Marks
1	OOSDC	401	Open Online Skill Development Courses	-	8	-	0	0
2	PW	402	Project Work – Orientation Classes	24	12	300	0	300
*	Conducting classes for competitive exams, communication skills, UGC / CSIR and NET / SLET examinations			12	-	-	-	-
			Total	**24**	**20**	**300**	**0**	**300**
			Total Semesters	**144**	**84**	**1320**	**480**	**1800**

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<u>**SEMESTER I**</u>
MSCS 101C: COMPUTER ORGANIZATION

UNIT I
Logic Circuits: Logic functions – synthesis of logic functions – Minimizations of logic - Synthesis with NAND and NOR gates Implementation of Logic gates - Flip-flops – Registers and shift registers– counters – decoders – Multiplexers – PLDs – sequential circuits. Basic Structure of Computers: Functional Units - Basic operational concepts – Bus structures – performance – Multi processors and Multi computers: Functional Units – Basic operational concepts – Bus structures – performance – Historical Perspective.

UNIT II
Machine Instructions and programs: Numbers, Arithmetic operations and characters – Memory locations and address, operations – instructions and instruction, sequencing – addressing modes.

UNIT III
Input / Output organization: accessing I/O Devices – Interrupts – direct memory access – buses 240- interface circuits – Standard I/O Interfaces.

UNIT IV
Memory System, Concepts – semiconductor RAM memories - Read only memories – cache memories – performance considerations – virtual memories management requirements – secondary storage Arithmetic: Addition and subtraction of sign members – design of fast adders – multiplication of positive members – signed operand multiplication – fast multiplication – integer division – floating point numbers and operations.

UNIT V
Basic Processing Unit: Concepts – execution of a complete instruction – Multiple – Bus organization – hardware control – micro programmed control. Pipelining: Concepts – Data hazards – instruction hazards – influence on Instruction sets - data path and control constructions – supers cal operation- ultra SPARC II – Performance considerations.

Text Books:
1. Hamacher C, Vranesic Z, and Zaky S. Computer Organization, 5th edition, Mc Graw – Hill, 2002

Reference Books:
1. Stallings W, Computer Organization and Architecture, 6th edition. Parson Education, 2003. Mano M.M. Computer System Architecture, 3rd edition. PHI, 1993.
2. Yarbrough JM, Digital Logic – Applications and Design, Thomas Lernig, 1997.
3. Heuring VP, and Jordan HF, Computer Systems Design and Architecture, Pearson Education, 1997.

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M.Sc Computer Science
MSCS 102 A : MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE

UNIT I
Mathematical Logic: Connectives Negation, Conjunction, disjunction, Statement Formulas and TT, Conditional and Biconditional, Well-formed formulas, tautologies, Equivalence of statement formulae, Duality law, Tautological implications, functionally complete set of connectives; Normal Forms Disjunctive, Conjunctive, Principal disjunctive and principal conjunctive normal forms.

UNIT II
The theory of inference for statement calculus, Validity using TT, rules of inference, consistency of premises and indirect method of proof, Automatic Theorem proving- Predicate Calculus, Predicates, the statement function, variables and quantifiers.

UNIT III
Set Theory : Basic Concepts of Set theory, Notation, Inclusion and equality , Power set, Operations on sets, Set identities, Ordered pairs and n-tuples, Cartesian products - Relations and Ordering , Relations, Properties of binary relation- relation matrix and graph of a relation, partition and covering of a set, equivalence relations, composition of binary relations, partial ordering, partially ordered set - Functions, Definition, composition, Inverse, Binary and n-ary operations, characteristic function of a set, hashing function- Recursions, Functions, sets and predicates.

UNIT IV
Lattices and Boolean Algebra: Lattices as partially ordered sets, properties of lattices, Lattices as Algebraic systems, Some special lattices - Boolean algebra, functions, representation and minimization.

UNIT V
Graph theory: Definition, Examples, Paths and Cycles, Planarity, coloring graphs
Text Books:
  1.   J.P. Tremblay and R.Manohar, Discrete Mathematical structures with applications to Computer Science, Tata McGraw Hill publishers, 2008.
  2.   Robin. J.Wilson, Introduction to Graph theory. (Fourth edition)

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MSCS 102 B : DISCRETE MATHEMATICAL STRUCTURE

UNIT - I
Mathematical Logic: Statements and notations, Connectives, Well formed formulas, Truth Tables, Tautology, Equivalence implication, Normal forms, Quantifiers, Universal quantifiers. Predicates: Predicative logic, Free & Bound variables, Rules of inference, Consistency, Proof of contradiction, Automatic Theorem Proving.

UNIT - II
Relations: Properties of Binary Relations, Equivalence Relation, Transitive closure, Compatibility and Partial ordering relations, Lattices, Hasse diagram. Functions: inverse Function , Composition of functions, Recursive Functions.

UNIT - III
Elementary Combinatorics: Basis of counting, Combinations & Permutations, With repetitions, Constrained repetitions, Binomial Coefficients, Binomial Multinomial theorems, The principles of Inclusion – Exclusion, Pigeon- hole principles and its applications.

UNIT - IV
Recurrence Relation: Generating Functions, Function of Sequences, Calculating Coefficient of generating function, Recurrence relations, Solving recurrence relation by substitution and Generating functions , Characteristics roots solution, In homogeneous Recurrence Relation.

UNIT - V
Introduction to Trees, Spanning Trees, DFS,BFS, Minimal Spanning Trees, Prims, Kruskal's Algorithm, Representation of Graphs, Planar Graphs, Graph theory and applications. Isomorphism and sub graphs, Multi graph and Euler circuits, Hamiltonian Graphs, Chromatic number.

TEXT BOOKS:
1.   Discrete Mathematics for computer scientists & Mathematicians, J.L. Mott, A. Kandel, T.P. Baker PHI

REFERENCES BOOK:
1.   Logic and Discrete Mathematics, Grass Man & Trembley, Pearson Education.

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M.Sc Computer Science
MSCS 103 A : OPERATING SYSTEMS

UNIT I
Introduction to Operating Systems, Types of Operating Systems, Computing Environments, Computer system operation, I/O structure, and Hierarchy, Hardware protection, Network structure, Operating system components and services – system calls, Systems programs, System Structure, Virtual machines, System design and Implantation.

UNIT II
CPU Scheduling: Scheduling criteria, Scheduling Algorithms, Multiple processors Scheduling, Real- time scheduling. Process Synchronization:- The critical-section problem, Synchronization hardware, Semaphores, Classic problems of Synchronization, Critical regions, Monitors. Dead Locks: Deadlock characterization, Deadlock handling, Deadlock prevention, Deadlock avoidance, Deadlock detection, and Recovery.

UNIT III
Memory Management: Swapping, Contiguous memory allocation, Paging, Segmentation with paring Concept of Virtual memory Demand paging Page replacement, Allocation of frames, Thrashing. File System Interface & Implementation: File concept, Access methods, Directory structure, File System Mounting File sharing Protection, File system structure, and implementation, Directory implementation, Allocation methods. Free space management, Efficiency and performance, Recovery.

UNIT IV
I/O Systems: overview, I/O hardware, Application I/O interface, Kernel I/O subsystem, Transforming I/O to Hard ware operations, STREAMS, Performance of I/O. Mass Storage Structure:- Disk Structure Disk Scheduling, Disk management, Swap-space Management, RAID Structure, Disk Attachment, Stable – Storage implementation, Tertiary – storage structure. Protection: Goals, Domain of protection, Access matrix and implementation, Access rights, capability – based systems, Language – based protection.

UNIT V
User authentication, program threats, system threats, security systems Facilities,. Linux system: History, Design principles, Kernel modules, process management, Scheduling Memory Management, File Systems, Input and output, IPC, Network structure, security.

Text Books:
1. Silberschatz A, Galvin P.B, and Gaghe G. Operating System Concepts, 6th edition, John Wiley, 2002. 2. Tenenbaum A.S., Modern Operating Systems, 2nd edition, Pearson Education, 2001.

Reference Books:
1. Dhamdhere D.M., Operating Systems – A concept based Approach, Tata McGraw-Hill, 2002.
2. Flym I M, and Mc Hoes A.M., Understanding Operating Systems, 3rd edition, Thomson Brooks/Cole, 2001.
3. Bhatt P.C.P., An Introduction to Operating Systems – Concepts and Practice, PHI, 2003.

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M.Sc Computer Science
MSCS 103 B : SYSTEM PROGRAMMING

UNIT I
Background introduction, system software and machine architecture, SIC, RISC, and CISC architecture. Assembler: basic assembler functions, machine dependent and independent assembler features, assembler design options, and implementation examples.

UNIT II
Loading and linkers basic loader junction, machine dependent and independent loader features, loader design options and implementation examples. Macro processors, basic macro processor functions machines – independent macro processor features, macro processor design options, implementation examples.

UNIT III
Compilers: basic compiler functions, machine dependent and independent compiler features, compiler design options and implementation examples. Other system software: text editors and interactive debugging systems

UNIT IV
Introduction to Device Drivers, Design issues-Types of Drivers, Character driver-1 and Design issues, Character Driver-2- A/D converter and its design issues, Block driver-1 and its design issues- RAM DISK driver-Anatomy-Prologue of drivers and programming Considerations.

UNIT V
Introduction to Linux- Linux Architecture- X-windows- Linux administration tools - Commands to use Linux OS- Executing Linux Shell scripts – Shell Programming concepts Shell scripts

Text Books:
1. Leland .Beck, System Software: An Introduction to systems Programming: 3/e, Pearson Educations Asia, 2003.
2. George pajari, Writing Unix Drivers, Addison – Wesley,1991.
3. Richard Petersen, Linux complete Reference, McGraw Hill Education (India) Private Limited; 6 edition (21 November 2007

Reference Books:
1. Dhamdhere, System programming and operation Systems Book 2/E, Tata Mc Graw, Hill, 1999
2. A.V. Aho, Ravi Sethi and J D Ullman, "compilers, Techniques and Tools", Addison Wesley, 1986.
3. Jhon J. Donovan, System Programming Tata Mc Graw Hill 2005.

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M.Sc Computer Science
MSCS 105 A: PROGRAMMING IN JAVA & DATA STRUCTURES

UNIT I

Object Oriented Programming Fundamentals & Java: Java Features, Object Oriented Programming Concepts –Abstraction, Encapsulation, Inheritance, and Polymorphism. Java Fundamentals: Data Types, variables, arrays, Inheritance to classes: class fundamentals, Objects, References, Constructors, Overloading of methods, Access control, Nested and Inner classes. Inheritance: Inheritance basics, Using super, multilevel hierarchy, method overriding, dynamic method dispatch, abstract classes, final with inheritance.

UNIT II

Packages, Exceptions and Threads: Packages and Interfaces: Packages, Access protection, Importing packages, interfaces, Exception Handling: fundamentals, exception types, uncaught exceptions, using try, nested try statements, throw, throws, Java built-in exceptions, user defined exceptions. Multithreading: Thread model, main thread, creating a thread, multiple threads, thread priorities, synchronization, Inter thread communication, String handling.

UNIT III

GUI Programming Features: Applets: Applet basics, Applet architecture, an applet skeleton, Applet display method, Repainting, Using Status window, HTML APPLET tag, passing parameters to applet, Audio Clip interface. Event Handling; two event handling mechanisms, Event model, Event classes, sources of events, Event Listener interfaces, Adapter classes.

UNIT IV

Introduction: Concept of Data Structures - Overview of Data Structures Implementation of Data Structures. Arrays: Definition - Terminology - One dimensional array – Multidimensional. Arrays - Pointer arrays. Linked Lists: Single linked lists Circular linked list - Double linked lists -Circular Double linked lists - Applications of linked lists. Stacks: Definition - Representation of stack - Operations of stack Applications of stack. Queues: Definition - Representation of Queues - Various queue structures - Application of queues.

UNIT V

Trees: Definition and concepts - Representation of Binary tree - Operations on Binary tree - Types of binary trees - Trees and forests - B Trees - B+ Tree Indexing Graphs: Terminology - Representation of graphs - Operations and graphs Application of graph structures

Text Book
1.   Herbert Schildt: "The Complete Reference Java 2"(Fifth Edition),TMH.
2.   CLASSIC DATA STRUCTURES; by D.Samanta -PHI, 2001

Reference Books
1.   Dietel & Dietel : "Java2 How to Program", Prentice Hall.
2.   Thamus Wu: "An Introduction to Object Oriented Programming With Java." TMH
3.   Balagurusamy:"Programming With Java": TMH.
4.   Aho, Hopcroft, Ullman, "Data Structures and Algorithms", Addison Wesley Publishing
5.   M.AWeiss, "Data Structures and Algorithm Analysis in C++", Benjamin Cummiys, 1994.

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M.Sc Computer Science
MSCS 105 B: DATA STRUCTURE AND ALGORITHMS USING JAVA

UNIT I
Introduction: Definition, Structure and Properties of algorithms –Development of an algorithm –Data Structures and algorithms –Data Structure definition and classification. Analysis of algorithms: Efficiency of algorithms –Apriori analysis –Asymptotic notations –Time complexity of an algorithm using O notation –Polynomial Vs Exponential algorithms –Average, Best and Worst-case complexities –Analyzing recursive programs.

UNIT II
Stacks & Queues: Introduction to Data Structures, ADT Stack and its implementation in Java, Evaluation of postfix expressions, ADT Queue and its implementation in Java, Generalising a Stack and its implementation using Templates.

UNIT III
Linked Lists: Defining & Implementing linked lists with creation, insertion and deletion operations in Java, Searching Algorithms: Sequential search & Binary search algorithms, Implementation in Java, Estimation of Time complexity in Best, Worst and average cases, Classification of algorithms, Big-OH notation.

UNIT IV
Sorting Algorithms: Methodology, Implementation and Algorithm Analysis of Insertion sort, Selection sort, Merge Sort and Quick Sort. Trees: Definition and Implementation of ADT Binary tree, AVL Trees, Heaps, Heap sort and Priority Queues.

UNIT V
Graphs: Definition of Graph, Representation of Graphs, Graph Traversal methods, Topological sorting, Minimum cost Spanning trees, Implementation of Kruskal's Algorithms, Finding shortest paths in a di-graph.

Text Books:

1. GAV Pai, Data Structures and Algorithms Concepts, Techniques and Applications, Tata   McGraw Hill, 2008.
2. Robert Sedgewick, Phillipe Flajolet, "An Introduction to the Analysis of Algorithms", Second Edition, Addison- Wesley Professional, 2013.

Reference Books
1. Jean Paul Tremblay, Paul G. Sorenson, An Introduction to Data Structures with Applications, Tata McGraw Hill, Second Edition.

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MSCS 106 A: COMPUTER NETWORKS

UNIT – I:
Introduction, Network models – Internet model, OSI model Physical Layer: Signals – Analog, Digital, Digital Transmission – Coding, Sampling, Analog Transmission – Modulation of digital and analog signal, Multiplexing – FDM, WDM, TDM, Transmission Media – cable, wireless, Circuit switching and Telephone network, DSL Technology, Cable modern, SONET.

UNIT – II:
Data Link Layer: Error detection and correction, Data link control and Protocols – Stop and wait, Go-back-n, Selective repeat, HDLC, point to point access, Channelization, LANS – Traditional Ethernet, Fast Ethernet, Gigabit Ethernet, Wireless LAN"s – IEEE 802.11, Blue tooth, Connecting LANs – Connecting devices, Backbone networks, Virtual LANS, Cellular telephony, Satellite networks, Virtual circuit switching, Frame relay, ATM.

UNIT – III:
Network Layer: Inter-networks, Addressing, Routing, Network layer Protocols – ARP, IP, JCMP. IPV6, Routing – Introduction, Unicast routing, Protocols – RIP, OSPF, BGP, Multicast Routing, Protocols – DVMRP, MOSPF, CBT, PIM.

UNIT – IV:
Transport Layer: Process-to-Process Delivery, UDP, TCP, Data traffic, Congestion and Control, Quality of service (QOS) and techniques to improve QOS, Integrated services, QOS in Switched networks. Security: Introduction. Symmetric-key cryptography, public key cryptography, Message security, Digital signature, User authentication, Key management, Kerberos. Communication Security, Authentications Protocols, E-mail Security, Web security, Social Issues.

UNIT – V:
Application Layer: Design issues, file transfer, access and management. Client-Server model, Socket interface Introduction to DNS, Distribution of name space, DNS in the Internet. Electronic mail, SMTP, File Transfer, FTP, HTTP, World Wide web.

Text Books:
1. Forouzan B A, Data Communications and Networking, 4th edition, Tata McGraw-Hill, 2007.
2. Tanenbaum A S, Computer Networks, 4th edition, Pearson Education, 2003.

Reference Books:
1. Stallings W, Data and Computer Communications, 7th edition, Pearson Education, 2004.
2. Gallo M A, and Hancock W M, Computer Communications and Networking Technologies, Thomson Brooks/Cole, 2002.
3. Comer D E, Computer Networks – and Internets with Internet Applications, 4th edition, Pearson Education, 2004.

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MSCS 106 B: DATA COMMUNICATION AND COMPUTER NETWORKS

UNIT I
Introduction, Network models – Internet model, OSI model Physical Layer: Signals – Analog, Digital, Digital Transmission – Coding, Sampling, Analog Transmission – Modulation of digital and analog signal, Multiplexing – FDM, WDM, TDM, Transmission Media – cable, wireless, Circuit switching and Telephone network, DSL Technology, Cable modern, SONET.

UNIT II
Data Link Layer: Error detection and correction, Data link control and Protocols – Stop and wait, Go-back-n, Selective repeat, HDLC, Point to point access, LANS – Traditional Ethernet, Fast Ethernet, Wireless LAN's – IEEE 802.11, Blue tooth, Connecting LANs – Connecting devices, Backbone networks, Virtual LANS, 2G,3G,4G,5G wireless technologies, Satellite networks, Virtual circuit switching, Frame relay, ATM.

UNIT III
Network Layer: Inter-networks, Addressing, Routing, Network layer Protocols, Types of Internet protocols – ARP, IPV4, ICMP, IPV6, Routing – Introduction, Unicast routing, Protocols – RIP, OSPF, BGP, Multicast Routing.

UNIT IV
Transport Layer: Process-to-Process Delivery, UDP, TCP, Data traffic, Congestion and Control, Quality of service (QOS) and techniques to improve QOS, Integrated services, QOS in Switched networks. Security: Introduction. Symmetric-key and Asymmetric cryptography, Key Management and Kerberos, Message security, Digital signature, User authentication, E-mail Security, Web security, Social Issues.

UNIT V
Application Layer: Design issues, file transfer, access and management. Client-Server model, Socket interface Introduction to DNS, Distribution of name space, DNS in the Internet. Electronic mail, SMTP, File Transfer, FTP, HTTP, World Wide web, Video- conferencing.

Text Books:
1. Forouzan B A, Data Communications and Networking, 4th edition, Tata McGraw-Hill, 2007.
2. Tanenbaum A S, Computer Networks, 4th edition, Pearson Education, 2003.
3. Ajay R. Mishra, Fundamentals of network planning and optimization, Willey,2nd edition,2018

Reference Books:
1. Stallings W, Data and Computer Communications, 7th edition, Pearson Education, 2004.
2. Gallo M A, and Hancock W M, Computer Communications and Networking Technologies, Thomson Brooks/Cole, 2002.

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II SEMESTER
MSCS 201: ADVANCED DATA BASE MANAGEMENT SYSTEM

UNIT-I
File System Vs. DBMS - Database System Applications - View of Data-Database language – Database design – ER Model _ Relational Model – Network Data Model – Hierarchical Data Model – Data Storage & Querying – Data Architecture.

UNIT-II
Relational Model – Structure of Relational Databases – Relational Algebra and Calculus – SQL – Basic Structure – Set Operations – Aggregate Functions – Null Values – Nested Queries – Complex Queries – Views – Modification of the Database - Advanced SQL – Triggers.

UNIT-III
Functional Dependencies - Features of Relational designs – Decomposition and Normalization using Functional Dependencies and Multivalued Dependencies – Join dependencies- Domain key Normal form.

UNIT-IV
Overview of Physical Storage Media – Magnetic disks – RAID – Territory Storage - File Organization – Organization of records in Files – Indexing and Hashing – Ordered Indices – B+ - Tree Index Files – B-Tree Index Files – multiple Key Access – Static and Dynamic Hashing – Query Processing – Transaction Management – Transactions – Concurrency.

UNIT-V
Distributed Databases – Homogeneous and Heterogeneous Databases – Distributed Data Storage – Distributed Transactions – Commit Protocols – Concurrency Control. Case Study : Oracle – Introduction – Basics elements of SQL – Operators – Expression Functions – SQL Statements – PL/SQL- Triggers – Cursor.

Text Books:
1. Abraham Silberschatz, Henry F. Korth and S. Sudarshan- "Database System Concepts", Fifth Edition, McGraw-Hill, 2006.

References Books:
1. Raghu Ramakrishnan and Johannes Gehrke, "Database Management Systems", Tata McGraw-Hill Publishing Company, 2003.
2. Ramez Elmasri and Shamkant B. Navathe, "Fundamental Database Systems", Third Edition, Pearson Education, 2003.
2. 3. Hector Garcia–Molina, Jeffrey D.Ullman and Jennifer Widom- "Database System Implementation"- Pearson Education- 2000.

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MSCS 202 A: COMPUTER GRAPHICS

UNIT I
Introduction, Application areas of Computer Graphics, overview of graphics systems, video-display devices, Raster-scan systems, random scan systems, graphics monitors and work stations and input devices Output primitives: Points and lines, line drawing algorithms, mid-point circle and ellipse algorithms. Filled area primitives: Scan line polygon fill algorithm, boundary-fill and flood-fill algorithms.

UNIT II
2-D Geometrical transforms: Translation, scaling, rotation, reflection and shear transformations, matrix representations and homogeneous coordinates, composite transforms, transformations between coordinate systems. 2-D Viewing: The viewing pipeline, viewing coordinate reference frame, window to view-port coordinate transformation, viewing functions, Cohen-Sutherland and Cyrus-beck line clipping algorithms, Sutherland –Hodgeman polygon clipping algorithm.

UNIT III
3-D Object representation: Polygon surfaces, quadric surfaces, spline representation, Hermite curve, Bezier curve and B-spline curves, Bezier and B-spline surfaces. Basic illumination models, polygon rendering methods.

UNIT IV
Geometric transformations: Translation, rotation, scaling, reflection and shear transformations, composite transformations, 3-D viewing: Viewing pipeline, viewing coordinates, view volume and general projection transforms and clipping.

UNIT V
Visible surface detection methods: Classification, back-face detection, depth-buffer, scan-line, depth sorting, BSP-tree methods, area sub-division and octree methods Computer animation: Design of animation sequence, general computer animation functions, raster animatio, computer animation languages, key frame systems, motion specifications

Text books:
1. "Computer Graphics C version", Donald Hearn and M. Pauline Baker, Pearson education.
2. "Computer Graphics Principles & practice", second edition in C, Foley, VanDam, Feiner and Hughes, Pearson Education.

Reference books:
1. "Computer Graphics Second edition", Zhigand xiang, Roy Plastock, Schaum's outlines, Tata Mc Graw Hill edition.
2. "Procedural elements for Computer Graphics", David F Rogers, Tata Mc Graw hill, 2nd edition.
3. "Principles of Interactive Computer Graphics", Neuman and Sproul, TMH.

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MSCS 202 B: DIGITAL IMAGE PROCESSING

UNIT I
Digital Image Fundamentals: Digital Image Representation – Fundamental steps in Image Processing)– Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels - colour models.

UNIT II
Image Enhancement: Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering–Smoothing and Sharpening Spatial Filtering – Frequency Domain: 2D Fourier Transform – Smoothing and Sharpening frequency domain filters.

UNIT III
Image Restoration And Segmentation: Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering. Segmentation: Edge detection Edge Linking and Boundary detection – Region based segmentation- Morphological processing- erosion and dilation.

UNIT IV
Image Compression And Representation: Compression: Fundamentals – Image Compression models – Error Free Compression – Lossy compression– Image Compression standards.

UNIT V
Image Representation And Recognition: Boundary representation – Chain Code – Polygonal approximation, signature, boundary segments – Boundary description – Shape number – Fourier Descriptor, moments- Regional Descriptors – Topological feature, Texture - Patterns and Pattern classes - Recognition based on matching.

Text Books
1. Rafael C. Gonzales, Richard E. Woods, "Digital Image Processing", Third Edition, Pearson Education, 2010.
2. Anil Jain K. "Fundamentals of Digital Image Processing", PHI Learning Pvt. Ltd., 2011.

References books:
1. Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, "Digital Image Processing Using MATLAB", Third Edition Tata Mc Graw Hill Pvt. Ltd., 2011.
2. Willliam K Pratt, "Digital Image Processing", John Willey, 2002.

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MSCS 203 A: CRYPTOGRAPHY AND NETWORK SECURITY

UNIT I
Attacks on Computers and Computer Security: Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security Cryptography: Concepts and Techniques: Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, steganography, key range and key size, possible types of attacks.

UNIT II
Symmetric key Ciphers: Block Cipher principles & Algorithms(DES, AES, Blowfish), Differential and Linear Cryptanalysis, Block cipher modes of operation, Stream ciphers, RC4,Location and placement of encryption function, Key distribution Asymmetric key Ciphers: Principles of public key cryptosystems, Algorithms(RSA, Diffie-Hellman,ECC), Key Distribution

UNIT III
Message Authentication Algorithms and Hash Functions: Authentication requirements, Functions, Message authentication codes, Hash Functions, Secure hash algorithm, Whirlpool, HMAC, CMAC, Digital signatures, knapsack algorithm Authentication Applications: Kerberos, X.509 Authentication Service, Public – Key Infrastructure, Biometric Authentication

UNIT IV
E-Mail Security: Pretty Good Privacy, S/MIME IP Security: IP Security overview, IP Security architecture, Authentication Header, Encapsulating security payload, Combining security associations, key management

UNIT V
Web Security: Web security considerations, Secure Socket Layer and Transport Layer Security, Secure electronic transaction Intruders, Virus and Firewalls: Intruders, Intrusion detection, password management, Virus and related threats, Countermeasures, Firewall design principles, Types of firewalls Case Studies on Cryptography and security: Secure Inter-branch Payment Transactions, Cross site Scripting Vulnerability, Virtual Elections

Text Books:
1. Cryptography and Network Security : William Stallings, Pearson Education,4th Edition
2. Cryptography and Network Security : Atul Kahate, Mc Graw Hill, 2nd Edition

Reference Books:
1. Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, 1 st Edition.
2. Cryptography and Network Security : Forouzan Mukhopadhyay, Mc Graw Hill, 2nd Edition
3. Information Security, Principles and Practice: Mark Stamp, Wiley India.

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MSCS 203 B: CYBER SECURITY

UNIT I
FUNDAMENTALS OF CYBER SECURITY: Introduction-Cyber Security and its problem-Intervention Strategies: Redundancy, Diversity and Autarchy.

UNIT II
ISSUES IN CYBER SECURITY: Private ordering solutions, Regulation and Jurisdiction for global Cyber security, Copy Right-source of risks, Pirates, Internet Infringement, Fair Use, postings, criminal liability, First Amendments, Data Loss.

UNIT III
INTELLECTUAL PROPERTY RIGHTS: Copy Right-Source of risks, Pirates, Internet Infringement, Fair Use, postings, Criminal Liability, First Amendments, Losing Data, Trademarks, Defamation, Privacy-Common Law Privacy, Constitutional law, Federal Statutes, Anonymity, Technology expanding privacy rights.

UNIT IV
PROCEDURAL ISSUES: Duty of Care, Criminal Liability, Procedural issues, Electronic Contracts & Digital Signatures, Misappropriation of information, Civil Rights, Tax, Evidence.

UNIT V
LEGAL ASPECTS OF CYBER SECURITY: Ethics, Legal Developments, Late 1990 to 2000,Cyber security in Society, Security in cyber laws case. studies, General law and Cyber Law-a Swift Analysis.

Text book:
1. Jonathan Rosenoer,"Cyber Law: The law of the Internet", Springer-Verlag, 1997.

REFERENCE BOOK:

1. Mark F Grady, Fransesco Parisi, "The Law and Economics of Cyber Security", Cambridge University Press, 2006.

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MSCS 205 A: COMPUTER ALGORITHMS

UNIT I:
Divide – and-Conquer and Greedy Methods.
UNIT II:
Dynamic Programming; Basic Traversal and Search Technique.
UNIT III:
Backtracking; and Branch-and Bound Technique.
UNIT IV:
Lower bound Theory; NP-Hard and NP-Complete Problems
UNIT V:
Mesh and Hypercube Algorithms, the Fast Fourier Transform and its Applications.

Text Books:
1. Eills Horowliz, Sartaj sahni and Sanguthevar Rajasekaran. Computer Algorithms Galgotia Publications, 1999.

Reference Books:
1. RCT Lec, SS Teang, RC Change and YT Tsai, Introduction to the Design and Analysis of Algorithms, McGraw-Hill 2005.
2. R. Jhonsonbaugh and Mschaefer, Algorithms, Pearson education 2004.

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MSCS 205 B: COMPILER DESIGN

UNIT I
Introduction to Compilers**:** Translators-Compilation and Interpretation-Language processors –The Phases of Compiler-Errors Encountered in Different Phases-The Grouping of Phases Compiler Construction Tools – Programming Language basics.

UNIT II
Lexical Analysis: Need and Role of Lexical Analyzer-Lexical Errors-Expressing Tokens by Regular Expressions Converting Regular Expression to DFA- Minimization of DFA Language for Specifying Lexical Analyzers-LEX-Design of Lexical Analyzer for a sample Language.

UNIT III
Syntax Analysis: Need and Role of the Parser-Context Free Grammars –Top Down Parsing –General Strategies Recursive Descent Parser Predictive Parser-LL(1) Parser-Shift Reduce Parser-LR Parser- LR (0)Item Construction of SLR Parsing Table –Introduction to LALR Parser – Error Handling and Recovery in Syntax Analyzer-YACC-Design of a syntax Analyzer for a Sample Language.

UNIT IV
Syntax Directed Translation & Run Time Environment: Syntax directed Definitions Construction of Syntax Tree-Bottom-up Evaluation of S-Attribute Definitions- Design of predictive translator – Type Systems-Specification of a simple type checker Equivalence of Type Expressions-Type Conversions – Run-Time Environment: Source Language Issues Storage Organization-Storage Allocation Parameter Passing-Symbol Tables-Dynamic Storage Allocation.

UNIT V
Code Optimization and Code Generation: Optimization-DAG Optimization of Basic Blocks-Global Data Flow Analysis Efficient Data Flow Algorithms Issues in Design of a Code Generator – A Simple Code Generator Algorithm.

Text Book:
1. Alfred V Aho, Monica S. Lam, Ravi Sethi and Jeffrey D Ullman, "Compilers – Principles, Techniques and Tools", Edition, Pearson Education, 2014.

Reference Book:
1. Steven S. Muchnick, "Advanced Compiler Design and Implementation", Morgan Kaufmann Publishers an imprint of Elsevier 2014.

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MSCS 206 A: FUNDAMENTALS OF MACHINE LEARNING

UNIT I

Introduction: Introduction – Definition of learning systems – Goals and applications of Machine Learning – Types of Machine Learning – Machine Learning process – Hypothesis space and Version space.

UNIT II

Supervised Learning: Linear models for Regression – Linear models for Classification –

Decision Tree Learning – Bayesian Learning – Naïve Bayes – Ensemble Methods – Bagging –

Boosting – Support Vector Machines.

UNIT III

Evaluation: Performance Evaluation metrics – ROC Curves – Validation methods – Bias-variance decomposition – Model complexity.

UNIT IV

Unsupervised Learning: Clustering – K-means – K-mode- K-median – Hierarchical clustering –

DBSCAN – Principal Component Analysis – Independent Component Analysis

UNIT V

Advanced Learning: Sampling – Basic sampling methods – Monte Carlo – Gibbs Sampling – Computational Learning theory – Reinforcement learning – Markov Decision Processes.

Text Books:
1. Tom Mitchell, "Machine Learning, McGraw-Hill, UK, 2017
2. Ethem Alpaydin, "Introduction to machine learning", MIT Press, Third Edition, 2014.

Reference Books:

1. Stephen Marsland, "Machine Learning – An Algorithmic Perspective", Chapman and Hall, CRC Press, Second Edition, 2014.
2. Shalev-Shwartz, Shai, Shai Ben-David, Understanding Machine Learning: From theory to algorithms, Cambridge University Press, 2014.

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MSCS 206 A: FUNDAMENTALS OF DEEP LEARNING

UNIT I

Applied Math and Machine Learning Basics: Linear Algebra: Scalars, Vectors, Matrices and Tensors , Multiplying Matrices and Vectors , Identity and Inverse Matrices, Linear Dependence and Span , norms, special matrices and vectors, eigen decompositions. Numerical Computation: Overflow and under flow, poor conditioning, Gradient Based Optimization, Constraint optimization.

UNIT II

Deep Networks: Deep feedforward network , regularization for deep learning , Optimization for Training deep models.

UNIT III

Convolutional Networks: Introduction, What is Convolutional Neural Network, Why ConvNets over Feed-Forward Neural Nets?, Convolutional Operation, Pooling, Data Types, Convolution Algorithms, Relation of Convolutional Network with Deep Learning, Difference between CNN and RNN. Sequence Modelling: Introduction, Auto-Completion, Unfolding Computational Graphs, Recurrent Neural Networks, Types of RNNs, Natural Language Processing and Word Embeddings.

UNIT IV

Application: Introduction, Large-Scale Deep Learning, Computer Vision, Speech Recognition, Natural Language Processing, Other Applications. Deep Learning Research: Linear Factor Models, Autoencoders, representation learning.

UNIT V

Approximate Inference, Approximate Inference in deep learning, Inference as Optimization, Expectation Maximization, Algorithm of Expectation Maximization, Maximum a Posteriori (MAP), Variational Inference and Learning, Discrete Latent Variables. Deep Generative Models: Generative Adversarial Networks, GANs as a Two Player Game, Boltzmann Machines, Restricted Boltzmann Machines, Deep Belief Networks.

Text Books:
1. "Deep Learning" Ian Goodfellow, Yoshua Bengio, Aaron Courvile An MIT Press book 1st 2016.
2. "Fundamentals of Deep Learning" Nikhil Buduma O'Reilly 1st 2017

Reference Books:
1. "Deep Learning Methods and Applications" Deng & Yu Now Publishers 1st 2013
2. "Deep Learning CookBook" Douwe Osinga O'Reilly 1st 2017

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MSCS 301 :DATA WAREHOUSING AND DATA MINING

Unit – I:

Chapter – I: Data Warehousing & OLAP Technologies [Kambler –chapter 3 (3.1,3.2,3.3)] Chapter

–II: Basic Data Mining Tasks: Classification-Regression-Time series Analysis Prediction-Clustering- Summarization-Association rules-Sequence discovery-Data mining Versus Knowledge discovery in databases-the development of Data Mining-Data Mining issues-Data mining Metrics-Social Implications of Data Mining-The future. [M.H.Dunham – chapter 1(1.1 to 1.7)] Chapter- III: Data Preprocessing [Kambler –chapter 2(2.1 to 2.6)]

UNIT II:

Chapter –I: Basic Data mining Tasks [M.H.Dunhum –chapter 1(1.1 to 1.7)] Chapter –II: Principles of dimensional modeling-design decisions, Dimensional Modeling basics-R Modeling versus Dimensional modeling-use of case tools-The star schema-Review of a simple STAR schema, inside a Dimension table, inside the fact table, the fact less fact table, Data Granularity. Star Schema keys- primary keys, surrogate keys, foreign keys. Advantages of star schema. Chapter –III: Dimensional Modeling: Updates to the dimensional tables-Miscellaneous Dimensions-The Snowflake schema- Aggregate fact tables-Families of stars

UNIT-III:

Chapter –I: Classification: Introduction-Issues in classification-Statistical Based Algorithm Regression-Bayesian Classification-Distance based algorithm-Simple approach-K nearest approach- Decision tree based algorithms-ID3-C4.5 & C5.0-CART-Scalable DT Techniques Neural network based algorithms-Propagation-NN Supervised Learning-Radial basis function works-Perceptrons- Rule based algorithms [M.H.Dunhum –chapter 4(4.1 to 4.6)]

UNIT – IV:

Chapter –I: Clustering: Introduction-Similarity & distance measures-outliers-Hierarchical algorithms agglomerative algorithms-Divisive clustering-Partitional Algorithms-Minimum spanning tree Squared error clustering algorithm-K-means clustering-nearest neighbor algorithm-PAM algorithm-Bond energy algorithm-Clustering with Genetic Algorithms-Clustering with neural networks-Clustering large databases-BIRCH- DBSCAN-CURE algorithm-Clustering with categorical attributes. [M.H.Dunhum –chapter 5(5.1 to 5.7)]

UNIT-V:

Chapter –I: Associate Rules: - Introduction-Large Item sets-Basic Algorithms-Apriori Algorithm- Sampling algorithm-Partitioning- Parallel and Distributed algorithms-Data Parallelism-Task parallelism-Comparing Approaches- Incremental Rules- Advanced Association Rule Technique- Generalized association rules-Multiple level association rules-Multiple –level Association rules- Quantitative association rules-Using multiple minimum supports Measuring the Quality of a Rules.

Text Books:
1.   Data Mining – Introductory & Advanced topics by Margaret H. Dunham. Pearson Education publishers.
2.   Data mining concepts & techniques-Jiawei Han & Micheline Kamber

Reference Books:
1.   Data Mining – Concepts and Techniques by Han and Kamber, 2001, Morgan Kaufmann Publishers

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MSCS 302 A: SOFTWARE ENGINEERING

UNIT – I:
Software Engineering – Introduction, Generic view of process, models, an agile view of process. Software Engineering practice – Software Engineering, communication, planning, modeling, construction practices and deployment.

UNIT-II:
System Engineering – Computer-based systems, the system engineering Hierarchy, business process engineering, product engineering and system modeling. Building The Analysis Model – Requirement Analysis, Modeling Approaches, Data Modeling. Behavioral Model. The web engineering process, analysis models for web apps.

UNIT –III:
Design Engineering-Design process and quality, design concepts the design model, and pattern-used software design. Architectural design – Software architecture, data design, architectural styles and patterns, architectural design mapping data flow into a software architecture. Component-based software engineering, Critical systems development, Software reuse, User interface design, web apps design issues and architecture design.

UNIT –IV:
Testing strategies – Strategies and issues, testing strategies for and object-oriented software. Validation testing and system testing. Software testing tactics – Fundamentals, black-box and white- box testing white-box testing basis path testing. Control structure testing, black box testing, object- oriented testing methods. Testing methods applicable at the class level inter class testing case design. Testing for specialized environments, architectures and applications, web application testing – concepts, testing process, component level testing.

UNIT – V:
Product metrics – Software quality, framework, metrics for analysis model design model, source case and testing. Managing software projects – The management spectrum, the W5 HH principle, metrics in process, software measurement, and metrics for software quality integrating metrics within the software process. Estimation – observations, decomposition techniques, empirical models, estimation for object-oriented projects other estimation techniques, project scheduling, risk management, reengineering, Security engineering, Service-oriented software engineering, Aspect- oriented software development.

Text Book:
1. Roger, S, Pressman, Software Engineering, A Practitioner"s Approach, Six Edition, McGraw- Hill, International Edition, 2005.
2. Ian Sommerville, Software Engineering, Pearson Education, 8th Edition.

Reference Books:
1. James F Peters, Software Engineering, John Wiley
2. Waruan S Jawadekar, Software Engineering, Tata McGraw Hill, 2004.
3. Carlo Ghezzi, Mehdi Jazayeri, Dino Manrioli, Fundamentals of Software Engineering, PHI, 2001 Pankaj Jalote, An Integrated approach to Software Engineering Narosa.

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MSCS 302 A: SOFTWARE TESTING

UNIT I
Software Engineering Evaluation - Software Development Process Models - Requirements Management ·Software Design - Coding and Unit Testing - Integration Testing - System testing - Installation and Acceptance - Customer Support / Maintenance.

UNIT II
System Testing Process: System testing Process - System Test Commencement - System Test Planning - Test Design - Test Execution - Test Reporting and Defect Tracking.

UNIT III
WinRunner 8.0: Introduction to WinRunner - checkpoints in WinRunner - Data Driven and Batch Testing - Improve Test Automation in WinRunner - GUI Mapping - Web test Option in WinRunner.

UNIT IV
QTP 8.2: QuickTestPro Introduction - Edit Test Scripts - Improving Test Automation in QTP - Data Driven and Batch Testing, Web Test Options in QTP.

UNIT V
Load Runner 8.0: Introduction to Performance Testing - VuserScript Creation Using LoadRunner - VuserScript Execution and Results Analysis TestDirector 8.0 - Site Administrator, Understanding Test Director.

TEXT BOOK:
1. Software Testing Concepts and Tools by Nageshwar Rao Pusuluri, Dreamtech Press.

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MSCS 303 A: WEB TECHNOLOGIES

UNIT-I

Introduction to Internet-Browser Architecture-IE, Chrome-Search Engines-Introduction to HTML- 5-HTML-5 Tags-Audio, Video Tags – HTML-5 Forms-Controls-CSS Styling-CSS Tags Attributes.

UNIT-II

Java Script-JQuery- JavaScript Programming Scripts- Control structures- Functions Document, Browser, Date, Math, String Objects-Events- JQuery Libraries-JQuery Objects, Functions – JQuery Events-Animations.

UNIT-III

AJAX Concepts- Simple AJAX objects-Ajax Libraries-Examples, Webservers IIS, Tomcat Hosting Website in a Webservers

UNIT-IV

Introduction to PHP-Control Structures-Arrays-Functions-Database connectivity Introduction to ZEND Framework and applications

UNIT-V

Introduction to Java Servlets, Servlets classes and interfaces - Java Database Connectivity Introduction to JSP-Java Server Page scriplets -JSP Objects-JSP Web applications

TEXT BOOK:
1. Deitel, Deitel and Goldberg Internet & World Wide Wide how to program" by End. Pearson Education
2. Ivan Bayross, Web enabled commercial Application Development in Java 2.0 BPB.
3. Nicholas C. Zakas., Jeremy McPeak,Joe Fawcett, Professional AJAX,2nd Edition, Willey publishing
4. HTML 5 Black book, Kogent Learning Solutions Inc.

REFERENCE BOOKS:
1. Raj Kamal Internet and web Technologies, Tata Mc Graw Hill, 2002.
2. Chirs Bates, Web Programming, John Wiley, 2nd Edition

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MSCS 305 A: BIG DATA ANALYTICS

UNIT-I

What is Big Data - Varieties of Data - Unstructured data – Trends in Data Storage- Industry Examples of Big Data

UNIT-II

Big data Technology – New and older approaches- Data Discovery – Open source technologies for Big Data Analytics- Cloud and Big Data –Big Data Foundation-Computation-Limitations Big Data Emerging Technologies

UNIT-III

Business Analytics- Consumption of Analytics- Creation to Consumption of Analytics-Data visualization by Organizations – 90/10 rule of critical thinking – Decision sciences and analytics- Learning over knowledge-Agility-Scale and convergence-Privacy and security in Big Data.

UNIT-IV

Predictive Analytics –Linear Regression – Decision trees-Neural networks-Classification trees Ensemble methods-Association Rules-Segmentation, Sequence Rules, Social Network analytics.

UNIT-V

Hadoop – Components of Hadoop – Hadoop File System –Hadoop Technology Stack-
Dataware housing Hadoop Concepts-Applications of Hadoop using PIG,YARN, HIVE.

Text Books

1. Micheal Minnelli,Ambiga Dhiraj,Chambers, Big Data and Big Analytics, Willey and Sons Inc,.
2. Bart Beasens, Analytics in Big Data World, Willey and Sons Inc
1. Sameer Wadker,Madhu Sidhalingaiah and Jason Winner,Apache Hadoop, APress

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MSCS 305 B: REAL WORLD HADOOP

UNIT I

What Hadoop, What features the Hadoop Distributed File, System (HDFS) provides, Architecture Features, Goals and Advantages of HDFS, Name Nodes, Data Nodes, Secondary Name Node, The concepts behind MapReduce, How Map Reduce Works?, Data Type, Input & Output Formats, How a Hadoop cluster operates, Cluster sizing, Capacity planning, Replication, Blocks, Heartbeat Mechanism, Data Organization.

UNIT II

The Hadoop Ecosystem, Introduction, Hive ,SQL Basics ,Hive Basics, Internal & External Tables, Partitioning, Buckets, DDL,DML, Joins, Index and Views, transferring data from one table to multiple tables, convert, unstructured data into structured data, and perform analytics and alter/rename/drop commands in Hive, Pig, Motivation, Pig Basics, Pig Latin Language, Statement Execution Steps, Data Types, Loading data files, Writing queries – SPLIT, FILTER, JOIN, GROUP, SAMPLE, ILLUSTRATE etc., Multi Query Execution, Debugging in Pig, Pig UDF, Wordcount using Pig Latin, Batting Data Analytics, Production Example

UNIT III

HBase, Overview, HBase vs HDFS, Data Model, Key Value, Common Commands in HBase, HBase Basics, Region Server, Flume, Flume, Basics, Features, Architecture, Agent Architecture, Example where we ingest files in real-time into HDFS, Flume Use Cases, HCatalog, Objective, Supported Projects and Formats, Sqoop, Motivation, Sqoop Features, Architecture, Hive Import, Sqoop Import, Sqoop Export, Zookeeper, Fault Tolerant, Zookeeper Service

UNIT-IV

Oozie, Overview , Features, Sample Workflow, Action Nodes, Decision Nodes, Workflow Design, Workflow Scheduler, Example of MapReduce task: Hadoop 2.X Classic MapReduce Architecture, Challenges with Hadoop 1, YARN, Daemons, Architecture , Resource Manager, Node Manager, Application Master, Hadoop 1.X Vs Hadoop 2.x

UNIT-V

Hadoop on Amazon Web Services, Introduction to AWS cloud infrastructure, Amazon SaaS, Paas and IaaS, Creating EC2 instance for processing, Creating S3 buckets, Deploying data on to the cloud, choosing size of our instance, Configuration of EMR instance, creating a virtual cluster on Amazon Web Services

Text Books:

1. Real World Hadoop by Ted Dunning & Ellen Friedman O'Reilly

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MSCS 306 A: ARTIFICIAL INTELLIGENCE

UNIT I
Introduction to Artificial Intelligence: Overview of AI – Definition of AI, Relationship between AI Systems and other computing systems, comparison between AI programming and other conventional programming; AI and related fields; Key Issues in AI Research, AI problems-Examples; problem spaces, production systems and characteristics; knowledge – general concepts.

UNIT II
Knowledge Representation: Approaches to knowledge representation, Issues in knowledge representation, Formal systems – basic concepts, Symbolic logics - Syntax and semantics of FOPL, properties of w.f.f, clausal forms, Resolution principle, Examples of Resolution.

UNIT III
Structural knowledge – graphs, frames, C.D's and scripts; probabilistic reasoning- Bayesean Networks, Dampster – Shafer theory; Non Monotonic Reasoning – TMS, Model and Temporal logics, Fuzzy sets & Fuzzy logics.

UNIT IV
Knowledge organisation and Manipulation: Search and control strategies - Examples of research problems, uninformed search techniques, Informed and Heuristic search techniques; Matching Techniques – Structures used in Matching, Measures of matching, partial matching, Fuzzy Matching Algorithms and RETE Matching Algorithm.

UNIT V
AI languages: LISP – Basic list manipulation functions, predicates, Conditionals, Input, output and local variables, Iteration and Recursion in LISP, property lists and Arrays, Prolog – Introduction, facts, questions, variables, conjunctions, syntax of character, Operators, equality, matching, arithmetic expressions; Goals; Back tracking, cut predicates; Input and output operations.

Text Books:
1. Artificial Intelligence by Elaine RICH and Kevin Knight – TMH
2. Introduction to AI & Expert systems by O.W. Patterson – PHI
3. Artificial Intelligence by N J Nilsson HARCOURT ASIA (Pvt) Ltd.

Reference Books:
1. Programming prolog by Clockson & Mellish - Narosa
2. Artificial Intelligence by P.H Winston - AWL

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MSCS 306 B: NEURAL NETWORKS

UNIT I

INTRODUCTION: Neural network, Human Brain, Models of a Neuron, Neural networks viewed as Directed Graphs, Network Architectures, Knowledge Representation, Artificial Intelligence and Neural Networks, LEARNING PROCESS, Error Correction learning, Memory based learning, Hebbian learing.

UNIT II

LEARNING PROCESS: Competitive, Boltzmann learning, Credit Assignment Problem, Memory, Adaption, Statistical nature of the learning process, SINGLE LAYER PERCEPTRONS – Adaptive filtering problem, Unconstrained Organization Techniques, Linear least square filters, least mean square algorithm, learning curves, Learning rate annealing techniques, perception –convergence theorem, Relation between perception and Bayes classifier for a Gaussian Environment.

UNIT III

MULTILAYER PERCEPTRON – Back propagation algorithm XOR problem, Heuristics, Output representation and decision rule, Computer experiment, feature detection, BACK PROPAGATION - back propagation and differentiation, Hessian matrix, Generalization, Cross validation, Network pruning Techniques, Virtues and limitations of back propagation learning, Accelerated convergence, supervised learning.

UNIT IV

SELF ORGANIZATION MAPS – Two basic feature mapping models, Self organization map, SOM algorithm, properties of feature map, computer simulations, learning vector quantization, Adaptive patter classification, Hierarchal Vector quantilizer, contexmel Maps.

UNIT V

NEURO DYNAMICS – Dynamical systems, stavility of equilibrium states, attractors, neurodynamical models, manipulation of attractors' as a recurrent network paradigm
HOPFIELD MODELS – Hopfield models, computer experiment

TEXT BOOK:

1. Neural networks A comprehensive foundations, Simon Hhaykin, Pearson Education 2nd Edition 2004

REFERENCE BOOKS:

1. Artificial neural networks - B.Vegnanarayana Prentice Halll of India P Ltd 2005
2. Neural networks in Computer intelligence, Li Min Fu TMH 2003
3. Neural networks James A Freeman David M S kapura Pearson Education 2004