Vikram University, Ujjain

Board of studies in Computer science (Faculty of Science)

SYLLABUS of M.Sc.(Data Science) Programme

[Choice Based Credit System & Grading System (CBCS& GS)]

Exclusively for University Teaching Department (ICS, VUU)

TWO YEAR M.Sc. (FULL TIME) PROGRAMME of UTD (ICS, VUU)

(Effective from Academic Session 2020-21)

[Modified as according to the provision of "Ordinance 14: Choice Based Credit System"

(Effective from Academic Session 2020-21)

COURSE STRUCTURE

M.Sc. (Data Science) FIRST SEMESTER

SN	Course Type	Course code	Title	End term sem Exam	Internal	Max Marks	Credits*	Distribution of Credits		
							C	L	T	P
1	Core Course	MSDS-101	Computational Mathematics	60	40	100	6	4	2	
		MSDS-102	Operating system & system software	60	40	100	6	4		2
2	Course for Ability Enhancement & skill Development (AE & SD)	MSDS-103	Communication Skills	60	40	100	6	4	2	
Choose any one From MSDS 104- E1 and 104- E2										
3	Elective Discipline Centric	MSDS 104-E1	Computer organisation & Architecture	60	40	100	6	4	2	
		MSDS 104-E2	Techniques Of Operation Research	60	40	100	6	4	2	
Choose any one From MSDS 105-E1 , 105-E2 and 105-E3										
4	Elective Generic Categories	MSDS 105-E1	Object oriented programming using C++	60	40	100	6	4		2
		MSDS 105-E2	Data Communication and Computer Network	60	40	100	6	4	2	
		MSDS 105-E3	Any Course from Massive Open Online Courses (MOOCs)available at SWAYAM	60	40	100	6	4	2	
5		MSDS-106	Comprehensive Viva Voce	50	-	50	04 Virtual (VR)			
			Total			550	30+4	20	06	04

(C=Credit Per Week) / (L = Lectures Per Week)/ (T & PW =Tutorials & Practical Work per week)

*One Credit is equivalent to one hour (60 minutes) of teaching (lecture or tutorial) and two hours (120 minutes) for practical

M.Sc. DS (Data Science) SECOND SEMESTER

SN	Course Type	Course code	Title	End term sem Exam	Internal	Max Marks	Credits*	Distribution of Credits		
							C	L	T	P
			Core Courses							
1	Core Course	MSDS-201	Data Structure Using C++	60	40	100	6	4		2
		MSDS-202	Data Base Management System	60	40	100	6	4	2	
2	Course for Ability Enhancement & skill Development (AE & SD)	MSDS-203	Computer Hardware and Networking	60	40	100	6	4	2	
	Choose any one From MSDS 204- E1 and 204- E2									
3	Elective Discipline Centric	MSDS 204-E1	Theory of Computation	60	40	100	6	4	2	
		MSDS 204-E2	Internet Programming	60	40	100	6	4	2	
	Choose any one From MSDS 205-E1 , 205-E2 and 205-E3									
4	Elective Generic Categories	MSDS 205-E1	programming with VB.Net	60	40	100	6	4		2
		MSDS205-E2	Computer System Architecture and parallel Processing	60	40	100	6	4	2	
		MSDS 205-E3	Any Course from Massive Open Online Courses (MOOCs)available at SWAYAM	60	40	100	6	4	2	
5		MSDS-206	Comprehensive Viva Voce	50	-	50	04 Virtual (VR)	20	06	04
			Total			550	30+04			

(C=Credit Per Week) / (L = Lectures Per Week)/ (T & PW =Tutorials & Project Work per week)

*One Credit is equivalent to one hour (60 minutes) of teaching (lecture or tutorial)and two hours (120 minutes) for practical

M.Sc. (Data Science) THIRD SEMESTER

SN	Course Type	Course code	Title	End term sem Exam	Internal	Max Marks	Credits*	Distribution of Credits		
							C	L	T	P
1	Core Course	MSDS-301	Basic Statistical Methods	60	40	100	6	4	2	
		MSDS-302	Data Mining and Data Warehousing	60	40	100	6	4	2	
2	Course for Ability Enhancement & skill Development (AE & SD)	MSDS-303	Mobile Application Development	60	40	100	6	4		2
	Choose any one From MSDS 304- E1 and 304- E2									
3	Elective Discipline Centric	MSDS 304-E1	Big Data Technologies	60	40	100	6	4		2
		MSDS 304-E2	RDBMS and NOSQL	60	40	100	6	4	2	
	Choose any one From MSDS 305-E1, 305-E2 and 305- E3									
4	Elective Generic Categories	MSDS 305- E1	Machine Learning	60	40	100	6	4	2	
		MSDS 305- E2	Cloud Computing	60	40	100	6	4	2	
		MSDS 305-E3	Any Course from Massive Open Online Courses (MOOCs)available at SWAYAM	60	40	100	6	4	2	
5		MSDS-306	Comprehensive Viva Voce	50	-	50	04 Virtual (VR)			
			Total			550	30+04	20	06	04

C=Credit Per Week) / (L = Lectures Per Week)/ (T & PW =Tutorials &Practical Work per week)

*One Credit is equivalent to one hour (60 minutes) of teaching (lecture or tutorial)and two hours (120 minutes) for practical

Note: (1) The students will have the choice to opt a course under the category of Elective Courses available within the UTD (ICS, VUU) or in other UTDs but from same level of the programmes. (2)An alternative choice will also be available to the students to opt a course in each semester under elective-generic category including skill development course from Massive Open Online Courses (MOOCs) available at SWAYAM plate form. (3) The student can also opt a course under Elective- Discipline Centric category from Massive open online courses (MOOCs) available at SWAYAM plate form. In such cases, the provisions "Ordinance 14 : Choice Based Credit System" shall be applicable and the conditions mentioned therein will need to be satisfied by the student if they opt courses from Massive Open Online Courses (MOOCs) available at SWAYAM plate form.

M.Sc.(Data Science) FOURTH SEMESTER

SN	Course Type	Course code	Title	End term sem Exam	Internal	Max Marks	Credits*	Distribution of Credits		
							C	L	T	P
1	Core Course	MSDS-401	Advance statistical Model and Analysis	60	40	100	6	4		2
		MSDS-402	Python for analytics	60	40	100	6	4	2	
2	Course for Ability Enhancement & skill Development (AE & SD)	MSDS-403	Software Testing and Project Management	60	40	100	6	4		2
Choose any one From MSDS 404- E1 and 404- E2										
3	Elective Discipline Centric	MSDS 404-E1	Decision Analysis	60	40	100	6	4	2	
		MSDS 404-E2	Fundamentals of Algorithm	60	40	100	6	4	2	
4		MSDS 405	Final presentation/ Seminar	30	20	50	3			3
		MSDS 405	Valuation of Dissertation	30	20	50	3			3
		MSDS 405	Final Viva-voce examination	50	-	50	04 Virtual (VR)			
			Total			550	30+04	16	04	10

C=Credit Per Week) / (L = Lectures Per Week)/ (T & PW =Tutorials & Practical Work per week)

*One Credit is equivalent to one hour (60 minutes) of teaching (lecture or tutorial)and two hours (120 minutes) for practical

Note: (1) The students will have the choice to opt a course under the category of Elective Courses available within the UTD (ICS, VUU) or in other UTDs but from same level of the programmes. (2)An alternative choice will also be available to the students to opt a course in each semester under elective-generic category including skill development course from Massive Open Online Courses (MOOCs) available at SWAYAM plate form. (3) The student can also opt a course under Elective- Discipline Centric category from Massive open online courses (MOOCs) available at SWAYAM plate form. In such cases, the provisions "Ordinance 14 : Choice Based Credit System" shall be applicable and the conditions mentioned thereinwill need to be satisfied by the student if they opt courses from Massive Open Online Courses (MOOCs) available at SWAYAM plate form.

MSDS 101: Computational Mathematics

UNIT 1

Set Theory: Introduction, Sets and Elements, Universal Set and Empty Set, Subsets, Venn Diagrams. Relations: Introduction, Product Sets, Relations, Pictorial Representation of Relations, Composition of Relations, Types of Relations, Partial Ordering Relations.

UNIT 2

Functions: Introduction, One-to-One, Onto, and Invertible Functions, Cardinality. Logic and Propositional Calculus: Introduction, Propositions and Compound Propositions, Basic Logical Operations, Propositions and Truth Tables, Tautologies and Contradictions.

UNIT 3

Counting: Introduction, Basic Counting Principles, Factorial Notation, Binomial Coefficients, Permutations and Combinations. Pigeon hole Principle.

UNIT 4

Graph Theory: Introduction, Graphs and Multigraphs, Subgraphs, Paths, Connectivity, Weighted Graphs, Complete, Regular and Bipartite Graphs. Directed Graphs: Introduction, Rooted Trees, Graph Algorithms: Depth first and Breadth-First Searches.

UNIT 5

TREES AND CUT - SETS : Paths and Circuits, Shortest Paths, Eulerian Paths and Circuits, Hamiltonian Paths and Circuits. Rooted Trees, Path Lengths in Rooted Trees, Binary Search Trees. Spanning Trees, Minimum Spanning Trees.

Reference Books:

1. Elements of Discrete Mathematics, C.L.Liu, Second Edition, TMH

2. Discrete Mathematics and its applications, Kenneth H. Rosen, (Fifth Edition), Tata McGraw Hill Publishing Company.

3. Theory and Problems of Discrete Mathematics, SemmourLipschutz, Marc Lipson, Second Edition, Schaum's Outline, T.M.H.

MSDS 102: Operating System and System Software

UNIT 1

Introduction to System Programs & Operating Systems, Evolution of Operating System (mainframe, desktop, multiprocessor, Distributed, Network Operating System, Clustered & Handheld System), Operating system services, operating system structure, System Call & System Boots, Operating system design & Implementations, System protection, Buffering & Spooling. Types of Operating System: Bare machine, Batch Processing, Real Time, Multitasking & Multiprogramming, timesharing system.File: concepts, access methods, free space managements, allocation methods, directory systems, protection, organization,sharing & implementation issues.

UNIT 2

Process: Concept, Process Control Blocks(PCB), Scheduling criteria Preemptive & non Preemptive process scheduling, Scheduling algorithms, algorithm evaluation, multiple processor scheduling, real time scheduling, operations on processes, threads, inter process communication, precedence graphs, critical section problem, semaphores, classical problems of synchronization. Deadlock: Characterization, Methods for deadlock handling, deadlock prevention, deadlock avoidance, deadlock detection, recovery from deadlock Process Management in Linux.

UNIT 3

Memory Hierarchy, Concepts of memory management, MFT & MVT, logical and physical address space, swapping, contiguous and non-contiguous allocation, paging, segmentation, and paging combined with segmentation. Structure & implementation of Page table.Concepts of virtual memory, Cache Memory Organization, demand paging, page replacement algorithms, allocation of frames, thrashing, demand segmentation.

UNIT 4

Mass Storage Structure: Disk Structure, Disk Scheduling- FCFS, SSTF, SCAN Scheduling, Disk Management, Swap-Space Management. Distributed operating system:-Types, Design issues, File system, Remote file access, RPC, RMI, Distributed Shared Memory(DSM), Basic Concept of Parallel Processing &Concurent Programming.

UNIT 5

System software and application software, layered organization of system software. Assemblers, Macros, Compilers, Cross compilers, Linking and loading, Relocation. Case study of Unix, Linux & Windows

Reference Books:

1. Operating Systems Concepts, A. Silberschatz, P.Galvin, G.Gagne, John Wiley & Sons, Inc.
2. Systems Programming and Operating Systems (Part II - Operating Systems), Dhamdhere, 2nd Edition, TMH
3. Donovan, J.J. : System programming, Mcgraw Hill,1972.
4. Dhamdhere. D.M.: Introduction to system software, Tata Mcgraw Hill Publ.comp. 1986

MSDS 103: Communication Skill

UNIT 1

Definition of Language, nature of language, Characteristics of Human Language. Varieties of English Language: British, American, Indian, Australian etc., English for specific and special purposes.

UNIT 2

Meaning and process of communication, importance of effective communication, communication skills, barriers to communication, Animal and human communication, Methods of communication (Verbal & Non-Verbal).

UNIT 3

Objectives of communication, types of communication, principles of communication, essentials of effective communication. Media of communication: written, oral, face-to-face, visual, audio-visual, merits and demerits of written and oral communication, preparing for oral presentation.

UNIT 4

Basic skills of communication, listening to and Understanding, Extended natural speech in business situations (Both face to face and on the telephone), Understanding standard American, British and Indian accents, speaking with correct, Pronunciation, English Consonants, English Vowels, Speaking with right accent.

UNIT 5

Developing communication skills, interview- how to face and how to conduct. Planning and preparing to speak, Strategies for making powerful openings in presentations and conducting presentations, Body Language, Voice Modulations.

Reference Books:

1. Essentials of Business Communication by Rajendra Pal and J.S.Korilahalli, Sultan Chand & Sons Publishers, New Delhi.
2. Business Communications by U.S. Rai &S.M.Rai, Himalaya Publishing House.
3. Writing a Technical Paper by Menzal and D.H.Jones, McGraw Hill, 1960.
4. Business Communication : Strategy and Skill, Prentice Hall New Jersey, 1987.

MSDS 104 E1: Computer Organization and Architecture

UNIT 1

Binary Systems: Digital Computers and Digital Systems, Binary Numbers, Number Base Conversion, Octal and Hexadecimal Numbers, Complements, Binary Codes. Boolean Algebra and Logic Gates: Boolean Functions, Digital Logic Gates.Simplification of Boolean Functions: The Map Method, Two and Three Variable Maps, Four Variable Map, Product of Sums Simplification, NAND and NOR Implementation, Don't-Care Conditions.

UNIT 2

Combinational Logic: Introduction, Design Procedure, Adders, Subtractors, Code Conversion, Analysis Procedure. Combinational Logic with MSI and LSI: Binary Parallel Adder, Decoders, Multiplexers. Sequential Logic: Introduction, Flip-Flops, Triggering of Flip-Flops.

UNIT 3

Analysis of Clocked Sequential Circuits, State Reduction and Assignment, Flip-Flop Excitation Tables, Design Procedure, Design of Counters. Processor Logic Design: Introduction, Processor Organization, Arithmetic Logic Unit, Design of Arithmetic Circuit, Design of Logic Circuit, Design of Arithmetic Logic Unit, Status Register, Design of Shifter, Processor Unit.

UNIT 4

Microcomputer System Design: Introduction, Microprocessor Organization, Basic Concept of Instruction, Instruction Types, Micro Instruction Formatsand Addressing Modes, Subroutines Interrupt, Fetch and Execution cycle, Hardwired control unit, Micro-programmed Control unit-microprogram sequencer Control Memory, Sequencing and Execution of Micro Instruction.

UNIT 5

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory. Input Output Organization: Peripheral Devices, Input-Output Interface, Direct Memory Access (DMA), Input-Output Processors (IOP), Structure of Multiprocessor- Inter-processor Arbitration, InterProcessor Communication and Synchronization. Memory in Multiprocessor System, Concept of Pipelining, Vector Processing, Array Processing, RISC And CISC,Study of Multicore Processor – Intel, AMD.

Reference Books:
1. Digital Logic and Computer Design, M. Morris Mano, P.H.I., Eastern Economy Edition.
2. Computer System Architecture (3rd ed..), M.Morris Mano, P.H.I., Eastern Economy Edition.
3. Computer Architecture and Organization, J.P. Hays, McGraw Hill.
4. Digital Principle and Applications, Malvino and Leach
5. Digital Computer Fundamentals, Thomas C. Bartee
6. William stalling ,"Computer Architecture and Organization" PHI

MSDS 104 E2: Techniques of Operation Research

UNIT 1

Introduction: nature and meaning of O.R. Modelling in operations research, features of operation research, scope of operations research. Linear Programming Problem: formulation of L.P.P. solution of L.P.P. graphical method, simplex methods, duality.

UNIT 2

Assignment problems: Mathematical formulation, Reduction theorem, methods of solving the assignments problems, Unbalanced assignment problem, Transportation problem: formulation, basic feasible solution: North-West-Corner method, least cost method, Vogel's approximation method, Optimum solution: Modi method.

UNIT 3

Project management: introduction, network diagram representation, time estimates and critical path in network analysis, project evaluation and review techniques. Job sequencing: processing n jobs through 2 machines, processing n jobs through 3 machines, processing 2 jobs through m machines.

UNIT 4

Queuing Theory: introduction, queuing system Transient and steady traffic inlets, Distribution of arrival distribution of departure, M/M/I: ∞/ FCFS model. Replacement problems: replacement policy for items whose maintenance cost increases with time and money value is constant.

UNIT 5

Deterministic Inventory Models, what is inventory, types of inventory, inventory decisions, how to develop n variables model, costs involved in inventory problems, variables in inventory problem, classification of characteristics of inventory systems, EOQ model without shortage.

Reference Books:

1. Operations Research by Taha.
2. Operations Research by S D Sharma.
3. Introduction to Operations Research (Sixth Edition) by F.S. Hillier and G.J. Lieberman, Mc Graw Hill International Edition, Industrial Engineering Series, 1995.
4. Linear Programming by G. Hadley, Narosa Publishing House, 1995.

MSDS 105 E1: Object Oriented Programming Using C++

UNIT 1
Object Oriented Systems Development : Introduction to traditional programming with C. Objectives of OOP, Object Oriented Analysis, Object Oriented Programming in C++: Concepts of Objects, Classes, Data Abstraction, Encapsulation, Inheritance, Polymorphism, Dynamic Binding and Message passing.

UNIT 2
Object modeling, Dynamic modeling, Events, Status, Scenarios, Event hate diagrams, Operations, State diagrams, Functional Models, Dataflow diagrams, Constraints specification, Relation of object, Functional and Dynamic models.

UNIT 3
Tokens, Expressions and Control Structures, Classes and Objects, Overloading and information hiding, Function overloading, Operator overloading in C++, Memory Management: Constructors, Overloading of constructors, copy constructors, destructors.

UNIT 4
Inheritance : Inheritance, Derived and base classes, Single, Multilevel, Hierarchical, Hybrid Inheritance, Protected member, overriding member function, class hierarchies, multiple inheritance, Containership

UNIT 5
Polymorphism : virtual functions, late binding, pure virtual functions, abstract classes, friend functions, friend classes, static functions, this pointer, templates, function templates, Class templates.

Reference Books:

1. Object-Oriented Programming with C++: E. Balagurusamy, TMH, 2005
2. Object Oriented Programming in C++, Robert Lafore, Galgotia Publication.
3. Object Oriented Programming, Tomothy Budd, Pearson education.
4. Object Oriented Modelling and Design, J. Rambaugh, M. Blaha, W. Premerlani, F. Eddy, W. Lorensen, P.H.I.

MSDS 105 E2: Data Communication & Computer Network

UNIT 1

Data Communication networks and system standards : Data Communication networks and open system standards: Data communication networks, Standards. ISO reference model. The Electrical Interface: Transmission media. Attenuation and distortion sources.

UNIT 2

Data Transmission: Data transmission basics. Asynchronous transmission. Synchronous transmission, Error detection methods. Data compression. Transmission control circuits. Communications control devices. Protocol basics: Error Control, Idle RQ, Continuous RQ, Link management.

UNIT 3

Local Area Networks : Topology Transmission Medium , Medium Access Control Methods, ICSMA/CD Bus, Token Ring , Performance , Wireless LANs , Wireless Media, Protocols, Network Layer, Bridges, Bridges, Source Routing Bridges Transparent , Internetworking with different types, Introduction to WAN.

UNIT 4

Transport Protocol : User Data Gram Protocol, TCP, Reliable Stream Service , Protocol Operations, Application support protocol, Session Layer, Token Concept, Presentation Layer, Data Encryption, Terminology, Message Authentication,

UNIT 5

TCP/IP Application protocols: Introduction to TELNET , FTP , SMTP , SNMP , World Wide Web, Directory Services, Domain Name system.

Reference Books:

1. Data Communications and Networking, Behrouz A. Forouzan, Tata McGraw Hill, 3rd Edition, ISBN 0-07-058408-7.
2. Data Communications and Networks, Godbole A, Tata McGraw-Hill Publications.
3. Data Communications, Gupta P., PHI, 2004, ISBN 81 - 203 - 1118 - 3
4. Understanding Data Communications and Networks, Shay W., Third Edition, Brooks Kale Thomson Learning/Vikas Publishing House, ISBN 981-254-966-8

MSDS 201 : Data Structures Using C++

UNIT 1

Stack and Queue: Introduction –Common operations on data structures, Types of data structures, Data structures & Programming,contiguous implementations of stack, various operations on stack, various polish notations-infix, prefix, postfix, conversion from one to another-using stack; evaluation of post and prefix expressions. Contiguous implementation of queue: Linear queue, its drawback; circular queue; various operations on queue; linked implementation of stack and queue- operations

UNIT 2

General List: list and it's contiguous implementation, it's drawback; singly linked list-operations on it; doubly linked list-operations on it; circular linked list; linked list using arrays.

UNIT 3

Trees: definitions-height, depth, order, degree, parent and child relationship etc; Binary Trees- various theorems, 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 representation of binary tree-operations. Threaded binary trees; forests, conversion of forest into tree. Heap-definition.

UNIT 4

Searching, Hashing and Sorting: requirements of a search algorithm; sequential search, binary search, indexed sequential search, interpolation search; hashing-basics, methods, collision, resolution of collision, chaining; Internal sorting- Bubble sort, selection sort, insertion sort, quick sort, merge sort on linked and contiguous list, shell sort, heap sort, tree sort.

UNIT 5

Graphs: related definitions: graph representations- adjacency matrix, adjacency lists, adjacency multilist; traversal schemes- depth first search, breadth first search; Minimum spanning tree; shortest path algorithm; kruskals&dijkstras algorithm. Miscellaneous features Basic idea of AVL tree-definition, insertion & deletion operations; basic idea of B-tree- definition, order, degree, insertion & deletion operations; B+-Tree- definitions, comparison with B-tree; basic idea of string processing.

Reference Books:

1. Introduction to Data Structures and Algorithms with C ++, GLENN W.ROWE, Prentice Hall India, 2003
2. Data Structures and Algorithms, Alfred V. Aho, John E. Hopecraft, Jaffrey D. Ullman, Pearson education
3. M. Tenenbaum, "Data Structures using C & C++", Pearson Pub
4. Venkatesan , Rose, "Data Structures" Wiley India Pvt.Ltd
5. Pai; Data structure and algorithm , TMH Publications
6. T.H.Coreman,"Introduction to algorithm",PHI.

MSDS 202 : Database Management System

UNIT 1

DBMS Concepts and architecture Introduction, Database approach v/s Traditional file accessing approach, Advantages, of database systems, Data models, Schemas and instances, Data independence, Data Base Language and interfaces, Overall Database Structure, Functions of DBA and designer, ER data model:Entitles and attributes, Entity types, Defining the E-R diagram,Concept of Generalization, Aggregation and Specialization. transforming ER diagram into the tables. Various other data models object oriented data Model, Network data model, and Relational data model, Comparison between the three types of models.

UNIT 2

Relational Data models: Domains, Tuples, Attributes, Relations, Characteristics of relations, Keys, Key attributes of relation, Relational database, Schemas, Integrity constraints. Referential integrity, Intension and Extension, Relational Query languages:SQL-DDL, DML, integrity constraints, Complex queries, various joins, indexing, triggers, ssertions,Relational algebra and relational calculus, Relational algebra operations like select, Project,Join, Division, outer union. Types of relational calculus i.e. Tuple oriented and domain oriented relational calculus and its operations.

UNIT 3

Data Base Design: Introduction to normalization, Normal forms, Functional dependency, Decomposition, Dependency preservation and losless join, problems with null valued and dangling tuples, multivalued dependencies.Query Optimization: Introduction, steps of optimization, various algorithms to implement select, project and join operations of relational algebra, optimization methods: heuristic based, cost estimation based.

UNIT 4

Transaction Processing Concepts: - Transaction System, Testing of Serilizability, Serializability of schedules, conflict & view serializable schedule, recoverability, Recovery from transaction failures. Log based recovery. Checkpoints deadlock handling. Concurrency Control Techniques: - Concurrency Control, locking Techniques for concurrency control, time stamping protocols for concurrency control, validation based protocol, multiple granularity. Multi version schemes, Recovery with concurrent transaction. Introduction to Distributed databases, data mining, data warehousing, Object Technology and DBMS, Comparative study of OODBMS Vs DBMS . Temporal, Deductive, Multimedia, Web & Mobile database.

UNIT 5

Study of Relational Database Management Systems through Oracle/Postgres SQL/MySQL: Architecture, physical files, memory structures, background process. Concept of table spaces, segments, extents and block. Dedicated server, multi threaded server. Distributed database, database links, and snapshot. Data dictionary, dynamic performance view.Security, role management, privilege management, profiles, invoker defined security model. SQL queries, Data extraction from single, multiple tables equi-join, non equi-join, self-join, outer join. Usage of like, any, all, exists, in Special operators. Hierarchical queries, inline queries, flashback queries. Introduction of ANSI SQL, anonymous block, nested anonymous block, branching and looping constructs in ANSI SQL. Cursor management: nested and parameterized cursors, Oracle exception handling mechanism. Stored procedures, in, out, in out type parameters, usage of parameters in procedures. User defined functions their limitations. Triggers, mutating errors, instead of triggers

Reference Books:

1. Date C J, "An Introduction To Database System", Pearson Educations

2. Korth, Silbertz, Sudarshan, "Fundamental of Database System", McGraw Hill

3. Rob, " Data Base System:Design Implementation & Management", Cengage Learninig

4. Elmasri, Navathe, "Fundamentals Of Database Systems", Pearson Educations

MSDS 203: Computer Hardware and Networking

UNIT 1

Introduction to computers, classification, generations, applications. Basic blocks of a digital computer. Hand Tools Basics and Specifications. Types of cabinets, relation with mother board form factor. Precautions to be taken while opening and closing PC cabinet. Main devices, components, cards, boards inside a PC(to card or device level only). Types and specifications of the cables and connectors used for interconnecting the devices, boards, cards, components inside a PC. Precautions to be taken while removing and/or reconnecting cables inside a PC

UNIT 2

Types of I/O devices and ports on a standard PC for connecting I/O devices. Function of keyboard, Function of Mouse, Function of monitor, Function of Speakers and Mic, Function of serial port, parallel port, brief principle of communication through these ports, types of devices that can be connected, interface standards, connectors, cable. Method of ensuring firm connection, Types of Processors and their specifications Memory devices, Semiconductor memories, Principle of working of Hard disk drive, cylinder, capacity, read write head, HDD interface IDE, SCSI-I/2/3 comparative study. Partitioning hard disk (primary and extended partitions) Precautions to be taken while fitting drives into bays and bay inside PC cabinet. CMOS setting(restrict to drive settings only).

UNIT 3

Installing UNIX / LINUX - Preparing functional system UNIX/LINUX - Adding new users, software, material components - Making back-up copies of the index and files - Dealing with the files and indexes, Basic Linux commands. - Linux file system, The Shell, Users and file permissions, VI editor, X window system, Filter Commands, Processes, Shell Scripting.Types of software. Functions of an operating system. Disk operating system. Version of a software, Service pack, Updating of OS, Different configurations of Computer system and its peripherals. Software Installation – Pre-installation - Prerequisites, Install procedure, Rollback or Uninstall procedure, Tests. Post-installation – Backup procedure & specifications, Restore procedure, Periodical view check. Awareness of legal aspects of using computers such as copyright, patent etc.

UNIT 4

OSI Model - The functions of different layers in OSI model, Network Components – Modems, Firewall, Hubs, Bridges, Routers, Gateways, Repeaters, Transceivers, Switches, Access point, etc. – their types, functions, advantages and applications. IP Routing in Network RIP IGRP Protocols, TCP/IP, FTP, Telnet etc., Theory on Setting IP Address(IP4/IP6) & Subnet Mask, Classes of IP Addressing.

UNIT 5

Concept of Internet. Architecture of Internet. DNS Server. Internet Access Techniques, ISPs and examples(Broadband/Dialup/ Wifi). Concept of Social Networking Sites, Video Calling & Conferencing. UTM and Firewall. Concept of Server, client, node, segment, backbone, host etc. Analog and Digital transmission, Network Interface Card, Crimping tools and Color standards for Straight crimping and Cross crimping Functions of NIC, Repeaters, Hub, Switches, Routers, Bridges, Router etc.

Reference Books:

1. PC Hardware: The Complete Reference Paperback – 2017 by Craig Zacker and John Rourke
2. "Computer Hardware: Installation, Interfacing, Troubleshooting and Maintenance" by James K L

MSDS 204 E1: Theory of Computation

UNIT 1
Automata: Basic machine, FSM , Transition graph, Transition matrix, Deterministic and nondeterministic FSM'S, Equivalence of DFA and NDFA, Mealy & Moore machines, minimization of finite automata, Two-way finite automata. Regular Sets and Regular Grammars: Alphabet, words, Operations, Regular sets, Finite automata and regular expression, Myhill- Nerode theorem Pumping lemma and regular sets, Application of pumping lemma, closure properties of regular sets.

UNIT 2
Regular Expressions, Two-way Finite Automata, Crossing Sequence of Two way Finite Automata Finite Automata with Output, Applications of Finite Automata, Closure Properties of Regular Sets.

UNIT 3
Context Free Grammars: Motivation and Introduction, Context-free Grammars, Derivation trees and Ambiguity,Normal Forms (Chomsky Normal Form and Greibach Normal forms), Unit Production Chomsky Normal Forms, The existence of inherently ambiguous context-free languages, Closure properties of Context Free Languages, Construction of Reduced Grammars, Elimination of null production.
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UNIT 4
Pushdown Automata: Definition of PDA, Deterministic Pushdown Automata, PDA corresponding to given CFG, CFG corresponding to a given PDA. Context Free Languages: The pumping lemma for CFL's, Closure properties of CFL's, Decision problems involving CFL's.
UNIT 5
Turing Machines: Introduction, TM model, representation and languages acceptability of TM Design of TM,Universal TM & Other modification, Church's hypothesis, composite & iterated TM. Turing machine as enumerators.Properties of recursive & recursively enumerable languages, Universal Turing Machine.

Reference Books:
1. Introduction to Automata Theory, Languages & Computation, J E Hopcraft& JD Ullman, Narosa Publications.
2. Theory of Computer Science, KLP Mishra & N Chandra Sekhar, PHI
3. Mathematical Foundations of Computer Science, Beckman
4. John C Martin, "Introdution to languages and theory of computation", McGraw Hill
5. Anami&Aribasappa , " Formal Languages and Automata Theory",Wiley India

MSDS 204 E2: Internet Programming

UNIT 1

Introduction to Internet Programming- Client-Server model, Browsers-Graphical and Hypertext Access to the Internet, HTTP–Hyper Text Transfer Protocol (how it actually works), The Phases of Web Site Development

UNIT 2

Creating Internet World Wide Web pages- HTML - Hypertext Markup Language , Basic HTML Concepts, HTML: Structured Language ,headers, body, html tags, tables , Text, graphics, sounds, video clips, multi- media ,Client side image mapping

UNIT 3

HTML forms programming: Building a form, Text fields and value, size, max length html buttons, radio, checkboxes, Selection lists.
CSS: Introduction To Style sheet, types of style sheets- Inline, External, Embedded CSS, text formatting properties, CSS Border, margin properties, Positioning Use of classes in CSS, color properties, use of <div>&<span>

UNIT 4

Intro to script, types, intro of JavaScript, JavaScript identifiers, operators, control & Looping structure, Intro of Array, Array with methods, Math, String, Date Objects with methods User defined & Predefined functions, DOM objects, Window Navigator, History, Location, Event handling, Validations On Forms

UNIT 5

Intro & features of XML, XML writing elements, attributes etc. XML with CSS, DSO, XML Namespaces XML, DTD, XML Schemas, Writing Simple sheets using XSLT, SAX & DOM Parsers, SOAP Introduction.

Reference Books:
1. Joe Fawcett,DannyAyers,Liam R.E. Quin, "Beginning XML" Wrox Press, 5th Ed., 2012
2. Deitel&Deitel, "XML how to program", Pearson, 2000
3. Hofstetterfred , "Internet Technology at work", Osborne pub. , ISBN : 9780072229998, 2004
4. Ivan Bayross , "HTML, DHTML, JavaScript, Perl & CGI" ,BPB pub. 3rd Ed.,2004
5. Ivan Bayross, "Web enabled commercial application development using HTML, DHTML, JavaScript, PERL-CGI", BPB pub., 2nd Ed., 2000

MSDS 205 E1: Programming with Visual Basic.Net

UNIT 1
Introduction to .NET, .NET Framework features & architecture, CLR, Common Type System, MSIL, Assemblies and class libraries. Introduction to visual studio, Project basics, types of project in .Net, IDE of VB.NET- Menu bar, Toolbar, Solution Explorer, Toolbox, Properties Window, Form Designer, Output Window, Object Browser.

UNIT 2
The VB.NET Language- Variables -Declaring variables, Data Type of variables, Forcing variables declarations, Scope & lifetime of a variable, Constants, Arrays, types of array, control array, Collections, Subroutines, Functions, Passing variable, Number of Argument, Optional Argument, Returning value from function. Control flow statements: conditional statement, loop statement. Msgbox&Inputbox.

UNIT 3
Working with Forms : Loading, showing and hiding forms, controlling One form within another. Using MDI form. Windows Form Control (with Properties, Methods and events): Textbox, Rich Text Boxes, Label, Link Label, Button, Checkbox, Radio Button, Panel, Group Box, Picture Box, Listbox, Combobox, Check Listbox, scroll bar, Timer. Advance Controls: Menus, Context Menus , Built-in Dialog Box: OpenFileDilog, SaveFileDialog, FontDialog, ColorDialog, PrintDialog, Printing. ListView, TreeView, toolbar, StatusBar..

UNIT 4
Object oriented Programming: Classes & objects, constructor, destructor, inheritance. Access Specifiers, Interfaces, Polymorphism. Exception Handling: using Try, Catch, Finally, Throw Keywords. Graphics Handling: Using Graphics & Pen classes for drawing colors and figures. File Handling: Opening or Creating a File, Writing & Reading Text.

UNIT 5
Database programming with ADO.NET – Overview of ADO, from ADO to ADO.NET, Accessing Data using Server Explorer. Creating Connection, Command, Data Adapter and Data Set with OLEDB and SQLDB. Display Data on data bound controls, display data on data grid. Generate Reports Using CrystalReportViwer.

Reference Books:
1. VB.NET Programming Black Book by stevenholzner –dreamtech publications
2. Mastering VB.NET by Evangelospetroutsos- BPB publications
3. Introduction to .NET framework-Worx publication

MSDS 205 E2: Computer System Architecture and parallel Processing

UNIT 1

Flynn's Classification, System Attributes to Performance, Parallel computer models Multiprocessors and multicomputer, Multivector and SIMD Computers. Data and resource dependences, Hardware and software parallelism, Program partitioning and scheduling, Grain size and latency, Control flow, data flow and Demand driven mechanisms. Static interconnection networks, Dynamic interconnection Networks: Bus Systems, Crossbar Switch, Multiport Memory, Multistage and Combining Networks

UNIT 2

Instruction set architecture, CISC Scalar Processors , RISC Scalar Processors, VLIW architecture, Memory Hierarchy, Inclusion, Coherence and Locality, Memory capacity planning. Interleaved memory organization- memory interleaving, pipelined memory access, Bandwidth and Fault Tolerance. Backplane Bus System :Backplane bus specification, Addressing and timing protocols, Arbitration transaction and interrupt.

UNIT 3

Linear pipeline processor, Nonlinear pipeline processor, Instruction pipeline design, Mechanisms for instruction pipelining, pipeline hazards, Dynamic instruction scheduling – score boarding and Tomosulo's algorithm, Branch handling techniques, Arithmetic Pipeline Design, Static arithmetic pipeline, Multifunctional arithmetic pipelines. Superscalar pipeline design, Super pipeline processor design.

UNIT 4

Cache coherence, Snoopy protocols, Directory based protocols. Message routing schemes in multicomputer network, deadlock and virtual channel. Vector Processing Principles, Vector Instruction types, Vector-access memory schemes. Vector supercomputer architecture, SIMD organization: distributed memory model and shared memory model. Principles of Multithreading: Multithreading Issues and Solutions, Multiple-Context Processors

UNIT 5

Parallel Programming Models, Shared-Variable Model, Message-Passing Model, Data-Parallel Model, Object-Oriented Model, Functional and Logic Models, Parallel Languages and Compilers, Language Features for Parallelism, Parallel Programming Environment, Software Tools and Environments

Reference Books:

1. Kai Hwang, "Advanced computer architecture", TMH. 2013 - 14
2. J.P.Hayes, "computer Architecture and organization"; MGH.
3. V.Rajaranam&C.S.R.Murthy, "Parallel computer"; PHI Learning.
4. Kain,"Advance Computer Architecture: - A System Design Approach", PHI Learning
5. M.J Flynn, "Computer Architecture, Pipelined and Parallel Processor Design"; Narosa Publishing.
6. Hwang and Briggs, "Computer Architecture and Parallel Processing"; MGH.

MSDS 301 : Basic Statistical Methods

Unit I:
Statistical analysis, Measures of central tendency and dispersion, mean, median, mode, range, mean and standard deviations, computing correlation in variables, linear and non-linear regression.

Unit II:
Probability and Probability distributions Probability: classical, relative frequency and axiomatic definitions of probability, addition rule and conditional probability, multiplication rule, total probability, Bayes'Theorem and independence. Probability distributions: binomial, poison, geometric, negative binomial uniform exponential, normal and log normal distribution.

UNIT III
Random Variables: Discrete, continuous and mixed random variables, probability mass, probability density and cumulative distribution functions, mathematical expectation, moments, probability and moment generating function, median and quintiles, Markov inequality, correlation and regression, independence of random variables.

Unit IV
Sampling & DistributionsThe Central Limit Theorem, distributions of the sample mean and the sample variance for a normal population, ChiSquare, t and F distributions, problems.

UNIT V
Hypothesis Testing: Basic ideas of testing hypothesis, null and alternative hypotheses, the critical and acceptance regions, two types of error, tests for one sample and two sample problems for normal populations, tests for proportions, Chi-square goodness of fit test and its applications. Software and Tools to be learnt: Statistical packages like SPSS and R.

Text:
1. R. Panneerselvam, "Research Methodologies," PHI.
2. C.R. Kothari: Research methodology, Methods and Techniques, New Age Publication.
3. S.M. Ross, A First Course in Probability, 8 th Edition, Prentice Hall.

MSDS 302: Data Mining and Data Warehousing

UNIT 1

Introduction : Data Mining: Definitions, KDD v/s Data Mining, DBMS v/s Data Mining , DM techniques, Mining problems, Issues and Challenges in DM, DM Application areas. Association Rules & Clustering Techniques: Introduction, Various association algorithms like A Priori, Partition, Pincer search etc., Generalized association rules.

UNIT 2

Clustering paradigms; Partitioning algorithms like K-Medioid, CLARA, CLARANS; Hierarchical clustering, DBSCAN, BIRCH, CURE; categorical clustering algorithms, STIRR, ROCK, CACTUS. Other DM techniques & Web Mining: Application of Neural Network, AI, Fuzzy logic and Genetic algorithm, Decision tree in DM. Web Mining, Web content mining, Web structure Mining, Web Usage Mining.

UNIT 3

Temporal and spatial DM: Temporal association rules, Sequence Mining, GSP, SPADE, SPIRIT, and WUM algorithms, Episode Discovery, Event prediction, Time series analysis. Spatial Mining, Spatial Mining tasks, Spatial clustering, Spatial Trends.

UNIT 4

Data Mining of Image and Video: A case study. Image and Video representation techniques, feature extraction, motion analysis, content based image and video retrieval, clustering and association paradigm, knowledge discovery.

UNIT 5

The vicious cycle of Data mining, data mining methodology, measuring the effectiveness of data mining data mining techniques. Market baskets analysis, memory based reasoning, automatic cluster detection, link analysis, artificial neural networks, generic algorithms, data mining and corporate data warehouse, OLA

Reference Books:

1. Data Mining Techniques ; ArunK.Pujari ; University Press.
2. Data Mining; Adriaans&Zantinge; Pearson education.
3. Mastering Data Mining; Berry Linoff; Wiley.

MSDS 303 : Mobile Application Development

UNIT 1

Mobile Communication Fundamentals Introduction, issues in mobile communications, Wireless telephony: cellular concept, GSM: airinterface, channel structure, location management: HLR-VLR, handoffs, channel allocation in cellular systems, CDMA, GPRS, Wireless LAN Overview: MAC issues, IEEE 802.11, Blue Tooth, Wireless multiple access protocols, TCP over wireless, Wireless applications, Mobile IP, WAP: Architecture, protocol stack, applications.

UNIT 2

Mobile Applications Development Frameworks and Tools Introduction of Mobile Applications, Types and Benefits of a Mobile App, Mobile Platforms, deployment on Apple iOS with versions, Android, Windows phone application using development platforms: worklight, kendo, Appcon, Xcode, Xpage, Architecture of Mobile Software Applications, N-Tier Client–Server Frameworks and Tools, Java, BREW, Windows CE, WAP, Symbian EPOC, Publishing Frameworks, Mobile User Interface Design, Building Generic User Interfaces, mobile apps in the cloud.

UNIT 3

Mobile Agents and Peer-to-Peer Architectures for Mobile Applications Mobile Agents for Mobile Computing, Applications of Mobile Agents to Mobile Applications and Implementation Tools, Techniques for Agent-Based Software, Peer-to-Peer Applications for Mobile Computing, security and fault tolerance.

UNIT 4

Synchronization and Replication of Mobile Data Taxonomy of Replication and Synchronization, Data Replication and Synchronization for Mobile Applications, SyncML, WebDAV, Mobile Agents, Replication, and Synchronization, Location Information Modeling, Problems with Building Location-Based Applications, Utilizing Location-Based Services with Mobile Applications, UML-Based Development Cycle for Mobile Applications, Architectural Patterns for Mobile Applications.

UNIT 5

Testing Mobile Applications, Validating the Mobile Use Cases before Development, The Effect of the Dimensions of Mobility on Software Testing, Stress Testing and Scalability Issues, Testing Location-Based Functionality, Android as your mobile platform, installation, Configuring of Eclipse and the Android SDK, Additional SDK Components, application layout and Android app development, Android user interface elements, Android Virtual Device, Connection to Google play.

Reference Books :

1. Reza b'far, Mobile computing Principles Designing and developing Mobile applications with Uml and xml, Cambridge University press.

2. Jeff Mcwherter, Scott Gowell, Professional Mobile application development, Wrox, John Wiley & Sons, Inc..

MSDS-304 E1: Big data Technologies

UNIT I:

Introduction Introduction to Big Data Platform – Challenges of Conventional Systems - Intelligent data analysis – Nature of Data - Analytic Processes and Tools - Analysis vs Reporting – Modern Data Analytic Tools. Big Data Analytics Process, Big Data Analytics for Business. Identifying problem and solving problem in Big Data environment. Analyzing Unstructured vs. Structured Data, Databases.

UNIT II:

Hadoop and MapReduce Introduction to Hadoop, Hadoop architecture, A Brief History of Hadoop, Apache Hadoop and the Hadoop Ecosystem, Hadoop Releases; Hadoop Distributed File system: Design of HDFS, HDFS Concepts.

UNIT III:

Introduction to MapReduce: MapReduce Basic Concepts, Understanding the Map Reduce architecture, Writing MapReduce Programs. understanding Map phase, shuffling, sorting, and reducing phase.

UNIT IV:

Spark Introduction to Spark, Resilient Distributed Dataset (RDD), RDD Operations: actions and transformation functions. Spark Data frames, operations on Data frames: Join, group by, aggregate, handling missing data.

UNIT V:

:Sparks and MLLib Sparks and its basic operations. MLLib: Data types, Basic statistics, Classification(Logistic regression, Decision tree classifier)and linear regression model generation, Model Evaluation, Collaborative filtering, and Clustering.

Text Books:

1. Arvind Sathi, "Big Data Analytics: Disruptive Technologies for Changing theGame", 1st Edition, IBM Corporation, 2012.

2. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", 1st Edition, Wiley and SAS Business Series, 2012.

3. Tom White,"Hadoop: The Definitive Guide", 3rd Edition, O'Reilly Media, 2012

4. Donald Miner, Adam Shook, Eric Sammer, "Hadoop Operation", O'Reilly 2012.

5. Donald Miner, Adam Shook "MapReduce Design Patterns: Building Effective Algorithms and Analytics for Hadoop and Other Systems", O'Reilly 2012.

6. Chuck Lam, "Hadoop in Action", Manning Publications, 2010.

7. https://spark.apache.org/docs/2.0.0/programming-guide.html

MSDS 304 E2: RDBMS and NO SQL

UNIT I:
Overview of DBMS: Comparison between Database approach and Traditional file accessing approach, Advantages of database systems, Schemas and instances, Data Dependency, Data Dictionary, and Meta Data. Data models, Types of Data models (ObjectOriented, Record Based and Physical data models), E-R Modelling.

UNIT II:
Relational Data model: Domains, Tuples, Attributes, Keys, Relational database, Schemas, Integrity constraints, Relational algebra and relational calculus; Normalization: Normal forms (INF, 2NF, 3NF, BCNF), Functional dependency, Decomposition,Dependency preservation and lossless join.

UNIT III:
Structured Query Language: DDL, DML, DCL, TCL, SQL Functions, integrity constraints, various joins, sub-query, index, View, Sequence, and Clusters.

UNIT IV:
NoSQL: Nosql Basics, Storage Architecture, Operations, Query Model, Modifying Data Stores and Managing Evolution, Indexing and Ordering Data Sets, Managing
Transactions and Data Integrity.

UNIT V:
UsingNosql in the Cloud, Scalable Parallel Processing with Mapreduce, Analyzing Big Data with Hive, Surveying Database Internals.

Text Books:

1. A Silberschatz, H Korth, S Sudarshan, "Database System and Concepts", fifth Edition
McGraw-Hill.
2. ElmasriRamez and NovatheShamkant, "Fundamentals of Database Systems", Benjamin
Cummings Publishing. Company.
3. Rob, Coronel, "Database Systems", Seventh Edition, Cengage Learning.
4. Fred R.McFadden,JeffreyA.Hoffer& Marry B.Prescott.?Modern Database Management,
Fifth Edition,Pearson Education Asia,2001.
5. Bayross Ivan, "SQL, PL/SQL: The Programming Language Of Oracle", 4th Revised Edition,
BPB Publications.

MSDS 305 E1: **: Machine Learning**

UNIT I

Learning Problems - Perspectives and Issues   - Concept Learning - Version Spaces and Candidate Eliminations - Inductive bias - Decision Tree learning - Representation Algorithm-Heuristic Space Search.

UNIT II

Neural Network Representation - Problems - Perceptrons – Multilayer Networks and Back Propagation Algorithms - Advanced Topics - Genetic Algorithms - Hypothesis Space Search Genetic Programming - Models of Evalution and Learning.

UNIT III

Bayes Theorem - Concept Learning - Maximum Likelihood – Minimum Description Length Principle - Bayes Optimal Classifier - Gibbs Algorithm - Naïve Bayes Classifier – Bayesian Belief Network - EM Algorithm - Probability Learning - Sample Complexity - Finite and Infinite Hypothesis Spaces - Mistake Bound Model.

UNIT IV

K- Nearest Neighbour Learning - Locally weighted Regression - Radial Bases Functions - Case Based Learning.

UNIT V

Learning Sets of Rules - Sequential Covering Algorithm - Learning Rule Set - First Order Rules - Sets of First Order Rules - Induction on Inverted Deduction - Inverting Resolution -Analytical Learning - Perfect Domain Theories - Explanation Base Learning – FOCL Algorithm- Reinforcement Learning - Task - Q-Learning - Temporal Difference Learning

TEXT BOOKS:

1. Machine Learning - Tom M. Mitchell, - MGH

REFERENCE BOOKS
1. Machine Learning: An Algorithmic Perspective, Stephen Marsland, Taylor & Francis

MSDS 305 E2: **CloudComputing**

UNIT 1
CloudComputing:Definition,CloudArchitecture,CloudStorage,AdvantagesandDisadvantagesofCloudComputing,CompaniesintheCloudToday,CloudServices,CloudTypes:TheNISTModel,TheCloudCubeModel,DeploymentModels,ServiceModelsCloudComputing,ServiceModels:InfrastructureasaService(IaaS),PlatformasaService(PaaS),SoftwareasaService(SaaS).

UNIT 2
Web-BasedApplication–ProsandConsofCloudServiceDevelopment–

TypesofCloudServiceDevelopment–SoftwareasaService–PlatformasaService–WebServices–On-

DemandComputing–DiscoveringCloudServicesDevelopmentServicesandTools–AmazonEc2–

GoogleAppEngine–IBMClouds

UNIT 3
CentralizingEmailCommunications–CollaboratingonSchedules–CollaboratingonTo-DoLists–

CollaboratingContactLists–CloudComputingfortheCommunity–

CollaboratingonGroupProjectsandEvents–CloudComputingfortheCorporation

UNIT 4
CollaboratingonCalendars,SchedulesandTaskManagement–ExploringOnlineSchedulingApplications–

ExploringOnlinePlanningandTaskManagement–CollaboratingonEventManagement–

CollaboratingonContactManagement–CollaboratingonProjectManagement–

CollaboratingonWordProcessing-CollaboratingonDatabases–StoringandSharingFiles

UNIT 5

Cloudcomputingsecurityarchitecture:ArchitecturalConsiderations-

GeneralIssues,TrustedCloudcomputing,SecureExecutionEnvironmentsandCommunications,Micro-

architectures;IdentityManagementandAccesscontrolIdentitymanagement,Accesscontrol,AutonomicSecurityCloudcomputingsecuritychallenges:Virtualizationsecuritymanagementvirtualthreats,VMSecurity

Recommendations,VM-

SpecificSecuritytechniques,SecureExecutionEnvironmentsandCommunicationsincloud.

Reference Books:

1.BarrieSosinsky,"CloudComputingBible",WileyIndiapub
2.DinakarSitaram,"MovingtoTheCloud",Elsevier,2014.
3.Danc.Marinercus,"CloudComputingTheoryAndPractice",Elsevier,2013.

MSDS 401: Advance Statistical Model and Analysis

UNIT-I
An overview of basic probability theory and theory of estimation; Bayesian statistics; maximum a posteriori (MAP) estimation; conjugate priors;

UNIT-II
Exponential family; posterior asymptotics; linear statistical models; multiple linear regression: inference technique for the general linear model, generalised linear models: inference procedures, special case of generalised linear models leading to logistic regression and log linear models;

UNIT-III
Introduction to non-linear modelling; sampling methods: basic sampling algorithms, rejection sampling, adaptive rejection sampling, sampling.

UNIT-IV
The EM algorithmMarkhov chain, Monte Carlo, Gibbs sampling, slice sampling.

References:
1. Dobson, A. J. and Barnett, A. G., An Introduction to Generalised Linear Models, 3rd ed., Chapman and Hall/CRC (2008).

2. Krzanowski, W. J., An Introduction to Statistical Modeling, Wiley (2010).

3. Hastie, T., Tibshirani, R., and Friedman, J., The Elements of Statistical Learning: Data Mining, Inference, and Prediction, Springer (2002).

4. Bishop, C. M., Pattern Recognition and Machine Learning, Springer (2006).

MSDS 402 : Python for Analytics

UNIT I:
Introduction to Python: Python versus Java, Python Interpreter and it's Environment, Python installation, Python basics: variables, operators, Strings, Conditional and Control Statements, loops; Data structures: lists and dictionaries; functions: global functions, local functions, lambda functions and methods.
UNIT II:
 Object Oriented Programming Concepts: Class, object, constructor, destructor and inheritance; Modules & Packages, File Input and Output, Catching exceptions to deal with
bad data, Multithreading, Database Connectivity.

UNIT III:
 Numpy: Creating Arrays, Arrays Operations, Multidimensional ArraysArrays transformation, Array Concatenation, Array Math Operations, Multidimensional Array and
its Operations, Vector and Matrix.

UNIT IV
Visualization: Visualization with matplotlib, Figures and subplots, Labeling and arranging figures, Outputting graphics.

UNIT IV:
Pandas: Manipulating data from CSV, Excel, HDF5, and SQL databases, Data analysis and modelling with Pandas, Time-series analysis with Pandas, Using Pandas, the Python data analysis library, Series and Data Frames, Grouping, aggregating and applying,
Merging and joining.
Text Books:
1. McKinney Wes, "Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython", O'Reilly Media, 2012.
2. Hauck Trent, "Instant Data Intensive Apps with Pandas How-To", Packt Publishing Ltd, 2013.
3. Beazley David M.,"Advanced Python Programming", Pearson Education,2009.
4. Chun Wesley , Core Python Programming, 3rd Edition,Prentice Hall Professional, 2012.
5. Telles Matt "Python Power!: The Comprehensive Guide", Cengage Learning, 2008.

MSDS 403: **SOFTWARE TESTING AND PROJECT MANAGMENT**

UNIT 1

Testing   Basics and Development Models: Principals and context of testing in software production usability and accessibility. Testing phases of software project ,process models to represent different phases, software quantity   Control and its relation with testing,validating and verification,software development   life cycle models ,various development models.White box testing :white box testing –static testing ,structural testing-unit code functional testing ,code coverage testing, code complexity testing ,Black box testing .What ?Why and When to do black box testing ,requirement based testing ,positive and negative testing ,boundary value testing.Decisiontables,equivalenceportioning,state   based or graph based testing ,compatibility testing user documentation testing ,domain testing.

UNIT2

Integration testing ,introduction and types of integration testing ,scenario testing,defect bash system, and acceptance testing ,overview functional and non functional testing ,acceptance testing .overview of some software testing tools .Win runner,loadrunner,test director.

UNIT3

Performance testing- introduction ,factors related to performance testing ,methodology for performing testing ,regression testing ,Ad hoc testing overview,buddy and pair testing ,.Exploratory testing ,interactive testing ,agile and extreme testing .testing of object oriented testing-introduction,difference in OO testing.

UNIT 4

Software project management :overview,software project management framework, software development life cycle, organization issue and project management ,managing process, project execution, problems in software projects, project management myths and its clarification .software project scope: need to scope a software project ,scope management process ,communication techniques and tools,communication methodology software requirement gathering and resource allocation ,requirement specification ,SRS document preparation   , resource type for software projects ,requirement for resource allocation.

UNIT 5

Software project estimation :workbreakdown structure (WBS),steps in WBS ,measuring efforts for a project ,techniques for estimation –SLOC ,FP,COCOMO, and Delphi methods ,projects scheduling ;scheduling and its need ,scheduling basics,Gannt chart   ,network scheduling techniques ,pert and CPM using a project management tools :Introduction to MS project 2000,managing task in Project 2000,tracing a project plan ,creating and displaying project information reports.

Books:

1.Software Testing: Principles and practice By Gopalaswamy and srinivasn,Pearson Education India.

2.Software Testing Tools: Covering Winrunner, Silk Test,Loadrunner,JMeter and TestDirector with case By Dr. K.V.K.K. Prasad ,ISBN:8177225324,Wiley Dreamtech,

3.Basics of Software project Management,Prentice Hall of India,ISBN 81-203-2490-0

4.Software project Management by Bob Huges& mike cotterell, Tata McGraw Hill.

MSDS 404 E1: Decision Analysis

Unit-I:
Game Theory: Introduction, definitions, two-person zero sum game. Game with pure strategies, saddle point, game value. Game with mixed strategies, solution methodsalgebraic method, graphical method, dominance, linear programming method.

Unit-II:
Decision Theory: Structuring the decision problem-payoff tables, decision trees. Decision making under certainty. Decision making under uncertainty: Optimistic, Conservative, Minimax regret. Decision making under risk: Expected value criterion, expected value of perfect information.

Unit-III
Sensitivity analysis. Decision making with sample information, expected value of sample information, efficiency of sample information. Computing branch probabilities. Utility and decision making: meaning of utility, developing utilities and payoffs, the expected utility approach.

Unit-IV:
Multi-criteria Decision Making: Multi-criteria decision making: Goal programming, Scoring models, Analytical Hierarchy Process.

Unit-V:

Markov Analysis: Transition probabilities, system behaviour. Methods of Analysis: Tree diagram, Matrix multiplication, Algebraic solution. Cyclical and absorbing states, Market share analysis, Accounts receivable analysis.

TEXTBOOKS

1. Hamdy A. Taha: Operations Research: An introduction, Pearson Prentice Hall
2. David R. Anderson, Dennis J. Sweeney, Thomas A. Williams: An Introduction to Management Science, South-Western College Publishing.

3. William J. Stevenson: Introduction to Management Science, IRWIN.

MSDS-404 E2:Fundamental of Algorithms

UNIT 1

Introduction and Review: What is an Algorithm, Algorithm's Performance, order architecture: Θ-Notation, O-Notation, Ω-Notation, Algorithm Analysis: time space complexities, Worst-case Complexity, Average-case Complexity.

UNIT 2

Divide and conquer: Structure of divide-and –conquer algorithms: examples, Binary search, quick sort, Analysis of divide and conquer, run time recurrence relations.

UNIT 3

Graph Searching and Traversal: Overview, Traversal methods: depth first and breadth first search.
Greedy Method: Overview of the greedy method, Minimum spanning trees, Single source shortest paths.

UNIT 4

Dynamic programming: The general method, principle of optimality, difference between dynamic programming and greedy method, Applications: optimal binary search trees, Back tracking: The general method, 8-queens problem.

UNIT5

Branch and Bound Algorithm: The Branch and bound method, FIFO and LIFO branch and bound, LC (Least Cost) search, Traveling Salesman Problem, LCBB on Traveling Salesman Problem.

Reference Books:

1. Fundamentals of Computer Algorithms By Ellis Horowittz and SartajSahni, Galgotia Publications.
2. Ullman "Analysis and Design of Algorithm" TMH
3. Goodman " Introduction to the Design & Analysis of Algorithms, TMH-2002
4. Sara Basse, A.V. Gelder, " Computer Algorithms, " Addison Wesley
5. T.H. Cormen, Leiserson, Rivert and stein, " Introduction of Computer algorithm, " PHI
6. E. Horowitz, S. Sahni, and S. Rajsekaran, "Fundamentals of Computer Algorithms, " Galgotia Publication.