INFORMATION TECHNOLOGY DEPARTMENT

MA78011: MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE

HOURS PER WEEK			CREDITS			MAXIMUM MARKS				
						THEORY		PRACTICAL		TOTAL MARKS
T	P	Tu	T	P	Tu	CW	END SEM	SW	END SEM	
3	-	-	3	-	-	30	70	-	-	100

PRE-REQUISITES:

COURSE OBJECTIVES:

1. To introduce the concepts of sets, relations, and functions. To relate practical examples to the appropriate set, function, or relation model, and interpret the associated operations and terminology in context.
2. To introduce generating functions and recurrence relations. To use Graph Theory for solving problems.
3. To study various sampling and classification problems.

COURSE OUTCOMES: After completion of course, students will be able to:

1. Understand the basic notions of discrete and continuous probability.
2. Understand the methods of statistical inference, and the role that sampling distributions
3. play in those methods.
4. Perform correct and meaningful statistical analyses of simple to moderate complexity.

COURSE CONTENTS:

THEORY:

UNIT 1: Set Theory: introduction, operations on binary sets, principle of Inclusion and Exclusion. Relations: properties of binary relations, relation matrix and digraphs. Operations on relations. Partitions and covering. Transitive closure, Equivalence. Compatibility and partial ordering relations.

Functions: Bi-jective functions, comparison of functions, inverse functions, permutation functions, recursive function.

UNIT 2: Statistical inference, Introduction to multivariate statistical models: regression and classification problems, principal components analysis, the problem of over-fitting model assessment. Random samples, sampling distributions.

UNIT 3: Probability mass, density, and cumulative distribution functions, parametric families of distributions, Expected value, variance, conditional expectation, Applications of the uni-variate and multivariate Central Limit Theorem, Probabilistic inequalities, Markov chains.
UNIT 4: Graph Theory: Isomorphism, Planar graphs, graph coloring, Hamilton circuits and Euler cycles. Permutations and Combinations with and without repetition. Specialized techniques to solve combinatorial enumeration problems

UNIT 5: Recurrence Relations: Generating Functions, Function of Sequences, Partial Fractions, Calculating Coefficient of Generating Functions, Recurrence Relations, Formulation as Recurrence Relations, Solving Recurrence Relations by Substitution and Generating Functions, Method of Characteristic Roots, Solving Inhomogeneous Recurrence Relations

ASSESMENT:

TEXT BOOKS RECOMMENDED:

1. K.H. Rosen, Discrete Mathematics and its Applications with Combinatorics and Graph Theory, 7th Edition, Tat McGraw Hill.
2. John Vince, "Foundation Mathematics for Computer Science", Springer.
3. K. Trivedi., "Probability and Statistics with Reliability, Queuing, and Computer Science Applications", Wiley.

REFERENCE BOOKS:

1. M. Mitzenmacher and E. Upfal, "Probability and Computing: Randomized Algorithms and Probabilistic Analysis",
2. Alan Tucker, "Applied Combinatorics", Wiley

INFORMATION TECHNOLOGY DEPARTMENT

IT78012: ADVANCED DATA STRUCTURES

HOURS PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	Tu	T	P	Tu	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
3	-	-	3	-	-	30	70	-	-	100

PRE-REQUISITES:

COURSE OBJECTIVES:

1. The student should be able to choose appropriate data structures, understand the ADT/libraries, and use it to design algorithms for a specific problem.
2. Students should be able to understand the necessary mathematical abstraction to solve problems.
3. To familiarize students with advanced paradigms and data structure used to solve algorithmic problems.
4. Student should be able to come up with analysis of efficiency and proofs of correctness.

COURSE OUTCOMES: After completion of course, students will be able to:

1. review basic data structures.
2. Understand advanced lists, trees and graph data structures.
3. Develop and analyze algorithms for red-black trees, B-trees and Splay trees.
4. Study advanced data structures for searching and sorting.
5. Understand the implementation of symbol table using hashing techniques.

COURSE CONTENTS:

THEORY:

UNIT 1: Abstract Data Types (ADT); review of primitive and non primitive data structures; analysis techniques used in data structures; different operations of data strucutres.

UNIT 2: Overview of linked lists, implementation of various types of lists, operation on lists. Advanced topics in list data structures: skip lists, operations on skip lists, analysis of skip lists etc.

UNIT 3: Binary search trees, AVL trees, Red-black trees, 2-3 trees, B trees, Splay trees. Study of advanced application specific trees like tries etc.

UNIT 4: Graph as ADT, graph algorithms: all pairs shortest path, single source shortest path; Dijkstra's algorithm, Bellman Ford algorithm; Prims and Kruskal's algorithm for MST, advanced topics in algorihtms using graph data structures.

UNIT 5: Advanced topics in data structures in searching and sorting: Review of hashing , hash function, collision resolution techniques in hashing, separate chaining, open addressing, linear probing, quadratic proving, double hashing, rehashing, extendible hashing, recent trends in hashing; dictionary ADT, implementation of dictionaries; various kinds of heaps - advanced topics in heaps, like binomial heap etc.

ASSESMENT:

TEXT BOOKS RECOMMENDED:

- Ellis Horowitz, Sartaj Sahni, "Fundamentals of Data Structures", Illustrated Edition by Computer Science Press.
- M T Goodrich, Roberto Tamassia, Algorithm Design, John Wiley, 2002.

REFERENCE BOOKS:

- Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", 2nd Edition, Pearson Education 2004.

INFORMATION TECHNOLOGY DEPARTMENT

IT78013: ADVANCED COMPUTER NETWORKS

HOURS PER WEEK			CREDITS			MAXIMUM MARKS				
						THEORY		PRACTICAL		TOTAL MARKS
T	P	Tu	T	P	Tu	CW	END SEM	SW	END SEM	
3	-	-	3	-	-	30	70	-	-	100

PRE-REQUISITES:

COURSE OBJECTIVES:

1. To let the students recall fundamentals of computer networks
2. To study advance network layer and transport layer working concepts.
3. To get an idea with real-time interactive and network management protocols
4. Familiarity with state of the art in computer networks research.

COURSE OUTCOMES: After completion of course, students will be able to:

1. Review of computer networks and gain advanced network layer concepts and protocols.
2. Categorize concepts in transport layer protocols like TCP and UDP.
3. To master the concept of network management and understand role of SNMP, RMON etc.
4. Summarize protocols for real time interactive applications, scheduling and policy mechanisms for QoS guarantee in networking.
5. Familiarity with advanced topics and state of the art in research in computer networks and distributed computing.

COURSE CONTENTS:

THEORY:

UNIT 1: Introduction: review of computer networks, TCP/IP protocol stack, addressing, routing. Introduction to IPv6, Advanced network layer concepts: intra: AS routing in the Internet, RIP, OSPF, Inter-autonomous system routing: BGP, broadcast and multicast routing, broadcast routing algorithms, multicast, Internet Group Management Protocol.

UNIT 2: Advanced concepts in transport layer protocols: connection oriented and connectionless protocols, UDP: services and header, IP fragmentation and path MTU discovery. TCP: services and header, TCP connection establishment and termination, TCP state transition diagram, delayed acknowledgement, Nagel's algorithm, window size advertisement, sliding windows, TCP timeout and retransmission, flow control, congestion control.

UNIT 3: Network management: general structure of network management, infrastructure for network management, Internet standard network management framework: SNMP protocol, Structure of Management Information, Management Information Base, SNMP protocol operations and transport mappings, ASN.1, SNMP management: introduction to remote monitoring, RMON SMI and MIB.

UNIT 4: Protocols for real-time interactive applications: RTP, RTP packet header fields, RTP control protocol, Session Initiation Protocol, Scheduling mechanisms: FIFO, RR and Weighted Fair Queuing, Policing: the leaky bucket, IntServ model, DiffServ model, MPLS, Reservation Protocol (RSVP): operation, reservation style and message format.

UNIT 5: Web Advanced topics in Computer Networks: Details of IPV6 Addressing, Multipath TCP, TCP Pacing and TCP low priority, Software Defined Networking(SDN) and Openflow, Current research trends in Computer Networks.

ASSESSMENT:

TEXT BOOKS RECOMMENDED:

1. James F. Kurose and Keith W Ross, "Computer Networking: A top-down approach featuring the internet", 3rd Edition, Pearson Education.
2. W. Richard Stevens and G. Gabrani ,"TCP/IP illustrated vol.1, The protocols", 2nd Edition Pearson Education.

REFERENCE BOOKS:

1. William Stallings, "Computer Networks", Pearson Education.
2. Andrew S. Tenanbaum "Computer Networks", 4th Edition, Prentice Hall of India
3. Peterson and Davie "Computer Networks : A Systems Approach" 2nd Edition.

INFORMATION TECHNOLOGY DEPARTMENT

IT78211: CLOUD COMPUTING

HOURS PER WEEK			CREDITS			MAXIMUM MARKS				
						THEORY		PRACTICAL		TOTAL MARKS
T	P	Tu	T	P	Tu	CW	END SEM	SW	END SEM	
3	-	-	3	-	-	30	70	-	-	100

PRE-REQUISITES:

COURSE OBJECTIVES:

COURSE OUTCOMES: After completion of course, students will be able to:

1. Understand the fundamental principles of distributed compuing and Cloud Computing. Identify variuos cloud services.
2. Explain the four primary cloud category "types". Student will be able to understand cloud ecosystem. Learn the concept of Cloud Infrastructure Model.
3. Understand the importance of virtualization in distributed computing and types of different virtualization techniques.
4. Analyze the performance of Cloud Computing. Understand the concept of Cloud Security. Constrast the risks and benefits of implementing cloud computing.
5. To enable students exploring some important cloud computing driven commercial systems such as Google Apps, Microsoft Azure and Amazon Web Services and other businesses cloud applications.

COURSE CONTENTS:

THEORY:

UNIT 1: Introduction: Historical Development, Vision of Cloud Computing, Characteristics of cloud computing as per NIST, Cloud services requirements, Cloud and dynamic infrastructure, Components, SAAS, PAAS, IAAS and Others, Organizational scenarios of clouds, Administering & Monitoring cloud services, benefits and limitations, Deploy

application over cloud. Case Study : Googel App Engine, Microsoft Azure, Hadoop, Amazon, Aneka.

UNIT 2: Cloud Computing Architecture: Cloud Reference Model, Types of Clouds, Cloud Interoperability & Standards, Scalability and Fault Tolerance, Cloud Solutions: Cloud Ecosystem, Cloud Business Process Management, Cloud Service Management. Cloud Offerings: Cloud Analytics, Testing Under Control, Virtual Desktop Infrastructure.

UNIT 3: Cloud Management & Virtualization Technology: Resiliency, Provisioning, Asset management, Conceps of Map reduce, Cloud Governance, High Availability and Disaster Recovery. Virtualization: Fundamental concepts of compute, Storage, Networking, desktop and application virtualization. Virtualization benefits, server virtualization, Block and file level storage virtualization, Hypervisor management software, Infrastructure Requirements, Virtual LAN(VLAN) and Virtual SAN (VSAN) and their benefits.

UNIT 4: Cloud Security: Cloud Information security fundamentals, Cloud security services, Design principles, Secure Cloud Software Requirements, Policy Implementation, Cloud Computing Security Challenges, Virtualization Security Management, Cloud Computing Secutity Architecture.

UNIT 5: Introduction to Docker and Container, Green Cloud, Fog Computing, Research areas of cloud.

ASSESMENT:

TEXT BOOKS RECOMMENDED:

1. Rajkumar Buyya, Christian Vecchiola, S.Thamarai Selvi, “Mastering Cloud Computing”, TMH.
2. Kumar Saurabh, “Cloud Computing” , 2nd Edition , Wiley Publication.
3. Barrie Sosinsky, “ Cloud Computing Bilble” , Wiley Publication.

REFERENCE BOOKS:

1. Krutz , Vines, “Cloud Security” , Wiley Publication.
2. Velte, “Cloud Computing- A Practical Approach” ,Tata McGrawHill.
3. Judith Hurwitz, R.Bloor, M.Kanfman,F.Halper, “Cloud Computing for Dummies”,Wiley Publication.

INFORMATION TECHNOLOGY DEPARTMENT

IT78311: DATA MINING & DATA WAREHOUSING

HOURS PER WEEK			CREDITS			MAXIMUM MARKS				
						THEORY		PRACTICAL		TOTAL MARKS
T	P	Tu	T	P	Tu	CW	END SEM	SW	END SEM	
3	-	-	3	-	-	30	70	-	-	100

PER-REQUISITES:

COURSE OBJECTIVES:

COURSE OUTCOMES: After completion of course, students will be able to:

1. Explain the data mining and data warehousing concept.
2. Describe various Data Mining algorithms to solve the real time problems.
3. Explain Time series Data and use of Time series Data in real world.
4. Understand data stream processing and its algorithm.
5. Understand Web Mining and Recent trends in Distributed Warehousing and Data Mining .

COURSE CONTENTS:

THEORY:

UNIT 1: Introduction to Data Warehousing; Data Mining: Mining frequent patterns, association and correlations; Sequential Pattern Mining concepts, primitives, scalable methods .

UNIT 2: Classification and prediction; Cluster Analysis – Types of Data in Cluster Analysis, Partitioning methods, Hierarchical Methods; Transactional Patterns and other temporal based frequent patterns.

UNIT 3: Mining Time series Data, Periodicity Analysis for time related sequence data, Trend analysis, Similarity search in Time-series analysis .

UNIT 4: Mining Data Streams, Methodologies for stream data processing and stream data systems, Frequent pattern mining in stream data, Sequential Pattern Mining in Data Streams, Classification of dynamic data streams, Class Imbalance Problem, Graph Mining, Social Network Analysis .

UNIT 5: Web Mining, Mining the web page layout structure, mining web link structure, mining multimedia data on the web, Automatic classification of web documents and web usage mining; Distributed Data Mining, Recent trends in Distributed Warehousing and Data Mining .

ASSESSMENT:

TEXT BOOKS RECOMMENDED:

1. Jiawei Han, Micheline Kamber, "Data Mining: Concepts and Techniques", Morgan Kaufmann Publisher.
2. Vipin Kumar, Introduction to Data Mining - Pang-Ning Tan, Michael Steinbach, Addison Wesley, 2006.

REFERENCE BOOKS:

1. Alex Berson, Stephen J. Smith, "Data Warehousing, Data Mining and OLAP: Basic Concepts of Data Mining", TMH.
2. R. J. Roiger & M. W. Geatz, "Data Mining: A Tutorial Based Primer", Pearson Education.
3. Kargupta, "Data Mining: Next Generation Challenges and Future Directions", PHI.
4. Hand, Mannila and Smyth, "Principles of Data Mining", PHI.