

Department of Information Technology

School of Engineering & Technology

Central University of Kashmir



Syllabus for M. Tech

Meeting of School Board of Engineering 24, 12, 2016

M. Tech. In Information Technology

Semester I

S. No.	Course Code	Course Title	Type	Credits	Evaluation		
					CIA	ESE	Total
1	MTIT C 101	Advanced Data structure & Algorithms	C	4	40	60	100
2	MTIT C 102	Internals of OS	C	4	40	60	100
3	MTIT C 103	Advanced Computer Architecture	C	4	40	60	100
4	MTIT C 104	Lab on Data Structure & Algorithms	P	2	20	30	50
5	MTIT C 105	Advanced Computing Lab	P	2	20	30	50
6	MTIT E ---	Elective I	E	4	40	60	100
7	---	Skill Enhancement Course (SEC)	E	4	40	60	100
		Total		24			600

Elective I

1. MTIT E 110: Image processing	5. MTIT E 114: Operation Research
2. MTIT E 111: Data Mining	6. MTIT E 115: Object Oriented Programming
3. MTIT E 112: System Analysis & Design	7. MTIT E 116: Cyber Forensics
4. MTIT E 113: eCommerce	8. MTIT E 117: Engineering Mathematics (Compulsory for Non Engineering Background)

Advanced Data structure & Algorithms

Unit I:

Introduction: to Notions of data type, abstract data type, and data structures. Relation to the notion of classes and objects in object oriented programming. Importance of algorithms and data structures in programming. Notion of Complexity covering time complexity and space complexity. Worst case complexity, Average case complexity. Big Oh Notation. Examples of simple algorithms and illustration of their complexity.

Unit II:

Iteration and Recursion- Problem solving using iteration and recursion with examples such as binary search, Fibonacci numbers, and Hanoi towers. Tradeoffs between iteration and recursion.

Unit III:

List ADT. Implementation of lists using arrays and pointers. Stack ADT. Queue ADT. Implementation of stacks and queues. Dictionaries, Hash tables: open tables and closed tables. Analysis of hashing. Skip lists and analysis.

Unit IV:

Binary Trees- Definition and traversals: preorder, postorder, inorder. Common types and properties of binary trees. Counting of binary trees. Huffman coding using binary trees. Binary search trees : worst case analysis and average case analysis. AVL trees. Splay trees. Priority Queues -Binary heaps: insert and delete min operations and analysis. Binomial queues.

Unit V: Directed Graphs- Data structures for graph representation. Shortest path algorithms: Dijkstra (greedy algorithm) and Bellman-Ford (dynamic programming). Depthfirst search and Breadth-first search. Directed acyclic graphs. Undirected Graphs- Depth-first search and breadth-first search. Minimal spanning trees and algorithms (Floyd and Kruskal) and implementation. Application to the travelling salesman problem.

Sorting- Bubblesort, selection sort, insertion sort, Shell sort; Quicksort; Heapsort; Mergesort; Radix sort; Analysis of the sorting methods. Selecting the top k elements. Lower bound on sorting.

References:

1. Data Structures and Algorithms by Alfred V. Aho, Jeffrey D. Ullman and John E. Hopcroft, AddisonWesley Series (1983)
2. Data Structures and Algorithm Analysis in Java (3rd Edition) by Mark Allen Weiss, Addison Wesley, (2011).
3. T.H. Cormen, C.E. Leiserson, and R.L. Rivest. Introduction to Algorithms. The MIT Press and McGraw-Hill Book Company, Cambridge, Massachusetts, 1990 (Available in Indian Edition).
4. Steven S. Skiena. The Algorithm Design Manual. Springer, Second Edition, 2008.

Internals of O.S

Unit I:

Fundamentals of Operating Systems Overview – Synchronization Mechanisms – Processes and Threads - Process Scheduling – Deadlocks: Detection, Prevention and Recovery – Models of Resources

Unit II:

Memory Management (Contiguous and non contiguous) : Address Binding, Dynamic Loading and Linking Concepts, Logical and Physical Addresses, Contiguous Allocation, Fragmentation, Paging, Segmentation, Virtual Memory, Demand Paging, Page fault, Page replacement algorithms, Global Vs Local Allocation, Thrashing, Working Set Model, Paging. File : File Attributes, File Types, File Access Methods, Directory Structure, File System Organization and Mounting, Allocation Methods, Free Space management; Secondary

Unit III:

Input Output Management Issues in human centric, device centric and computer centric IO management, input output modes, programmed IO, polling, interrupt mode of IO, various types of interrupts, interrupt servicing, priority interrupts, interrupt vectors, Storage Management: Disk Structure, Logical and Physical View, Disk Head Scheduling, Formatting.

Unit IV:

Real Time O. S, Characteristics of real-time operating systems, classification of real-time systems, architectures of real-time systems, micro-kernels, scheduling in RTOS, Rate monotonic scheduling, priority inversion. Real Time Task Scheduling - Handling Resource Sharing.

Unit V:

Case Studies Linux System: Design Principles - Kernel Modules - Process Management Scheduling – Memory Management - Input-Output Management - File System Interprocess Communication.

References:

1. Abraham Silberschatz; Peter Baer Galvin; Greg Gagne, “Operating System Concepts”, John Wiley & Sons.
2. “Distributed Systems Concepts and Design”, G. Coulouris, J. Dollimore, Addison Wesley.
3. “Advanced Operating Systems”, M. Singhal, N.G. Shivarathri, McGraw Hill
4. Daniel P Bovet and Marco Cesati, “Understanding the Linux kernel”, O’Reilly, 2005.
5. Rajib Mall, “Real-Time Systems: Theory and Practice”, Pearson Education India, 2006.

Advanced Computer Architecture

Unit I:

Introduction to computer architecture. Software-hardware interface. Performance metrics. Performance measurement, Benchmark programs.

Micro-operations, Computer Instruction, Timing and control, Instruction Cycle, Instruction Types and formats, Micro-programmed and hardware control unit, Addressing Modes, Program Control

Unit II:

Auxiliary memory, Main memory, Memory Address Map, Associative memory, Cache memory, Virtual Memory

Computer Arithmetic: Floating point representation. Addition, Subtraction. Multiplication and Division;

Unit III:

Pipelining, Instruction and arithmetic pipelining, Structural Hazards, Control Hazards, Data Hazards: Forwarding versus Stalling. Vector processing

I/O interfaces, Asynchronous Data Transfer, DMA, Priority Interrupt, I/O Processor

Unit IV:

Multiprocessor Organization, types, Symmetric Multi Processors, Cache Coherence, Multicore computers, hardware and software performance issues, Multicore Organization.

Interconnection Network: Multistage Cube and Omega Network.

Unit V:

Data Flow Computers: Data flow graphs, Operators, Static and dynamic.

Reference

1. . Computer Organisation & Architecture: Designing for performance by W. Stallings, 9th edition, PrenticeHall International edition.
2. Computer System Architecture by M. Mano, 2001, Prentice-Hall.
3. Computer Organization and Design, 2nd Ed., by David A. Patterson and John L. Hennessy, Morgan 1997, Kauffmann.
4. Computer Organization, 5th Edi, by Carl Hamacher, Zvonko Vranesic, 2002, Safwat Zaky.

Electives Semester I

Image Processing

Unit I

Digital Image Processing: Introduction, Origin, Applications, Examples: Gamma-Ray Imaging, X-ray Imaging, Imaging in the Ultraviolet Band, Imaging in the Visible and Infrared Bands etc. Digital Image Fundamentals: Elements of Visual Perception, Structure of the Human Eye, Image Formation in the Eye, Brightness Adaptation and Discrimination, Light and the Electromagnetic Spectrum, Image Sensing and Acquisition Image Formation Model, Image Sampling and Quantization: Basic Concepts, Representing Digital Images, Spatial and Gray-Level Resolution, Basic Relationships Between Pixels : Linear and Nonlinear Operations.

Unit II

Image Enhancement in the Spatial Domain: Gray Level Transformations, Histogram Processing, Enhancement Using Arithmetic/Logic Operations, Image Subtraction, Image Averaging, Spatial Filtering, Smoothing Spatial Filters, Smoothing Linear Filters, Order-Statistics Filters, Image Transforms; Fourier Transform and their properties, Fast Fourier Transform, Other Transforms.

Unit III

Image Enhancement in Frequency Domain: Filtering in the Frequency Domain, Correspondence between Filtering in the Spatial and Frequency Domains, Smoothing Frequency-Domain Filters, Ideal Lowpass Filters, Butterworth Lowpass Filters, Gaussian Lowpass Filters, Sharpening Frequency Domain Filters :Ideal Highpass Filters, Butterworth Highpass Filters, Gaussian Highpass Filters, Homomorphic Filtering;

Unit IV

Image Restoration: Image Degradation/Restoration Process, Noise Models, Properties of Noise, Periodic Noise, Estimation of Noise Parameters, Restoration in the Presence of Noise Only–Spatial Filtering, : Mean Filters, Order-Statistics Filters, Adaptive Filters, Periodic Noise Reduction by Frequency Domain Filtering, Inverse Filtering, Minimum Mean Square Error (Wiener) Filtering, Constrained Least Squares Filtering, Geometric Mean Filter, Color Image Processing :Color Models, Pseudocolor Image Processing, Full-Color Image Processing, Color Transformations, Smoothing and Sharpening, Color Segmentation.

Unit V

Wavelets and Multiresolution Processing : Introduction, Image Pyramids, Subband Coding, The Haar Transform, Multiresolution Expansions, Wavelet Transforms in One Dimension, Fast Wavelet Transform, Wavelet Transforms in Two Dimensions, Wavelet Packets. Image Compression: Fundamentals, Different Redundancies, Image Compression Models, Error-Free Compression.

References :

1. Rafael C Gonzalez, Richard E Woods 2nd Edition, Digital Image Processing - Pearson Education.
2. William K Pratt, Digital Image Processing John Willey .
3. Image Processing Analysis and Machine Vision – Millman Sonka, Vaclav hlavac, Roger Boyle, Broos/colic, Thompson Learniy.
4. A.K. Jain, PHI, New Delhi (1995)-Fundamentals of Digital Image Processing.
5. Chanda Dutta Magundar – Digital Image Processing and Applications, Prentice Hall of India,

Data Mining

Unit I

Introduction, Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Implementation, Further Development, Data Warehousing to Data Mining

Unit II

Pre-processing, Cleaning, Integration, Transformation, Reduction, Discretization, Concept Hierarchy Generation, Data Mining Primitives, Query Language, Graphical User Interfaces, Architectures, Concept Description, Data Generalization, Characterizations, Class Comparisons, Descriptive Statistical Measures.

Unit III

Association Rule Mining, Single-Dimensional Boolean Association Rules from Transactional Databases, Multi-Level Association Rules from Transaction Databases

Unit IV

Classification and Prediction, Issues, Decision Tree Induction, Bayesian Classification, Association Rule Based, Other Classification Methods, Prediction, Classifier Accuracy, Cluster Analysis, Types of data, Categorisation of methods, Partitioning methods, Outlier Analysis.

Unit V

Multidimensional Analysis and Descriptive Mining of Complex Data Objects, Spatial Databases, Multimedia Databases, Time Series and Sequence Data, Text Databases, World Wide Web, Applications and Trends in Data Mining

References:

1. Data Mining: Concepts and Techniques, J.Han, M.Kamber, Academic Press, Morgan Kanf Man Publishers.
2. Data Mining, Pieter Adrians, DolfZantinge, Addison Wesley.
3. Data Mining with Microsoft SQL Server, Seidman, Prentice Hall of India.
4. Mastering Data Mining: The Art and Science of Customer Relationship Management, Berry and Linoff, John Wiley and Sons.
5. Data Ware housing: Concepts, Techniques, Products and Applications, C.S.R. Prabhu, Prentice Hall of India.

eCommerce

Unit I

An introduction to Electronic commerce, E-Commerce (Introduction And Definition), activities of ECommerce, Goals of E-Commerce, Technical Components of E-Commerce, Functions of ECommerce, Advantages and disadvantages of E-Commerce, Scope of E-Commerce, Electronic Commerce Applications, Electronic Commerce and Electronic Business(C2C)(2G,G2G, B2G, B2P, B2A, P2P, B2A, C2A, B2B, B2C).

Unit II

The Internet and WWW, Evolution of Internet, Domain Names and Internet Organization (.edu,.com, .mil,.gov, .net etc.), Types of Network, Internet Service Provider, World Wide Web

Unit III

Internet and Security: Internet and Extranet, Definition of Internet, Advantages and Disadvantages of the Internet, Development of a Intranet, Extranet and Intranet Difference, Role of Internet in B2B Application, Secure Transaction, Computer Monitoring, Privacy on Internet, Corporate , Email privacy, Computer Crime(Laws , Types of Crimes), Threats, Attack on Computer System, Software Packages for privacy, Hacking, Computer Virus.

Unit IV

Encryption and Decryption, Secret key Cryptography, DES, Public Key Encryption, RSA, Authorisation and Authentication, Firewall, Digital Signature. Electronic Data Exchange : Introduction, Concepts of EDI and Limitation, Applications of EDI, Disadvantages of EDI, EDI model. Electronic Payment System: Introduction,

Unit V

Electronic Payment System: Types of Electronic Payment System, Payment Type, Traditional Payment, Value Exchange System, Credit Card System, Electronic Fund Transfer, Paperless bill, Modern Payment Cash, Electronic Cash, E – Governance for India: E – Governance of India, Indian customer EDI System, Imports, Exports

References :

1. E-Commerce Concepts, Models, Strategies- :- G.S.V.Murthy Himalaya PublishingHouse
2. E- Commerce Technology and Management, Kamlesh K Bajaj and Debjani Nag, McGraw Hill
3. Electronic commerce :- Gray P. Schneider , Wiley
4. e-Business Essentials : Successful e-Business Practices - From the Experts at PC Magazine, Frank J. Derfler, Pearson.
5. Building E-Commerce Sites With . Net Framework, Bentrum, Pearson.

Engineering Mathematics

Unit 1: Discrete Mathematics

Propositional and first order logic, Sets, relations, functions, partial orders and lattices. Groups

Unit 2: Discrete Mathematics

Graphs: connectivity, matching, Coloring. Combinatorics: Counting, recurrence relations, generating functions

Unit 3: Linear Algebra

Matrices, determinants, system of linear equations, eigenvalues and eigenvectors.

Unit 4: Calculus

Limits, Continuity and differentiability. Maxima and minima. Mean value theorem

Unit 5: Calculus

Integration, Integration as anti derivative, Rules for calculating integrals, integrating power of x and other elementary functions. chain rule