

# Department of Information Technology

School of Engineering & Technology

Central University of Kashmir



Syllabus for M. Tech. IT

BOS- 21/5/2018

## 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 Operating System	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	40	60	100
5	MTIT C 105	Advanced Computing Lab	P	2	40	60	100
6	MTIT E ---	Elective I	E	4	40	60	100
7	---	Skill Enhancement Course (SEC)	E	4	40	60	100
		<b>Total</b>		24			700

### 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)

## MTIT C 101: 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.

## MTIT C 102: Internals of Operating System

### 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.

## MTIT C 103: 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, Priority Interrupt, I/O Processor

### Unit IV:

Multiprocessor Organization, types, Symmetric Multi Processors, Cache Coherence, Hardware solutions and MESI protocol. MultiThreading and chip multiprocessors. Multicore Organization. Interconnection Network: Multistage Cube and Omega Network.

### Unit V:

Introduction to OpenMP, OpenMP directives, Parallel constructs, Work-sharing constructs, Data environment constructs, Synchronization constructs, Extensive API library for finer control.

### 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

**Introduction and Fundamentals:** Motivation and Perspective, Applications, Components of Image Processing System, Element of Visual Perception, A Simple Image Model, Sampling and Quantization.

**Image Enhancement in Spatial Domain:** Introduction; Components of Image Processing System, Basic Gray Level Functions – Piecewise-Linear Transformation Functions: Contrast Stretching; Histogram Specification; Histogram Equalization; Local Enhancement; Enhancement using Arithmetic/Logic Operations – Image Subtraction, Image Averaging; Basics of Spatial Filtering; Smoothing – Mean filter, Ordered Statistic Filter; Sharpening – The Laplacian.

#### Unit II

**Image Enhancement in Frequency Domain:** Fourier Transform and the Frequency Domain, Basis of Filtering in Frequency Domain, Filters – Low-pass, High-pass; Correspondence Between Filtering in Spatial and Frequency Domain; Smoothing Frequency Domain Filters – Gaussian Lowpass Filters; Sharpening Frequency Domain Filters – Gaussian Highpass Filters; Homomorphic Filtering.

**Image Restoration:** A Model of Restoration Process, Noise Models, Restoration in the presence of Noise only-Spatial Filtering – Mean Filters: Arithmetic Mean filter, Geometric Mean Filter, Order Statistic Filters – Median Filter, Max and Min filters; Periodic Noise Reduction by Frequency Domain Filtering – Bandpass Filters; Minimum Mean-square Error Restoration.

#### Unit III

**Color Image Processing:** Color Fundamentals, Color Models, Color Transformation, Smoothing and Sharpening, Color Segmentation.

**Morphological Image Processing:** Introduction, Logic Operations involving Binary Images, Dilation and Erosion, Opening and Closing, Morphological Algorithms – Boundary Extraction, Region Filling, Extraction of Connected Components, Convex Hull, Thinning, Thickening

#### Unit IV

**Registration:** Introduction, Geometric Transformation – Plane to Plane transformation, Mapping, Stereo Imaging – Algorithms to Establish Correspondence, Algorithms to Recover Depth

**Segmentation:** Introduction, Region Extraction, Pixel-Based Approach, Multi-level Thresholding, Local Thresholding, Region-based Approach, Edge and Line Detection: Edge Detection, Edge Operators, Pattern Fitting Approach, Edge Linking and Edge Following, Edge Elements Extraction by Thresholding, Edge Detector Performance, Line Detection, Corner Detection.

#### Unit V

**Feature Extraction:** Representation, Topological Attributes, Geometric Attributes

**Description:** Boundary-based Description, Region-based Description, Relationship.

**Object Recognition:** Deterministic Methods, Clustering, Statistical Classification, Syntactic Recognition, Tree Search, Graph Matching

**References**

- 1) *Rafael C. Gonzalvez and Richard E. Woods, Digital Image Processing 2nd Edition, Published by: Pearson Education.*
- 2) *R.J. Schalkoff, Digital Image Processing and Computer Vision, Pubished by John Wiley and Sons, NY. I*
- 3) William K Pratt, Digital Image Processing John Willey .
- 4) Millman Sonka, Vaclav hlavac, Roger Boyle, Broos/colic, Image Processing Analysis and Machine Vision –Thompson Learniy.
- 5) A.K. Jain, PHI, New Delhi (1995)-Fundamentals of Digital Image Processing.
- 6) 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.

## Cyber Forensics

### Unit I: Introduction:

Crime, Cyber Crime, internet and security backdrop of crime. What is Computer Forensics? Use of Computer Forensics in Law Enforcement, Computer Forensics Assistance to Human Resources, Computer Forensics Services, Forensics Methodology, Steps taken by Computer Forensics Specialists.

*Computer Forensics Evidence and Capture:* Data Recovery Defined -Data Back-up and Recovery-The Role of Back-up in Data Recovery - The Data- Recovery Solution

### Unit II: Evidence Collection and Data Seizure:

Why Collect Evidence? Collection Options obstacles, Types of Evidence - The Rules of Evidence-Volatile Evidence ,General Procedure - Collection and Archiving, Artifacts.

*Digital Evidence:* Preserving the Digital Crime Scene - Legal Aspects of Collecting and Preserving Computer Forensic Evidence Computer Image Verification and Authentication: Special Needs of Evidential Authentication.

### Unit III: Computer Forensics analysis and validation:

Determining what data to collect and analyze, validating forensic data. addressing data-hiding techniques. Network forensics overview, performing live acquisitions, developing standard procedures for network forensics.

*Processing Crime and Incident Scenes:* Identifying digital evidence. seizing digital evidence at the scene, storing digital evidence, obtaining a digital hash, reviewing a case.

### Unit IV: Current Computer Forensic tools:

Computer forensic tools, Computer Forensics software tools, computer forensics hardware tools, validating and testing forensics software

*E-Mail Investigations:* Exploring the role of e-mail in investigation, exploring the roles of the client and server in email, investigating e-mail crimes and violations.

### Unit V: Practical Approaches:

*Cell phone and mobile device forensics:* Understanding mobile device forensics, understanding acquisition procedures for cell phones and mobile devices.

Problem Assorted Activity Approach for performing Cyber Forensic for Crime Investigation.

### Text Books:

1. Computer Forensics, Computer Crime Investigation by Jhon R. Vacca, Firewall Media, New Delhi.
2. Computer Forensics and Investigations by Nelson. Phillips Enfinger. Stewart, CENGAGE Learning

## **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

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Syllabus for M. Tech. IT

Semester II

## M. Tech. In Information Technology Semester II

S. No.	Course Code	Course Title	Type	Credits	Evaluation		
					CIA	ESE	Total
1	MTIT C 201	Advanced Data Communication & Networking	C	4	40	60	100
2	MTIT C 202	Web Technology	C	4	40	60	100
3	MTIT C 203	Advanced Database Technologies	C	4	40	60	100
4	MTIT C 204	Lab on Web Technology	C	2	40	60	100
5	MTIT C 205	Lab on Database Technologies	C	2	40	50	100
6	MTIT E ---	Elective II	E	4	40	60	100
7		Ability Enhancement Course (AEC)	E	4	40	60	100
		<b>Total</b>		24			700

### Elective II

1. MTIT E 210: Formal Language Automata Theory	7. MTIT E 216: Enterprise Resource Planning
2. MTIT E 211: Modelling & Simulation	8. MTIT E 217: Reconfigurable Computing
3. MTIT E 212: Computer Vision	9. MTIT E 218: Management Information Systems
4. MTIT E 213: Distributed Computing	10. MTIT E 219: Microprocessor
5. MTIT E 214: Bioinformatics	11. MTIT E 220: Artificial Intelligence
6. MTIT E 215: Computer Based Numerical Techniques	12. MTIT E 221: Elective on Special Topics

## **MTIT C 201: Advanced Data Communication & Networking**

### **Unit I**

Computer Networks: Review –Computer networks and layered architectures. Circuit Switching, Packet Switching. Asynchronous Transfer Mode: ATM layered model, switching and switching fabrics, network layer in ATM, QOS.

### **Unit II**

Internet Protocols: IPv4, IPv6 ICMP, Routing algorithms. Transport layer Protocols: TCP and UDP, TCP connection management, TCP congestion control.

### **Unit III**

Application Layer Network application architectures: Client- server, P2P and hybrid, Application layer protocols: DNS, FTP, TFTP, TELNET, HTTP and WWW, SMTP and Electronic mail, Network management and SNMP

### **Unit IV**

Wireless and Mobile Networks: Wireless links and network characteristics, WiFi: 802.11 wireless LANs, Cellular internet Access, mobile IP mobility management: addressing and routing, handoffs, WAP, mobility in cellular networks. Multimedia Networking: Multimedia Network Application, VoIP, Real Time protocols.

### **Unit V**

SDN: software Defined networks, Architecture, open flow switch. Internet of things (IOT) : introduction , Application , IOT enabling Technologies, barriers .

### **References:**

1. Kurose, J. F. and Ross, R.W, Computer Networking, Pearson Education
2. Comer, D.E. and Droms, R.E, Computer Networks and Internets, Prentice-Hall.
3. Walrand, J. and Varaiya, P, High Performance Communication Networks, Morgan

## MTIT C 202: Web Technologies

**Unit-I:** Basic web designing: Introduction to web browser, architecture of web browser, web page, static & dynamic web pages. Web-servers& clients.www. Introduction to HTML: History, structure of HTML document, creating & executing HTML. Tags of HTML. Tables and Frames. Understanding Form and form elements. Use of <META> Tag. Creating CSS, applying CSS to HTML documents, CSS Rules, Classes, CSS types.

**Unit II:** Client side Vs Server side Technology , Java Script (Constants, Variables and datatypes, Operators, Window Object, document object and string function). Event Handling & Form Validation: onClick, onChange, onLoad, onSelect, onSubmit, onMouseOver, onFocus, onBlur, Validation of text box entries, checkboxes, radio buttons, e-mail address validation, date validation. Introduction to JSON, Datatypes, Objects.

**Unit III:** Introduction to ASP.net, Web Server Tags (Textbox, Label, Button, CheckBox, CheckBoxList, DropDownList, Hyperlink, Image, ImageButton, LinkButton, ListBox, RadioButton, RadioButtonList), Comparison between Html tags, Web tags and Web Server Tags, comparison between ASP and ASP.net, web Development cycle.

**Unit-IV:** Creating WEB Application: ASP.NET Tools, Advanced Tools & Features, User Interface, Creating Master Pages, Creating Web Pages, User Controls, Data Binding Controls (Data List, Grid View and Data Repeater), Validation Server Controls, Web Config, Cookies, Query String, and Session State.

**Unit-V:** Data Access with ADO.Net: Database Access Using Wizard, Database Access Using Code, DataProvider, OLEDB, ODBC, Connection Object, Command Object(ExecuteNonQuery, ExecuteQuery, Execute scalar), Datareader, Understanding the role of Dataset, Data Adapter, creating connections , connecting to Data Base, closing an open connection, Executing SQL statements with connection object –creating, inserting, updating, deleting database table.

### References:

1. HTML 4.0, E. Stephen Mac, J. Platt, bpb
2. Completer Reference HTML - Thomas A. Powell ,TMH
3. ASP.NET 4 Unleashed, Stephen Walther, Kevin Scott Hoffman, Nate Scott Dudek, Sams Publishing
4. Teach Yourself ASP.NET in 21 Days (2nd Edition), Sams Publishing; 2 edition (August 22, 2002)
5. Applied Microsoft .Net Frame Work Programming, Jeffrey Richter, Microsoft Press.
6. Microsoft.Net for Programmers, Fergal Grimes, Microsoft Press.



## MTIT C 203: Advanced Database Technologies

### Unit I

Physical database design & Tuning Database workloads, physical design and tuning decisions, Need for Tuning Index selection: Guideline for index selection, Clustering & Indexing Tools for index selection Database Tuning: Tuning indexes, Tuning Conceptual schema Tuning Queries & views, Impact of Concurrency, Benchmarking

### Unit II

Distributed Databases Introduction, Design Framework, Design of database fragmentation, The Allocation of Fragments, Translation of global queries to fragment queries, Optimization of access queries, Distributed Transaction Management, Concurrency Control, and Reliability.

### Unit III

Advance Transaction Processing Transaction Processing Monitors, Transactional Workflow, Real time transaction System, Long duration Transactions, Transaction Management in Multi-databases, Distributed Transaction Management, Main Memory Databases, and Advanced Transaction Models.

### Unit IV

Semi-Structured Data and XML Semi-Structured Data, Introduction to XML, XML hierarchical Model, DTD & XML schema, XML Namespace, XML query & Transformation: Xpath, XSLT, XQuery, Storage of XML data, XML Technologies: DOM & SAX Interfaces X pointer, Xlink, XHTML, SOAP, WSDL, UDDI, XML database Application.

### Unit V

Emerging Trends in Databases Introduction, Motivation, Temporal databases, Spatial & geographic databases, Multimedia Databases, Mobility & personal Databases

### References:

1. Database system Concept by Silberschatz And Korth 6th Edition
2. Distributed Databases principles & systems by Stefano Ceri, Giuseppe Pelagatti
3. Database Systems, Thomas Connolly, Carolyn Begg, Pearson 4th Edition
4. Web Data Management, Abiteboul, Loana, Philippe et.al Cambridge publication.
5. Database Management Systems by Raghu Ramakrishnan and Johannes Gehrke

## Semester II

### Electives

#### Formal Languages & Automata

**Unit- I:** Introduction to theory of computation: Significance of theoretical computer science, Mathematical model of computer and programming languages, Automata, historical aspect of automata, application of Automata theory. Mathematical preliminaries & Notation: Sets, Cartesian product (cross product of two sets), various operations on sets, Relation and Functions, Graphs and Trees.

**Unit- II:** Basics of Languages: Informal & formal definitions. Alphabets, Strings, Languages, Grammar, automata and other related definitions, various operation on languages: - union, concatenation, negation, reverse, star closure, Positive closure properties. Grammar: Informal and formal definitions. Illustrations for generating grammar for various languages

**Unit- III:** Finite Automata: Components of Automata, types of Automata, Deterministic Automata, Non- Deterministic Automata, Representation of Finite Automata, Deterministic Finite Automata (DFA), Representation of Deterministic Finite Automata using Transition Graphs, Transition diagraphs, Transition Tables, Languages generated by Deterministic Automata.

**Unit- IV:** Regular Languages: Definition of Regular Languages, Application of Finite Automata, NonDeterministic Finite Automata (NFA): Definition of Non- Deterministic Automata, Properties of Transitive function,  $\lambda$ -NFA, Conversion of NFA to DFA. Finite Automata with  $\lambda$ - transition,  $\lambda$ -Closure,  $\lambda$ -NFA. Regular Expression : Formal Definition of Regular Expression, Languages Associated with Regular Language. Relationship between Regular Expression and Regular Language. Conversion of Regular Expression to  $\lambda$ -NFA, Conversion of Finite Automata (DFA or NFA) to Regular Expression (Kleen's theorem).

**Unit- V:** Types of grammars, Classification of Chomsky Hierarchy, Phase structured grammars, context free grammar, context sensitive grimmer, regular grammar. Pushdown Automata: Definition and Representation of Pushdown automata, Non Deterministic Pushdown automata, operations on Pushdown automata. Turing machine: Basic Model, definition and representation of Turing Machine. Application of Turing Machine.

#### References:

1. Introduction to Automata Theory, Languages and Computation, J. E. Hopcroft and J. D. Ullman and Rajeev Motwani: Pearson Education Asia
2. Elements of the Theory of Computation, H. R. Lewis and C. H. Papadimitriou: Pearson education Asia.
3. Introduction to languages and the Theory of Computation , J. C. Martin, Tata Mc-Graw Hill
4. Introduction Formal Languages and Automata ,Peter Linz, Narosa,.

4. Theory of Computer Science: Automata, Language and Computation, M. Chandrasekaran, and K.L.P. Mishra: Prentice Hall of India

## Modelling & Simulation

**Unit I:** Introduction-Systems, System types, System Modeling, Types of system modelling, Classification and comparison of simulation models, attributes of modelling, Comparison of physical and computer experiments, Application areas and Examples

**Unit II:** Mathematical and Statistical Models- Probability concepts, Queuing Models, Methods for generating random variables and Validation of random numbers.

**Unit III:** Language-System modelling, programming languages, comparison of languages, Identifying and selection of programming language, feasibility study of programming language for the given application.

**Unit IV:** Experiments-Simulation of different systems, Analysis, validation and verification of input and output simulated data, study of alternate techniques.

**Unit V:** Case study-Developing simulation model for information centers, inventory systems and analysis of maintenance systems.

### References:

1. Geoffrey Gordon, "System Simulation", Second edition, Prentice Hall, India, 2002.
2. Jerry Banks and John S.Carson, Barry L.Nelson, David M.Nicol, "Discrete Event System Simulation", Third edition, Prentice Hall, India, 2002.
2. Robert E. Shannon, "System Simulation The art and science", , Prentice Hall, New Jersey, 1995.
3. D.S. Hira, "System Simulation", S.Chand and company Ltd, New Delhi, 2001.

## Computer Vision

**Unit I :** Introduction: History about computer vision, introduction to vision, computer graphics, image processing, human and computer vision. Image Formation Models: Monocular imaging system, orthography & perspective projection, camera model and camera calibration, Binocular imaging system. Recognition Methodology: Conditioning, Labeling, Grouping, Extraction and Matching.

**Unit II:** Morphological Image Processing: Introduction, Dilation, Erosion, Opening, Closing, Hit-or-Miss transformation, Morphological algorithm operations on binary images, Morphological algorithm operations on gray scale images, Thinning, Thickening, region growing, region shrinking. Image Representation and Description : Representation Scheme, Boundary description, Region description.

**Unit III:** Binary Machine Vision: Thresholding, Segmentation connected component labeling, Hierarchical Segmentation Spatial clustering, Split & merge, Rule-based Segmentation, Motion-based Segmentation. Area Extraction: Concept, Data-structure, Edge, Line- Linking, Hough transformation, Line fitting, Curve fitting (Least-square fitting). Region Analysis: Region properties, External points, spatial moments, mixed spatial gray-level moments, Boundary analysis: Signature properties, Shape numbers.

**Unit IV:** Fact model recognition: Labelling lines, Understanding line drawings, Classification of shapes by labeling of edge, Recognition of shapes, Consistent labeling problem, Back-tracking Algorithm Perspective projective projection, Photogrammetry-from 2D image, Hierarchical image matching. Object Model And matching: 2D representation, Global vs. Local features. General Frame Works for Matching: Distance relational approach, ordered structural matching, view class matching, Models database organization.

**Unit V:** General frame work: Distance- relational approach, Ordered- Structural matching, view class matching, Models database organization. Knowledge Based Vision: Knowledge representation, Control strategies, Information Integration. Object recognition: Hough transformation and other simple objectives recognition, Shape correspondence and shape matching principle component analysis , Shape priors for recognition.

### References:

1. "Computer and robot vision", Robert Haralik and Linda Shapiro, Addison wesley.
2. "Computer vision: A Modern approach", David A.Forsyth, Jean Ponce.
3. "Introduction Techniques for 3D Computer Vision" , E .Trucco and A.Veer, PHI.
4. "Image Processing Analysis and Machine Vision" Milan Sonka, Vaclava Hlavac, Roger Boyle, Thomson Learning.
5. "Robot Vision", by K.P Horn, McGraw-Hill

## Distributed Computing

**Unit-I:** Distributed Computing-introduction, history; Distributed Computing system: Strength and weaknesses, Different forms of Computing: Minicomputer model, workstation model, workstation server model, Cluster:-definitions, cluster computer system architecture, Windows cluster, distributed Computing System models: Distributed operating system, Introduction to DCE, architecture of Distributed Applications,. Frameworks, and component, Message passing:-Features, Issues in IPC by Message passing, synchronization.

**Unit II:** Group Communication: Unicasting versus multicasting, Multicast API, Connectionless versus connection oriented Multicast Reliable multicast versus unreliable multicast API, Reliable multicast API, Ordering and their implementation: Absolute, causal, Consistent Distributed Computing Paradigms, Client-server paradigm, Peer to Peer paradigm. Message system paradigm Remote Procedure call model, Network services Paradigm.

**Unit-III:** Remote Procedure Calls(RPC): Introduction, RPC model its transparency, implementation, stub generation, RPC messages, Marshalling Arguments and result, server management Call semantics, Communication protocols for RPCs, Complicated RPCs, client server binding special RPCs, RPC in heterogeneous environment, Light weight RPC, Datagram Socket API, Stream mode Socket API, sockets with non blocking I/O Operations Secure Socket API Client server paradigm issues, software engineering issues for a network service, Connection Oriented and connectionless Servers Iterative servers and concurrent server, stateful servers

**Unit IV:** Synchronization :Mutual exclusion, deadlock, election algorithm, Resource Management: Introduction, desirable features of a good global scheduling algorithm, task assignment approach, load balancing approach, Load sharing approach; Process management: introduction, Process migration, threads

**Unit V:** Distributed file system: introduction, desirable features of a good DFS, file models, File accessing models, file sharing semantics, file caching semantics, file replication, fault tolerance, atomic transaction, design principles, Distributed object: Message passing versus distributed objects, distributed object architecture, distributed object system, RPC, remote method invocation, RMI architecture API for RMI,RMI application, comparison of RMI and socket API, Client Call back, Stubdownloading, RMI security manager

### References:

1. Distributed Computing Principles and Application, M.L.Liu, Pearson Education
2. Distributed Computing : Concepts and Application, M L Liu, Addison Wesley
3. Distributed Operating system, Pradeep k Singha, PHI
4. Distributed System Concepts and design, Couloouris, Pearson education
5. Distributed System, Principles and paradigm , Tanenbaum,PHI

## Bioinformatics

### Unit-I

Introduction: genomes - diversity size and structure - proteins proteomes - Information Content in Biological sequences - Prediction of molecular function and structure.

### Unit-II

Internet resources and public data bases: databases and tools -sequence similarity searches - Alignment - Prediction software - Molecular Biology Software - BLAST-FASTA-BLOSUM.

### Unit-III

Sequence Comparison in Biology: global alignment - local alignment - gaps . Multiple Sequence Alignment, Phylogenetic Trees.

### Unit-IV

Mapping and Sequencing :DNA mapping and sequencing problems - Mapping and genome project - Large-scale sequence and sequence assembly - shotgun sequencing.

### Unit-V

Stings And Evolutionary Trees: Ultra metric Trees and distances - Maximum parsimony - stenes trees - phylogenetic alignment.

### References:

1. Edwards, David; Stajich, Jason; Hansen, David, Bioinformatics : Tools and Applications
2. Mount D.W, Bioinformatics. Sequence and Genome Analysis , Cold Spring Harbar, New York
3. Bioinformatics: A practical guide to the analysis of genes and proteins, John Wiley & Sons, New York.
4. Attuvod T.K. Smith D.J. Parry, Introduction to Bioinformatics , Addison Wesley .
5. Higgins Des, Taylor, Bioinformatics: sequence structure and data banks ,Oxford Univ. Press, Oxford

## **Enterprise Resource Planning**

### **Unit I**

Enterprise Resources Planning: Evolution of ERP-MRP and MRP-II-problems of system islands -need for system integration and interface-early ERP Packages-ERP products and Market opportunities and problems in ERP selection and implementation.

### **Unit II**

ERP implementation: Identifying ERP benefits team formation-consultant intervention-selection ERPprocess of ERP implementation –Managing changes in IT organization – Preparing IT infrastructure Measuring benefits of ERP.

### **Unit III**

Integrating With other systems: Post ERP, Modules in ERP: Business Modules of ERP package, Reengineering Concepts: the emergence of Reengineering Concept; Concept of business Process rethinking of processes –identification of Reengineering need -preparing for Reengineering – implementing change –change management –BPR & ERP.

### **Unit IV**

Supply chain Management: The concept of value chain differentiation between ERP & SCM -SCM for customer focus -need and specificity of SCM -SCM scenario in India -products and markets of Sehl issues in selection and implementation of SCM solutions -CRM solutions; E-business: Introduction to 1 Net technologies.

### **Unit V**

Evolution of E-commerce, EDI and E-business –business opportunities –basic and advanced business on Internet –Internet banking and related technologies –security and privacy issues – technologies for Ebusiness, Future and growth of E-Business.

### **References**

1. Hammer, Mcheal and JamtsChamby Reengineering the corporation, 1997.
- 2.Leon, Alexix Countdown 2000, Tata MC Graw
- 3.Ptak, Carol A. & Eli Schragenheim ERP, St. Lucie Press NY, 2000.
- 4.JosephBrady,EllenMonk,Bret Wagner-Concepts in Enterprise Resource Planning
- 5.Bret Wagner-Enterprise Resource Planning



# Artificial Intelligence

## Unit-I

Introduction: Intelligence , Artificial Intelligence. Turing Test . History of AI . Characteristics of AI Computing . Applications of AI. AI Languages . Intelligent Agents.

## Unit-II

Problem Solving . State Space Representation. Production System. Classical AI Problems and solution. Searching for solutions, uniformed search strategies – Breadth first search, depth first search, Depth limited search, Iterative-deepening depth first search bi-direction search - comparison.

## Unit-III

Heuristic search : Search with information Greedy best first search, A\* search, Memory bounded heuristic search, Heuristic functions. Local search Algorithms: Hill climbing, simulated, annealing search, local beam search, Genetic algorithms. Constrain satisfaction problems: Backtracking search for CSPs local search for constraint satisfaction problems. Game Playing : Adversial search, Games, minimax algorithm, optimal decisions in multiplayer games, Alpha-Beta pruning, Evaluation functions, cutting of search.

## Unit-IV

Knowledge Representation Schemes : Logical , Procedural , Network and Structural schemes. Propositional Logic (PL) : Syntax and Semantic rules . Reasoning in PL. Inference Rules. Resolution in PL. First Order Predicate Logic (FOPL) : Syntax and Semantic rules. Inference rules. Resolution in Predicate logic. Reasoning: Inductive , abductive and deductive reasoning . Forward and backward reasoning. Reasoning with uncertain knowledge- Probabilistic reasoning. Bayes' rule (statistical reasoning ). Expert System: Architecture . Examples of Expert system. Applications. Building Expert system. Expert system tools.

## Unit-V

Machine Learning : Models of learning. Machine learning through Game playing . Inductive learning. Decision trees. Decision list. Ensemble learning. FOL descriptions. Role of Knowledge. Inductive logic programming. Learning by analogy.

Neural Network. Characteristics. Neuron Model. Neural network directed graphs, Feedback. Neural network architecture.. AI and neural network (knowledge , reasoning and learning.) Learning neural networks and neurons.(memory based Hebbian competition, Boltzmann). Supervised and unsupervised. Application of NNW. Deep Learning.

**References :**

1. Introduction to Artificial Intelligence – RajendraAkerkar, PHI.
2. Artificial Intelligence – A Modern Approach. Second Edition, Stuart Russel, Peter Norvig, PHI/Pearson Education.
3. Artificial Intelligence, 3<sup>rd</sup> Edition, Patrick Henry Winston., Pearson Edition,
4. Artificial Intelligence , 2<sup>nd</sup> Edition, E.Rich and K.Knight (TMH).
5. Artificial Intelligence and Expert Systems – Patterson PHI
6. Expert Systems: Principles and Programming- Fourth Edn, Giarrantana/ Riley, Thomson
7. PROLOG Programming for Artificial Intelligence. Ivan Bratka- Third Edition – Pearson Education.
8. Nilsson, Artificial Intelligence: A New Synthesis, Morgan Kaufmann.
9. R.O. Duda, Hart, Stork (2001) Pattern Classification 2nd Edition, John wiley, New York.
10. Shinghal (2006) Pattern Recognition : Technique and Applications, Oxford University Press,New Delhi

# Department of Information Technology

School of Engineering & Technology

Central University of Kashmir



Syllabus for M. Tech. IT

Semester III

## Central University of Kashmir

### Semester III

S. No.	Course Code	Course Title	Type	Credits	Evaluation		
					CIA	ESE	Total
1	MTIT C 301	Advanced Software Engineering	C	4	40	60	100
2	MTIT C 302	Wireless Communication	C	4	40	60	100
3	MTIT C 303	Network Security	C	4	40	60	100
5	MTIT C 304	Research Project Phase I (Seminar)	C	2	100	-	100
6	MTIT C 305	Research Methodologies	C	2	40	60	100
4	MTIT E ---	Elective III	E	4	40	60	100
7		Open Generic Elective (OGE)	E	4	40	60	100
		<b>Total</b>		24			700

#### Elective III

1. MTIT E 310: Compiler Design	8. MTIT E 317:Expert Systems
2. MTIT E 311: Natural Language Processing	9. MTIT E 318: Advanced Java & Android Programming
3. MTIT E 312: Multimedia Technologies	10. MTIT E 319: Computer Graphics
4. MTIT E 313: Machine Learning	11. MTIT E 320: Embedded Systems
5. MTIT E 314: Optimization Techniques	12. MTIT E 321: Elective on Special Topics
6. MTIT E 315:VLSI	13. MTIT E 322: Cloud Computing
7. MTIT E 316:Software Project Management	

## **MTIT C 301: Advanced Software Engineering**

### **Unit I**

Introduction to Software Engineering Concepts, System Life Cycle, Software Product: Software development paradigms, Development Activities, Managing Software Development, Project Organization. COCOMO Model, Software Equation, Project Scheduling and Tracking.

### **Unit II**

Analysis Requirement Elicitation and Characteristic, (SRS), Use Case, Unified Modelling Languages, Software prototyping. DFD, ER- Diagrams. Data Dictionary (DD), Analysis object Model(Domain Model)/Dynamic Model, Non-Functional Requirements, Analysis Patterns, Data flow analysis, Control flow analysis.

### **Unit III**

System Design: Overview, Concepts and Activities. Addressing Design Goals, Managing System Design. Effective modular design, Cohesion & Coupling. Decomposing the System. Software Quality Assurance (SQA), Process and Product Quality, Capability Maturity Model (CMM). Software Quality Assurance: Need and Reliability Measures.

### **Unit IV**

Testing: Objectives, need & Advantages, Levels of Testing, Testing lifecycle, Test Cases. Configuration Management, Project Management \_(Cyclometric Analysis). Feature of modern GUI, Real time interface design. Implementation and Managing change, Programming language and Coding, Human Computer Interaction, Reusing Pattern Solution, Specifying Interface.

### **Unit V**

Concern, Separation of Concerns, Cross-Cutting concerns, Theme Approach. Aspect Oriented Software Development, AO Design Principle, Trait (Computer programming), Aspect Oriented programming, Subject Oriented programming. Aspect Oriented Programming Using Aspect-J.

### **References**

1. Bernd Bruegge, Alan H.Dutiot, Object –Oriented Software Engineering, Pearson Education.
2. Robert E. Filman, TzillaElrad, Siobhan Clarke, and Mehmet Aksit, Aspect-Oriented Software Development. Addison-Wesley.
3. R. Pressman, Software Engineering: A Practioner’s approach, McGraw Hill.
4. I. Sommerville, “Software Engineering,9<sup>th</sup> ed.” Addison Wesley Professional.
5. Stephen R. Schach, Object Oriented Software Engineering, McGraw-Hill.

## MTIT C 302: Wireless Communication

### UNIT I: SERVICES AND TECHNICAL CHALLENGES

Types of Services, Requirements for the services, Multipath propagation, Spectrum Limitations, Noise and Interference limited systems, Principles of Cellular networks, Milestones in wireless communication R&D

### UNIT II: WIRELESS PROPAGATION CHANNELS

Propagation Mechanisms (Qualitative treatment), and its effects on mobile communication: Free space attenuation, Reflection and Transmission, Diffraction, Scattering by surfaces. Channel Classification, Narrowband and Wideband models.

### UNIT III: WIRELESS TRANSCEIVERS

Structure of a wireless communication link, Modulation and demodulation – Quadrature Phase Shift Keying,  $\pi/4$ -Differential Quadrature Phase Shift Keying, Offset-Quadrature Phase Shift Keying, Binary Frequency Shift Keying.

### UNIT IV: SIGNAL PROCESSING IN WIRELESS SYSTEMS

Principle of Diversity, Macrodiversity, Microdiversity, Signal Combining Techniques, Transmit diversity, Equalisers- Linear and Decision Feedback equalisers, Review of Channel coding and Speech coding techniques.

### UNIT V: ADVANCED TRANSCEIVER SCHEMES

Spread Spectrum Systems- Cellular Code Division Multiple Access Systems- Principle, Power control, Effects of multipath propagation on Code Division Multiple Access, Orthogonal Frequency Division Multiplexing . Antennas: Introduction, Antennas for Mobile Stations, Antennas for Base Stations

### REFERENCES

1. Andreas.F. Molisch, “Wireless Communications”, John Wiley – India, 2006.
2. Simon Haykin & Michael Moher, “Modern Wireless Communications”, Pearson Education, 2007.
3. Rappaport. T.S., “Wireless communications”, Pearson Education, 2003.
4. Gordon L. Stuber, “Principles of Mobile Communication”, Springer International Ltd., 2001.

## MTIT C 303: Network Security

### UNIT-I:

Security: Introduction, Concepts, Threats and Risks, Attacks and its types, Security Services, Mechanisms. Malicious Software: Viruses, Worms, Trojan, spyware, Access Control: Introduction, Models ( Bell-LaPadula, Biba Integrity Models), Role Based Models.

### UNIT-II:

Number theory : Basic Concepts, Divisibility Algorithm, Groups, Rings ,Field , Finite Field( $GF(P)$  &  $GF(2^n)$ ) , prime numbers ( Fermat's & Euler's Theorem) Cryptography: Symmetric Cryptography: Symmetric Ciphers Models, Block Ciphers :DES, AES, Symmetric Cipher Modes, Stream Ciphers: RC4

### UNIT-III:

Asymmetric cryptography: RSA. Deffie Hellman key exchange Message Authentication: MD5 and SHA 512, Digital Signatures, Digital Signature Standard, Public Key Infrastructure (PKI): Key Management and Distribution, Kerberos protocol.

### UNIT-IV:

Web security Consideration: Secured Socket Layer and Transport layer security, Secured Electronic Transaction (SET) and Secured Mail: Pretty Good Privacy (PGP), S/MIME, Network Attacks: Buffer Overflow, IP Spoofing, TCP Session Hijacking, Sequence Guessing, DNS Cache poisoning, IPSec, VPN.

### UNIT-V:

Network Defence tools: Intrusion Detection and Prevention system, Firewall: Types of Firewalls: Packet Filtering Router, Stateful Inspection Firewall, Application Level Gateway or Proxy, Circuit level gateway, Bastion Host Firewall Configuration: Screened Host Firewall System, Screened Subnet Firewall System. Mobile platform Security Model (Android and IOS), Mobile Threats and Malware.

### References:

1. Network Security Essentials ,William Stallings, Prentice-Hall.
2. Fundamentals of Computer Security Technology, Edward Amoroso, Prentice-Hall.
3. Cryptography and Data Security ,Dorothy E. Denning, Addison-Wesley.
4. Computers under Attack ,Peter J. Denning, Addison-Wesley.
5. Cryptography: Theory and Practice ,Douglas R. Stinson, CRC Press.
6. Computer Crime and Computer Forensics, Dr. R.K.Tiwari,P.K.Sastri,K.V.Ravikumar, First Edition, 2002, Select Publishers
7. Computer Security Gollmann, Dieter, First Edition, 1999, John Wiley & Sons Ltd.

## MTIT C 305: Research Methodologies

### Unit I

Introduction to Scientific Research, Meaning, Objectives and Significance of Research Motivation in Research, Types of research approaches, Quantitative research methods, Research methods versus methodology, Research process, Criteria of good research, Research problems, Necessity of defining the problem, Technique involved in defining the problem, Design and Development Research Methods, Meaning of research design, Need for research design, Features of a good design, Different research designs, Basic principles of experimental designs, literature survey for research work, arriving at directions of research, Formulation of research title, development of criteria based research proposal

### Unit II:

Root Finding: Bisection Method, False Position Method, Secant Method, Interpolation: Newtons forward method, Newtons backward method and Lagrangian Interpolation.

A brief history of python, Installing python, Basic Python Syntax: String operations, The format method, String Slices, String operators, Numeric Data types, Conversions, Simple Input and Output, Control flow and syntax, Loops, Collections ,Lists, Tuples , Sets, Dictionaries.

### Unit III

Scientific Writing : Significance of report writing, Structure and Components of Research Report, Types of Report: research papers, thesis, Research Project Reports, Precautions for writing research reports, Pictures and Graphs, Citation Styles, Oral presentation,

Technical writing using LaTeX: Installation, MikTeX, TeXnicCenter, Creating reports and articles, Text environment, Math environment, Figures, Tables, BibTeX - reference manager, Camera Ready Preparation.

### References

1. C.R. Kothari, Research Methodology Methods & Techniques, 2nd Edition, Wishwa Prakashan Publishers.
2. B.L. Garg, R. Karadia, Aggarwal. An introduction to Research methodology, RBSA publishers.
3. Donald H.Mc Burney, Research Methods, Thomas learning.
4. Donald R. Cooper, Pamela S. Schinder, Business Research Methods, 8/e, Tata MC graw-Hill Co.ltd., 2006
5. Misra R.P, Research Methodology – A Hand Book, Concept publishing Company, New Delhi
6. Leslie Lamport, LaTeX: A Document Preparation System, Second Edition.



## Semester III

### Electives

#### Compiler Design

##### Unit I

Introduction to Compiling- Compilers-Analysis of the source program-The phases- Cousins- The grouping of phases-Compiler construction tools. The role of the lexical analyzer- Input bufferingSpecification of tokens-Recognition of tokens-A language for specifying lexical analyzer.

##### Unit II

Syntax Analysis- The role of the parser-Context-free grammars-Writing a grammar-Topdown parsingBottom-up Parsing-LR parsers-Constructing an SLR(1) parsing table. Type checking, Type SystemsSpecification of a simple type checker.Run-Time Environments-Source language issues-Storage organization-Storage-allocation strategies.

##### Unit III

Intermediate languages-Declarations-Assignment statements - Boolean expressions- Case statementsBackpatching-Procedure calls

##### Unit IV

Issues in the design of a code generator- The target machine-Run-time storage management- Basic blocks and flow graphs- Next-use information-A simple codegenerator-Register allocation and assignment-The dag representation of basic blocks - Generating code from DAG.

##### Unit V

Introduction-The principle sources of optimization-Peephole optimization- Optimization of basic blocks Loops in flow graphs- Introduction to global data-flow analysis-Code improving transformations.

#### References:

1. Compilers- Principles, Techniques, and Tools”,Alfred V. Aho, Ravi Sethi Jeffrey D. Ullman, , Pearson Education Asia,
2. Modern Compiler Design,DavidGalles, Pearson Education Asia.
3. Advanced Compiler Design &Implementation, Steven S. Muchnick,Morgan Kaufmann Pulishers,.
4. Crafting a Compiler with C, C. N. Fisher and R. J. LeBlanc “, Pearson Education.
5. Modern Compiler Design, Galles, Pearson.

## Natural Language Processing

### Unit I

**Introduction:** Natural language processing- Linguistic Background, Regular Expressions and Automata, Morphology and Finite- state Transducers, Computational Phonology and Text-to- Speech, word level Morphology, Probabilistic Models of Pronunciation and spelling, N-grams, HMMs and speech Recognition.

### Unit II

**Grammars and Parsing:** Grammars and Sentence structure, Top- Down Parser, Bottom- up chart Parser, Transition Network Grammars, Top Down chart parsing, Finite state Models and Morphological Processing Grammars and Logic Programming.

### Unit III

**Grammars for Natural language :** Auxiliary verbs and verb phrases , Movement phenomena in language, Handling questions in context-free Grammars, Relative clauses, The Hold Mechanism in ATNs, Gap threading

### Unit IV

**Semantic Interpretation:** Sements and logical form, Word Senses and Ambiguity, The Basic Logical form, Language, Encoding Ambiguity in the logical form, Verb & States in Logical forms Thematic Roles, Speech acts and Embedded Sentences Defining Semantic Structure: Model Theory

### Unit V

**Linking Syntax and Semantics:** Semantic Interpretation and Compositionality, Lexicalized Semantic Interpretation and sematic roles, Semantic Interpretation Using feature Unification, Generating Sentences from Logical Form

**Ambiguity Resolution:** Selectional Restriction, Semantic Filtering Using Selectional Restrictions, Semantic Networks, Stastical Word Sense Disambiguation, Stastical Semantic Preferences Combining Approaches to Disambiguation

### References:

1. Allen, j., Natural Language Understanding. 2Nd Edition
2. Jurafsky, D.& J .Martin.2000.Speech and language processing: An introduction to Natural language processing, Computational Linguistics, and speech Recognition.
3. Christopher D. Manning and Hinrich Schutze, Foundation of Statistical Natural Language Processing.1999.MITPress

## Multimedia Technologies

### Unit I

Introduction: Multimedia basics, Multimedia Information representation as Text, image, audio and video.

### Unit II

Multimedia Networks, Multimedia applications, Networking terminology.

Text and image compression, compression Principles.

### Unit III

Audio and Video compression, MPEG, Dolby, Coding and compression.

Standards for multimedia Communication. Digital communication, Enterprise Networks.

### Unit IV

The internet and its applications, World Wide Web. Broadband ATM Networks.

### Unit V

Entertainment Networks and high speed modems. Transport Protocols, Application support functions.

### References:

1. Fred Halsall, Multimedia Communications Applications, Networks, protocols and standards, Pearson Education.
2. Fundamentals of Multimedia, ZE-Nian li and Mark S.Drew, Pearson Prentice Hall.
3. Image and video compression for Multimedia Engineering: Fundamentals, Algorithms, and standards, Yun Q. Shi, Huifang sun, CRC Press
4. Multimedia Communication systems, K. Rammohanrao, Z.S Bolzkovic,, D.A. Milanovic, Prentice Hall.
5. Video Processing and communications, Yao Wang Joern Ostermann and Ya-Qin Zhang, Prentice Hall.
6. Image and video compression for multimedia Engineering: Fundamentals, Algorithms, and Standards , Yun Q. Shi, Huifung sun, CRC Press.
7. Multimedia Database management systems, Springer International Edition.

# Machine Learning

## UNIT I

Introduction: Towards Intelligent Machines, Soft Computing/Machine Learning, Well posed machine learning problems, Data Representation, Forms of learning, Machine learning and data mining, Basic Linear Algebra in Machine learning Techniques.

## UNIT II

Supervised Learning: Learning from Observations, Occam's Razor Principle and Overfitting Avoidance, Heuristic Search in Inductive Learning, Estimating Generalization errors, Metrics for Assessing Regression Accuracy, Metrics for Assessing Classification Accuracy.

## UNIT III

Statistical Learning: Descriptive Statistics in Learning Techniques, Bayesian Reasoning, k-Nearest Neighbor (k-NN) Classifier, Linear Regression with Least Square Error Criterion, Logistic Regression for classification Tasks, Fisher's Linear Discriminant and Thresholding , Minimum Description Length Principle.

## UNIT IV

Learning with Neural Networks: Neuron Models, Network Architecture, Perceptron's, Multi- Layer Perceptron Networks and the Error-backpropagation.

Support Vector Machines (SVM), Basic variants of SVM.

## UNIT V

Unsupervised Learning: Clustering, Clustering Algorithms, Overview of basic clustering methods (k-means, Agglomerative clustering, EM algorithm), Principle Component Analysis for Attribute Reduction.

## References

1. Applied Machine Learning by M. Gopal, McGraw Hill Education
2. Pattern Recognition and Machine Learning by Christopher M. Bishop.
3. Machine Learning a Probabilistic Perspective by Kevin P. Murphy

## Optimization Techniques

### Unit I

**Introduction to Optimization:** Engineering applications of Optimization, Statement of an Optimization problem, Classification of Optimization Problems, Single-Variable Optimization, Multivariable Optimization with No Constraints, Multivariable Optimization with equality Constraints, multivariable Optimization with inequality Constraints.

Linear Programming: Principles of simplex Method, Simplex method in tabular form, Duality and dual simplex method.

### Unit II

**Assignment and Transportation Problems:** Mathematical model of assignment problem, solution methods of assignment problem: Enumeration Method, Transportation method, Hungarian method. Mathematical model of transportation problem, The transportation Algorithm, Methods of solving Transportation problems: North West corner Method, Least cost Method.

### Unit III

**Dynamic Programming:** Introduction, Developing optimal Decision Policy, Dynamic Programming Approach for Solving Linear Programming Problems, Continuous Dynamic Programming.

### Unit IV

**Queuing Theory:** Probability Description of arrivals and service times, Objectives and different Characteristics of queuing system .Discrete time Queuing Systems, steady state behaviour of Markovian and Eriangian Models (MM/1, MM/CM/Ek /1)

### Unit V

**Network Models:** Scope and Definition of Network Models, Minimal spanning Tree algorithm, Shortest- Route Problem, Maximal Flow Model, CPM and PERT.

### References:

1. S.S Rao, Engineering optimization: Theory & practice
2. Taha H.A “Operations Research- an Introduction”, prentice Hall of India, 2003

## Software Project Management

### Unit I: Conventional Software Management

The Waterfall model, Conventional Software Management Performance. Evolution of Software Economics: Software Economics, Pragmatic software cost estimation. Improving software Economics: Reducing Software size, improving software processes, improving team effectiveness, improving automation, Achieving Required Quality, peer inspections.

### Unit II: Comparison of old and new

The Principles Conventional software engineering, Principles of modern software management, transitioning to an iterative process. Life cycle phases: Engineering and production stages, inception, Elaboration, Construction, transition phases.

**Artifacts of the process:** The artifacts sets, Management artifacts, Engineering artifacts, Programmatic artifacts. Model Based software architectures: A Management Perspective and technical Perspective.

### Unit III : Flows of the process

Software process workflows, Inter trans-work-flows. Checkpoints of the process: Major Milestones, Minor Milestones, Periodic status assessments. Interactive process Planning: Work breakdown structures, Planning Guidelines, cost and schedule estimating, Interaction Planning Process, Pragmatic planning.

### Unit IV: Project Organizations Responsibilities

Line-of-Business Organizations, Project Organizations, Evolution of Organizations. Process Automations: Automation Building Blocks, The project environment. Project control and process instrumentation: The server care Metrics, Management indicators, life cycle expectations pragmatic software Metrics, Metrics automation. Tailoring the process: Process discriminants.

### Unit V: Future Software Project Management

Modern Project profiles Next Generation Software Economics, modern process transitions.

**Case Study:** The command centre processing and Display System Replacement (CCPDS-R).

### References:

1. Walker Rayce: "software project management A unified Framework", 1st Edition, Pearson Education, 2005.
2. Richard H. Thayer: "Software Engineering Project Management", 2nd Edition, IEEE Computer society, 1997.
3. Shere K.D: "Software Engineering & Management", 1st Edition, Hall, 1988.

## Expert Systems

### Unit I :Overview introduction to rule- based expert systems

Background, general introduction. Forward and backward chaining, conflict resolution. Uses, structured selection, configuration, diagnosis and business rules

### Unit II

#### Rule- based expert system

Uncertainty, fuzzy logic and belief nets. Expert system shells

### Unit III

#### Other Expert system Paradigms

PIES example system (Pan and Tenenbaum) OOPs, frames, case-based reasoning and help desks, Recommendor systems (Cd Now case study). Scheduling (Steelmaking example: Dorn and Slany)

### Unit IV

#### Building expert systems

CLUES example system (Talebzadeh, Mandutianu and Winner), Building expert systems Discussion of shells. Knowledge Management (Wiki Web case study)

### Unit V

#### Machine Learning and data-base mining

Data Mining Decision Trees, Neural Networks, Text Mining, Web Mining current trends in AI

#### References:

1. The Engineering of knowledge- based system, A.J. Gonzalez and .D.Dankel, Prentice Hall, 1993.
2. A guide to expert systems, Donald A. Watermann, Pearson publications.
3. Introduction to knowledge systems, Stefik M., Morgan Kaufkannn.
4. Giarratano J., Riley G., Expert systems, Principles and Programming, PWS Publising Company.

## Embedded Systems

### Unit-I

Embedded system:- Definition, components, I/O, Processor, Memory, Characteristics, attributes, design metrics, design challenges, application areas, Issues of designing efficient Embedded system, Difference between ES and PC, Design Technology, Integration and Testing of Embedded Hardware and Firmware, Embedded System Development Environment:-IDE, compiler, assembler, simulator, Emulator, debugging, Target hardware debugging and Boundary Scan, EDLC, Trends in the Embedded Industry: Processor trends, OS trends, Development languages trends, Open Standard and framework. S/W H/W Co-design.

### Unit-II

Microcontroller:-Introduction, criteria for choosing a microcontroller, Overview of 8051 Microcontroller family: Architecture, basic assembly language programming concepts, Memory Organization of 8051, SFR, Addressing Modes, Instruction set including bit manipulating instruction and programming using it, Subroutine, Stack, Time delay generations and calculations, I/O port programming, Programming of 8051 Timers, Counter Programming. Watch Dog Timer, Real Time clock.

### Unit -III

8051 hardware connections, basics of Communication with 8051, Basics of Communication, Overview of RS-232, I2C Bus, UART, USB, 8051 connections to RS-232, 8051 serial communication programming, 8051 interrupts, Programming of timer interrupts, Programming of External hardware interrupts, Programming of the serial communication interrupts, Interrupt priority in the 8051

### Unit-IV

Basic Concepts of Interfacing, Introduction 8051 Interfacing to an external memory and Accessing External data Memory and External Code Memory, Interfacing to LCD/Keyboard, DAC/ADC, Sensors, a Stepper Motor, Interfacing with 8255

### Unit-V

Real-Time Operating Systems: Review of Concepts, Basic Concepts, Types of RTOS, RTOS Issues, Implementing of RTOS, Distributed Processing Sysyem-Networking with msCAN: Design Approaches, CAN protocol, RTOS:- introduction, type, overview of commercially available RTOS, Introduction to ES design using RTOS .

### References:

1. Introduction to Embedded Systems ,Shibu K V , TMH.
2. Embedded System Design ,FrankVahid& Tony Givargis, John Wiley & sons.
3. “The 8051 Microcontroller and Embedded Systems”,M.A. Mazidi and J. G. Mazidi, PHI.
4. An Embedded Software Primer ,David E. Simon, Pearson Education.
5. “Embedded Systems”,Raj Kamal, TMH.



## Computer Graphics

### Unit I

Overview of Graphics Systems: Video Display Devices , Refresh cathode ray tubes, Refresh scan displays, Random scan displays, color CRT Monitors, DVST, Flat- Panel displays, Three Dimensional viewing devices, Raster scan systems, Input Devices: Keyboards, Mouse, Track ball, Joysticks, Data Glove, Touch Panels, Light pens.

### Unit II

Curves and Surfaces: Line Drawing Algorithm, DDA Algorithm, Bresenham's Line Drawing Algorithm, Bresenham's Circle Drawing Algorithm, Ellipse Drawing Algorithm, Pixel Addressing and object geometry: Screen Grid coordinates, Maintaining Geometry properties of Displayed objects.

### Unit III

Geometric Transformation: Homogeneous Coordinate System for 2D and 3D, Various 2D, 3D Transformation matrices (Translation, Scaling, Rotation, Shear), Rotation about an arbitrary point (2D), Rotation about an arbitrary axis (3D), Computing location of V.P, Clipping Algorithms, SutherlandCohen Clipping Algorithm.

### Unit IV

Curves and Visible Surface Detection Methods: Bezier Curves, 4 point and 5 point Bezier curves using Bernstein Polynomials, B-Spline Curves, Computing control points given end slopes for a specified curve segment. Back Face Detection, Depth Buffer (Z-Buffer, A-Buffer) Method, Scan Line Method, Depth Sorting Method, Area Subdivision Method.

### Unit V

Illumination Model and Surface Rendering: Basic Illumination models, shading models for curve surfaces, Half tone Pattern and Dithering Techniques, Rendering, Color Models: XYZ Color Model, RGB, YIQ, CMY, HSV, HLS.

### References:

1. Computer Graphics, D. Hearn and P. Baker, Prentice Hall.
2. Computer Graphics, R. Plastock and Z.Xiang, Schaum's Series, McGraw Hill.
3. Computer Graphics Principles & Practice, Foley et. al., Addison Wesley.
4. Procedural Elements for Computer Graphics, David F. Rogers, McGraw Hill.
5. Principles of Interactive Computer Graphics, W. Newman and R. Sproul, McGraw-Hill.

## Cloud Computing

### Unit I: INTRODUCTION

Cloud Computing – Evolution of Cloud Computing, the role of networks in Cloud computing, essential characteristics of Cloud computing, Cloud deployment model, Cloud service models, Cloud cube model, Advantages and Disadvantages of Cloud Computing.

### Unit II: Cloud Services and Data in Cloud

Web-Based Application – Pros and Cons of Cloud Service Development. Types of Cloud Service Development – Software as a Service, Platform as a Service, Infrastructure as a Service. Storage system architecture, Big data, Virtualized Data Centre (VDC) architecture.

### Unit III: Virtualization, Server, Storage and Networking

Virtualization concepts, types, Server virtualization, Storage virtualization, Storage services, Network virtualization, Service virtualization, Virtualization technologies and architectures, Hypervisors: KVM, Xen, Different hypervisors and features.

### Unit IV: Cloud Security

Cloud Security risks, Security, Privacy, Trust, Operating system security, Security of virtualization, Security risks posed by shared images, Security risk posed by a management OS, Trusted virtual machine monitor.

### Unit V: QoS [Quality of Service] of Cloud and Cloud Patterns

Taxonomy and survey of QoS management and service, Selection methodologies for cloud computing, Auto scaling, Load balancing in Cloud. Discovering Cloud Services and tools – Amazon EC2, Google App Engine, IBM Clouds.

### References:

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8. Christopher M. Moyer, Building Applications in the Cloud: Concepts, Patterns, and Projects

# Department of Information Technology

School of Engineering & Technology

Central University of Kashmir



Syllabus for M. Tech. IT

Semester IV

## Semester IV

S. No.	Course Code	Course Title	Type	Credits	Evaluation		
					CIA	ESE	Total
1	MTIT C 401	Research Project Phase II (Dissertation)	C	12	40	60	100
		<b>Total</b>		12			100

**Total Credits: 84**