

# **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**

## **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	20	30	50
5	MTIT C 205	Lab on Database Technologies	C	2	20	30	50
6	MTIT E ---	Elective II	E	4	40	60	100
7		Ability Enhancement Course (AEC)	E	4	40	60	100
		<b>Total</b>		24			600

### 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

# **Advanced Data Communication & Networking**

## **Unit I**

Introduction to Computer Networks Review – Computer networks and layered architecture. Asynchronous Transfer Mode: ATM layered model, switching and switching fabrics, network layer in ATM, QOS.

## **Unit II**

Transport Layer Elements of transport protocols; Internet transport protocols: TCP and UDP, TCP connection management, 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, Multimedia Networking Wireless and Mobile Networks: Wireless links and network characteristics, 802.11 wireless LANs, mobility management, addressing and routing, mobile IP, WAP, mobility in cellular networks.

## **Unit V**

Introduction to Network Security Cryptography, symmetric and public-key algorithms, digital signatures, communication security, authentication protocols, E-mail security, PGP and PEM.

## **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 Kaufmann.

# Web Technologies

**Unit-I:** Basic web designing: Introduction to web browser, architecture of web browser, web page, static & dynamic web pages, home page, web-site. Web-servers& clients.www. Introduction to HTML: History, structure of HTML document, creating & executing HTML. Tags of HTML.Tables and Frames:Creating Table with <TABLE>tag,..spanning cells with rowspan, colspan attributes. Understanding Form, <FORM> tag, creating text boxes, buttons, checkboxes, radio buttons, hidden control, password, lists & dropdown list,textarea. Submitting a form, get & post method, Use of <META> Tag.

**Unit II:** Client side Vs Server side Technology , Java Script and CSS:introduction to DHTML, XHTML, Creating CSS, applying CSS to HTML documents, CSS Rules, Classes, CSS types.Java Script (Constants, Variables and datatypes, Operaters, 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.

**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.



# 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 comparison - Multiple alignment to Phylogenetic trees.

## **Unit-IV**

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

## **Unit-V**

Clones And Evolutionary Trees: Ultra metric Trees and distances - Maximum parsimony - distance trees - phylogenetic alignment.

## **References:**

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