

M.Sc. IT Syllabus

M Sc – IT First Year

Subjects	
1	Computer Simulation and Modeling & Programming with Components
2	Mobile Computing & Advanced Computer Networks
3	Image Processing & Speech Recognition
4	Data Warehousing and Mining & Advanced Database Systems

M Sc – IT Second Year

Subjects	
1	Software Testing & Information Security

2	Artificial Intelligence & Robotics
3	Elective I
4	Elective II
5	Project

Elective-I (Any one)		Elective-II (Any one)	
1	Parallel Processing & Distributed Computing	1	Pattern Recognition & Computer Vision
2	Intelligent Systems & Neural Networks and Fuzzy Systems	2	System Security & Virtual Reality and Virtual Environment
3	Digital Signal Processing & Enterprise Networking	3	Multimedia systems and convergence of technologies & Java Technology

M Sc – Information Technology Year I

M Sc – Information Technology Year I, Paper I, Term I

SUBJECT: COMPUTER SIMULATION AND MODELING

Objective: In the last five decades digital computer simulation has developed from infancy to a full-fledged discipline. The field of modeling and simulation is as diverse as of man. The application of simulation continues to expand, both in terms of extent to which simulation is used and the range of applications. This course gives a comprehensive and state of art treatment of all the important aspects of a simulation study, including modeling, simulation software, model verification and validation, input modeling.

DETAILED SYLLABUS

1. **Introduction to Simulation:** System and System environment, Components of system, Type of systems, Type of models, Steps in simulation study, Advantages and Disadvantages of simulation.
2. **Simulation Examples:** Simulation of Queueing systems, Other examples of simulation.
3. **General Principles:** Concepts of discrete event simulation, List processing,
4. **Simulation Software:** History of simulation software, Desirable software features, General-purpose simulation packages, Object oriented simulation, Trends in

simulation software.

5. **Statistical Models in Simulation:** Useful statistical model, Discrete distribution, Continuous distribution, Poisson process, Empirical distribution.
6. **Queueing Models:** Characteristics of Queueing systems, Queueing notations, Long run measures of performance of Queueing systems, Steady state behavior of infinite population Markovian models, Steady state behavior finite population model, Network of Queues.
7. **Random Number Generation:** Properties of random numbers, Generation of pseudo random numbers, Techniques for generating random numbers, Tests for random numbers.
8. **Random Variate Generation:** Inverse transform technique, Convolution method, Acceptance rejection techniques
9. **Input Modeling:** Data Collection, Identifying the Distribution of data, Parameter estimation, Goodness of fit tests, Selection input model without data, Multivariate and Time series input models.
10. **Verification and Validation of Simulation Model:** Model building, Verification, and Validation, Verification of simulation models, Calibration and Validation of models.
11. **Output Analysis for a Single Model:** Types of simulations with respect to output analysis, Stochastic nature of output data, Measure of performance and their estimation, Output analysis of terminating simulators, Output analysis for steady state simulation
12. **Comparison and Evaluation of Alternative System Design:** Comparison of two system design, Comparison of several system design, Meta modeling, Optimization via simulation.
13. **Case Studies:** Simulation of manufacturing systems, Simulation of computer systems, Simulation of super market, Simulation of pert network

BOOKS

Text Books:

1. Jerry Banks, John Carson, Barry Nelson, David Nicol, "*Discrete Event System*

Simulation”

2. Averill Law, W. David Kelton, “*Simulation Modeling and Analysis*”, McGRAW-HILL

References:

1. Geffery Gordon, “*System Simulation*”, PHI
2. Bernard Zeigler, Herbert Praehofer, Tag Gon Kim, “*Theory of Modeling and Simulation*”, Academic Press
3. Narsing Deo, “*System Simulation with Digital Computer*”, PHI
4. Donald W. Body, “*System Analysis and Modeling*”, Academic Press Harcourt India
5. W David Kelton, Randall Sadowski, Deborah Sadowski, “*Simulation with Arena*”, McGRAW-HILL.

TERM WORK

1. Term work should consist of at least 10 practical experiments/Assignments covering the topics of the syllabus.

ORAL EXAMINATION

An oral examination is to be conducted based on the above syllabus.

M Sc – Information Technology Year I, Paper I, Term II

SUBJECT: PROGRAMMING WITH COMPONENTS

Objectives of the course: COM addresses software design in a very pragmatic way. Instead of providing a solution based on almost religious academic dogma of object oriented programming, COM's design takes into account both human nature and capitalism. COM is mostly widely used object model for developing distributed and concurrent systems. Aim of this subject to study and learn COM and use COM to deploy such systems successfully.

Pre-requisites: C++, Java Programming, OOAD

DETAILED SYLLABUS

1. **Introduction to object oriented systems:** Preview of Object-orientation, Concept of distributed object systems, Reasons to distribute for centralized objects. Mapping objects to locations. Object oriented system architecture, client-server system architecture, multi tier system architectures. Design of object oriented system architecture and component technology compound document.
2. **Introduction to distributed objects:** Computing standards, OMG, Overview of CORBA, Overview of COM/DCOM and of an open doc, Overview of Object Web, Overview of java, Enterprise java beans.
3. **Component Object Model (COM) introduction:** Com as better C++ software distribution, Dynamic linking, Separating interface and COM implementation, Run time polymorphism, Introduction to DCOM.
4. **Interface in COM-DCOM:** Introduction to interfaces, Interface definition language (IDL), Interface and IDL, Using COM interface pointers, Optimizing query interface,

Code sharing and reuse.

5. **Classes and Objects in COM-DCOM:** Introduction, Classes and servers, Optimizations, Classes and IDL, Class emulation, Query interface types and properties, Object services and dynamic composition.
6. **Apartments:** Cross-apartments access, lifecycle management.
7. **CORBA:** Introduction and concepts, distributed objects in CORBA, CORBA components, architectural features, method invocations static and dynamic: IDL (Interface Definition Language) models and interfaces. Structure of CORBA IDL, CORBA's self-describing data; CORBA interface repository.
8. **CORBA Services:** Services for object naming, Object lifecycle, Event, Transaction service features, concurrency control services, persistent object service and CORBA security service.
9. **Enterprise Java Beans**
10. **JAVA Interface:** JNI interface with C++, VC++.
11. **Object Web:** web technologies interfacing with distributed objects over client server and distribute architecture.

BOOKS

Text Books:

1. Booch, Jacobson, Ramburg, "*Essential COM*", Pearson Education
2. Don Box, "*Essential COM*", Pearson Education.
3. Jason Pritchard, "*COM and CORBA side by side*", Pearson Education.

References:

1. Tom Valesky, "*Enterprise Java Beans*", Pearson Education

TERM WORK

1. Term work should consist of at least 10 practical experiments covering the topics of the syllabus using COM/ EJB Technologies

ORAL EXAMINATION

An oral examination is to be conducted based on the above syllabus.

M Sc – Information Technology Year I, Paper II, Term I

SUBJECT: MOBILE COMPUTING

Objective: Recent developments in portable devices and high-bandwidth, ubiquitous wireless networks has made mobile computing a reality. Indeed, it is widely predicted that within the next few years' access to Internet services will be primarily from wireless devices, with desktop browsing the exception. Such predictions are based on the huge growth in the wireless phone market and the success of wireless data services. This course will help in understanding fundamental concepts, current developments in mobile communication systems and wireless computer networks.

Pre-requisites: Computer Networks.

DETAILED SYLLABUS

1. **Introduction:** Applications, A short history of wireless communication
2. **Wireless Transmission:** Frequency for radio transmission, Signals, Antennas, Signal propagation, Multiplexing, Modulation, Spread spectrum, Cellular systems.
3. **Medium Access Control:** Motivation for a specialized MAC: Hidden and Exposed terminals. Near and Far terminals; SDMA, FDMA, TDMA: Fixed TDM, Classical Aloha, Slotted Aloha, Carrier sense multiple access, Demand assigned multiple access, PRMA packet reservation multiple access, Reservation TDMA, Multiple access with collision avoidance, Polling, Inhibit sense multiple access; CDMA: Spread Aloha multiple access.
4. **Telecommunication Systems:** GSM: Mobile services, System architecture, Radio

interface, Protocols, Localization And Calling, Handover, Security, New data services; DECT: System architecture, Protocol architecture; TETRA, UMTS and IMT-2000: UMTS Basic architecture, UTRA FDD mode, UTRA TDD mode

5. **Satellite Systems:** History, Applications, Basics: GEO, LEO, MEO; Routing, Localization, Handover, Examples
6. **Broadcast Systems:** Overview, Cyclic repetition of data, Digital audio broadcasting: Multimedia object transfer protocol; Digital video broadcasting
7. **Wireless LAN:** Infrared vs. Radio transmission, Infrastructure and Ad hoc Networks, IEEE 802.11: System architecture, Protocol architecture, Physical layer, Medium access control layer, MAC management, Future development; HIPERLAN: Protocol architecture, Physical layer, Channel access control. Sublayer, Medium access control Sublayer, Information bases And Networking; Bluetooth: User scenarios, Physical layer, MAC layer, Networking. Security, Link management.
8. **Wireless ATM:** Motivation for WATM, Wireless ATM working group, WATM services, Reference model: Example configurations, Generic reference model; Functions: Wireless mobile terminal side, Mobility supporting network side; Radio access layer: Requirements, BRAN; Handover: Handover reference model, Handover requirements, Types of handover, Handover scenarios, Backward handover, Forward handover; Location management: Requirements for location management, Procedures and Entities; Addressing, Mobile quality of service, Access point control protocol
9. **Mobile Network Layer:** Mobile IP: Goals, assumptions and requirements, Entities and Terminology, IP packet delivery, Agent advertisement and discovery, Registration, Tunneling and Encapsulation , Optimizations, Reverse tunneling, Ipv6; Dynamic host configuration protocol, Ad hoc networks: Routing, Destination sequence distance vector, Dynamic source routing, Hierarchical algorithms, Alternative metrics
10. **Mobile Transport Layer:** Traditional TCP: Congestion control, Slow start, Fast retransmit/fast recovery, Implications on mobility; Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/fast recovery, Transmission/time-out freezing, Selective retransmission, Transaction oriented TCP
11. **Support for Mobility:** File systems: Consistency, Examples; World Wide Web: Hypertext transfer protocol, Hypertext markup language, Some approaches that might help wireless access, System architectures; Wireless application protocol: Architecture, Wireless datagram protocol, Wireless transport layer security, Wireless transaction protocol, Wireless session protocol, Wireless application environment, Wireless markup language, WML script, Wireless telephony application, Examples Stacks with Wap, Mobile databases, Mobile agents

BOOKS

Text Books:

1. Jochen Schiller, “*Mobile communications*”, Addison wisely , Pearson Education
2. Wiiliam Stallings, “*Wireless Communications and Networks*”

References :

1. Rappaort, “*Wireless Communications Principals and Practices*”
2. YI Bing Lin , “*Wireless and Mobile Network Architectures*”, John Wiley
3. P. Nicopolitidis , “*Wireless Networks*”, John Wiley
4. K Pahlavan, P. Krishnamurthy , “*Principles of Wireless Networks*”
5. M. Richharia , “*Mobile Satellite Communication: Principles and Trends*”, Pearson Education

TERM WORK

2. Term work should consist of at least 10 practical experiments and two assignments covering the topics of the syllabus.

ORAL EXAMINATION

An oral examination is to be conducted based on the above syllabus.

M Sc – Information Technology Year I, Paper II, Term II

SUBJECT: ADVANCED COMPUTER NETWORKS

Objectives: In first part, Advanced technologies like High speed Devices etc. are to be considered. Second part Network analysis considering deterministic and non-deterministic approach. We expect natural thinking from student. For e

Pre-requisites: Computer networks

DETAILED SYLLABUS

1. **Data Communications:** Business Drivers and Networking Directions : Data communication Past and future
2. **Understanding the standards and their maker:** Creating standards: players and Process, Current forums, s
3. **Introduction to Transmission Technologies:** Hardware selection in the design process.
4. **Optical Networking:** SONET/SDH standards, Dense wavelength division multiplexing (DWDM), Performa
5. **Physical Layer Protocols and Access Technologies:** Physical Layer Protocols and Interfaces, Accessing the
6. **Common Protocols and Interfaces in the LAN environment:** Data link layers protocols, LLC and MAC s
7. **Frame Relay:** FR specification and design, VoFR: Performance and Design considerations, Advantages and
8. **Common WAN Protocol:** ATM: Many faces of ATM, ATM protocol operation (ATM cell and Transmission parameters, Traffic and Congestion control defined, AAL Protocol model, Traffic contract and QoS, User plan
9. **Common Protocols and Interfaces in the Upper Layers(TCP/IP):** Background (Routing protocols), TCP/

10. **Mature Packet Switched Protocol:** ITU Recommendation X.25, User connectivity, Theory of Operation, Network Traffic control.
11. **Requirements Definition:** User requirements, Traffic matrix, Capacity planning and Network vision, Design tool, Categories of tools, Classes of design tools.
13. **Technology Comparisons:** Circuits-message-packet and cell switching methods, Packet switching service as compared to circuit services, High speed LAN protocols comparisons, Application performance needs.
14. **Access Network Design:** Network design layers, Access layer design, Access network capacity, network topology.
15. **Backbone Network Design:** Backbone requirements, Network capacities, Topologies, Topologies strategies, Network design.

BOOKS

Text Books:

1. Darren L Spohn, "Data Network Design", TMH
2. D. Bertsekas, R. Gallager, "*Data Networks*", PHI

References:

1. W.R. Stevens, "*Unix Network Programming*", Vol.1, Pearson Education
2. J.Walrand, P. Varaiya, "High Performance Communication Networks", Morgan Kaufmann
3. Y. Zheng, S. Akhtar, "Networks for Computer Scientists and Engineers", Oxford
4. A.S. Tanenbaum, "Computer Networks"
5. Peterson & Davie, "Computer Networks", Harcourt Asia.
6. James D. McCabe , "Practical Computer Analysis and Design", Harcourt Asia.

TERM WORK

3. Term work should consist of at least 10 practical experiments and two assignments covering all the topics of

An oral examination is to be conducted based on the above syllabus.

M Sc – Information Technology Year I, Paper III, Term I

SUBJECT: IMAGE PROCESSING

Objective: Digital Image Processing is a rapidly evolving field with growing applications in science and engineering. Image processing holds the possibility of developing the ultimate machine that could perform the visual functions of all living beings. There is an abundance of image processing applications that can serve mankind with the available and anticipated technology in the near future.

DETAILED SYLLABUS

1. **Introduction to Computer Graphics:** Geometry and line generation, Graphics primitives, Transformations
2. **Digital Image Processing Systems:** Introduction, Structure of human eye, Image formation in the human eye, Brightness adaptation and discrimination, Image sensing and acquisition, Storage, Processing, Communication, Display. Image sampling and quantization, Basic relationships between pixels
3. **Image Transforms (Implementation):** Introduction to Fourier transform, DFT and 2-D DFT, Properties of 2-D DFT, FFT, IFFT, Walsh transform, Hadamard transform, Discrete cosine transform, Slant transform, Optimum transform: Karhunen - Loeve (Hotelling) transform.
4. **Image Enhancement in the Spatial Domain:** Gray level transformations, Histogram processing, Arithmetic and logic operations, Spatial filtering: Introduction, Smoothing and sharpening filters
5. **Image Enhancement in the Frequency Domain:** Frequency domain filters: Smoothing and Sharpening filters, Homomorphic filtering
6. **Wavelets and Multiresolution Processing:** Image pyramids, Subband coding, Haar transform, Series expansion, Scaling functions, Wavelet functions, Discrete wavelet transforms in one dimensions, Fast wavelet transform, Wavelet transforms in two dimensions
7. **Image Data Compression:** Fundamentals, Redundancies: Coding, Interpixel, Psycho-visual, Fidelity criteria, Image compression models, Error free compression, Lossy compression, Image compression standards: Binary image and Continuous tone still image compression standards, Video compression standards.
8. **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
9. **Image Segmentation:** Detection of discontinuities, Edge linking and Boundary detection, Thresholding, Region based segmentation
10. **Image Representation and Description:** Representation schemes, Boundary descriptors, Regional descriptors

BOOKS

Text Books:

1. R.C.Gonsales R.E.Woods, "*Digital Image Processing*", Second Edition, Pearson Education
2. Anil K. Jain, "*Fundamentals of Image Processing*", PHI

References:

1. William Pratt, "*Digital Image Processing*", John Wiley
2. S. Harrington, "*Computer Graphics*", McGraw Hill
3. Milan Sonka, Vaclav Hlavac, Roger Boyle, "*Image Processing, Analysis, and Machine Vision*" Thomson Learning
3. N Ahmed & K.R. Rao, "*Orthogonal Transforms for Digital Signal Processing*" Springer
4. B. Chanda, D. Dutta Majumder, "*Digital Image Processing and Analysis*", PHI

TERM WORK

4. Term work should consist of at least 10 practical experiments and two assignments covering the topics of the syllabus.

ORAL EXAMINATION

An oral examination is to be conducted based on the above syllabus.

An oral examination is to be conducted based on the above syllabus.	

M Sc – Information Technology Year I, Paper III, Term II

SUBJECT: SPEECH RECOGNITION

Objectives: Develop an understanding of the relationship of vocal tract shapes and physical acoustics to the acoustic speech signal. Use a spectrum analyzer to relate the acoustic speech signal to acoustical processes. Design and implement digital filters to synthesize speech and code speech at a low bit rate. Implement speech analysis and speech synthesis modules using object-oriented software programs, using techniques such as class derivation, the use of software objects as components in a larger software system.

DETAILED SYLLABUS

1. **Fundamentals Of Speech Recognition:** Introduction, The paradigm for speech Recognition, out line, Brief history of speech recognition research.
2. **The Speech Signal:** Production, reception, and Acoustic-phonetic characterization: The speech production system, Representing speech in time and frequency domains, Speech Sounds and features, Approaches to automatic speech recognition by machine.
3. **Signal Processing And Analysis Methods For Speech Recognition:** The bank-of-filters front-end processor. Linear predictive model for speech recognition, Vector quantization, Auditory based Spectral analysis model.
4. **Pattern Comparison Techniques:** Speech detection, Distortion Measures-Mathematical Considerations, Distortion Measures-Perceptual Considerations, Spectral-Distortion Measures, Incorporation of spectral dynamic features into distortion measures, Time Alignment and Normalization.
5. **Speech Recognition System Design And Implementation Issues:** Application of

source coding techniques to recognition, Template training methods, Performance analysis and recognition enhancements, Template adoption to new talkers, Discriminative methods in speech recognition, Speech recognition in adverse environment.

6. **Theory And Implementation Of Hidden Markov Models:** Discrete time Markov processes, Extensions to hidden Markov Models, The three basic problems for HMMs, Types of HMMs, Implementation issues for HMMs, HMM system for isolated word recognition
7. **Speech Recognition Based On Connected Words Models:** General notations for the connected Word-Recognition problem, The two level dynamic programming algorithm, The level building algorithm, The one pass algorithm, Multiple candidate strings, Grammar networks for connected digit recognition, Segmental K-Means training procedure, Connected digit recognition implementation.
8. **Large Vocabulary Continuous Speech Recognition.**
9. **Task Oriented Applications Of Automatic Speech Recognition**

BOOKS

Text Books:

1. L. Rabiner and B. Juang, "*Fundamentals of Speech Recognition*", Pearson Education.
2. L R Rabiner and RW Schafer, "*Digital Processing of Speech Signals*", Pearson Education.

References:

1. B. Gold and N. Morgan, "*Speech and Audio Signal Processing*", John Wiley.
2. D. Jurafsky and J.H. Martin, "*Speech and Language Processing*", Pearson Education.

TERM WORK

5. Term work should consist of at least 10 practical experiments and two assignments covering the topics of the syllabus.

ORAL EXAMINATION

An oral examination is to be conducted based on the above syllabus.

M Sc – Information Technology Year I, Paper IV, Term I

SUBJECT: DATA WAREHOUSING AND MINING

Objectives of the course: The data warehousing part of module aims to give students a good overview of the ideas and techniques which are behind recent development in the data warehousing and online analytical processing (OLAP) fields, in terms of data models, query language, conceptual design methodologies, and storage techniques. Data mining part of the model aims to motivate, define and characterize data mining as process; to motivate, define and characterize data mining applications.

Pre-requisites: DBMS

DETAILED SYLLABUS

Data Warehousing:

1. **Overview And Concepts:** Need for data warehousing, Basic elements of data warehousing, Trends in data warehousing.
2. **Planning And Requirements:** Project planning and management, Collecting the requirements.
3. **Architecture And Infrastructure:** Architectural components, Infrastructure and metadata.
4. **Data Design And Data Representation:** Principles of dimensional modeling, Dimensional modeling advanced topics, data extraction, transformation and loading, data quality.
5. **Information Access And Delivery:** Matching information to classes of users, OLAP in data warehouse, Data warehousing and the web.
6. **Implementation And Maintenance:** Physical design process, data warehouse

deployment, growth and maintenance.

Data Mining:

1. **Introduction:** Basics of data mining, related concepts, Data mining techniques.
2. **Data Mining Algorithms:** Classification, Clustering, Association rules.
3. **Knowledge Discovery :** KDD Process
4. **Web Mining:** Web Content Mining, Web Structure Mining, Web Usage mining.
5. **Advanced Topics:** Spatial mining, Temporal mining.
6. **Visualisation :** Data generalization and summarization-based characterization, Analytical characterization: analysis of attribute relevance, Mining class comparisons: Discriminating between different classes, Mining descriptive statistical measures in large databases
7. **Data Mining Primitives, Languages, and System Architectures:** Data mining primitives, Query language, Designing GUI based on a data mining query language, Architectures of data mining systems
8. **Application and Trends in Data Mining:** Applications, Systems products and research prototypes, Additional themes in data mining, Trends in data mining

BOOKS

Text Books:

1. Paulraj Ponnian, "*Data Warehousing Fundamentals*", John Wiley.
2. M.H. Dunham, "*Data Mining Introductory and Advanced Topics*", Pearson Education.
3. Han, Kamber, "*Data Mining Concepts and Techniques*", Morgan Kaufmann

References:

1. Ralph Kimball, "*The Data Warehouse Lifecycle toolkit*", John Wiley.
2. M Berry and G. Linoff, "*Mastering Data Mining*", John Wiley.
3. W.H. Inmon, "*Building the Data Warehouses*", Wiley Dreamtech.
4. R. Kimpall, "*The Data Warehouse Toolkit*", John Wiley.

5. E.G. Mallach, "*Decision Support and Data Warehouse systems*", TMH.

TERM WORK

6. Term work should consist of at least 10 practical experiments and two assignments covering the topics of the syllabus.

ORAL EXAMINATION

An oral examination is to be conducted based on the above syllabus.

M Sc – Information Technology Year I, Paper IV, Term II

SUBJECT: ADVANCED DATABASE SYSTEMS

Objectives: To study the further database techniques beyond which covered in the second year, and thus to acquaint the students with some relatively advanced issues. At the end of the course students should be able to: gain an awareness of the basic issues in objected oriented data models, learn about the Web-DBMS integration technology and XML for Internet database applications, familiarize with the data-warehousing and data-mining techniques and other advanced topics, apply the knowledge acquired to solve simple problems

Pre-requisites: Database Systems, OOAD.

DETAILED SYLLABUS

- 1. The Extended Entity Relationship Model and Object Model:** The ER model revisited, Motivation for complex data types, User defined abstract data types and structured types, Subclasses, Super classes, Inheritance, Specialization and Generalization, Constraints and characteristics of specialization and Generalization, Relationship types of degree higher than two.
- 2. Object-Oriented Databases:** Overview of Object-Oriented concepts, Object identity, Object structure, and type constructors, Encapsulation of operations, Methods, and Persistence, Type hierarchies and Inheritance, Type extents and queries, Complex objects; Database schema design for OODBMS; OQL, Persistent programming languages; OODBMS architecture and storage issues; Transactions and Concurrency control, Example of ODBMS
- 3. Object Relational and Extended Relational Databases:** Database design for an ORDBMS - Nested relations and collections; Storage and access methods, Query processing and Optimization; An overview of SQL3, Implementation issues for

extended type; Systems comparison of RDBMS, OODBMS, ORDBMS

4. **Parallel and Distributed Databases and Client-Server Architecture:** Architectures for parallel databases, Parallel query evaluation; Parallelizing individual operations, Sorting, Joins; Distributed database concepts, Data fragmentation, Replication, and allocation techniques for distributed database design; Query processing in distributed databases; Concurrency control and Recovery in distributed databases. An overview of Client-Server architecture
5. **Databases on the Web and Semi Structured Data:** Web interfaces to the Web, Overview of XML; Structure of XML data, Document schema, Querying XML data; Storage of XML data, XML applications; The semi structured data model, Implementation issues, Indexes for text data
6. **Enhanced Data Models for Advanced Applications:** Active database concepts. Temporal database concepts.; Spatial databases, Concepts and architecture; Deductive databases and Query processing; Mobile databases, Geographic information systems.

BOOKS

Text Books:

1. Elmasri and Navathe, "*fundamentals of Database Systems*", Pearson Education
2. Raghuram Ramakrishnan, Johannes Gehrke, "*Database Management Systems*", McGraw-Hill

References:

1. Korth, Silberchatz, Sudarshan , "*Database System Concepts*", McGraw-Hill.
2. Peter Rob and Coronel, "*Database Systems, Design, Implementation and Management*", Thomson Learning.
3. C.J.Date, Longman, "*Introduction To Database Systems*", Pearson Education

TERM WORK

7. Term work should consist of at least 10 practical experiments and two assignments covering the topics of the syllabus.

ORAL EXAMINATION

An oral examination is to be conducted based on the above syllabus.

M Sc – Information Technology Year II

M Sc – Information Technology Year II, Paper I, Term I

SUBJECT: SOFTWARE TESTING

Objectives To improve your understanding of software testing - its purpose and nature - and raise your awareness of issues and constraints around testing. To provide a professional qualification widely recognized by employers, customers and peers. To learn standard terminology. Discover good sources of information. To provide a complete picture of the test activities and processes from requirements review to system implementation.

Pre-requisites: Software Engineering, OOAD

DETAILED SYLLABUS

1. **Introduction:** Defect, Defect Vs failures, Process problems and defect rates, The business perspective for testing
2. **Building a Software Testing Strategy:** Computer system strategic risk, Economics of testing, Common computer problems, Economics of SDLC testing, Testing- an organizational issue, Establishing a testing policy, Structured approach to testing, Test strategy, Testing methodology
3. **Establishing a Software Testing Methodology:** Introduction, Verification and validation, Functional and structural testing, Workbench concept, Considerations in developing testing methodologies

4. **Determining Software Testing Techniques:** Testing techniques/tool selection process, Selecting techniques/tools, Structural system testing techniques, Functional system testing techniques, Unit testing techniques, Functional testing and analysis
5. **Selecting and Installing Software Testing Tools:** Testing tools-Hammers of testing, Selecting and using the test tools, Appointing managers for testing tools
6. **Software Testing Process:** Cost of computer testing, Life cycle testing concept, Verification and validation in the software development process, Software testing process, Workbench skills
7. **Software Testing Process:** Access Project Management Development Estimate and Status, Test Plan, Requirements Phase Testing, Design Phase Testing, Program Phase Testing, Execute Test and Record Results, Acceptance Test, Report Test Result, Testing Software Installation, Test Software Change, Evaluate Test Effectiveness
8. **Testing Specialized Systems and Applications:** Client/Server systems, RAD, System documentation, Web based systems, Off-the-self software, Multi platform environment, Security, Data Warehouse
9. **Building Test Document:** Uses, Types, Responsibility, Storage, Test plan documentation, Test analysis report documentation

Books

Text Books:

1. W.E. Perry, "*Effective Methods for Software Testing*", John Wiley.
2. Kaner C., Nguyen H., Falk J., "*Testing Computer Software*", John Wiley.

References :

1. Boris Beizer, "*Software Testing Techniques*", Dreamtech
2. Louise Tamres, "*Introducing Software Testing*", Pearson Education.

Assignments: 10 assignments covering the syllabus has to be submitted

M Sc – Information Technology Year II, Paper I, Term II

SUBJECT: INFORMATION SECURITY

Objectives of the course: Learn about the threats in computer security. Understand what puts you at a risk and how to control it. Controlling a risk is not eliminating the risk but to bring it to a tolerable level.

Pre-requisites: Computer Networks, Operating system.

DETAILED SYLLABUS

1. **Introduction:** Security, Attacks, Computer criminals, Method of defense
2. **Program Security:** Secure programs, Non-malicious program errors, Viruses and other malicious code, Targeted malicious code, Controls against program threats
3. **Operating System Security:** Protected objects and methods of protection, Memory address protection, Control of access to general objects, File protection mechanism, Authentication: Authentication basics, Password, Challenge-response, Biometrics.
4. **Database Security:** Security requirements, Reliability and integrity, Sensitive data, Interface, Multilevel database, Proposals for multilevel security
5. **Security in Networks:** Threats in networks, Network security control, Firewalls, Intrusion detection systems, Secure e-mail, Networks and cryptography, Example

protocols: PEM, SSL, IPsec

6. **Administrating Security:** Security planning, Risk analysis, Organizational security policies, Physical security.
7. **Legal, Privacy, and Ethical Issues in Computer Security:** Protecting programs and data, Information and law, Rights of employees and employers, Software failures, Computer crime, Privacy, Ethical issues in computer society, Case studies of ethics

Books

Text Books:

1. C. P. Pfleeger, and S. L. Pfleeger, "*Security in Computing*", Pearson Education.
2. Matt Bishop, "*Computer Security: Art and Science*", Pearson Education.

References :

1. Stallings, "*Cryptography And Network Security: Principles and practice*"
2. Kaufman, Perlman, Speciner, "*Network Security*"
3. Eric Maiwald, "*Network Security : A Beginner's Guide*", TMH
4. Macro Pistoia, "*Java Network Security* ", Pearson Education
5. Whitman, Mattord, "*Principles of information security*", Thomson

Assignments: 10 assignments covering the syllabus has to be submitted

M Sc – Information Technology Year II, Paper II, Term I

SUBJECT: Artificial Intelligence

1 AI and Internal Representation

Artificial Intelligence and the World, Representation in AI, Properties of Internal Representation, The Predicate Calculus, Predicates and Arguments, Connectives Variables and Quantification, How to Use the Predicate Calculus, Other Kinds of Inference Indexing, Pointers and Alternative Notations, Indexing, The Isa Hierarchy, Slot-Assertion Notation, Frame Notation

2 Lisps

Lisps, Typing at Lisp, Defining Programs, Basic Flow of Control in Lisp, Lisp Style, Atoms and Lists, Basic Debugging, Building Up List Structure, More on Predicates, Properties, Pointers, Cell Notation and the Internals (Almost) of Lisp, Destructive Modification of Lists, The for Function ,Recursion, Scope of Variables, Input/Output, Macros

3. Neural Networks and Fuzzy systems

Neural and fuzzy machine Intelligence, Fuzziness as Multivalence, The Dynamical Systems approach to Machine Intelligence, The brain as a dynamical system, Neural and fuzzy systems as function Estimators, Neural Networks as trainable Dynamical system, Fuzzy systems and applications, Intelligent Behavior as Adaptive Model free Estimation, Generalization and creativity, Learning as change, Symbol vs Numbers, Rules vs Principles, Expert system Knowledge as rule trees, Symbolic vs Numeric Processing, Fuzzy systems as Structured Numerical estimators, Generating Fuzzy rules with product space Clustering, Fuzzy Systems as Parallel associators, Fuzzy systems as Principle based Systems

1. Neural Network Theory

Neuronal Dynamics: Activations and signals, Neurons as functions, signal monotonicity, Biological Activations and signals, Neuron Fields, Neuron Dynamical Systems, Common signal functions, Pulse-Coded Signal functions

2. Genetic Algorithms

A simple genetic algorithm, A simulation by hands, similarity templates(Schemata), Mathematical foundations, Schema Processing at work, The two- armed and k-armed Bandit Problem, The building block hypothesis, The minimal Deceptive Problem

Computer implementation of Genetic algorithm, Data Structures, Reproduction , Cross over and Mutation, Time to reproduce and time to Cross Mapping objective function to fitness form, Fitness scaling

Applications of genetic algorithm, De Jong and Function Optimization, Improvement in basic techniques, Introduction to Genetics based machine learning, applications of genetic based machine leaning

3. Data Mining

Introduction to Data Mining, Computer systems that can learn, Machine learning and methodology of science, Concept learning, Data ware house, designing decision support systems, Client server and data warehousing, Knowledge Discovery Process, Visualization Techniques, K- nearest neighbor, Decision trees, OLAP tools, Neural networks, Genetic algorithm, Setting up a KDD environment, Real life applications, Customer profiling, Discovering foreign key relationships

Assignments

10 assignments covering the syllabus has to be submitted

Text book

1. Introduction to Artificial Intelligence By Eugene Charniak, Drew McDermott- Addison Wesley
2. Neural Networks and fuzzy systems A dynamical systems approach to machine Intelligence by Bart Kosko- PHI
3. Genetic Algorithms in search, Optimization & Machine Learning by David E Goldberg- Addison wesley
4. Data Mining by Pieter Adriaans and Dolf Zantinge – Pearson Education Asia
5. Data Warehousing in the Real World by Sam Anahory and Dennis Murray, Addison -Wesley

M Sc – Information Technology Year II, Paper II, Term II

SUBJECT: ROBOTICS

Objective: The goal of the course is to familiarize the students with the concepts and techniques in robot manipulator control, enough to evaluate, chose, and incorporate robots in engineering systems.

Pre-requisite: Exposure to linear algebra and matrix operations. Exposure to programming in a high level language

DETAILED SYLLABUS

1. **Robotic Manipulation:** Automation and Robots, Classification, Application, Specification, Notations.
2. **Direct Kinematics:** Dot and cross products, Co-ordinate frames, Rotations, Homogeneous, Co-ordinates, Link co-ordination arm equation, (Five-axis robot, Four axis robot, Six axis robot).
3. **Inverse Kinematics:** General properties of solutions tool configuration Five axis robots, Three-Four axis, Six axis robot (Inverse kinematics).
4. Workspace analysis and trajectory planning work envelop and examples, workspace fixtures, Pick and place operations, Continuous path motion, Interpolated motion,

Straight-line motion.

5. **Robot Vision:** Image representation, Template matching, Polyhedral objects, Shape analysis, Segmentation (Thresholding, region labeling, Shrink operators, Swell operators, Euler numbers, Perspective transformation, Structured Illumination, Camera calibration).
6. **Task Planning:** Task level programming, Uncertainty, Configuration, Space, Gross motion, Planning, Grasp planning, Fine-motion Planning, Simulation of Planer motion, Source and goal scenes, Task planner simulation.
7. **Moments of Inertia.**
8. **Principles of NC and CNC Machines.**

BOOKS

Text Books:

1. Robert Shilling, "*Fundamentals of Robotics-Analysis and control*", PHI.
2. Fu, Gonzales and Lee, "*Robotics*", McGraw Hill
3. J.J, Craig, "*Introduction to Robotics*", Pearson Education

References:

1. Staughard, "*Robotics and AI*", PHI.
2. Grover, Wiess, Nagel, Oderey, "*Industrial Robotics*", McGraw Hill
3. Walfram Stdder, "*Robotics and Mecatronics*", TMH.
4. Niku, "*Introduction to Robotics*", Pearson Education
5. Klafter, Chmielewski, Negin, "*Robot Engineering*", PHI
6. Mittal, Nagrath, "*Robotics and Control*", TMH

Assignments: 10 assignments covering the syllabus has to be submitted

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M Sc – Information Technology Year II, Elective I, Term I

SUBJECT: PARALLEL PROCESSING

Objective: Upon completion of this course students will be able to understand and employ the fundamental concepts and mechanisms which form the basis of the design of parallel computation models and algorithms, recognize problems and limitations to parallel systems, as well as possible solutions

Pre-requisite: Computer architecture, Data structures

DETAILED SYLLABUS

1. **Introduction:** Parallel Processing Architectures: Parallelism in sequential machines, Abstract model of parallel computer, Multiprocessor architecture, Pipelining, Array processors.
2. **Programmability Issues:** An overview, Operating system support, Types of operating systems, Parallel programming models, Software tools
3. **Data Dependency Analysis:** Types of dependencies loop and array dependences, Loop dependence analysis, Solving diophantine equations, Program transformations

4. **Shared Memory Programming:** General model of shared memory programming, Process model under UNIX
5. **Algorithms for Parallel Machines:** Speedup, Complexity and cost, Histogram computation, Parallel reduction, Quadrature problem, Matrix multiplication, Parallel sorting algorithms, Solving linear systems, Probabilistic algorithms
6. **Message Passing Programming:** Introduction, Model, Interface, Circuit satisfiability, Introducing collective, Benchmarking parallel performance
7. **Parallel Programming languages:** Fortran90, nCUBE C, Occam, C-Linda
8. **Debugging Parallel Programs:** Debugging techniques, Debugging message passing parallel programs, Debugging shared memory parallel programs
9. **Memory and I/O Subsystems:** Hierarchical memory structure, Virtual memory system, Memory allocation and management, Cache allocation and management, Cache memories and management, Input output subsystems
10. **Other Parallelism Paradigms:** Data flow computing, Systolic architectures, Functional and logic paradigms, Distributed shared memory
11. **Performance of Parallel Processors:** Speedup and efficiency, Amdahl's law, Gustafson-Barsis's law, Karf-Flatt metric, Isoefficiency metric

BOOKS

Text Books:

1. Hawang Kai and Briggs F. A., "*Computer Architecture and Parallel Processing*", McGraw Hill
2. Jordan H. F. and Alaghaband G., "*Fundamentals of Parallel Processing*"
3. M.J. Quinn, "*Parallel Programming*", TMH

References:

1. Shasikumar M., *“Introduction to Parallel Processing”*, PHI
2. Wilson G.V., *“Practical Parallel Programming”*, PHI
3. D. E. Culler, J.P. Singh, A. Gupta, *“Parallel Computer Architecture”*, Morgan Kaufman

TERM WORK

8. Term work should consist of at least 10 practical experiments and two assignments covering the topics of the syllabus.

ORAL EXAMINATION

An oral examination is to be conducted based on the above syllabus.

M Sc – Information Technology Year II, Elective I, Term II

SUBJECT: DISTRIBUTED COMPUTING

Objective: This course aims to build concepts regarding the fundamental principles of distributed systems. The design issues and distributed operating system concepts are covered.

Pre-requisites: Operating Systems and Computer Networks

DETAILED SYLLABUS

1. **Introduction to Distributed System:** Goals, Hardware concepts, Software concepts, and Client-Server model. Examples of distributed systems.
2. **Communication:** Layered protocols, Remote procedures call, Remote object invocation, Message-oriented communication, Stream-oriented communication.
3. **Processes:** Threads, Clients, Servers, Code Migration, Software agent.
4. **Naming:** Naming entities, Locating mobile entities, Removing un-referenced entities.
5. **Synchronization:** Clock synchronization, Logical clocks, Global state, Election algorithms, Mutual exclusion, Distributed transactions.
6. **Consistency and Replication:** Introduction, Data centric consistency models,

Client centric consistency models, Distribution protocols, Consistency protocols.

7. **Fault Tolerance:** Introduction, Process resilience, Reliable client server communication, Reliable group communication. Distributed commit, Recovery.
8. **Security:** Introduction, Secure channels, Access control, Security management.
9. **Distributed File System:** Sun network file system, CODA files system.
10. **Case Study:** CORBA, Distributed COM, Globe, Comparison of CORBA, DCOM, and Globe.

BOOKS

Text Books:

1. A. Taunenbaum, "*Distributed Systems: Principles and Paradigms*"
2. G. Coulouris, J. Dollimore, and T. Kindberg, "*Distributed Systems: Concepts and Design*", Pearson Education

References:

1. M. Singhal, N. Shivaratri, "*Advanced Concepts in Operating Systems*", TMH

TERM WORK

9. Term work should consist of at least 10 practical experiments and two assignments covering the topics of the syllabus.

ORAL EXAMINATION

An oral examination is to be conducted based on the above syllabus.

M Sc – Information Technology Year II, Elective I, Term I

SUBJECT: INTELLIGENT SYSTEMS

Objectives: To understand and apply principles, methodologies and techniques in design and implementation of intelligent system.

Prerequisite: Data Structures, Programming Languages, and Algorithms

DETAILED SYLLABUS

1. **Artificial Intelligence:** An overview, Intelligent Systems: Evolution of the concept.
2. **Intelligent Agents:** How agent should act, Structure of intelligent agents, Environments
3. **Problem Solving:** Solving problems by searching, Informed search methods, Game playing
4. **Knowledge and Reasoning:** A knowledge based agent, The wumpus world environment, Representation, Reasoning, Logic, Proportional logic, First order logic: Syntax and Semantics, Extensions and Notational variation, Using first order logic
5. **Building a Knowledge Base:** Properties of good and bad knowledge base,

Knowledge engineering, General ontology

6. **Interfacing First Order Logic:** Interface rules involving quantifiers, An example proof, Forward and backward chaining, Completeness
7. **Acting Logically:** Planning, Practical planning: Practical planners, Hierarchical decomposition, Conditional planning
8. **Uncertain Knowledge and Reasoning:** Uncertainty, Representing knowledge in an uncertain domain, The semantics of belief networks, Inference in belief networks
9. **Learning:** Learning from observations: General model of learning agents, Inductive learning, learning decision trees, Learning in neural and belief networks: Introduction to neural networks, Perceptrons, Multilayer feed-forward network, Application of ANN, Reinforcement learning: Passive learning in a known environment, Generalization in reinforcement learning, Genetic algorithms
10. **Agents that Communicate:** Communication as action, Types of communicating agents, A formal grammar for a subset of English
11. **Expert system:** Introduction to expert system, Representing and using domain knowledge, Expert system shells, Explanation, Knowledge acquisition
12. **Applications:** Natural language processing, Perception, Robotics

BOOKS

Text Books:

1. Stuart Russell and Peter Norvig, "*Artificial Intelligence: A Modern Approach*"
2. George F.Luger, "*Artificial Intelligence: Structures and Strategies for Complex Problem Solving*", Pearson Education

References:

1. Nils J. Nilsson, "*Artificial Intelligence: A New Synthesis*", Harcourt Asia

2. Elaine Rich and Kevin Knight, “*Artificial Intelligence*”, TMH
3. Patrick Winston, “*Artificial Intelligence*”, Pearson Education
4. Ivan Brakto, “*Prolog Programming for Artificial Intelligence*”, Pearson Education
5. Efraim Turban Jay E.Aronson, “*Decision Support Systems and Intelligent Systems*”
6. Ed. M. Sasikumar and Others, “*Artificial Intelligence : Theory and Practice*”
Proceedings of the International Conference KBCS-2002, Vikas Publishing House

TERM WORK

10. Term work should consist of at least 10 practical experiments and two assignments covering the topics of the syllabus.

ORAL EXAMINATION

An oral examination is to be conducted based on the above syllabus.

SUBJECT: NEURAL NETWORKS & FUZZY SYSTEMS

Objective: This course covers basic concepts of artificial neural networks, fuzzy logic systems and their applications. Its focus will be on the introduction of basic theory, algorithm formulation and ways to apply these techniques to solve real world problems.

Pre-requisite: Knowledge of calculus, and basic probability and statistics are required. Background in the following subjects desirable: numerical analysis (including optimization). Programming skills in one of the following would be desirable: Matlab, MathCad, C, Java, C++

DETAILED SYLLABUS

1. **Introduction:** Biological neurons, McCulloch and Pitts models of neuron, Types of activation function, Network architectures, Knowledge representation. Learning process: Error-correction learning, Supervised learning, Unsupervised learning, Learning Rules.
2. **Single Layer Perceptron:** Perceptron convergence theorem, Method of steepest descent - least mean square algorithms.
3. **Multilayer Perceptron:** Derivation of the back-propagation algorithm, Learning Factors.
4. **Radial Basis and Recurrent Neural Networks:** RBF network structure, theorem and the reparability of patterns, RBF learning strategies, K-means and LMS

algorithms, comparison of RBF and MLP networks, Hopfield networks: energy function, spurious states, error performance .

5. **Simulated Annealing:** The Boltzmann machine, Boltzmann learning rule, Bidirectional Associative Memory.
6. **Fuzzy logic:** Fuzzy sets, Properties, Operations on fuzzy sets, Fuzzy relations, Operations on fuzzy relations, The extension principle, Fuzzy measures, Membership functions, Fuzzification and defuzzification methods, Fuzzy controllers.

BOOKS

Text Books:

1. Simon Haykin, "*Neural Network a - Comprehensive Foundation*", Pearson Education
2. Zurada J.M., "*Introduction to Artificial Neural Systems*, Jaico publishers
3. Thimothy J. Ross, "*Fuzzy Logic with Engineering Applications*", McGraw Hill
4. Ahmad Ibrahim, "*Introduction to Applied Fuzzy Electronics*", PHI

References:

1. Yegnanarayana B., "*Artificial Neural Networks*", PHI
2. Driankov D., Hellendoorn H. & Reinfrank M., "*An Introduction to Fuzzy Control*", Norosa Publishing House
3. Berkan R.C., and Trubatch S.L., "*Fuzzy Systems Design Principles*", IEEE Press

TERM WORK

11. Term work should consist of at least 10 practical experiments and two assignments covering the topics of the syllabus.

ORAL EXAMINATION

An oral examination is to be conducted based on the above syllabus.

SUBJECT: DIGITAL SIGNAL PROCESSING

Objective: Digital Signal Processing continues to play an increasingly important role in the fields that range literally from A (astronomy) to Z (zeugmatography, or magnetic resonance imaging) and encompass applications such as Compact Disc player, Speech Recognition, echo cancellations in communication systems, image Enhancement, geophysical exploration, and noninvasive medical imaging. This course aims to build concepts regarding the fundamental principles and applications of Signals, System Transforms and Filters.

Pre-requisites: Nil

DETAILED SYLLABUS

1. **Discrete Time Signals & System:** Discrete-time signals, Discrete-time systems, Analysis of discrete-time LTI systems, Discrete-time systems described by differential equations, Implementation of discrete-time systems, Correlation of discrete-time systems
2. **Z-Transform:** Definition and Properties of Z-transform, Rational Z-transforms, Inverse Z-transform, one-sided Z-transform, Analysis of LTI systems in Z-domain
3. **Frequency Analysis of Signals and Systems:** Frequency analysis: Continuous time signals and Discrete-time signals, Properties of the Fourier transform for discrete-time signals, Frequency domain characteristics of LTI systems, LTI system as a frequency selective filter, Inverse systems and deconvolution
4. **Discrete Fourier Transform:** Frequency domain sampling, Properties of DFT, Linear filtering method based on DFT, Frequency analysis of signals using DFT, FFT

algorithm, Applications of FFT, Goertzel algorithm, Quantisation effects in the computation of DFT

5. **Implementation of Discrete Time Systems:** Structure of FIR systems, Structure of IIR systems, quantization of filter coefficients, round-off effects in digital filters
6. **Design of Digital Filters:** Design of FIR filters, Design of IIR filters from analog filters, frequency transformations, Design of digital filters based on least-squares method digital filters from analogue filters, Properties of FIR digital filters, Design of FIR filters using windows, Comparison of IIR and FIR filters, and Linear phase filters.
7. **Introduction to DSP co-processors:** TMS 320C40/50, Analog Devices.
8. **Applications :** Image processing, Control, Speech, Audio, Telecommunication

BOOKS

Text Books:

1. J.G. Proakis, "*Introduction to Digital Signal Processing*", PHI
2. Oppenheim and Schaffer, "*Discrete Time Signal Processing*"

References:

1. S.K. Mitra, "*Digital Signal Processing*", TMH.
2. T.J. Cavicchi, "*Digital Signal Processing*", John Wiley.
3. L.C. Ludeman, "*Fundamentals Of Digital Signal Processing*", John Wiley.
4. E.C. Ifeachor, B.W. Jervis, "*Digital Signal Processing*", Pearson Education.
5. S Sallivahanan, "*Digital Signal Processing*", TMH.
6. Ashok Ambardar, "*Analog and Digital Signal Processing*", Thompson Learning.

TERM WORK

12. Term work should consist of at least 10 practical experiments and two assignments

covering the topics of the syllabus.

ORAL EXAMINATION

An oral examination is to be conducted based on the above syllabus.

M Sc – Information Technology Year II, Elective I, Term I

SUBJECT: Enterprise Networking

Introduction

Growth of Computer Networking, Complexity in Network Systems, Mastering the Complexity, Resource Sharing, Growth of the Internet, Probing the Internet, Interpreting A Ping Response

PART I DATA TRANSMISSION

Transmission Media

Copper Wires, Glass Fibers, Radio, Satellites, Geosynchronous Satellites, Low Earth Orbit Satellites, Low Earth Orbit Satellite Arrays, Microwave, Infrared, Light Form a Laser

Local Asynchronous Communication

The Need for Asynchronous Communication, Using Electric Current to Send Bits, Standards for Communication, Baud Rate, Framing, and Errors, Full Duplex Asynchronous Communication, Limitations of Real Hardware, Hardware Bandwidth and the Transmission of Bits, The Effect of Noise On Communication, Significance for Data Networking

Long-Distance Communication (Carriers, Modulation and Modems)

Sending Signals across Long Distances, Modem Hardware Used for Modulation and Demodulation, Leased Analog Data Circuits, Optical, Radio Frequency, And Dialup Modems, Carrier Frequencies and Multiplexing, Base band And Broadband Technologies

Wave Division Multiplexing, Spread Spectrum, Time Division Multiplexing

PART II PACKET TRANSMISSION

Packets, Frames and Error Detection

The Concept of Packets, Packets and Time-Division Multiplexing, Packets and Hardware

Frames, Byte Stuffing, Transmission Errors, Parity Bits and Parity Checking, Probability, Mathematics And Error Detection, Detecting Errors With Checksums, Detecting Errors With Cyclic Redundancy Checks, Combining Building Blocks, Burst Errors, Frame format And Error Detection Mechanisms

LAN Technologies and Network Topology

Direct Point-To-Point Communication, Shared Communication Channels, Significance of LANs and Locality of Reference, LAN Topologies, Bus Network: Ethernet Carrier Sense on Multi-Access Networks (CSMA), Collision Detection and Back off With CSMA/CD, Wireless LANs And CSMA/CA, Bus Network: Local Talk

Hardware Addressing and Frame Type Identification

Specifying a Recipient, How LAN Hardware Uses Addresses to Filter Packets Format of a Physical Address, Broadcasting, Multicasting, Multicast Addressing, Identifying Packet Contents, Frame Headers And Frame Format, Using Networks That Do Not Have Self-Identifying Frames, Network Analyzers

LAN Wiring, Physical Topology, and Interface Hardware

Speeds of LANs and Computers, Network Interface Hardware, the Connection between A NIC and A Network, Original Thick Ethernet Wiring, Connection Multiplexing, Thin Ethernet Wiring Twisted Pair Ethernet, the Topology Paradox, Network Interface Cards and Wiring Schemes,

Extending LANs: Fiber Modems, Repeaters, Bridges and Switches

Distance Limitation and LAN Design, Fiber Optic Extensions, Repeaters, Bridges, Frame Filtering

Startup and Steady State Behavior of Bridged Networks, Planning a Bridged Network, Bridging Between Buildings, Bridging Across Longer Distances, A Cycle Of Bridges, Distributed Spanning Tree, Switching, Combining Switches And Hubs, Bridging And Switching With Other Technologies

Long-Distance Digital Connection Technologies

Digital Telephony, Synchronous Communication, Digital Circuits and DSU, Telephone Standards

DS Terminology and Data Rates, Lower Capacity Circuits, Intermediate Capacity Digital Circuits Highest Capacity Circuits, Optical Carrier Standards, the C Suffix, Synchronous Optical Network (SONET), the Local Subscriber Loop, ISDN, Asymmetric Digital Subscriber Line Technology

Other DSL Technologies, Cable Modem Technology, Upstream Communication, Hybrid Fiber Coax

Wan Technologies and Routing

Large Networks and Wide Areas, Packet Switches, Forming A WAN, Store and Forward Physical Addressing In A WAN, Next-Hop Forwarding, Source Independence, Relationship of Hierarchical Addresses to Routing, Routing In A WAN, Use of Defaults Routes, Routing Table Computation, Shortest Path Computation in a Graph, Distributed Route Computation, Distance Vector Routing

Network Ownership, Service Paradigm, and Performance

Network Ownership, Virtual Private Networks, Service Paradigm, Connection Duration and Persistence, Examples of Service Paradigms, Addresses and Connection Identifiers, Network Performance Characteristics

Protocols and Layering

The Need for Protocols, Protocol Suites, A Plan for Protocol Design, the Seven Layers, Stacks: Layered Software, How Layered Software Works, Multiple, Nested Headers, the Scientific Basis for Layering,

TERM WORK

Term work should consist of at least 10 assignments from the aforementioned topics. A Seminar to be presented by each student as part of term works carrying 15 marks.

REFERENCE

Computer Network, Tuekeun, PHI

Networking Technology, Jaiswal, Galgotia.

Data Networking, Bertsekas, PHI

Computer Networks and Internets, Douglas E. Comer Pearson Education Asia

M Sc – Information Technology Year II, Elective II, Term I

SUBJECT: PATTERN RECOGNITION

Objective: This course teaches the fundamentals of techniques for classifying multi-dimensional data, to be utilized for problem-solving in a wide variety of applications, such as engineering system design, manufacturing, technical and medical diagnostics, image processing, economics, psychology.

Pre-requisite: Linear Algebra, Probability and Statistics

DETAILED SYLLABUS

1. **Introduction:** Machine perception, Pattern recognition systems, Design cycle, Learning and Adaptation
2. **Bayesian Decision Theory:** Bayesian decision theory: Continuous features, Minimum-error rate classification, classification, Classifiers, Discriminant functions and Decision surfaces, Normal density, Discriminant functions for normal density, Bayes Decision theory: discrete features
3. **Maximum-Likelihood and Bayesian Parameter Estimation:** Maximum likelihood estimation, Bayesian estimation, Bayesian parameter estimation: Gaussian case and General theory, Problems of dimensionality, Hidden Markov Model
4. **Nonparametric Techniques:** Density estimation, Parzen windows, k_n -Nearest-

Neighbor estimation, Nearest-Neighbor rule, Matrices and Nearest-Neighbor classification

5. **Linear Discriminants Functions:** Linear discriminant functions and decision surfaces, Generalised linear discriminant functions, 2-Category linearly separable case, Minimising the Perceptron criterion function, Relaxation procedure, Non-separable behavior, Minimum squared error procedure, Ho-Kashyap procedures, Multicategory generalizations
6. **Nonmetric Methods:** Decision tree, CART, ID3, C4.5, Gramatical methods, Gramatical interfaces
7. **Algorithm Independent Machine Learning:** Lack of inherent superiority of any classifier, Bias and Variance, Resampling for estimating statistic, Resampling for classifier design, Estimating and comparing classifiers, Combining classifiers
8. **Unsupervised Learning and Clustering:** Mixture densities and Identifiability, Maximum-Likelihood estimations, Application to normal mixtures, Unsupervised Bayesian learning, Data description and clustering criterion function for clustering, Hierarchical clustering
9. **Applications of Pattern Recognition**

BOOKS

Text Books:

1. Duda, Hart, and Stock, "*Pattern Classification*", John Wiley and Sons.
2. Gose, Johnsonbaugh and Jost, "*Pattern Recognition and Image analysis*", PHI

TERM WORK

13. Term work should consist of at least 10 practical experiments and two assignments covering the topics of the syllabus.

ORAL EXAMINATION
An oral examination is to be conducted based on the above syllabus.

An oral examination is to be conducted based on the above syllabus.

M Sc – Information Technology Year II, Elective II, Term II

SUBJECT: COMPUTER VISION

Objective: To introduce the student to computer vision algorithms, methods and concepts which will enable the student to implement computer vision systems with emphasis on applications and problem solving

Pre-requisite: Introduction to Image Processing.

DETAILED SYLLABUS

9. **Recognition Methodology:** Conditioning, Labeling, Grouping, Extracting, Matching. Edge detection, Gradient based operators, Morphological operators, Spatial operators for edge detection. Thinning, Region growing, region shrinking, Labeling of connected components.
10. **Binary Machine Vision:** Thresholding, Segmentation, Connected component labeling, Hierarchical segmentation, Spatial clustering, Split & merge, Rule-based Segmentation, Motion-based segmentation.
11. **Area Extraction:** Concepts, Data-structures, Edge, Line-Linking, Hough transform, Line fitting, Curve fitting (Least-square fitting).
12. **Region Analysis:** Region properties, External points, Spatial moments, Mixed spatial gray-level moments, Boundary analysis: Signature properties, Shape numbers.
13. **Facet Model Recognition:** Labeling lines, Understanding line drawings, Classification of shapes by labeling of edges, Recognition of shapes, Consistent

labeling problem, Back-tracking, Perspective Projective geometry, Inverse perspective Projection, Photogrammetry – from 2D to 3D, Image matching : Intensity matching of ID signals, Matching of 2D image, Hierarchical image matching.

14. **Object Models And Matching:** 2D representation, Global vs. Local features.
15. **General Frame Works For Matching:** Distance relational approach, Ordered-structural matching, View class matching, Models database organization.
16. **General Frame Works:** Distance –relational approach, Ordered –Structural matching, View class matching, Models database organization.
17. **Knowledge Based Vision:** Knowledge representation, Control-strategies, Information integration.

BOOKS

Text Books:

1. David A. Forsyth, Jean Ponce, “*Computer Vision: A Modern Approach*”
2. R. Jain, R. Kasturi, and B. G. Schunk, “*Machine Vision*”, McGraw-Hill.

References:

1. Milan Sonka, Vaclav Hlavac, Roger Boyle, “*Image Processing, Analysis, and Machine Vision*” Thomson Learning
2. Robert Haralick and Linda Shapiro, “*Computer and Robot Vision*”, Vol I, II, Addison-Wesley, 1993.

TERM WORK

14. Term work should consist of at least 10 practical experiments and two assignments covering the topics of the syllabus.

ORAL EXAMINATION

An oral examination is to be conducted based on the above syllabus.

M Sc – Information Technology Year II, Elective II, Term I

SUBJECT: SYSTEM SECURITY

Objectives of the course: Learn about the threats in computer security. Understand what puts you at a risk and how to control it. Controlling a risk is not eliminating the risk but to bring it to a tolerable level.

Pre-requisites: Computer Networks, Operating system.

DETAILED SYLLABUS

8. **Introduction:** Security, Attacks, Computer criminals, Method of defense
9. **Cryptography:** Basic Cryptography: Classical Cryptosystems, Public key Cryptography, Cryptographic checksum, Key Management: Key exchange, Key generation, Cryptographic key infrastructure, Storing and revoking keys, Hash algorithm, Digital signature, Cipher Techniques: Problems, Stream and block ciphers: AES, DES, RC4.
10. **Program Security:** Secure programs, Non-malicious program errors, Viruses and other malicious code, Targeted malicious code, Controls against program threats
11. **Operating System Security:** Protected objects and methods of protection, Memory address protection, Control of access to general objects, File protection mechanism, Authentication: Authentication basics, Password, Challenge-response, Biometrics.
12. **Database Security:** Security requirements, Reliability and integrity, Sensitive data,

Interface, Multilevel database, Proposals for multilevel security

13. **Security in Networks:** Threats in networks, Network security control, Firewalls, Intrusion detection systems, Secure e-mail, Networks and cryptography, Example protocols: PEM, SSL, IPsec
14. **Administrating Security:** Security planning, Risk analysis, Organizational security policies, Physical security.
15. **Legal, Privacy, and Ethical Issues in Computer Security:** Protecting programs and data, Information and law, Rights of employees and employers, Software failures, Computer crime, Privacy, Ethical issues in computer society, Case studies of ethics

Books

Text Books:

3. Stallings, "*Cryptography And Network Security: Principles and practice*"
4. C. P. Pfleeger, and S. L. Pfleeger, "*Security in Computing*", Pearson Education.
5. Matt Bishop, "*Computer Security: Art and Science*", Pearson Education.

References :

6. Kaufman, Perlman, Speciner, "*Network Security*"
7. Eric Maiwald, "*Network Security : A Beginner 's Guide*", TMH
8. Bruce Schneier, "*Applied Cryptography*", John Wiley.
9. Macro Pistoia, "*Java network security* ", Pearson Education
10. Whitman, Mattord, "*Principles of information security*", Thomson

TERM WORK

15. Term work should consist of at least 10 practical experiments and two assignments covering the topics of the syllabus.

ORAL EXAMINATION

An oral examination is to be conducted based on the above syllabus.

M Sc – Information Technology Year II, Elective II, Term II	
Subject: Virtual Reality and Virtual Environment	

Real time computer graphics, Flight simulation, virtual environment, Benefits of virtual reality, Evolution of Virtual Reality, Historical perspective, scientific land marks

3D Computer graphics

The virtual world space, positioning the virtual observer, the perspective projection, Human vision, Stereo perspective projection, 3D clipping, colour theory, simple 3D modelling, illumination models, shading algorithms, radiosity, hiddensurface removal, realism, stereographic images

Geometric modelling

From 2D to 3D, 3D space curves, 3D boundary representation,

Geometrical Transformations

Frames of reference, Modelling transformations, instances, picking flying, Scaling the VE, Collision detection

A generic VR Systems

The virtual Environment, The computer environment, VR Technology, Modes of Interaction, VR systems

Animating the Virtual Environment

Dynamics of numbers, the animation of objects, shape and object inbetweening, free-form deformation, particle systems

Physical Simulation

Objects falling in a gravitational field, rotating wheels, Elastic collisions, Projectiles, simple pendulums, springs, flight dynamics of an aircraft

Human factors

The eye, The ear, the somatic senses, Equilibrium

Virtual Reality Hardware

Sensor hardware, Head-coupled displays, Acoustic hardware, Integrated VR Systems

Virtual Reality Software

Modelling Virtual worlds, Physical simulation, VR tool kits

Virtual Reality Applications

Engineering, Entertainment, science, Education, training

Future

Virtual Environment, Modes of Interaction

Text Books

Virtual Reality Systems John Vince- Pearson Education Asia

M Sc – Information Technology Year II, Elective III, Term I	
Subject: Multimedia systems and convergence of technologies	

Multimedia systems and convergence of technologies

Defining the scope of multimedia, Hypertext and Collaborative research, Multimedia and personalised computing, Multimedia on the map, Emerging applications, The challenges

The convergence of computers, Communications, and entertainment products

The technology trends, Multimedia appliances, Hybrid Devices, Designers perspective, industry perspective of the future, Key challenges ahead, Technical, regulatory, Social

Architectures and issues for Distributed Multimedia systems

Distributed Multimedia systems, Synchronization, and QOS Architecture, The role of Standards, A frame work for Multimedia systems

Digital Audio Representation and processing

Uses of Audio in Computer Applications, Psychoacoustics, Digital representation of sound, transmission of digital sound, Digital Audio signal processing, Digital music making, Speech recognition and generation, digital audio and the computers

Video Technology

Raster Scanning Principles, Sensors for TV Cameras, Colour Fundamentals, Colour Video, Video performance Measurements, Analog video Artifacts, video equipments, World wide television standards

Digital Video and Image Compression

Video compression techniques, standardization of Algorithm, The JPEG Image Compression Standard, ITU-T Recommendations, The EPEG Motion Video Compression Standard, DVI Technology

Operating System Support for Continuous Media Applications

Limitation of Work station Operating system, New OS support, Experiments Using Real Time Mach

Middleware System Services Architecture

Goals of Multimedia System services, Multimedia system services Architecture, Media stream protocol

Multimedia Devices, Presentation Services, and the User Interface

Client control of continuous multimedia, Device control, Temporal coordination and composition, toolkits, hyperapplications

Multimedia File systems and Information Models

The case for multimedia information systems, The file system support for continuous Media, Data models for multimedia and Hypermedia information, Content- based Retrieval of Unstructured Data

Multimedia presentation and Authoring

Design paradigms and User interface, barriers to wide spread use, research trends

Multimedia Services over the Public Networks

Requirements, Architecture, and protocols, Net work services, applications

Multimedia Interchange

Quick time Movie File Format, QMFI, MHEG (Multimedia and Hypermedia Information Encoding Expert Group), Format Function and representation, Track model and Object model, Real Time Interchange

Multimedia conferencing

Teleconferencing Systems, Requirements of Multimedia Communications, Shared Application Architecture and embedded Distributed objects, Multimedia Conferencing Architecture

Multimedia Groupware

Computer and Video fusion approach to open shared work place, High Definition Television and desktop computing, HDTV standards, Knowledge based Multimedia systems, Anatomy of an Intelligent Multimedia system

Text Book

Multimedia Systems by John F. Koegel Buford- Pearson Education

M Sc – Information Technology Year II, Elective II, Term I	
SUBJECT: Java Technology	

Java Programming

Object oriented programming revisited, JDK, Java Virtual machine-Platform independent- portability-scalability Operators and expressions-decision making ,branching, looping, Classes, Objects and methods, Arrays Strings and Vectors, Interfaces, Packages, Multi-Threading, managing errors and exceptions, Applet programming, Managing files and streams

Java Technology for Active Web Documents

An Early Form of Continuous Update, Active Documents and Server Overhead, Active Document Representation and Translation, Java Technology, the Java Run-Time Environment, The Java Library

A Graphics Toolkit, Using Java Graphics on a Particular Computer, Java Interpreters and Browsers

Compiling a Java Program, Invoking an Applet, Example of Interaction with a Browser

RPC and Middleware

Programming Clients and Servers, Remote Procedure Call Paradigm, RPC Paradigm, Communication Stubs, External Data Representation, Middleware and Object-Oriented Middleware

Network Management (SNMP)

Managing an Internet, The Danger of Hidden Features, Network Management Software, Clients, Servers, Managers and Agents, Simple Network Management Protocol, Fetch-Store Paradigm, The MIP and Object Names, The Variety of MIB Variables, MIB variables that

correspond to arrays

Java technologies

Graphics, JFC-JAVA foundation classes, swing, images, java 2d graphics, internationalization, Communication and Networking, TCP Sockets, UDP Sockets, **java.net**, java security, Object serialization, Remote method serialization, JDBC: Java Data Base Connectivity, Java beans, Java interface to CORBA, JAVA- COM Integration, Java Media Framework, commerce and java wallet, Data structures and java utilities, JavaScript, Servlets

TERM WORK

Term work should consist of at least 06 assignments including debugged java source code for the applications from the aforementioned topics. A Seminar to be presented by each student as part of term work carrying 15 marks.

REFERENCE

Using JAVA 2, Joseph L weber, PHI

JAVA 2 complete, Sybex, BPB

Java2 The complete Reference, Patrick Naughton, T M H

Computing concepts With JAVA2, Cay Horstmann, WILEY

JSP Java Server Pages, Barry Burd, IDG Books India(p) Ltd

Java2 Programming Bible, Aaron Walsh, IDG Books India(p) Ltd

Java2, swing, servlets, JDBC & JAVA Beans Programming Black Book Steven Holzner
dreamtech press