M. Tech (CSE) – program w.e.f. August, 2007

SCHEME OF EXAMINATION
&
SYLLABI

for

Master of Technology
(Computer Science & Engineering)
Regular

Offered by
University School of Information Technology

Guru Gobind Singh Indraprastha University
Kashmere Gate, Delhi – 6 [INDIA]
www.ipu.ac.in
### Master of Technology
(Computer Science & Engineering)

**First Semester**

<table>
<thead>
<tr>
<th>Code No.</th>
<th>Paper</th>
<th>L</th>
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<tr>
<td>Theory Papers</td>
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<tr>
<td>*ITR-601</td>
<td>Algorithm Analysis &amp; Design</td>
<td>4</td>
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<tr>
<td>ITR-603</td>
<td>Software Engineering</td>
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<td>ITR-605</td>
<td>Advanced Computer Architecture</td>
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<td>*ITR-607</td>
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<tr>
<td>*ITR-609</td>
<td>Digital system Design</td>
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<tr>
<td>*ITR-611</td>
<td>Data Base Management systems</td>
<td>4</td>
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<td>ITR-613</td>
<td>Communication Systems</td>
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<tr>
<td>*ITR-615</td>
<td>Advanced Computer Graphics</td>
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<tr>
<td>*ITR-617</td>
<td>Programming Language</td>
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**NOTE:** The subject marked with (*) have been coded uniformly across M. Tech (IT) and M. Tech (CSE). Minor modifications have been done in the course contents and syllabi of these subjects.
## Master of Technology
### (Computer Science & Engineering)

### Second Semester

<table>
<thead>
<tr>
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<tr>
<td>*ITR-602</td>
<td>Object Oriented software Engineering</td>
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<tr>
<td>*ITR-614</td>
<td>Advanced Data Base Management System</td>
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<tr>
<td>*ITR-630</td>
<td>Enterprise Computing in JAVA</td>
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**Electives (Choose any Two)**

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<td>*ITR-604</td>
<td>Embedded System Design</td>
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<td>*ITR-606</td>
<td>Wireless Mobile Networks</td>
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<td>*ITR-610</td>
<td>Digital Signal Processing</td>
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<td>ITR-620</td>
<td>Neural Networks</td>
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<td>Network Programming</td>
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<td>Fuzzy Logic &amp; Design</td>
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### Practical

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**Total**  

|          |          | 20 | 8   | 24      |
## Master of Technology
(Computer Science & Engineering)

### Third Semester

<table>
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<td>ITR-701</td>
<td>Multimedia Technology</td>
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<tr>
<td>ITR-707</td>
<td>Network Management &amp; Security</td>
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**Electives (Choose any Two)**

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<tr>
<td>ITR-713</td>
<td>Software Testing</td>
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<td>*ITR-719</td>
<td>Cellular &amp; Mobile Communication</td>
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<td>*ITR-723</td>
<td>Distributed Computing</td>
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<td>ITR-727</td>
<td>Digital Image Processing</td>
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<tr>
<td>*ITR-729</td>
<td>Information Storage &amp; Management</td>
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<td>ITR-731</td>
<td>Advanced Software Project Management</td>
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<td>ITR-733</td>
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**Practical**

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**Total**

|              | 16 | 8  | 28   |
Master of Technology
(Computer Science & Engineering)

Fourth Semester

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<tr>
<td>ITR - 752</td>
<td>Dissertation</td>
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<tr>
<td>ITR – 754*</td>
<td>Seminar &amp; Progress Report</td>
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<td>ITR– 756*</td>
<td>Comprehensive Viva</td>
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*Non University Exam System

NOTE:

1. The total number of credits of the Programme M. Tech. = 104.
2. Each student shall be required to appear for examination in all courses. However, for the award of the degree a student shall be required to earn the minimum of 100 credits.
ITR-601: Algorithm Analysis and Design

Unit 1: Introduction: Role of algorithms in computing, Asymptotic notation, asymptotic analysis of recurrence relations, probabilistic analysis and randomized algorithms. Divide and conquer paradigm (Merge Sort, Inversion Counting); Dynamic Programming (Matrix Chain Multiplication, Longest Common Subsequence, Optimal Binary Search Trees); Greedy Algorithms (Activity Selection Problem, Theoretical Foundation of Greedy Algorithm, Task Scheduling Problems). Comparison of Dynamic programming and greed Algorithm with Knapsack problem as a Case Study.

Unit 2: Graphs: Review of Graphs (Representation, Depth First Search, Breadth First Search, Kruskal and Prim Algorithm, Dijkstra’s Algorithm); Flow Networks, Ford Fulkerson Method, Comparison Networks, Zero-One Principle, Bitonic Sorting Network, Merging Network, Sorting Network.

Unit 3: Matrix Operation (Properties, Strassen’s Algorithm, Solution of Linear Equations, Matrix Inversion); Polynomials and FFT (Representation of Polynomials, DFT and FFT, FFT implementation); Number Theoretic Algorithms (GCD, Modular Arithmetic, Solution of Modular Linear Equations, Chinese Remainder Theorem, RSA)


Text Books

Reference Books
Introduction:
Software Crisis, Software Processes & Characteristics, Software life cycle models, Waterfall, Prototype, Evolutionary and Spiral Models, Overview of Quality Standards like ISO 9001, SEI – CMM.

Software Requirements analysis & specifications:
Requirement engineering, requirement elicitation techniques like FAST, QFD & Use case approach, requirements analysis using DFD, Data dictionaries & ER Diagrams, Requirements documentation, Nature of SRS, Characteristics & organization of SRS.

Software Project Planning:

Software Design:
Cohesion & Coupling, Classification of Cohesiveness & Coupling, Function Oriented Design, Object Oriented Design, User Interface Design.

Software Metrics:

Software Testing:
Testing process, Design of test cases, functional testing: Boundary value analysis, Equivalence class testing, Decision table testing, Cause effect graphing, Structural testing, Path Testing, Data flow and mutation testing, Unit Testing, Integration and System Testing, Debugging, Alpha & Beta Testing, Regression Testing, Testing Tools & Standards.

Software Reliability:
Importance, Hardware Reliability & Software Reliability, Failure and Faults, Reliability Models, Basic Model, Logarithmic Poisson Model, Calendar time Component.

Software Maintenance:

Test Books:

Reference Books:
Parallel computer models:
The state of computing, Classification of parallel computers, Multiprocessors and multicomputers, Multivector and SIMD computers.

Program and network properties:
Conditions of parallelism, Data and resource Dependences, Hardware and software parallelism, Program partitioning and scheduling, Grain Size and latency, Program flow mechanisms, Control flow versus data flow, Data flow Architecture, Demand driven mechanisms, Comparisons of flow mechanisms

System Interconnect Architectures:
Network properties and routing, Static interconnection Networks, Dynamic interconnection Networks, Multiprocessor system Interconnects, Hierarchical bus systems, Crossbar switch and multiport memory, Multistage and combining network.

Advanced processors:
Advanced processor technology, Instruction-set Architectures, CISC Scalar Processors, RISC Scalar Processors, Superscalar Processors, VLIW Architectures, Vector and Symbolic processors

Pipelining:
Linear pipeline processor, nonlinear pipeline processor, Instruction pipeline Design, Mechanisms for instruction pipelining, Dynamic instruction scheduling, Branch Handling techniques, branch prediction, Arithmetic Pipeline Design, Computer arithmetic principles, Static Arithmetic pipeline, Multifunctional arithmetic pipelines

Memory Hierarchy Design:
Cache basics & cache performance, reducing miss rate and miss penalty, multilevel cache hierarchies, main memory organizations, design of memory hierarchies.

Multiprocessor architectures:
Symmetric shared memory architectures, distributed shared memory architectures, models of memory consistency, cache coherence protocols (MSI, MESI, MOESI), scalable cache coherence, overview of directory based approaches, design challenges of directory protocols, memory based directory protocols, cache based directory protocols, protocol design tradeoffs, synchronization,

Scalable point – point interfaces:
Alpha364 and HT protocols, high performance signaling layer.

Enterprise Memory subsystem Architecture:
Enterprise RAS Feature set: Machine check, hot add/remove, domain partitioning, memory mirroring/migration, patrol scrubbing, fault tolerant system.

Text Books:

**Reference Books:**

Introduction:
Introduction to Network models-ISO-OSI, SNA, Appletalk and TCP/IP models. Review of Physical layer and Data link layers, Review of LAN (IEEE 802.3, 802.5, 802.11b/a/g, FDDI) and WAN (Frame Relay, ATM, ISDN) standards.

Network layer
ARP, RARP, Internet architecture and addressing, internetworking, IPv4, overview of IPv6, ICMP, Routing Protocols- RIP, OSPF, BGP, IP over ATM.

Transport layer
Design issues, Connection management, Transmission Control Protocol (TCP), User Datagram Protocol (UDP), Finite state machine model.

Application layer
WWW, DNS, e-mail, SNMP, RMON

Network Security: Cryptography, Firewalls, Secure Socket Layer (SSL) and Virtual Private Networks (VPN).

Case study
Study of various network simulators, Network performance analysis using NS2

TEXT BOOKS:

REFERENCES:
Gajski’s ‘Y’ chart, Introduction to HDL languages, VHDL, Verilog, key differences, structural, sequential construct, concurrent construct.

VHDL Overview and concept: VHDL object classes, VHDL Design Unit, identifier, operators, Data types, behavioral, and data flow modeling, Concurrent and sequential statements

VHDL for combinational circuits: Assignment statement, selected signal statement, conditional signal assignment, Designing of basic combinational circuit: Multiplexer, Decoders, Encoders, Code converter, Comparator, Structural modeling: component declaration & instantiation, Signal and Variables, Attributes, Block statements, Generics, Generate statement, VHDL Timing: WAIT statements, simulation engine, modeling with delta time delays,

Sequential Circuits: process, if, case, Loop, Designing FF, Mealy state model, Design of FSM using VHDL, VHDL code of moore-type FSMs, synthesis of VHDL code, Specifying the state assignment in VHDL code, Specification in Mealy FSM using VHDL, Mealy-type FSM for serial adder, Moore type FSM for serial adder, State minimization, Design of Counters using sequential circuit approach, Algorithm state Machine,

Testbenches: Testbench modeling, Testbench architecture,
Register Transfer Level Design: RTL Design Method, Organization of system, specification of RTL System, Data Subsystem, Control Subsystem, Microprogrammed controller: structure and format, Microinstruction timing, study of FIR filter Design Example

Textbooks:
1. Circuit Design with VHDL by Volnei A. Pedroni, PHI, 2005

Reference Books:
3. VHDL Coding Styles and Methodology by Ben Cohen, Springer India, 2005
ITR-611  Data Base Management Systems  L  T/P  C
4  0  4

**Basic concepts:**
Database & database users, characteristics of the database, database systems, concepts and architecture, date models, schemas & instances, DBMS architecture & data independence, database languages & interfaces, data modelling using the entity-relationship approach. Overview of hierarchical, Network & Relational Data Base Management Systems.

**Relational model, languages & systems:**
Relational data model & relational algebra: relational model concepts, relational model constraints, relational algebra, SQL- a relational database language: date definition in SQL, view and queries in SQL, specifying constraints and indexes in sql, a relational database management systems.

Oracle Architecture, Logical Data Structures Physical Data Structure, Instances, Table Spaces, Types of Tablespaces, Internal Memory Structure, Background Processes, Data Types, Roles & Privileges, Stored Procedures, User Defined Functions, Cursors, Error Handling, Triggers.

**Relational data base design:**
Function dependencies & normalization for relational databases: functional dependencies, normal forms based on primary keys, (1NF, 2NF, 3NF & BCNF), lossless join and dependency preserving decomposition.

**Concurrency control & recovery techniques:**
Concurrency control techniques, locking techniques, time stamp ordering, granularity of data items, recovery techniques: recovery concepts, database backup and recovery from catastrophic failures.

Concepts of object oriented database management systems, Distributed Data Base Management Systems.

**Text Books:**

**Reference Books:**
Analog Modulation Methods:

Pulse Analog Modulation:
Sampling theorem, Sampling of Low Pass and Band pass signals, Aliening, Aperture effect, PAM, PWM and PPM generation and demodulation, TDM.

Pulse Digital Modulation:
Pulse code modulation signal to quantization noise ratio, companding, DPCM, Prediction Filter, DM and ADM modulators and demodulators, Data Modem, Data encoding methods, ASK, FSK, PSK, QAM, M-ary systems, line coding, Inter symbol Interference, Multiplexing methods: time division multiplexing (TDM), STDM, CDMA, FDM.

Introduction to Information Theory:
Discrete messages, The concept of amount of information, Entropy, Information rate, mutual information, Shannon’s source coding Theorem, Huffman code, Lempel –ziv code, channel coding and channel capacity theorem. Coding to increase average information per bit, Shannon’s theorem, Capacity of a Gaussian channel, Bandwidth – S/N tradeoff, use of orthogonal signals to attain Shannon’s limit.

Text Books:

Reference Books:
Line Drawing and transformation:
Basic raster graphical algorithm for 2D primitives, Line drawing algorithm, 2D and 3D transformation

Clipping:
Window, Viewport, Clipping algorithm,

Curves and Surfaces:
Circle drawing algorithm, Ellipse drawing algorithm, Bezier curve, b-spline curve, surfaces, Solid modelling

Projection:
Parallel projection, Perspective projection, Computation of vanishing point

Visible surface determination:
Z-buffer algorithm, Scan line algorithm, Area subdivision algorithm, Raytracing algorithm

Shading:
Illumination mode, Specular reflection model, Shading models for curve surfaces, Radiosity method, Rendering, Recursive ray tracing, Texture mapping

Advanced Modelling Techniques
Procedural Models, Fractal Models, Grammar based models, particle systems.

Animation
3D animation, morphing, simulation of key frames

Text Books:

References:
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Functional programming languages - Lambda calculus- Introduction to pure LISP. Applications of functional programming languages.

Logic programming languages- a brief introduction to predicate calculus - Horn clauses - Logic programming. Introduction to prolog. Applications of Logic programming.

**Text Books:**

**References:**
The experiments will be based on the following papers:

1. Algorithm Analysis and Design
2. Advanced Computer Networks
3. Electives
Introduction to Software Engineering:

Object Methodology & Requirement Elicitation:
Introduction to Object Oriented Methodology, Overview of Requirements Elicitation, Requirements Model-Action & Use cases, Requirements Elicitation Activities, Managing Requirements Elicitation

Architecture:
Model Architecture, Requirements Model, Analysis Model, Design Model, Implementation Model, Test Model

Modeling with UML:
Basic Building Blocks of UML, A Conceptual Model of UML, Basic Structural Modeling, UML Diagrams

System Analysis:
Analysis Model, Dynamic Modelling & Testing

System Design:
Design concepts & activities, Design models, Block design, Testing

Testing Object Oriented Systems:
Introduction, Testing Activities & Techniques, The Testing Process, Managing Testing, State Based testing and Data flow testing for Classes.

Component Based Computing Fundamentals: Definition and nature of components, components and interfaces, Interfaces as contracts, the benefits of components.

Basic Techniques: component design and assembly, Relationship with the client-server model and with patterns, Use of objects and object lifecycle services, use of object brokers

Case Studies

Text Books:
1. Ivar Jacobson “Object Oriented Software Engineering: A Use Case Driven Approach”, Addison-Wesley, 2002
2. Grady Booch “Object-Oriented Analysis and Design with Applications”, 2/E, Addison-Wesley Professional, 2005

Reference Books:
Relational Databases  
Integrity Constraints revisited, Extended ER diagram, Relational Algebra & Calculus, Functional, Multivalued and Join Dependency, Normal Forms, Rules about functional dependencies.

Query Processing and Optimization  
Valuation of Relational Operations, Transformation of Relational Expressions, Indexing and Query Optimization, Limitations of Relational Data Model, Null Values and Partial Information.

Deductive Databases  
Datalog and Recursion, Evaluation of Datalog program, Recursive queries with negation.

Objected Oriented and Object Relational Databases  
Modeling Complex Data Semantics, Specialization, Generalization, Aggregation and Association, Objects, Object Identity, Equality and Object Reference, Architecture of Object Oriented and Object Relational Databases.

Parallel and Distributed Databases  
Distributed Data Storage – Fragmentation & Replication, Location and Fragment Transparency Distributed Query Processing and Optimization, Distributed Transaction Modeling and concurrency Control, Distributed Deadlock, Commit Protocols, Design of Parallel Databases, Parallel Query Evaluation.

Advanced Transaction Processing  

Active Database and Real Time Databases  
Triggers in SQL, Event Constraint and Action: ECA Rules, Query Processing and Concurrency Control, Compensation and Databases Recovery.

Image and Multimedia Databases  
Modeling and Storage of Image and Multimedia Data, Data Structures – R-tree, k-d tree, Quad trees, Content Based Retrieval: Color Histograms, Textures, etc., Image Features, Spatial and Topological Relationships, Multimedia Data Formats, Video Data Model, Audio & Handwritten Data, Geographic Information Systems (GIS).

WEB Database  
Accessing Databases through WEB, WEB Servers, XML Databases, Commercial Systems.

Data Mining
Knowledge Representation Using Rules, Association and Classification Rules, Sequential Patterns, Algorithms for Rule Discovery

Data Warehousing
Data Warehousing Architecture, Multidimensional Data Model, Update Propagation
OLAP Queries.

Case Study: Oracle Xi

Text Books:

References:
J2EE: Introduction to J2EE, Building J2EE Applications, JDBC, Servlets and Web Applications, Java Server Pages and Model/View/Controller, J2EE Web Services Overview, Introduction to EJB, Session EJBs, Entity EJBs, JMS and message driven Beans, Transactions and Security, Application Servers (Case Study of any one of IBM Websphere, BEA Weblogic, JBoss)


Web Services: Introduction to XML, Service-Oriented Architectures SOAP, SOAP message structure, handling errors WSDL, UDDI, Java Web Service implementations JAX-RPC, Web service clients in Java, Introduction to Ajax.

Text Books:

Reference Books:
4. James Cooper, “Java Design Patterns: A Tutorial”, Addison Wesley
Introduction to Embedded Realtime Systems: Fundamental components of ESD, Preprocessing, Compiling, cross compiling, Linking, Locating, compiler driver, Linker script, Program segments, Type of memory, Memory Management in Embedded realtime systems, Interrupt and ISR

Introduction to Real-time theory: Scheduling theory, Rate Monotonic Scheduling, Utilization bound theorem, RTOS, Task Management, Task management, Race condition, Priority inversion, ISRs and scheduling, Inter-Task communication, Timers

Microcontrollers: Role of processor selection in Embedded System (microprocessor vs microcontroller), 8051 microcontroller: architecture, assembly language programming, instruction set, addressing mode, logical operation, arithmetic operation, interrupt handling, Timing subroutines

Serial data communication, RS-232, USB, I^2C, Interfacing with ADC & sensors, Interfacing with DAC, Interfacing with external ROM, Interfacing with 8255 IEEE 1149.1 (JTAG) testability: Boundary Scan Architecture

Textbook:

References:
1. Embedded System by Raj Kamal, TMH, 2004
3. Microcontrollers by Deshmukh, TMH, 2006
4. 8051 Microcontroller & Embedded systems by Rajiv Kapadia, Jaico, 2006
5. Computer as components by wayne wolf, Harcourt India Pvt. Ltd, 2002
6. Real time System and Analysis by Philip A. Laplante, Wiley, 2006
8. An Embedded Software Primer by David E. Simon, Pearson Education, 2005
9. Designing Embedded Hardware by John Catsoulis, O’reily 2005
10. Real time System & Software by Alan c. Shaw, Wiley, 2005
11. Programming Embedded System by Michael Barr, O’reilly, 2005
12. Networking and Internetworking with microcontrollers by Fred Eady, elsevier, 2005
Introduction to Personal Communication Services (PCS): PCS architecture, Mobility management, Networks signaling.

Global system for Mobile Communication (GSM) system overview: GSM Architecture, Mobility Management, Network signaling.


Mobile Data Communication: WLANs (Wireless LANs) IEEE 802.11 standard, Mobile IP.


Third Generation (3G) Mobile Services: Introduction to International Mobile Telecommunications 2000 (IMT 2000) vision, Wideband Code Division Multiple Access (W-CDMA), and CDMA 2000, Quality of services in 3G.

Wireless local Loop (WLL): Introduction to WLL architecture, WLL technologies.

Global Mobile Satellite Systems: Case studies of IRIDIUM and GLOBALSTAR systems.

Bluetooth technology and Wi-Max

**Text Books:**

**References:**
Introduction
Signals and signal Processing, characterization & classification of signals, typical Signal Processing operations, example of typical Signals, typical Signals Processing applications.

Time Domain Representation of Signals & Systems

Transforms
Z-transforms, Inverse Z-transform, properties of Z-transform, & its applications in system analysis & design. Discrete Fourier Transform (DFT) & its properties, computation of the DFT of real sequences, Linear Convolution using the DFT.

Digital Filter Structure

Digital Filter Design

Computation of Discrete Fourier Transform
Complexity of the DFT computation by direct method, Goertzel algorithm, Decimation – in-time FFT algorithms, Decimation-in frequency FFT algorithms.

Text Books:

References:
ITR-620 Neural Network

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Biological analogy, Architecture classification, Neural Models, Learning Paradigm and Rule, single unit mapping and the perception.

Feed forward networks – Review of optimization methods, back propagation, variation on Backpropagation, FFANN mapping capability, properties of FFANN’s Generalization.

PCA, SOM, LVQ, Adaptive Resonance Networks.

Hopfield Networks, Associative Memories, RBF Networks.

Applications of Artificial Neural Networks: Regression, applications to function approximation, Classification, Blind Source Separation.

Text Book:

References:

Processes and Inter-Process Communication: timers, polling vs interrupts, environment, fork, exec, wait, environment, exit and wait, pipe, fifos, message queues, semaphore

Network Programming: Sockets, Operation, Socket types, Domains Name Binding, Closing Sockets, I/O Multiplexing, Client/Server Models, Connection Based Services, Handling Out of Band Data, Connectionless Services, Design issues of Concurrent and iterative servers, Socket options

XDR and Remote Procedure Calls, Network Programming at the level of Programming Language (can use Java or Python as case study)

**Text Book:**

**References:**
1. Internetworking with TCP/IP, Volume3, Douglas Comer, Prentice Hall, 2000
2. Internetworking with TCP/IP, Volume1, Douglas Comer, Prentice Hall, 2000


Applications of Fuzzy Logic:

Text Book:

Reference Books:
Introduction
A brief history of evolutionary computation, Elements of Genetic Algorithms, A simple genetic algorithm, Applications of genetic algorithms

Genetic Algorithms in Scientific models
Evolving computer programs, data analysis & prediction, evolving neural networks, Modeling interaction between learning & evolution, modeling sexual selection, measuring evolutionary activity.

Theoretical Foundation of genetic algorithm
Schemas & Two-Armed and k-armed problem, royal roads, exact mathematical models of simple genetic algorithms, Statistical-Mechanics Approaches.

Computer Implementation of Genetic Algorithm
Data structures, Reproduction, crossover & mutation, mapping objective functions to fitness form, fitness scaling, coding, a multiparameter, mapped, fixed point coding, discretization and constraints.

Some applications of genetic algorithms
The risk of genetic algorithms, De Jong & function optimization, Improvement in basic techniques, current application of genetic algorithms

Advanced operators & techniques in genetic search
Dominance, duplicity, & abeyance, inversion & other reordering operators. Other micro operators, Niche & speciation, multiobjective optimization, knowledge based techniques, genetic algorithms & parallel processors.

Text Book:

Reference Books:
Introduction:
Introduction to intelligent agents

Problem solving:
Solving problems by searching: state space formulation, depth first and breadth first search, iterative deepening

Intelligent search methods:
A* and its memory restricted variants

Production systems:
Design implementation and limitations, case studies

Game Playing:
Minimax, alpha-beta pruning

Knowledge and reasoning:
Propositional and first order logic, semantic networks, building a knowledge base, inference in first order logic, logical reasoning systems

Planning:
STRIPS partial order planning, uncertain knowledge and reasoning, probabilistic reasoning systems, Baysian networks

Learning from observations:
Inductive learning, learning decision trees, computational learning theory, Explanation based learning

Applications:
Environmental Science, Robotics, Aerospace, Medical Science etc.

Text Book:

Reference Books:
1. "Neural Networks in Computer Intelligence" by KM Fu, McGraw Hill
2. "AI: A modern approach" by Russel and Norvig, Pearson Education
The student will submit a synopsis at the beginning of the semester for the approval to the school project committee in a specified format. The student will have to present the progress of the work through seminars and progress report. A report must be submitted to the school for evaluation purpose at the end of the semester in a specified format.
The experiments will be based on the following papers:

1. Embedded Systems Design
2. Electives like VLSI Design, Network Programming, Enterprise Computing in JAVA
Introduction:
Concept of Multimedia, Media & data stream, main properties of multimedia system,
Data stream characteristics & for continuous media Multimedia Applications, Hardware
Software requirements, Storage Technologies: RAID, Optical Media.

Components of multimedia and file formats:
Text, Basic sound concepts, MIDI, Speech, Basic concept of Images, Graphics format,
Basic concepts of Video & animation, Conventional system, Computer based animation,
Authoring Tools, Categories of Authoring Tools.

Compression Techniques
Lossless and Lossy compression, Run length coding, Statistical Coding, Transform
Coding, JPEG, MPEG, Text compression using static Huffman technique, Dynamic
Huffman Technique, Arithmetic Technique.

Animation:
Introduction, Basic Terminology techniques, tweaning & morphing, Motion Graphics 2D
& 3D animation.

Introduction to MAYA (Animating Tool):
Fundamentals, Modeling: NURBS, Polygon, Organic,
Animation: Key frame animation, reactive animation, path animation, Skeleton animation etc., deformers..
Dynamics: soft bodies, Rigid bodies and its usages in the scene etc.,
Rendering: soft, Hard rendering, IPR rendering, Line and box rendering etc.,
Special Effects: Shading & Texturing Surfaces, Lighting, Special effects.
Working with MEL: Basics & Programming

Text Book:

Reference Books:
3. Maya manuals.
Introduction

Secure Networking Threats

Encryption Techniques

Designing Secure Networks

Network Security Platform Options

IPsec VPN Design Considerations

Secure Network Management and Network Security Management

Text Books:

Reference Books:
Introduction: What is software testing and why it is so hard?, Error, Fault, Failure, Incident, Test Cases, Testing Process, Limitations of Testing, No absolute proof of correctness, Overview of Graph Theory.

Functional Testing: Boundary Value Analysis, Equivalence Class Testing, Decision Table Based Testing, Cause Effect Graphing Technique.

Structural Testing: Path testing, DD-Paths, Cyclomatic Complexity, Graph Metrics, Data Flow Testing, Mutation testing.

Reducing the number of test cases: Prioritization guidelines, Priority category, Scheme, Risk Analysis, Regression Testing, Slice based testing


Text Books:

Reference Books:
Introduction to Cellular Mobile Systems
A basic cellular system, performance criteria, uniqueness of mobile radio environment, operation of cellular systems, planning of cellular system, overview of generations of cellular systems.

Elements of Cellular Radio Systems Design and interference
General description of the problem, concept of frequency reuse channels, co-channel interference reduction factor, desired C/I from a normal case in an omni directional antenna system, cell splitting, consideration of the components of cellular systems, introduction to co-channel interference, co-channel measurement design of antenna system, antenna parameter and their effects.

Cell Coverage for Signal & antenna structures
General introduction, obtaining the mobile point to point mode, propagation over water or flat open area, foliage loss, propagation near in distance, long distance propagation, point to point prediction model-characteristics, cell site, antenna heights and signal coverage cells, mobile to mobile propagation, Characteristics of basic antenna structures, antenna at cell site, mobile antennas.

Frequency Management & Channel Assignment, Hand Off & Dropped Calls
Frequency management, fixed channel assignment, non-fixed channel assignment, traffic & channel assignment. Why hand off, types of hand off and their characteristics, dropped call rates & their evaluation.

Modulation method and coding for error detection and correction
Introduction to Digital modulation techniques, modulation methods in cellular wireless systems, OFDM. Block coding, convolution coding and Turbo coding.

Multiple access techniques: FDMA, TDMA, CDMA,
Time-division multiple access (TDMA), code division multiple access (CDMA), CDMA capacity, probability of bit error considerations, CDMA compared with TDMA

Spread spectrum Tecniques:
Direct sequence spread spectrum, Frequency Hopping Spread spectrum techniques.

TEXT BOOKS:

REFERENCES:
Fundamentals of Distributed Computing:
Architectural models for distributed and mobile computing systems. Basic concepts in distributed computing such as clocks, message ordering, consistent global states, and consensus.

Basic Algorithms in Message:

Distributed Operating Systems:
OS and network operating systems, Distributed File systems. Middleware, client/server model for computing, common layer application protocols (RPC, RMI, streams), distributed processes, network naming, distributed synchronization and distributed object-based systems.

Simulation:
A Formal Model for Simulations, Broadcast and Multicast, Distributed Shared Memory, Fault-Tolerant Simulations of Read/Write Objects Simulating Synchrony, Improving the Fault Tolerance of Algorithms, Fault-Tolerant Clock Synchronization.

Distributed Environments:
Current systems and developments (DCE, CORBA, JAVA).

Advanced Topics:

Parallel Processing:
Basic Concepts: Introduction to parallel processing, parallel processing terminology, Parallel & Distributed Programming: Parallel Programming environments

Text Books:
2. Tannenbaum, A. Distributed Operating Systems, Pearson Education. 2006

Reference Books:
2. Cameron Hughes, Tracey Hughes, “Parallel and distributed programming using C++”, Pearson Education, 2005
Introduction And Digital Image Fundamentals

Image Enhancement in the Spatial Domain
Some basic Gray Level Transformations, Histogram Processing, Enhancement Using Arithmetic and Logic operations, Basics of Spatial Filters, Smoothening and Sharpening Spatial Filters, Combining Spatial Enhancement Methods.

Image Enhancement in the Frequency Domain
Introduction to Fourier Transform and the frequency Domain, Smoothening and Sharpening Frequency Domain Filters, Homomorphic Filtering.

Image Restoration

Image Compression

Image Segmentation
Detection of Discontinuities, Edge linking and boundary detection, Thresholding, Region Oriented Segmentation, Motion based segmentation.

Representation and Description
Representation, Boundary Descriptors, Regional Descriptors, Use of Principal Components for Description, Introduction to Morphology, Some basic Morphological Algorithms.

Object Recogniton
Patterns and Pattern Classes, Decision-Theoretic Methods, Structural Methods.

Text Books:

Reference Books:
ITR – 729  Information Storage & Management  

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Complexity of Information Management: Proliferation of Data, Data Center Evolution, Managing Complexity, I/O and the five pillars of technology, Storage Infrastructure, Evolution of Storage


Introduction to Networked Storage: Storage Networking Overview, Direct Attached Storage, Storage Area Networks, Case study – Applying SAN concepts, Network Attached Storage, Case study – Applying NAS concepts, IP SAN, CAS, Hybrid Network Storage Based Solutions/ Emerging Technologies, Case study – Applying SAN, NAS, IP SAN concepts

Introduction to Information Availability: Business Continuity Overview, Data Availability, Business Continuity – Local, Case study – Applying local information availability strategies, Business Continuity – Remote, Case study – Applying remote information availability strategies, Disaster Recovery

Managing and Monitoring: Monitoring in the Data Center, Case study – Monitoring exercise, Management in the Data Center, Case study – Managing exercise

Case Studies must be supported by laboratory

Text Book:
Introduction to Software Project Management:
Software development as a project; Stakeholders in software project; Software product, process, resources, quality, and cost; Objectives, issues, and problems relating to software projects.

Overview of Project Planning:
Steps in project planning; Defining scope and objectives; work breakdown structure; Deliverables and other products; time, cost, and resource estimation; Alternatives in planning

Project Evaluation:
Strategic assessment; Technical assessment; Cost-benefit analysis; Cash flow forecasting; Cost-benefit evaluation techniques; Break-even analysis; Risk evaluation

Selection of Appropriate Project Approach:
Choosing development technology and methodology; choice of process model; Rapid application development; Waterfall model; V-process model; Spiral model; Prototyping.; Incremental delivery.

Software Effort Estimation
Problem in software estimation; Effort estimation techniques; Expert judgement; Estimation by analogy; Delphi technique; Algorithmic methods; Top-down and bottom-up estimation; Function point analysis; Object points; COCOMO model.

Activity Planning
Network planning model; Activity-on-arrow network; Precedence network; Forward pass; Backward pass; Critical path; Slack and float.

Risk Analysis and Management
Nature and categories of risk in software development; risk Identification; Risk assessment; Risk mitigation, monitoring, and management; Evaluating schedule risk using PERT.

Recourse Allocation
Nature of project resources; Identifying resource requirement of activities; Allocating and scheduling resources; cost of resources; Standard, planned, and actual cost; Cost variance; time-cost trade-off.

Project Tracking and Control
Measurement of physical and financial progress; Earned value analysis; Status reports; Milestone reports; Change control.

Contact Management
Outsourcing of products and services; Types of contracts; Stages in contract placement; Terms of contract; Contract monitoring; Acceptance testing
Managing People and Organizing Teams
Organizational behaviour; Recruitment and placement; Motivation; Group behaviour; Individual and group decision making; Leadership and leadership styles; forms of organizational structures.

Software Quality Assurance
Planning for quality; Product versus process quality management; Procedural and quantitative approaches; Defect analysis and prevention; Statistical process control; Pareto analysis; Causal analysis; Quality standards; ISO 9000; Capability Maturity Model; Quality audit.

Configuration Management
Configuration management process; Software configuration items; Version control; change control; Configuration audit; Status reporting.

Text:

Reference:
Data Warehousing:
Introduction to Data Warehousing: Evolution of Data Warehousing, Data Warehousing concepts, Benefits of Data Warehousing, Comparison of OLTP and Data Warehousing, Problems of Data Warehousing.

Data Warehousing Architecture
Architecture: Operational Data and Datastore, Load Manager, Warehouse Manager, Query Manager, Detailed Data, Lightly and Highly summarised Data, Archive/Backup Data, Meta-Data, architecture model, 2-tier, 3-tier and 4-tier data warehouse, end user Access tools.

Data Warehousing Tools and Technology
Tools and Technologies: Extraction, cleaning and Transformation tools, Data Warehouse DBMS, Data Warehouse Meta-Data, Administration and management tolls, operational vs. information systems. 
OLAP & DSS support in data warehouse.

Distributed Data Warehouse
Types of Distributed Data Warehouses, Nature of development Efforts, Distributed Data Warehouse Development, Building the Warehouse on multiple levels.

Types of Data Warehouses & Data Warehouse Design
Host based, single stage, LAN based, Multistage, stationary distributed & virtual data-warehouses. Data warehousing Design: Designing Data warehouse Database, Database Design Methodology for Data Warehouses, Data Warehousing design Using Oracle, OLAP and data mining: Online Analytical processing, Data mining.

Knowledge discovery
Knowledge discovery through statistical techniques, Knowledge discovery through neural networks, Fuzzy technology & genetic algorithms. 
Text:
Thomas Connolly, Carolyn Begg-“Database Systems-A practical approach to Design, Implementation and management” 3rd Edition Pearson Education

TEXT BOOKS:

REFERENCES:
2. Kamber and Han, “Data Mining Concepts and Techniques”, Hartcourt India P. Ltd., 2001
Neural Networks:  

Fuzzy Logic:  

Operations on Fuzzy Sets:  
Compliment, Intersections, Unions, Combinations of Operations, Aggregation Operations.

Fuzzy Arithmetic:  

Fuzzy Logic:  

Uncertainty based Information:  
Information & Uncertainty, Nonspecificity of Fuzzy & Crisp Sets, Fuzziness of Fuzzy Sets.

Introduction of Neuro-Fuzzy Systems:  
Architecture of Neuro Fuzzy Networks.

Application of Fuzzy Logic:  
Medicine, Economics etc.

Genetic Algorithm:  
An Overview, GA in problem solving, Implementation of GA.

Text:  

Reference:  
Introduction to wireless technologies: WAP services, Serial and Parallel Communication, Asynchronous and synchronous Communication, FDM, TDM, TFM, Spread spectrum technology

Introduction to Bluetooth: Specification, Core protocols, Cable replacement protocol

Bluetooth Radio: Type of Antenna, Antenna Parameters, Frequency hoping

Bluetooth Networking: Wireless networking, wireless network types, devices roles and states, adhoc network, scatternet

Connection establishment procedure, notable aspects of connection establishment, Mode of connection, Bluetooth security, Security architecture, Security level of services, Profile and usage model: Generic access profile (GAP), SDA, Serial port profile, Secondary bluetooth profile


Programming with Java: Java Programming, J2ME architecture, Javax.bluetooth package Interface, classes, exceptions, Javax.obex Package: interfaces, classes

Bluetooth services registration and search application, bluetooth client and server application.
Overview of IrDA, HomeRF, Wireless LANs, JINI

Text Books:

Reference Book:
Practical assignments will be based on electives chosen.

**ITR – 753  Minor Project**

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The student will submit a synopsis at the beginning of the semester for approval to the project committee in a specified format. The student will have to present the progress of the work through seminars and progress report. A report must be submitted to the project committee for evaluation purpose at the end of the semester in a specified format.

**ITR – 755  Seminar**

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The student will have to present the progress of the project work through seminars and progress reports at the interval of four weeks.
The student will submit a synopsis at the beginning of the semester for the approval from the project committee in a specified format. Synopsis must be submitted within two weeks. The first defense, for the dissertation work, should be held within two months time. Dissertation Report must be submitted in a specified format to the project committee for evaluation purpose at the end of semester.

ITR – 754 Seminar & Progress Report

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ITR - 756 Comprehensive Viva

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