

# KALASALINGAM UNIVERSITY

Anand Nagar, Krishnankoil - 626 190

## CURRICULUM AND SYLLBI FOR M.TECH INFORMATION TECHNOLOGY

### Semester I

Code	Subject	L	T	P	C
INT5001	Operating Systems	3	0	0	3
INT5002	Internet Programming	3	0	0	3
INT5003	High Performance Communication Networks	3	0	0	3
INT5004	Network Engineering and Management	3	0	0	3
INT5005	Modern Digital Communication Techniques	3	0	0	3
INTXXXX	Elective-I	3	0	0	3
INT5081	Operating System Laboratory	0	0	3	1
INT5082	Internet Programming Laboratory	0	0	3	1
	<b>Total</b>	<b>18</b>	<b>0</b>	<b>6</b>	<b>20</b>

### Semester II

Code	Subject	L	T	P	C
INT5006	Database Technology	3	0	0	3
INT5007	Graph Theory	3	0	0	3
INT5008	Network Security	3	0	0	3
INT5009	Distributed Computing	3	0	0	3
INT5010	Software Engineering Methodologies	3	0	0	3
INTXXXX	Elective-II	3	0	0	3
INT5083	Database Technology Laboratory	0	0	3	1
INT5084	Network Programming Laboratory	0	0	3	1
	<b>Total</b>	<b>18</b>	<b>0</b>	<b>6</b>	<b>20</b>

### Semester III

Code	Subject	L	T	P	C
INTXXXX	Elective – III	3	0	0	3
INTXXXX	Elective – IV	3	0	0	3
INTXXXX	Elective – V	3	0	0	3
INT6098	Project Work - Phase I	0	0	18	6
	<b>Total</b>	<b>9</b>	<b>0</b>	<b>18</b>	<b>15</b>

#### Semester IV

Code	Subject	L	T	P	C
INT6099	Project Work - Phase II	0	0	36	12
	<b>Total</b>	<b>0</b>	<b>0</b>	<b>36</b>	<b>12</b>

#### List of electives

Code	Subject	L	T	P	C
INT5011	Design and Analysis of Algorithms	3	0	0	3
INT5012	Cellular Mobile Communication	3	0	0	3
INT5013	Digital Image Processing	3	0	0	3
INT5014	Advanced Computer Architecture	3	0	0	3
INT5015	Optical Fiber Communication	3	0	0	3
INT5016	Wireless Communication System	3	0	0	3
INT5017	Advanced Digital Signal Processing	3	0	0	3
INT5018	Embedded Systems	3	0	0	3
INT5019	Multimedia and Virtual Reality Systems	3	0	0	3
INT5020	Evolutionary Computation Techniques	3	0	0	3
INT6001	Soft Computing	3	0	0	3
INT6002	Grid Computing	3	0	0	3
INT6003	Data Mining	3	0	0	3
INT6004	Real Time Systems	3	0	0	3
INT6005	Neural Networks and its Applications	3	0	0	3
INT6006	Advanced Operating Systems	3	0	0	3
INT6007	Advanced Database Technologies	3	0	0	3
INT6008	Satellite Communication	3	0	0	3
INT6009	Software Testing	3	0	0	3
INT6010	Knowledge Engineering	3	0	0	3

**Total Credits (from 1<sup>st</sup> semester to 4<sup>th</sup> semester = 67)**

**SEMESTER I**

<b>INT5001</b>	<b>OPERATING SYSTEMS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**PROCESSES**

Evolution of OS functions - Processes - Process Definition - Process control - Interacting processes and implementation of Interacting processes - Job scheduling Algorithms - Deadlocks.

**THREADS**

Threads – Overview – Threading issues - CPU Scheduling – Basic Concepts – Scheduling Criteria – Scheduling Algorithms – Multiple-Processor Scheduling – Real Time Scheduling - The Critical-Section Problem – Synchronization Hardware – Semaphores – Classic problems of Synchronization – Critical regions – Monitors.

**MEMORY MANAGEMENT**

Memory Allocation preliminaries - contiguous memory Allocation - Non contiguous memory Allocation - Virtual memory using paging - Virtual memory using segmentation - file systems - protection and security.

**FILE SYSTEM**

File System Structure – File System Implementation – Directory Implementation – Allocation Methods – Free space Management. Kernel I/O Subsystems - Disk Structure – Disk Scheduling – Disk Management – Swap Space Management.

**CASE STUDIES**

The Linux System, Windows, Unix, Solaris.

**TEXT BOOK**

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, Operating System Concepts, John Wiley & Sons (ASIA) Pvt. Ltd, Sixth Edition, 2003.

**REFERENCES**

1. Harvey M. Deitel, Operating Systems, Pearson Education Pvt. Ltd, Second Edition, 2002.
2. Andrew S. Tanenbaum, Modern Operating Systems, Prentice Hall of India Pvt. Ltd, 2003.
3. William Stallings, Operating System, Prentice Hall of India, 4<sup>th</sup> Edition, 2003.
4. Pramod Chandra P. Bhatt, An Introduction to Operating Systems, Concepts and Practice, PHI, 2003.

<b>INT5002</b>	<b>INTERNET PROGRAMMING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **INTERNET AND WORLD WIDE WEB**

The Internet and World Wide Web - World Wide Web Consortium (W3C) - History of the Internet - History of the World Wide Web - History of SGML -XML - Introduction to Hypertext Markup Language - Editing HTML - Common Elements - Headers - Linking - Images - Unordered Lists - Nested and Ordered Lists - HTML Tables-Basic HTML Forms.

### **DYNAMIC HTML**

Dynamic HTML Object Model and Collections - Event Model - Filters and Transitions - Data Binding with Tabular Data Control - Dynamic HTML - Structured Graphics ActiveX Controls - Dynamic HTML - Path - Sequencer and Sprite ActiveX Controls.

### **JAVASCRIPT**

JavaScript - Introduction to Scripting - Control Statements - Functions - Arrays - Objects.

### **XML**

Creating Markup with XML - Parsers and Well-formed XML Documents - Parsing an XML Document with MSXML - Document Type Definition (DTD) - Document Type Declaration - Element Type Declarations - Attribute Declarations - Document Object Model - DOM Implementations - DOM Components - path - XSL: Extensible Style sheet Language Transformations (XSLT).

### **PERL, CGI AND PHP**

Perl - String Processing and Regular Expressions - Form Processing and Business Logic - Server-Side Includes - Verifying a Username and Password - Using DBI to Connect to a Database - PHP - Form Processing and Business Logic - Connecting to a Database - Dynamic Content in PHP.

### **TEXT BOOK**

1. Deitel & Deitel, Internet & World Wide Web How to Program, Pearson Education India, Third Edition, 2004.

### **REFERNCES**

1. Negrino and Smith, JavaScript for the World Wide Web, and Peach pit press ,5th Edition, ,2003.
2. Deitel & Deitel, Perl How to Program, Pearson Education, India ,1<sup>st</sup> Edition, 2001.
3. Benoit Marchal, XML by Example, 2nd Edition, Que/Sams, 2002.
- 4.N.P.Gopalan and J.Akilandeswari, Web Technology A Developer's Perspective PHI, 2007

<b>INT5003</b>	<b>HIGH PERFORMANCE COMMUNICATION NETWORKS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **NETWORKS**

Telephone - computer - cable television and wireless networks - networking principles - and digitization - service integration, network services and layered architecture - traffic characterization and QOS - network services - network elements and network mechanisms.

### **PACKET SWITCHED NETWORKS**

OSI and IP models - Ethernet (IEEE 802.3) - token ring (IEEE 802.5) - FDDI - DQDB - frame relay - SMDS - Internet working with SMDS.

### **INTERNET AND TCP/IP NETWORKS**

Overview - Internet protocol - TCP and VDP - performance of TCP / IP networks circuit -switched networks - SONET - DWDM - Fiber to home - DSL. Intelligent networks - CATV.

### **ATM AND WIRELESS NETWORKS**

Main features - addressing, signaling and routing - ATM header structure - adaptation layer, management and control - BISDN - Interworking with ATM - Wireless channel, link level design, channel access - Network design and wireless networks.

### **OPTICAL NETWORKS AND SWITCHING**

Optical links - WDM systems cross-connects optical LANs, optical paths and networks - TDS and SDS - modular switch designs - packet switching, distributed, shared input and output buffers.

### **TEXT BOOK**

1. Jean Warland and Pravin Varaiya, High Performance Communication Networks, 2<sup>nd</sup> Edition, London, 2000.

### **REFERENCES**

1. Leon Garcia, Widjaja, Communication Networks, Tata McGraw-Hill, New Delhi, 2000.
2. Sumit Kasera, Pankaj Sethi, ATM Networks, Tata McGraw-Hill, New Delhi, 2000.
3. Behrouz Forouzan A., Data Communication and Networking, Tata McGraw-Hill, New Delhi, 2000.

<b>INT5004</b>	<b>NETWORK ENGINEERING AND MANAGEMENT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **FUNDAMENTALS OF COMPUTER NETWORK TECHNOLOGY**

Network Topology - LAN - Network node components - hubs - Bridges - Routers - Gateways - Switches - WAN - ISDN Transmission Technology - Communications protocols and standards.

### **OSI NETWORK MANAGEMENT**

OSI Network management model - Organizational model - Information model, communication model - Abstract Syntax Notation - Encoding structure - Macros Functional model CMIP/CMIS.

### **INTERNET MANAGEMENT (SNMP)**

SNMP - Organizational model-System Overview - The information model, communication model - Functional model, SNMP proxy server - Management information - protocol remote monitoring.

### **BROADBAND NETWORK MANAGEMENT**

Broadband networks and services - TM Technology - VP, VC, ATM Packet - Integrated service - ATMLAN emulation - Virtual LAN - ATM Network Management - ATM Network reference model - integrated local management Interface - TM Management Information base - Role of SNMD and ILMI in ATM Management - M1, M2, M3, M4 Interface - ATM Digital Exchange Interface Management.

### **NETWORK MANAGEMENT APPLICATIONS**

Configuration management - Fault management - performance management - Event Correlation Techniques security Management - Accounting management - Report Management - Policy Based Management Service Level Management.

### **TEXT BOOK**

1. Mani Subramanian, Network Management Principles and practice , Addison Wesley New York, 2000.

### **REFERENCES**

1. Salah Aaidarous, Thomas Plevayk, Telecommunications Network Management Technologies and Implementations, Eastern Economy Edition IEEE press, New Delhi, 1998.
2. Lakshmi G. Raman, Fundamentals of Telecommunication Network Management, Eastern Economy Edition IEEE Press, New Delhi, 1999.

<b>INT5005</b>	<b>MODERN DIGITAL COMMUNICATION TECHNIQUES</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **POWER SPECTRUM AND COMMUNICATION**

PSD of a synchronous data pulse stream - M-ary Markov source - Convolutionally coded modulation - Continuous phase modulation - Scalar and vector communication over memory less channel - Detection criteria.

### **COHERENT AND NON-COHERENT COMMUNICATION**

Coherent receivers - Optimum receivers in WGN - IQ modulation & demodulation - Non coherent receivers in random phase channels - M-FSK receivers - Rayleigh and Rician channels - Partially coherent receivers - DPSK - M-PSK - M-DPSK - BER Performance Analysis.

### **BANDLIMITED CHANNELS AND DIGITAL MODULATIONS**

Eye pattern - demodulation in the presence of ISI and AWGN - Equalization techniques - IQ modulations - QPSK - QAM - QBOM - BER Performance Analysis - Continuous phase modulation - CPM - CPFSK - MSK - OFDM.

### **BLOCK CODED DIGITAL COMMUNICATION**

Architecture and performance - Binary block codes - Orthogonal - Bi orthogonal - Trans orthogonal - Shannon's channel coding theorem - Channel capacity - Matched filter - Concepts of Spread spectrum communication - Coded BPSK and DPSK demodulators - Linear block codes - Hamming - Golay - Cyclic - BCH - Reed - Solomon codes.

### **CONVOLUTIONAL CODED DIGITAL COMMUNICATION**

Representation of codes using Polynomial - State diagram - Tree diagram - and Trellis diagram - Decoding techniques using Maximum likelihood - Viterbi algorithm, Sequential and Threshold methods - Error probability performance for BPSK and Viterbi algorithm, Turbo Coding.

### **TEXTBOOK**

1. Simon Haykin, Digital communications, John Wiley and sons, 2<sup>nd</sup> edition,2001.

### **REFERENCES**

1. Wayne Tomasi., Advanced electronic communication systems, 4<sup>th</sup> Edition Pearson Education Asia, 1998.
2. Lathi B.P., Modern digital and analog communication systems, 4<sup>th</sup> Edition, Oxford University press, 2001.
3. Simon M.K., Hinedi S.M., and Lindsey W.C., Digital communication techniques; Signalling and detection, Prentice Hall India, New Delhi, 1998.

<b>INT5081</b>	<b>OPERATING SYSTEM LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>1</b>

1. Implementation of the following CPU Scheduling Algorithms.
  - i) FCFS
  - ii) Round Robin
  - iii) Shortest Job First.
2. Implementation of Decker's Algorithm.
3. Semaphores Implementation.
4. Implementation of Best fit, First Fit Algorithm for Memory Management.
5. Implementation of Memory Allocation with Pages.
6. Implémentation of FIFO Algorithm.
7. Implementation of LRU Algorithm.
8. Implementation of Shared memory Segmentation.
9. Implementation of File Locking concept.
10. Implementation of Banker's algorithm.

<b>INT5082</b>	<b>INTERNET PROGRAMMING LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>1</b>

1. Implementation of library Management using java applet and JDBC
2. Implementation of client side details Validation using java script.
3. Implementation of screen saver animations using java script.
4. Implementation of data binding concepts in DHTML.
5. Implementation of a web page containing your personal biodata, educational qualification, skills and abilities for use by a prospective employer.
6. Implementation of On-line Quiz.
7. Display response header as well as contents during response from the server.
8. Implementation of session tracking Management in a website using Java servlet.
9. Implementation of Static Routing.
10. Implementation of Dynamic Routing Protocols (RIP, OSPF and BGP).
11. Implementation of IP Multicast.

## SEMESTER II

INT5006	DATABASE TECHNOLOGY	L	T	P	C
		3	0	0	3

### **DATABASE SYSTEM CONCEPT**

File systems - Database systems - Database systems architecture - Data models - Relational model - Hierarchical model - Network model - Entity - Relationship model - Data Dictionary - Database Administration and control.

### **RELATIONAL DATABASES**

Codd's rules - Base tables - Views - Domains and key concept - Integrity rules - Relational Algebra - Relational calculus - Commercial query languages - Embedded SQL - Normalization and database design.

### **DATABASE SYSTEM DESIGN**

File and storage structures - Indexing and Hashing - Query processing - Database recovery - Concurrency control - Transaction processing - Security and Integrity - Triggers.

### **DISTRIBUTED DATABASES**

Centralized versus distributed databases - Fragmentation - Distributed database architecture - Client / Server databases - Distributed transactions - Locking and Commit protocols - Distributed concurrency control - Security and reliability - Parallel databases.

### **WEB DATABASES**

The World Wide Web - HTML - Architecture - XML - XML / QL - Database Connectivity.

### **TEXT BOOK**

1. Ramez Elmasri, Shamkant Navathe B., Fundamentals of Database Systems, 3<sup>rd</sup> Edition, Addison Wesley, 2000.

### **REFERENCE**

1. Tamer Ozsü M., and Patric Valduriez, Principles of Distributed Database Systems, Prentice Hall International Inc, 2<sup>nd</sup> Edition 1999.

<b>INT5007</b>	<b>GRAPH THEORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **INTRODUCTION**

Introduction Of Graphs, Paths, Cycles, And Trails, Vertex Degrees And Counting - Directed Graphs - Trees and Distance: Basic Properties. Spanning Trees and Enumeration, Optimization and Trees.

### **MATCHING CONNECTIVITY AND FLOW**

Matching and Covers Algorithms and Applications. Matching in General Graphs. - Connectivity and Paths: Cuts and Connectivity, k-connected graphs - Network Flow Problems.

### **COLOURING**

Vertex Colourings and Upper Bounds - Structure of k-chromatic Graphs, Enumerative Aspects.

### **PLANAR GRAPHS, EDGES AND CYCLES**

Planar Graphs - Embeddings and Euler's Formula - Characterization of Planar graphs - Parameters of Planarity, Line Graphs and Edge-Colouring, Hamiltonian Cycles, Planarity, Colouring and Cycles.

### **RAMSEY THEORY AND RANDOM GRAPHS**

Ramsey Theory for Graphs: Ramsey's Theorems - Ramsey numbers -Induced Ramsey theorems - Ramsey Properties and Connectivity. Random Graphs: The notion of a random graph - The Probabilistic method - Properties of almost all graphs - Threshold functions and second moments.

### **TEXTBOOKS**

- 1.Narsingh Deo, Graph theory with applications to Engineering and Computer Science, PHI, 2007.
2. R J Wilson, Introduction to Graph Theory , Pearson Education, 4<sup>th</sup> Edition, 2003.

### **REFERENCES**

- 1.Jay Yellen, Jonathan L.Gross, Graph Theory and Its Applications ,CRC Press LLC, 1998.
2. Reinhard Diestel, Graph Theory,, 2<sup>nd</sup> Edition, 2000.

<b>INT5008</b>	<b>NETWORK SECURITY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **CLASSICAL ENCRYPTION TECHNIQUES**

OSI Security Architecture - Classical Encryption techniques – Cipher Principles – Data Encryption Standard – Block Cipher Design Principles and Modes of Operation - Evaluation criteria for AES – AES Cipher – Triple DES – Placement of Encryption Function – Traffic Confidentiality.

### **PUBLIC KEY ENCRYPTION**

Key Management - Diffie-Hellman key Exchange – Elliptic Curve Architecture and Cryptography - Introduction to Number Theory – Confidentiality using Symmetric Encryption – Public Key Cryptography and RSA.

### **MESSAGE AUTHENTICATION**

Authentication requirements – Authentication functions – Message Authentication Codes – Hash Functions – Security of Hash Functions and MACs – MD5 message Digest algorithm - Secure Hash Algorithm – RIPEMD – HMAC Digital Signatures – Authentication Protocols – Digital Signature Standard.

### **NETWORK SECURITY PRACTICE**

Authentication Applications: Kerberos – X.509 Authentication Service – Electronic Mail Security – PGP – S/MIME - IP Security – Web Security.

### **SYSTEM SECURITY**

Intrusion detection – password management – Viruses and related Threats – Virus Counter measures – Firewall Design Principles – Trusted Systems.

### **TEXT BOOK**

1. Stallings, Cryptography and Network Security, Principles and Practice, Prentice Hall, 3<sup>rd</sup> Edition 2002.

### **REFERENCES**

1. Bruce Schneier, Applied Cryptography, John Wiley & Sons Inc, 2001.
2. Charles B. Pfleeger, Shari Lawrence Pfleeger, Security in Computing, Third Edition, Pearson education, 2003.
3. Atul Kahate, Cryptography and Network Security, Tata McGraw-Hill, 2003.

<b>INT5009</b>	<b>DISTRIBUTED COMPUTING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **HARDWARE INFRASTRUCTURE**

Broad Band Transmission Facilities - Open Interconnection Standards - Local Area Networks - Wide Area Networks - Network Management - Network Security - Cluster Computers.

### **SOFTWARE ARCHITECTURES**

Client-Server Architectures - Challenges - Design Methodology - Intranets and Groupware - Hardware and Software for Intranet - Groupware and Features - Network as a Computer - The Internet - IP Addressing - Internet Security - Open Systems - Concepts and Reality.

### **OPERATING SYSTEM ISSUES**

Distributed Operating Systems - Transparency - Inter-Process Communication - Client-Server Model - Remote Procedure Call - Group Communications - Threads - System Models - Process Synchronization - Deadlocks - Solutions - Load Balancing - Distributed File Systems - Distributed Shared Memory Systems – Micro kernels.

### **FUNDAMENTAL DISTRIBUTED COMPUTING ASPECTS**

Theoretical Foundations - Logical Clocks - Vector Clocks - Global State - Termination - Correctness - Election Algorithms - Termination Detection - Fault Tolerance - Missing Token - Consensus Algorithms - Byzantine - Consensus - Interactive Consistency.

### **MANAGING DISTRIBUTED DATA**

Distributed Databases - Distribution Transparency - Distributed Database Design - Query Translation - Query Optimization - Concurrency Control.

### **TEXT BOOK**

1. Albert Fleishman, Distributed Systems - Software Design & Implementation, Springer-Verlag, 1994.

### **REFERENCES**

1. Mukesh Singal and Shivaratu N.G., Advanced Concepts in Operating System, McGraw-Hill, New York, 1994.
2. Gerard tel, Introduction to Distributed Algorithms, Cambridge University Press, 1994.
3. George Coulouris and Jean Dollimore, Distributed Systems - Concepts and Design, Addison - Wesley, 1988.
4. Sape Mullender, Distributed Systems, Addison - Wesley, 1993.

<b>INT5010</b>	<b>SOFTWARE ENGINEERING METHODOLOGIES</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **SOFTWARE ENGINEERING PROCESS**

Software Engineering Process paradigms - Project management - Process and Project Metrics - Software estimation - Empirical estimation models - planning - Risk analysis - Software project scheduling.

### **REQUIREMENTS ANALYSIS**

Functional and non functional – User – System - Prototyping - Specification - Analysis modeling – Data dictionary.

### **SOFTWARE DESIGN**

Software design - Abstraction - Modularity - Software Architecture - Effective modular design - Cohesion and Coupling - Architectural design and Procedural design - Data flow oriented design.

### **USER INTERFACE DESIGN AND REAL TIME SYSTEMS**

User interface design - Human factors - Human computer interaction - Human - Computer Interface design - Interface design - Interface standards - Programming languages and coding - Language classes - Code documentation - Code efficiency - Software Configuration Management.

### **SOFTWARE QUALITY AND TESTING**

Software Quality Assurance - Quality metrics - Software Reliability - Software testing - Path testing - Control Structures testing - Black Box testing - Integration - Validation and system testing - Software Maintenance - Reverse Engineering and Re-engineering. CASE tools - projects management - tools - analysis and design tools - programming tools - integration and testing tool - Case studies.

### **TEXT BOOK**

1. Roger Pressman S., Software Engineering: A Practitioner's Approach, McGraw-Hill, 5<sup>TH</sup> Edition, 2001.

### **REFERENCES**

1. Sommerville I., Software Engineering, 5<sup>th</sup> edition, Addison Wesley, 1996.
2. Pfleeger, Software Engineering, 3<sup>rd</sup> Edition Prentice Hall, 1999.
3. Carlo Ghezzi, Mehdi Jazayari, Dino Mandrioli, Fundamentals of Software Engineering, 3<sup>rd</sup> edition Prentice Hall of India 1991.

<b>INT5083</b>	<b>DATABASE TECHNOLOGY LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>1</b>

### **MS-ACCESS**

1. Tables and Queries implementation.
2. Forms and Reports implementation.

### **SQL**

3. Implementation of DDL commands in RDBMS.
4. Implementation of DML and DCL commands in RDBMS.
5. Implementation of Date and Built in Functions of SQL.

### **PL/SQL**

6. Implementation of Simple Programs.
7. Implementation of High-level language extension with Cursors.
8. Implementation of High level language extension with Triggers
9. Implementation of stored Procedures and Functions.
10. Implementation of Embedded SQL Programs.
11. Database design using E-R model and Normalization.
12. ADO implementation.
13. ODBC implementation.
14. JDBC implementation.

<b>INT5084</b>	<b>NETWORK PROGRAMMING LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>1</b>

1. File transfer implementation using TCP.
2. File transfer implementation using UDP.
3. Implementation of packets capturing through the network interface
4. Implementation of Data Link layer functions.
5. Implementation of Selective repeat algorithm
6. Implementation of Go-Back-N protocol
7. Implementation of IP fragmentation and Reassembly
8. Implementation of SSL client/Server architecture
9. Implementation of simple multicast client/server
10. Implementation of TCP in client/server architecture
11. Study of NS2 with implementation of Simple Programs.
12. Study of Glomosim with implementation of Simple Programs.

<b>ELECTIVES</b>
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<b>INT5011</b>	<b>DESIGN AND ANALYSIS OF ALGORITHMS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**ALGORITHM**

Fundamentals of algorithmic problem solving - Important problem types - Fundamentals of the analysis of algorithm efficiency - analysis frame work - Asymptotic notations - Mathematical analysis for recursive and non-recursive algorithms.

**DIVIDE AND CONQUER METHOD AND GREEDY METHOD**

Divide and conquer methodology - Merge sort - Quick sort - Binary search - Binary tree traversal - Multiplication of large integers - Strassen's matrix multiplication - Greedy method - Prim's algorithm - Kruskal's algorithm - Dijkstra's algorithm.

**DYNAMIC PROGRAMMING**

Computing a binomial coefficient - Warshall's and Floyd' algorithm - Optimal binary search tree - Knapsack problem - Memory functions.

**BACKTRACKING AND BRANCH AND BOUND**

Backtracking - N-Queens problem - Hamiltonian circuit problem - Subset sum problem - Branch and bound - Assignment problem - Knapsack problem - Traveling salesman problem.

**NP-HARD AND NP-COMPLETE PROBLEMS**

P & NP problems - NP-complete problems - Approximation algorithms for NP-hard problems - Traveling salesman problem - Knapsack problem.

**TEXT BOOK**

1. Anany Levitin, Introduction to the Design and Analysis of Algorithms, Pearson Education (Singapore), Indian branch, New Delhi, 2003.

**REFERENCE**

1. Thomas H.Cormen, Charles E.Leiserson, Ronald L.Rivest, Introduction to Algorithms Prentice Hall, MIT Press 1990.

<b>INT5012</b>	<b>CELLULAR MOBILE COMMUNICATION</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **CELLULAR CONCEPT**

Frequency reuse - Channel Assignment Strategies - Hand off Strategies - Interference and System Capacity - Trunking and Grade of Service - Improving coverage and capacity in cellular systems.

### **RADIO PROPAGATION**

Free Space Propagation Model - Propagation Mechanisms - Reflection - Diffraction and scattering - Models for Path loss - Small scale Multipath Propagation - Parameters of Mobile Multipath Channels - small scale fading types.

### **MULTIPLE ACCESS TECHNIQUES**

FDMA - TDMA - CDMA - Spread Spectrum Multiple Access - Multiplexing and OFDM - Packet Radio Protocols - Capture Effect - Capacity of cellular systems.

### **EQUALIZATION, DIVERSITY AND CODING**

Linear and Nonlinear Equalization - Adaptive Equalization - Diversity techniques - RAKE Receiver - Fundamentals of Channel Coding - Block codes and finite fields - convolutional codes - coding gain - Trellis coded Modulation - Turbo Codes.

### **WIRELESS STANDARDS**

GSM - IS-95 -UMTS - IMT-2000 - Signaling - Call Control - Mobility Management and location tracing.

### **TEXT BOOK**

1. Rappaport T.S., Wireless Communications Principles and Practice, Pearson Education, 2<sup>nd</sup> Edition, 2003.

### **REFERENCES**

1. Blake R., Wireless Communication Technology, Thomson Delmar, 2<sup>nd</sup> Edition, 2003.  
 2. Lee W.C.Y., Mobile Communications Engineering: Theory and applications, McGraw-Hill International, 2nd Edition, 1998.

<b>INT5013</b>	<b>DIGITAL IMAGE PROCESSING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **CONTINUOUS AND DISCRETE IMAGES AND SYSTEMS**

Light - Luminance - Brightness and Contrast - Eye - The Monochrome Vision Model, Image Processing Problems and Applications - Vision Camera - Digital Processing System - 2-D Sampling Theory - Aliasing - Image Quantization, Lloyd Max Quantizer - Dither - Color Images - Linear Systems and Shift Invariance - Fourier Transform - Z - Transform - Matrix Theory Results - Block Matrices and Kronecker Products.

### **IMAGE TRANSFORMS**

2-D orthogonal and Unitary transforms - 1-D and 2-D DFT - Cosine - Sine - Walsh - Hadamard - Haar - Slant - Karhunen-loeve - Singular value Decomposition transforms.

### **IMAGE ENHANCEMENT**

Point operations - Contrast stretching, clipping and thresholding density slicing - Histogram equalization - Modification and specification - Spatial operations - Spatial averaging - Low pass - High pass - Band pass filtering - Direction smoothing - Medium filtering - Generalized cepstrum and homomorphic filtering - Edge enhancement using 2-D IIR and FIR filters - Color image enhancement.

### **IMAGE RESTORATION**

Image observation models - Sources of degradation - Inverse and Wiener filtering - geometric mean filter - Non linear filters - Smoothing splines and interpolation - Constrained least squares restoration.

### **IMAGE DATA COMPRESSION AND RECONSTRUCTION**

Image data rates - Pixel coding, predictive techniques transform coding and vector DPCM - Block truncation coding - Wavelet transform coding of images - Color image coding - Random transform - Back projection operator - Inverse random transform - Back projection algorithm - Fan beam and algebraic restoration techniques.

### **TEXT BOOK**

1. Gonzalaz R. and Wintz P, Digital Image Processing, Addison Wesley, 3<sup>rd</sup> Edition 2008.

### **REFERENCES**

1. Anil K. Jain, Fundamentals of Digital Image Processing, PHI, 1995.
2. Sid Ahmed M.A., Image Processing, McGraw Hill Inc, 3<sup>rd</sup> Edition 2000.
3. William. K. Pratt, Digital Image Processing, Wiley Interscience, 2<sup>nd</sup> Edition, 1991.

<b>INT5014</b>	<b>ADVANCED COMPUTER ARCHITECTURE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **FUNDAMENTALS OF COMPUTER DESIGN**

The changing face of computing and the task of the computer designer - Technology Trends - Cost - Price and their trends - Measuring and Reporting performance - Quantitative Principles of computer design - Performance and Price Instruction set Principles: Introduction - Classifying Instruction set Architectures - Memory Addressing - Addressing Modes for signal processing - Type and size of operands -Operands for media and signal processing - Operations - Control flow - Encoding .

### **PIPELINING**

The Major Hurdle of pipelining - pipeline Hazards - Implementation - Extending the MIPS pipeline to handle multicycle operations Instruction - Level parallelism - concepts and challenges - overcoming data Hazards with Dynamic scheduling - Dynamic scheduling - Examples and the Algorithm.

### **EXPLOITING INSTRUCTION**

Level Parallelism with Software Approaches: Basic compiler Techniques for Exposing ILP - Static Branch Prediction - Static Multiple issue: The VLIW approach - advanced compiler support for Exposing and Exploiting ILP - Hardware support for exposing more parallelism at compile Time - crosscutting issues - Hardware versus software speculation mechanisms.

### **MULTIPROCESSORS AND THREAD**

Level Parallelism- Introduction - Characteristics of Application domains - symmetric shared - memory architectures - performance of symmetric shared - memory multiprocessors Distributed shared - memory architectures - performance of distributed shared - memory multiprocessors - synchronization - models of memory consistency - Introduction - Multithreading: Exploiting Thread - Level parallelism within a processor.

### **MEMORY HIERARCHY DESIGN**

Introduction - Review of the ABCs of the caches - Cache Performance - Reducing Cache Miss Penalty - Reducing Miss Rate - Reducing Cache Miss Penalty or Miss Rate via Parallelism - Reducing Hit Time - Main Memory and Organizations for Improving Performance - Memory Technology - Virtual Memory - Protection and Examples of Virtual Memory.

### **TEXT BOOK**

1. John L. Hennessy and David Patterson, Computer Architecture, A Quantitative Approach, Elsevier, 3<sup>rd</sup> Edition 2003.

### **REFERENCE**

1. William Stallings, Computer Organization Architecture, Prentice Hall, 5<sup>th</sup> Edition 2000.

<b>INT5015</b>	<b>OPTICAL FIBER COMMUNICATION</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **OPTICAL FIBERS**

Geometrical description - wave propagation - Dispersion in single mode (SM) and multimode (MM) fibers - Limitations due to dispersion - Fiber Losses - Non liner optical effects.

### **OPTICAL AMPLIFIERS**

Concepts - Semiconductor optical Amplifier - Raman and Brillouin amplifier - Fiber amplifiers - Erbium doped amplifiers - System applications.

### **DISPERSION MANAGEMENT**

Need-Precompensation schemes - Post compensation techniques - Dispersion compensating fibers - Optical filters - Fiber Bragg gratings - Optical Phase Conjugation - Long Haul light wave systems - High capacity systems.

### **MULTICHANNEL SYSTEMS**

WDM light wave systems - WDM components - System performance issues - Time Division Multiplexing (TDM) - Sub carrier multiplexing - Code Division Multiplexing - DWDM.

### **COHERENT LIGHTWAVE SYSTEMS**

Concepts - Modulation formats - Demodulation formats - Bit Error Rate (BER) - Sensitivity degradation - System performance.

### **TEXT BOOKS**

1. G.P. Agrawal, Fiber optic communication systems, John Wiley & Sons, New York, 3<sup>rd</sup> Edition, 2002.
2. G. Keiser, Optical fiber communication systems, McGraw-Hill, New York, 3<sup>rd</sup> Edition, 2000.

### **REFERENCES**

- 1.H. Franz & V.K. Jain, Optical communication, Components and Systems, Narosa Publications New Delhi, 2<sup>nd</sup> Edition, 2002.
- 2.Selvarajan, S. Kar and T. Srinivas, Optical fiber Communication - Principle and Systems, Tata McGraw-Hill, 2<sup>nd</sup> Edition, 2002.

<b>INT5016</b>	<b>WIRELESS COMMUNICATION SYSTEM</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **WIRELESS STANDARDS**

3G - Proposals for 3G Standard - 3GPP2 - 3GPP2 - 3G Evolution Paths - CDMA Principles - Radio - Channel Access Schemes - Spread Spectrum - RAKE Receiver - Power Control - Handovers - Multi-user Detection - TDD - Modulation Techniques and Spread Spectrum – Spreading Techniques – Data Modulation.

### **CODING TECHNIQUES**

Spreading Codes - Orthogonal Codes - Pseudo - Noise Codes - Synchronization Codes - autocorrelation and Cross-Correlation - Intercell Interference - Channel Coding - Coding Processes - Coding Theory - Block Codes - Convolutional Codes - Turbo Codes - Channel Coding in UTRAN.

### **WIRELESS NETWORKS**

Network - General Discussion - Evolution from GSM - UMTS Network Structure - Core Network - UMTS Radio Access Network - GSM Radio Access Network. Interfaces - Network Protocols - UMTS Network Evolution - Network Planning - Network Planning Terminology - Network Planning Process - Admission Control - Congestion Control - Network Management - Telecommunication Management Architecture.

### **DATA TRANSMISSION**

Procedures - RRC Connection Procedures - Radio Bearer Procedures. Data Transmission - Handovers - Random Access Procedure - New Concepts in the UMTS Network - Locations Services - High-Speed Downlink Packet Access - Multimedia Broadcast/Multicast Service - Multimedia Messaging Service - Super - Charger. Prepaging - Gateway Location Register - Optimal Routing - Adaptive Multirate Codec - Support of Localized Service Area - Smart Antennas.

### **SERVICES**

3G Services - Service Categories - Teleservices - Bearer Services Supplementary Services - Services Capabilities - Quality of Service - 3G Applications - Application Technologies - Multimedia - Traffic Characteristics of 3G Applications - M-Commerce. Examples of 3G Applications - Terminals - The Future - New Spectrum. Satellites - 3G Upgrades - Downlink Bottleneck. 4G Vision.

### **TEXT BOOK**

1. Juha Korhonen, Introduction to 3G Mobile Communications, Artech House, 2<sup>nd</sup> Edition 2003.

### **REFERENCES**

1. Roman Kitka, Richard Levine, Lawrence J. Harte, 3G Wireless Demystified Tata McGraw Hill, India, 4<sup>th</sup> Edition, 2001.
2. Daniel Collins, Clint Smith, 3G Wireless Networks, Tata McGraw Hill, India, 3<sup>rd</sup> Edition, 2001.

<b>INT5017</b>	<b>ADVANCED DIGITAL SIGNAL PROCESSING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **DISCRETE RANDOM SIGNAL PROCESSING**

Discrete Random Processes - Ensemble averages - stationary processes - Autocorrelation and Auto covariance matrices - Parseval's Theorem - Wiener–Khinchine Relation - Power Spectral Density - Periodogram Spectral Factorization - Filtering random processes. Low Pass Filtering of White Noise - Parameter estimation - Bias and consistency.

### **SPECTRUM ESTIMATION**

Estimation of spectra from finite duration signals, Non–Parametric Methods - Correlation Method - Periodogram Estimator - Performance Analysis of Estimators - Unbiased - Consistent Estimators - Modified periodogram - Bartlett and Welch methods - Blackman - Tukey method - Parametric Methods - AR, MA, and ARMA model based spectral estimation - Parameter Estimation - Yule - Walker equations - solutions using Durbin's algorithm.

### **LINEAR ESTIMATION AND PREDICTION**

Linear prediction - Forward and backward predictions, Solutions of the Normal equations - Levinson - Durbin algorithms - Least mean squared error criterion - Wiener filter for filtering and prediction - FIR Wiener filter and Wiener IIR filters - Discrete Kalman filter.

### **ADAPTIVE FILTERS**

FIR adaptive filters - adaptive filter based on steepest descent method - Widrow-Hoff LMS adaptive algorithm - Normalized LMS - Adaptive channel equalization - Adaptive echo cancellation - Adaptive noise cancellation - Adaptive recursive filters (IIR) - RLS adaptive filters - Exponentially weighted RLS - Sliding window RLS.

### **MULTIRATE DIGITAL SIGNAL PROCESSING**

Mathematical description of change of sampling rate - Interpolation and Decimation - Decimation by an integer factor - Interpolation by an integer factor - Sampling rate conversion by a rational factor - Filter implementation for sampling rate conversion - direct form FIR structures - Polyphase filter structures - Time–variant structures - Multistage implementation of multirate system - Application to sub band coding - Wavelet transform and filter bank implementation of wavelet expansion of signals.

### **TEXT BOOK**

1. John G. Proakis, Dimitris G. Manolakis, Digital Signal Processing Pearson Education, 2<sup>nd</sup> Edition, 2002.

### **REFERENCES**

1. Dimitris G. Manolakis et al. Statistical and adaptive signal processing, McGraw Hill, Newyork, 2<sup>nd</sup> Edition, 2000.
2. Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing, Pearson Education, Inc., 2<sup>nd</sup> Edition, 2004.

<b>INT5018</b>	<b>EMBEDDED SYSTEMS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **EMBEDDED ARCHITECTURE**

Embedded Computers - Characteristics of Embedded Computing Applications - Challenges in Embedded Computing system design - Embedded system design process - Requirements - Specification - Architectural Design - Designing Hardware and Software Components - System Integration - Formalism for System Design - Structural Description - Behavioral Description - Design Example - Model Train Controller.

### **EMBEDDED PROCESSOR AND COMPUTING PLATFORM**

ARM processor - processor and memory organization - Data operations - Flow of Control - SHARC processor - Memory organization - Data operations - Flow of Control - parallelism with instructions - CPU Bus configuration - ARM Bus - SHARC Bus - Memory devices - Input/output devices - Component interfacing - designing with microprocessor development and debugging - Design Example - Alarm Clock.

### **NETWORKS**

Distributed Embedded Architecture - Hardware and Software Architectures - Networks for embedded systems - I2C - CAN Bus - SHARC link ports - Ethernet - Myrinet - Internet - Network-Based design-Communication Analysis - system performance Analysis - Hardware platform design - Allocation and scheduling - Design Example - Elevator Controller.

### **REALTIME CHARACTERISTICS**

Clock driven Approach - weighted round robin Approach - Priority driven Approach - Dynamic Versus Static systems - effective release times and deadlines - Optimality of the Earliest deadline first (EDF) algorithm - challenges in validating timing constraints in priority driven systems - Off-line Versus On-line scheduling.

### **SYSTEM DESIGN TECHNIQUES**

Design Methodologies - Requirement Analysis - Specification - System Analysis and Architecture Design - Quality Assurance - Design Example - Telephone PBX- System Architecture - Ink jet printer - Hardware Design and Software Design - Personal Digital Assistants - Set-top Boxes.

### **TEXT BOOKS**

- 1.Frank Vahid and Tony Givargi, Embedded System Design: A Unified Hardware/Software Introduction, s, John Wiley & Sons, 2000
- 2.Wayne Wolf, Computers as Components: Principles of Embedded Computing System Design, Morgan Kaufman Publishers, 2<sup>nd</sup> Edition, 2001.

### **REFERENCES**

- 1.Jane.W.S. Liu Real-Time systems, Pearson Education Asia, 4<sup>th</sup> Edition, 2000.
- 2.C. M. Krishna and K. G. Shin, Real-Time Systems, Tata McGraw-Hill, 3<sup>rd</sup> Edition 1997.

<b>INT5019</b>	<b>MULTIMEDIA AND VIRTUAL REALITY SYSTEMS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **MULTIMEDIA**

Architecture and issues for distributed multimedia systems – Digital audio representation and processing – Video Technology – Digital video and image compression – Time based media representation and delivery.

### **MULTIMEDIA DEVICES**

Multimedia Services over public networks – Requirements – Architecture – Protocols – Multimedia interchange – Multimedia Conferencing – Multimedia groupware – Computer and video fusion approach to open shared workspaces.

### **MULTIMEDIA SERVICES**

Operating System support for continuous media applications – Middleware system services architecture – Multimedia devices – Presentation devices and user interface – Multimedia File Systems – Information Models - Multimedia presentation and authoring.

### **VIRTUAL REALITY SYSTEMS**

Virtual environment system: An introduction – terminology – classification – system architecture – synthesis – Physiology & perception in virtual environments – Enabling technology: Visual, Auditory, Haptic/Kinaesthetic environment systems.

### **SOFTWARES**

Desktop virtual reality, VPL RB2 system, virtual environmental operating shell, Minimal Reality, World Tool Kit, Multigen, Generic Visual system – Software considerations - Virtual environment displays – position and orientation tracking – visually coupled system requirements – interaction with virtual objects – applications of virtual environments.

### **TEXT BOOKS**

1. Antonio S. Camara, Multimedia and Virtual Reality, Addison Wesley, 2<sup>nd</sup> Edition 2004.
2. John F. Koegel Bufford, Multimedia Systems, Addison Wesley, 1994.

### **REFERENCE**

1. Roy S. Kalawsky, The science of Virtual Reality and Virtual Environments, Addison Wesley 1993.

<b>INT5020</b>	<b>EVOLUTIONARY COMPUTATION TECHNIQUES</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **INTRODUCTION**

History of Evolutionary computation – Genetic algorithm-Evolutionary strategy- Evolutionary programming- Derivative methods-Stochastic processes- Modes of stochastic convergence- Schema processing-Transform methods-Fitness land scale- Probably approximately correct(PAC)- Learning Analysis- Limitation of Evolutionary computation methods- Local performance measures.

### **GENETIC ALGORITHM**

Robustness of Traditional optimization and search techniques - The goals of optimization - Genetic Algorithm - An Overview of GA – Genetic operators - GA in problem solving - Implementation - Applications.

### **EVOLUTIONARY PROGRAMMING**

Introduction- Representation- Reproductive Operators- Objective- Population sizes and dynamics- Convergence and stopping criteria.

### **EVOLUTIONARY STRATEGIES**

Introduction- ES and Real Valued Parameter optimization problem- Self Adaptation- Exploiting Parallelism- Dynamic Landscape.

### **HYBRID METHODS**

Hybridization of Genetic Algorithm (GA) with Artificial Neural Networks (ANN) , Fuzzy Logic (FL) and other Optimization methods like Particle Swarm Optimization (PSO) and Ant Colony Optimization(ACO)- Case Studies and Application.

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### **TEXT BOOKS**

1. J.S.R. Jang, C.T. Sun and E. Mizutani, Neuro Fuzzy and soft computing, PHI, 1997.
2. Timothy J.Ross. Fuzzy Logic with Engineering Applications, McGraw- Hill, 2000

### **REFERENCE BOOKS**

1. Kosko. B, Neural Networks and Fuzzy Systems, Prentice-Hall of India Pvt. Ltd., 1994.
2. Fogel, Evolutionary Computation, Prentice Hall India Publications, 2001.

<b>INT6001</b>	<b>SOFT COMPUTING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **AIM OF SOFT COMPUTING**

Foundations of Fuzzy Sets Theory - Basic Concepts and properties of Fuzzy Sets - Elements of Fuzzy Mathematics - Fuzzy relations - Fuzzy logic.

### **APPLICATION OF FUZZY SETS**

Application of Fuzzy sets - Fuzzy Modeling - Fuzzy decision making - Pattern analysis and classification - Fuzzy control systems - Fuzzy information processing - Fuzzy robotics.

### **ARTIFICIAL NEURAL NETWORKS**

Artificial neural networks - Models of neuron - Feed forward neural networks - Recurrent neural networks - Time delay neural networks - Radial basis function neural networks - cerebellar model articulation controller - Adaptive Resonance Theory (ART) NN - Associative neural memory models - supervised learning of neural networks - Unsupervised Learning - Reinforcement Learning - Application of ANN - Probabilistic Reasoning.

### **GENETIC ALGORITHM**

Genetic Algorithm Main operators - Genetic Algorithm based Optimization - Genetic Algorithm with Group principle - Group Genetic Algorithm with Directed Mutation - comparison of Conventional and Genetic search algorithms - applications - Elements of Chaos system - Basic concepts - Identification of Chaotic movement system - Bifurcation and handling of development of Chaos - Empirical Chaos.

### **NEURO-FUZZY TECHNOLOGY**

Fuzzy neural networks and their learning - architecture of neuro - Fuzzy systems - Generation of Fuzzy rules and membership functions - Fuzzification and Defuzzification in Neuro - Fuzzy systems - Neuro - Fuzzy identification - Neuro Fuzzy control - Neuro Fuzzy Navigation system for Intelligent Robot - Combination of Genetic algorithm with Neural networks - Combination of Genetic algorithms and Fuzzy logic - Neuro - Fuzzy - Genetic approach.

### **TEXT BOOK**

1. Aliev R.A, Aliev R.R., Soft Computing and its Application, World Scientific Publishing Co. Pvt. Ltd., 2001.

### **REFERENCES**

1. Cordón, O, Herrera, F, Hoffman F, Magdalena L., Genetic Fuzzy systems, World Scientific Publishing Co. Pvt. Ltd., 3<sup>rd</sup> Edition 2001.
2. Kecman, V, Learning and Soft Computing, The MIT Press, 2001.

3. Mehrotra, K, Mohan C, K, Ranka, S, Elements of Artificial Neural Networks, the MIT Press, 1997.

<b>INT6002</b>	<b>GRID COMPUTING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COMPUTING TECHNOLOGY**

Cluster Computing – Peer to Peer computing – Grid Computing – Grid Protocols- Types of Grids – Desktop Grids – Types of Grids.

### **INITIATIVES & SERVICES**

Grid Computing Organizations and their roles - Grid Computing analog - Grid Computing road map – Creating and managing Grid Services – Service discovery – operational requirements – tools .

### **GRID MANAGEMENT**

Managing Grid Environments – Managing grids – Management reporting – Monitoring – Data catalogs and replica management – portals – Grid enabling network services.

### **APPLICATIONS & TECHNOLOGIES**

Merging the Grid sources- Architecture with the Web Devices Architecture- OGSA- Sample use cases- OGSA platform components - OGSi - OGSA Basic Services.

### **GRID COMPUTING TOOL KITS**

Globus Toolkit - Architecture - Programming model - High level services - OGSi - Net middleware Solutions.

### **TEXT BOOK**

1. Joshy Joseph and Craig Fellenstein, Grid Computing, PHI, 2<sup>nd</sup> Edition 2003

### **REFERENCES**

- 1.Ahmar Abbas, Grid Computing: A Practical Guide to technology and Applications, Charles River media , 2003.
- 2.Daniel Minoli, A Networking Approach to Grid Computing, Wiley–Inter science, 2004.
- 3.Mark Baker and Rajkumar Buyya, Cluster Computing at a Glance, High Performance Cluster Computing: Architectures and Systems, Prentice Hall, NJ, USA, 1999.

<b>INT6003</b>	<b>DATA MINING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **DATA MINING**

Data mining – data types - Data mining functionalities - patterns- Classification of data mining systems - Major issues in data mining - Data warehouse and OLAP technology for data mining - Introduction to data warehousing - A multidimensional data model - Data warehouse architecture - Data warehouse implementation - Further development of data cube technology - From data warehousing to data mining.

### **DATA PREPROCESSING, DATA MINING PRIMITIVES, LANGUAGES AND SYSTEM ARCHITECTURE**

Data cleaning - Data integration and transformation - Data reduction - Discretization and concepts hierarchy generation - Data mining primitives - A data mining query language - Designing graphical user interface based on a data mining query language - architectures of data mining systems - Concept description.

### **MINING ASSOCIATION RULES, CLASSIFICATION AND PREDICTION**

Association rule mining - Mining single dimensional Boolean association rules - Mining multilevel association rules - Association mining to correlation analysis - Constraint based association mining - Introduction to classification and prediction - Issues regarding classification and prediction - Classification by decision tree induction - Bayesian classification - Bayesian classification - Classification by back propagation - classification based on concepts from association rule mining - Other classification methods - Prediction - Classifier accuracy.

### **CLUSTER ANALYSIS**

Clustering methods - Partitioning - hierarchical - density - grid - and model based methods - Outlier analysis - Mining complex types of data objects - Mining spatial - multimedia databases - Mining time-series and sequence data-mining text - www databases.

### **APPLICATION AND TRENDS IN DATA MINING**

Data mining applications - Data mining system products and research prototypes - Additional themes on data mining - social impacts of data mining - Trends in data mining - DB miner.

### **TEXT BOOK**

1.Han J and Kamber M, Data Mining: Concepts and Techniques, 2<sup>nd</sup> Edition,2000.

### **REFERENCES**

- 1.Jarke M, Lenzerini M, Vassiliou Y, Vassiliadis P,Fundamentals of Data Warehouses, SpringerVerlag, 3<sup>rd</sup> Edition, 1999.
- 2.Hand D, Mannila H and Smyth P, Principles of Data Mining, 2<sup>nd</sup> Edition, MIT Press, 2001.

<b>INT6004</b>	<b>REAL TIME SYSTEMS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **TYPES & ISSUES**

Real time Definitions - Types - Examples - Structure of an RTS - Task classes Real - time system issues - Architecture issues - OS issues - other issues - Performance measure for real - time systems.

### **REAL TIME LANGUAGES**

Programming languages and tools - Language features - survey of commonly used programming languages - programming environments - run - time support Real - Time Systems life cycle - Real - time Specification and Design Techniques Natural languages - mathematical specification - Flow charts - structure charts - Pseudo code and PDL - FSA - DFD - Petri Nets - Warnier - Orr notation - state charts.

### **SCHEDULING ALGORITHMS**

Real - Time OS Task - control block model - Task states - Task management - POSIX. Task assignment and scheduling classical uniprocessor scheduling Algorithms - Task assignment - Fault Tolerance scheduling.

### **FAULT TOLERANT SYSTEMS**

Real-time communication Network Topologies - Protocols - Reliability - Testing and Fault Tolerance - Faults - Failures - Bugs and effects - reliability - Testing - Fault Tolerance.

### **FUTURE APPLICATIONS**

Real - Time Applications - The first real - time application - Real - time database - real - time image processing - real-time UNIX.

### **TEXT BOOK**

1. Phillip A. Laplante., Real Time Systems Hand book, Prentice Hall of India Pvt. Ltd., 3<sup>rd</sup> Edition,2004.

### **REFERENCE**

1. C.M. Krishna. Kang G. Shin ,Real Time Systems, 2<sup>nd</sup> Edition Tata McGraw Hill International, 2001.

<b>INT6005</b>	<b>NEURAL NETWORKS AND ITS APPLICATIONS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **ARTIFICIAL NEURAL NETWORKS**

Neuro-physiology - General Processing Element - ADALINE - LMS learning rule - MADALINE - MR2 training algorithm.

### **BPN AND BAM**

Back Propagation Network - updating of output and hidden layer weights - Application of BPN - Associative memory - Bi-directional Associative Memory - Hopfield memory - traveling sales man problem.

### **SIMULATED ANNEALING AND CPN**

Annealing - Boltzmann machine learning - Application - Counter Propagation network - architecture - Training - Applications.

### **SOM AND ART**

Self-organizing map- Learning algorithm- Feature map classifier- Applications- Architecture of Adaptive Resonance Theory - Pattern matching in ART network.

### **NEOCOGNITRON**

Architecture of Neocognitron - Data processing and performance of architecture of spacio - temporal networks for speech recognition.

### **TEXT BOOK**

1.M. Ananda Rao, J. Srinivas, Neural networks : algorithms and applications, Alpha Science International,2003.

### **REFERENCES**

- 1.Laurene Fausett, Fundamentals of Neural Networks: Architecture, Algorithms and Applications, 2<sup>nd</sup> Edition, Prentice Hall, 1994.
- 2.Freeman J.A. and Skapura B.M., Neural Networks, Algorithms Applications and Programming Techniques, Addison-Wesely, 1990.

<b>INT6006</b>	<b>ADVANCED OPERATING SYSTEMS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **DISTRIBUTED OPERATING SYSTEMS**

Architectures of Distributed Systems - Theoretical Foundations - Distributed Mutual Exclusion - Distributed Deadlock Detection - Agreement Protocols.

### **DISTRIBUTED RESOURCE MANAGEMENT**

Distributed File Systems - Distributed Shared Memory - Distributed Scheduling.

### **FAULT TOLERANCE**

Failure Recovery and Fault Tolerance - Recovery - Fault Tolerance.

### **PROTECTION AND SECURITY**

Resource Security and Protection: Access and Flow Control - Multiprocessor Operating Systems - Multiprocessor System Architectures - Multiprocessor Operating Systems.

### **DATABASE OPERATING SYSTEMS**

Introduction to Database Operating Systems - Concurrency Control: Theoretical Aspects - Concurrency Control Algorithms.

### **TEXT BOOK**

1. Mukesh Singhal, Niranjana G. Shivaratri, Advanced Concepts in Operating Systems Distributed, Database, and Multiprocessor Operating Systems, Tata McGraw-Hill Edition 2001.

### **REFERENCE**

1. Mary S. Gorman, S. Todd Stubbs, Introduction to Operating Systems , PHI, 3<sup>rd</sup> Edition, 2001.

<b>INT6007</b>	<b>ADVANCED DATABASE TECHNOLOGIES</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **TRANSACTION MANAGEMENT**

The ACID Properties-Transactions and schedules-Concurrent execution of transaction-Lock-Based concurrency control - performance of locking - Transaction support in SQL-Introduction to crash recovery concurrency control - 2PL - Serializability and Recoverability - Introduction to lock management - Lock conversion - Dealing with deadlock - Specialized locking techniques - Concurrency control without locking - Crash Recovery - Introduction to ARIES - The log - Other recovery .

### **PHYSICAL DATABASE DESIGN AND TUNING**

Introduction to physical database design - Guidelines for Index selection - Clustering and indexing - Tools to assist Index selection - Overview of database tuning - Choices in tuning the conceptual schema - Choices in tuning queries and views - Impact of concurrency - Case Study - The Internet Shop - Security and Authorization - Introduction to Database Security - Access Control - Discretionary and Mandatory Access Control-Security for Internet Application - Additional Issues Related to Security.

### **PARALLEL AND DISTRIBUTED DATABASES**

Architecture for parallel databases - Parallel query evaluation - Parallelizing individual operations - Parallel query optimization - Types of distributed databases - Distributed DBMS architecture - Storing data in distributed DBMS - Distributed catalog management - Distributed query processing - Updating distributed data - Distributed transaction-Distributed concurrency control - Distributed recovery.

### **INFORMATION RETRIEVAL AND XML DATA**

Colliding worlds - Databases - IR and XML - Introduction to Information retrieval - Indexing for Text Search - Web Search Engines-Managing Text in a DBMS-A Data Model for XML - X Queries - Querying XML Data - Efficient Evaluation of XML Queries.

### **SPATIAL DATA MANAGEMENT**

Types of Spatial Data and Queries-Application involving Spatial Data-Introduction to Spatial Indexes-Indexing Based on Space Filling Curves-Grid files - R-Trees - Issues in High Dimensional Indexing. Further Reading: Advanced Transaction Processing - Data Integration - Mobile Databases - Main Memory Databases - Multimedia Databases - Geographic Information System - Temporal Databases - Biological Databases - Information Visualization.

### **TEXT BOOK**

1.Raghu Ramakrishnan & Johannes Gehrke, Database Management Systems, 3<sup>rd</sup> Edition TataMcGrawHill, 2003.

### **REFERENCE**

1.Elmasri & Navathae, Fundamentals of Database Systems, 3<sup>rd</sup> Edition, Pearson Education, 2004.

<b>INT6008</b>	<b>SATELLITE COMMUNICATION</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **ORBITAL PARAMETERS**

Orbital parameters - Orbital perturbations, Geo stationary orbits - Low Earth and medium Earth orbits - Frequency selection - Frequency co-ordination and regulatory services - Sun transit outages - Limits of visibility - Attitude and Orientation control - Spin stabilisation techniques - Gimbal platform.

### **LINK CALCULATIONS**

Space craft Configuration - Payload and supporting subsystems - Satellite up link-down link - Link power budget - C/No, G/T, Noise temperature - System noise - Propagation factors - Rain and Ice effects - Polarization calculations.

### **ACCESS TECHNIQUES**

Modulation and Multiplexing - Voice, Data - Video, Analog and Digital transmission systems - Multiple access techniques – FDMA – TDMA - T1- T2 carrier systems – SPADE - SS - TDMA - CDMA - Assignment Methods - Spread spectrum communication - Compression - Encryption and Decryption techniques.

### **EARTH STATION PARAMETERS**

Earth station location - Propagation effects of ground, High power transmitters - Klystron - Crossed field devices - Receivers - Low noise front end amplifiers - MIC devices, Antennas - Reflector antennas - Cassegranian feeds - Measurements on G/T and  $E_b/N_o$ .

### **SATELLITE APPLICATIONS**

INTELSAT series - INSAT - VSAT - Remote sensing - Mobile Satellite service - GSM - GPS - INMARSAT - Satellite Navigation System - Direct to home service (DTH) - and Special services - E-mail - Video conferencing and Internet connectivity.

### **TEXT BOOK**

1. Wilbur L. Pritchard, Hendri Suyderhood G., Robert A. Nelson, Satellite Communication Systems Engineering, Prentice Hall, New Jersey, 2<sup>nd</sup> Edition 2000.

### **REFERENCES**

1. Dennis Rody, Satellite Communication, Regents/Prentice Hall, Englewood cliffs, New Jersey, 4<sup>th</sup> Edition 1999.
2. Bruce R. Elbert, The Satellite Communication Applications Hand Book, Artech House Boston, 1997.

<b>INT6009</b>	<b>SOFTWARE TESTING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **SOFTWARE TESTING**

Assessing software testing capabilities and staff competencies: Multiple roles of testing – Defect – Business perspective for testing. Building a Software Testing Strategy: Computer system strategic risks – Economics of testing – Common computer problems – Economics of SDLC testing – Testing issue – Testing policy – Structured approach – Test strategy – Testing methodology – Status of software testing. Establish a Software Testing Methodology: Defects – Cost of testing – Verification and validation – Functional and structural testing – work bench concept – eight considerations in developing testing methodologies.

### **TECHNIQUES**

Determining Software Testing Techniques: Testing techniques/Tool selection process – Structural system testing techniques – Functional system testing techniques – Unit Testing techniques – Functional testing and analysis – Functional testing – Test factor/test technique matrix. Eleven Steps Software Testing Process Overview: Cost of computer testing – Life cycle testing concept – Verification and validation in Software – Eleven-step software-testing process.

### **DESIGN LEVEL**

Assess Project Management Development Estimate and Status – Develop Test Plan – Requirements Phase Testing – Design Phase Testing [Overview, Objective, Concerns, Workbench, Input, Do procedure, Check Procedure, Output].

### **EXECUTION LEVEL**

Program Phase Testing – Execute Test and Record Results – Acceptance Test – Report Test Results. [Overview, Objective, Concerns, Workbench, Input, Do procedure, Check Procedure, Output].

### **TESTING SOFTWARES**

Testing Software Installation – Test Software Changes – Evaluate Test Effectiveness. [Overview, Objective, Concerns, Workbench, Input, Do procedure, Check Procedure, Output].

### **TEXT BOOK**

1. William E Perry, Effective Methods for Software Testing, John Wiley & Sons, 2<sup>nd</sup> Edition, 2005.

### **REFERENCE**

1. Illene Burnstien, Practical Software Testing, Springer International Edition, 1<sup>st</sup> Edition, 2004.

<b>INT 6010</b>	<b>KNOWLEDGE ENGINEERING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **BASICS AND MANAGEMENT**

The value of knowledge-Historical Perspective-The methodological pyramid-Principles-model suite-Process roles-Some terminology-Case studies-Explicit and tacit knowledge-Knowledge management cycle-Common KADS.

### **KNOWLEDGE MODEL**

Components and challenges-Typographic convention and comparison-Template Knowledge Models-Knowledge model construction and knowledge Elicitation techniques.

### **KNOWLEDGE SYSTEM DESIGN**

Modeling Communication Aspects-Case Study: The Housing Application-Designing Knowledge systems- Structure preserving design-Design of prototypes-distributed architectures.

### **KNOWLEDGE AND IMPLEMENTATION MODELING**

Knowledge system implementation in Prolog-Aion-Domain knowledge-Inference knowledge and task knowledge.

### **UML NOTATIONS AND PROJECT MANAGEMENT**

UML background-Control versus flexibility-Project planning- Case study -Managing knowledge system project.

### **TEXT BOOK**

1. Guus Schreiber, Inc, Knowledge Engineering and Management: The CommonKADS, MIT Press, 1<sup>st</sup> Edition , 2000.

### **REFERENCE**

1. Hojjat Adeli, Knowledge Engineering: Fundamentals, PHI, 2003.