III Semester B.Tech.(I.T)

ICT – 201 OBJECT ORIENTED PROGRAMMING [4 0 0 4]

Introduction [2 Hours]
The birth of modern programming language C, the need for C++, Java, Importance of Java in the internet, Java applets and applications, security, portability, the byte code. An overview of Java, OOP, Two paradigms, abstraction, the three OOP Principles.

Data Types, Variable and arrays [4 Hours]
Simple types, integers, floating point types, characters, Booleans, variables – declaring variable, dynamic initialization, the scope and life time of variables, type conversion and casting, arrays-one dimensional arrays and multi dimensional arrays.

Operators and control statements [5 Hours]
Arithmetic operators, bitwise operators, relational operators, logical operators, assignment operators, ternary operators, operator precedence. Control statements – if, switch, while, do-while, for nested loops, break, continue. All with examples.

Classes and Inheritance [8 Hours]
Class fundamentals, declaring objects, assigning object references variables, introducing methods, constructors, overloading method, using objects as parameters, argument passing, returning objects, recursion, use of static and final key word, nested and inner class, using command line arguments. Inheritance – basics, using super, creating a multi level hierarchy, when constructor are called, method overriding, dynamic method dispatch, using abstract classes, using final with inheritance, Wrapper classes.

Packages and Interfaces [5 Hours]
packages, defining a package, use of CLASSPATH, package example, access protection, importing packages, Interfaces – defining an interface, implementing interfaces, applying interfaces, variables in interfaces, extending interfaces.

Exception Handling [6 Hours]
Fundamentals, exception types, uncaught exception, using try and catch, multiple catch clauses, nested try statements, throw, throws, finally, Java's built in exception, creating exception subclasses, using exception.

Multi Threaded programming [6 Hours]
The java thread model, thread priorities, synchronization, thread class and runnable interface, the main thread, creating a thread, creating multiple threads, using is Alive[] and join[], inter thread communication.

String Handling [4 Hours]
String constructors, string length, special operations, character extraction, string comparison, searching strings, modifying a string, string buffer.

Input/Output [8 Hours]
Java I/O classes and Interfaces, File – directories, using filename filter, the stream classes, the byte streams-input stream, output stream, file input stream, file output stream, byte array in put stream, byte array output stream, random access files. The character streams- Reader, Writer, FileReader, FileWriter, char ArrayReader, CharArrayWriter, BufferedReader, BufferedWriter. Serialization, Serialiabel, Externalizable, Object Output, Object Output Stream, Object Input, Object Input Stream.

TEXT BOOKS:

1. Patrick Naughton and Herbert Schildt, "The Complete Reference – Java 2", Tata McGrawHill, 3rd Edition, 2000.

REFERENCES:

1. Aaron Walsh and John Fronckowiak, " Java Programming Bible",IDG Books, 1st Edition, 2000, India.
2. E.Balaguruswamy, "Programming with JAVA A Primer", Tata McGrawHill, 2nd Edition, 2000.

ICT – 203 DIGITAL SYSTEMS [3 1 0 4]

Number Systems [3 Hours]
Digital computers and digital systems, Binary numbers and number base conversion, Complements, Binary codes, logic gates and integrated circuits.

Boolean algebra and logic gates [4 Hours]
Axiomatic definition of Boolean algebra, basic theorems and properties, truth table, Boolean functions, canonical and standard forms, other logic operations, Digital logic families, Fan in & Fan out, propagation delay.

Simplification of Boolean functions [8 Hours]
The map method: maps up to six variables, Product of sums and Sum of products simplification, NAND and NOR implementation. Don't care conditions, the tabulation method, determination and selection of prime implicants.

Combinational logic [6 Hours]
Design procedure, Design of Adders, Subtractors, code converters etc., Analysis of Procedure, Multilevel NAND and NOR circuits, EX-OR and equivalence functions.

Combinational logic with MSI and LSI [10 hours]
Application of typical TTL integrated circuit components like Binary Parallel adder[74283], carry look ahead adder [74182], multiplier using 74283, BCD adder [82583], Magnitude Comparator [7485], Decoders [74138,7442], Encoders [74148], Multiplexers [74157], De Multiplexers, ROMS and Programmable logic arrays [PLA-829 100] for designing combinational logic, introduction to ASICS, VHDL, VLSI.

Synchronous sequential logic [10 hours]
Different types of flip-flops and their triggering, Analysis of clocked sequential circuits, Design Of clocked sequential circuits-state reduction, state assignment, flip-flop excitation tables, Shift Registers, design of counters[Asynchronous and Synchronous],Shift register counters, Design of synchronous sequential circuits [Ex: sequence detectors]

Asynchronous sequential logic [3 hours]
Analysis Procedure, Circuits with latches, Design Procedures, Hazards.

Memory Devices [4 hours]
RAM, ROM, PROM, EPROM, EEPROM, PLD.

TEXT BOOK:

1. M. Morries Mano: "Digital Logic and Computer Design", Prentice Hall India, 1986.
2. Tocci and Widmer: Digital Systems", Prentice Hall, 1998.
3. J.F.Wakerly, Digital Design Principles and Practices, PH, 1999.

ICT – 205 DATA STRUCTURES USING C++ [4 0 0 4]

Introduction [6 Hours]

Overview of C++, Introduction to algorithms, Algorithm Specification, Performance Analysis and Measurements – Asymptotic notations.

Arrays **[4 Hours]**

The Array as Abstract Data type, Sparse Matrix – Representation, Transpose of a sparse matrix, Representation of multidimensional arrays, The String abstract data type- Pattern matching.

Stacks **[4 Hours]**

Definition, operations on stacks, implementations, Applications of stacks-Evaluation of Arithmetic Expressions, Conversion of arithmetic expressions, Recursion, Multiple Stacks

Queues **[2 Hours]**

Definition, operations, implementations, circular queues, applications.

Linked Lists **[8 Hours]**

Introduction to pointers and Dynamic memory allocation, Singly linked lists-Insertion, traversal and deletion operations , Circular lists, Dynamically Linked Stacks and Queues, Polynomial representation and polynomial operations using singly linked list, singly circular linked list, Doubly linked lists.

Trees **[12 Hours]**

Introduction, Binary trees- Abstract Data Type, Properties, Binary tree representations, Binary Tree Traversal[both recursive and non-recursive] algorithms, Additional tree operations- copying and testing equality. Binary tree applications-Huffman coding, Threaded Binary Trees, Heaps, Binary Search Trees, Height Balanced tree -Introduction to AVL trees.

Graphs **[4 Hours]**

The Graph Abstract Data type- Definitions and Representations, Elementary Graph Operations- Depth First Search, Breadth First Search, Connected components, Spanning trees.

Sorting **[5 Hours]**

Insertion Sort, Quick Sort, Merge sort, Heap sort, Radix sort, Sorting on several keys.

Searching **[1 Hours]**

Linear search, Binary search. List verification

Hashing techniques **[2 Hours]**

Different hashing functions, methods for collision handling.

TEXT BOOKS:

1. Ellis Horowitz, Sartaj Sahni, Dinesh Mehta, "Fundamentals of Data Structures in C++", Galgotia Publications, Reprint 2004.
2. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", 2nd Edition, Pearson Education, 2005.

REFERENCES:

1. Lipschutz – Data Structures – Schaum Outline Series
2. Michael T, Goodrich, Roberto Tamassia, David Mount , "Data Structures and Algorithms in C++", John Wiley & Sons, 2004

ICT-- 207 ELECTRICAL & ELECTRONIC CIRCUITS [3 1 0 4]

Electrical Circuits

Circuit elements and energy sources [4 Hours]

Circuit elements, series and parallel combinations of resistances, inductances & capacitance, power, energy sources, source transformations, inductance and capacitance in AC circuits, star-delta connections.

Analysis of networks by Kirchoff's laws, Node and Mesh analysis **[8 Hours]**

Kirchoff's laws, KCL, current division in parallel circuits, KVL, voltage division in series circuits, nodal and mesh analysis of AC and DC electric circuits. RC**,**

Network theorems [8 Hours]

Introduction, Thevenin, Norton, superposition, maximum power transfer, reciprocity theorems – statements, explanation, steps for solving a network using these theorems.

Electronic Circuits

Diode**:** Diode as a switch, clipping and clamping circuits, voltage regulators

Voltage regulators using ICS **[4 Hours]**

Transistors: Transistor as a switch, clipping and clamping circuit, transistor as an amplifier, transistor biasing circuits. **[6 Hours]**

Operational amplifiers [16 Hours]

Introduction, differential, Inverting and non inverting configurations, Instrumentation amplifiers, Integrator, Differentiator

Filters: first order, second order filters

Oscillators: introduction, phase shift oscillator, Wien bridge oscillator, Quadrature oscillator, voltage controlled oscillators

Waveform generators: square wave, triangular wave, sawtooth wave generators.

Comparators: Basic comparator, Schmitt trigger circuits

D/A converter: with binary weighted resistors, with R and 2R resistors

A/D converter: Successive approximation, counter type, flash type

Multi vibrators using 555 timers: Monostable, Astable multivibrators.

Display devices, Power supplies [2 Hours]

Basic principles, CRT, LED, LCD- circuits, working & applications.

REFERENCES :

1. A Chakrabarti - Circuit Theory, Dhanpat Rai & Co.(PVT) LTD, Delhi-2000.
2. W.H. Hayt etl – Engineeing Circuit Analysis, Tata Mc Graw Hills –2004.
3. Ramakant A Gayakaward – OP-AMPS and linear Integrated circuits – Pearson Education Delhi-2001.
4. Bernard Grob, Basic Electronics, McGraw Hill, 1996.
5. Malvino & Leach – Digital Principles & Applications, Tata Mc Graw Hills –New Delhi. 2002.
6. Malvino-Electronic Principles, Tata Mc Graw Hills –New Delhi 1999.

ICT--209 DATA STRUCTURES LAB USING C++ [0 1 3 2]

Implementation of stacks, Arithmetic expression conversion and evaluation using stack, queues, Linked lists-singly linked lists, circular linked lists, doubly linked lists, polynomial addition using circular linked lists, Binary Trees & Binary search tree operations, Different sorting techniques and Searching techniques.

ICT – 211 DIGITAL SYSTEMS LAB [0 0 3 1]

1] Verification of Boolean algebra and De Morgan theorems.
[2] Simplification of Boolean expressions using K-maps.
[3] Combinational logic – Adders, subtractors, multiplexers, Decoders, encoders, shift registers, code converters.
[4] Counters - Asynchronous and Synchronous counters, Shift register counters.

ICT--213 OBJECT ORIENTED PROGRAMMING LAB [0 1 3 2]

Java programs based on the following concepts: Classes, inheritance, polymorphism, threads, interfaces and packages. String handling and File handling.

IV Semester B.E.(IT)

ICT --202 PRINCIPLE OF DATA COMMUNICATION [4 0 0 4]

Data Communication and Networking Overview: A communications Model, Data Communication, Data Communication Networking **[2 Hours]**

Data Transmission: Concept and Technology, Analog and Digital Transmission, Transmission Impairments, Channel Capacity, **[4 Hours]**

Guided and Wireless Transmission: Guided Transmission Media, Types of cables, Wireless Transmission, Wireless Propagation, LOS Transmission **[4 Hours]**

Signal Encoding Techniques: Nonreturn to Zero, Multilevel Binary, Biphase, Modulation Rate, Scrambling techniques, Amplitude Shift Keying, Frequency Shift Keying, Phase Shift Keying, Performance, Quadrature Amplitude Modulation, Pulse Code Modulation, Delta Modulation, Performance, Amplitude Modulation, Angle Modulation **[10 Hours]**

Digital Data Communication Techniques: Asynchronous and Synchronous Transmission, Types of Errors, Error Detection: Parity, CRC, VRC, LRC, Error Correction: Block Code Principle, Hamming code, Line Configuration, Interfacing, **[7 Hours]**

Data link Control: Data Frame Format, Bit oriented and character Oriented, HDLC, Point-Point, Multipoint, Flow Control: stop and wait ARQ, continuous ARQ: Go back N and selective repeat, Sliding Window, Case study: **[7 Hours]**

Multiplexing: Frequency Division Multiplexing, Synchronous Time Division Multiplexing, Statistical Time Division Multiplexing **[4 Hours]**

Spread Spectrum: The Concept of Spread Spectrum, Frequency- Hopping Spread Spectrum, Direct Sequence Spread Spectrum, Code- Division Multiple Access **[4 Hours]**

Modems types: Basic idea, interface standards- RS-232-C,RS-449,Standard direct digital interface[x.21]. **[3 Hours]**

Circuit Switching and Packet Switching: Switching Networks, Circuit- Switching Networks, Circuit switching Concept, Control signaling, Packet- Switching Principles **[3 Hours]**

REFERENCES :

1. William Stallings: Data & Computer Communications - Maxwell Mcmillan Publications, Prentice Hall of India Pvt., Ltd., New Delhi – 1, 2002.
2.Behrouz Forouzan – Introduction to data communication & networking. Tata McGraw Hill, New Delhi-2004.
3.Fred Halsal – Data Communication Computer Network & OSI, Addison Wesley, Longmen 2001.
4. PC Gupta – Data Communications, Prentice Hall of India Pvt Ltd. New Delhi – 1, 1999.

ICT --204 COMPUTER ORGANIZATION & MICROPROCESSOR SYSTEMS [4 0 0 4]

8086 Architecture:
Intel 8086 based micro computer system, 8086 architecture, and programmers' model, and functional pin diagram, modes of operation, segmentation and memory addressing. **[5 Hours]**

Instruction Set
Addressing modes, assembler directives.
Instruction types: Data movement instruction, arithmetic and logic instruction, process control instructions, string instructions, branch instructions and related programs. **[12 Hours]**

Development Tools
Assembly language development tools, stacks and subroutine, macros and procedures and related programs **[5 Hours]**

Interrupts:
BIOS and DOS interrupts and related programs. **[3 Hours]**

Basic I/O interfacing:
8254, 8255, 8259- Architecture and interfacing **[3 Hours]**

Computer Organization:

Introduction
Evolution of computers, Von- Neumann architecture, Computer structures: General register machine, Accumulator based machine, stack machines. Introduction to RISC and CISC architecture. **[2 Hours]**

Execution Unit
Combinational shifter design, Adders. Arithmetic and Logic Unit Design, multiplication algorithms, division algorithms, basics of floating point arithmetic and IEEE floating point standards, **[6 Hours]**

Control Unit
Introduction, basic concepts, Design methods: Hardwired and Micro – programming approach. **[4 Hours]**

Memory Unit
Types of memory and characteristics, memory hierarchy, main memory design, the cache memory and mapping techniques the virtual memory, Associative memory. **[5 Hours]**

Input & Output
Programmed I/O, Interrupt I/O, direct memory access, I/O bus standards. **[3 Hours]**

REFERENCES:

1. Douglas V. Hall, Microprocessors and Interfacing: Programming and Hardware, Tata McGraw Hill, Dec 2003, revised 2nd Edition
2. Barry B. Brey, The Intel Microprocessors: 8086 to Pentium Pro - Architecture, Programming and Interfacing, Prentice Hall of India., 2007, 6th Edition
3. Mohd. Rafiquizzaman, Microprocessors and Microcomputer based System Design, CRC Press, 1995, 2nd Edition.
4. K Udaykumar and B. S Umashankar, Advanced microprocessors and IBM –PC assembly language programming-Tata McGrawhill ,1998
5. Carl Hamacher, Zvonko Vranesic, Safwat Zaky: Computer Organization, Mc Graw Hill, 2002, 5th ed.
6. M Morris Mano: Computer System Design, Prentice- Hall, Englewood Cliffs, NJ, 1993
7. Mohamed Rafiquzzaman and Rajan Chandra: Modern computer Architecture, St. Paul, Minnesota, U.S.A, 1999

ICT-- 206 DATABASE SYSTEMS [4 0 0 4]

Database and database users **[2 Hours]**

Introduction, Characteristics of the database approach, actors on the scene, advantages of using a DBMS.

Relational Databases

Introduction to the Relational Model-Structure of Relational Databases, Database Schema, Keys, Schema Diagrams, Relational Query Languages, Relational Operations **[4 Hours]**

Introduction to SQL-Overview of the SQL Query Language, SQL data definition, Basic structure of SQL queries, Additional basic operations, Set operations, Null values, Aggregate functions, Nested subqueries, Modification of the Database **[6 Hours]**

Intermediate SQL-Join expressions, Views, Transactions, Integrity Constraints, SQL Data types and schemas, Authorization **[4 Hours]**

Advanced SQL-Accessing SQL from a programming language, Functions and procedures, Triggers, Recursive queries, Advanced aggregation features, OLAP **[2 Hours]**

Formal Relational Query Languages- The Relational Algebra, The Tuple Relational Calculus, The Domain Relational Calculus **[2 Hours]**

Database Design

Database design and ER model- overview of the design process, the entity relationship model, constraints ,removing redundant attributes in entity sets, entity relationship diagrams, ER design issues, Extended ER features **[6 Hours]**

Relational database design- features of good relational designs, Atomic domains and first normal form(NF),Decomposition using functional dependencies, Functional dependency theory, Algorithms for decomposition, Decomposition using multivalued dependencies, More normal forms. **[10 Hours]**

Transaction management

Transactions - transaction concept, A simple transaction model, Storage structure, Transaction Atomicity and durability, Transaction isolation, Serializability, Transaction isolation and atomicity, Transaction isolation levels, Implementation of isolation levels, transactions as SQL statements **[6 Hours]**

Concurrency control – Lock based protocols, deadlock handling, Multiple granularity, Timestamp based protocols, Validation based protocols, Multiversion schemes, Snapshot isolation, Insert operations, delete operations and predicate reads **[4 Hours]**

Recovery system – Failure classification, Storage, recovery and atomicity, recovery algorithm, buffer management, failure with loss of nonvolatile storage, early lock release and logical undo operations **[2 Hours]**

REFERENCES:

1. Abraham Silberschatz, Henry F.Korth, S. Sudarshan, "Database System Concepts", McGraw Hill International Edition, Sixth Edition, , 2011
2. Ramez Elmasri , Shamkant B Navathe, "Fundamentals of Database Systems", Addison Wesley Publication,F Fourth edition, , 2000
3. C.J.Date, "An Introduction to database systems" Addison Wesley Publication, 2000

ICT--208 SOFTWARE ENGINEERING. & PROJECT MANAGEMENT [4 0 0 4]

Introduction to software engineering **[2 Hours]**
Software and software engineering, the changing nature of the software, Legacy software, Software Myths.

Software Engineering Process Models **[4 Hours]**
Phases in software development , The Waterfall Model, Evolutionary Models, Incremental Models, Specialized Models, Unified Models.

Project Management **[2 Hours]**
Management Spectrum, People, Process, Project,

Project Scheduling and Estimation **[6 Hours]**
Project Scheduling, Defining task set, Scheduling.
Metrics, Size Oriented Metrics, Function based metrics, Process Based models, Empirical Estimation Models

Requirements Engineering **[5 Hours]**
Requirements engineering tasks, Requirements engineering process, Eliciting Requirements, Developing Use cases, Building Analysis Model, Negotiating requirements, Validating requirements.

Analysis Modeling **[8 Hours]**
Requirement Analysis,Analysis Modeling approaches, Data Modeling concepts- Data objects, Data attributes, Relationships, Cardinality and Modality., Case study with Object oriented Concepts- Scenario Based Modeling, Flow Oriented Modeling, Class based Modeling, Creating a Behavioral Model.

Design Engineering **[10 Hours]**
Design Process and Quality, Design concepts, Design Model- Data design elements, Architectural design elements, Interface elements, Component level elements, Deployment level design elements. Design Methodologies- Object Oriented Methods, Functional Methods.

Software Testing Strategies and Testing Techniques **[9 Hours]**
Strategic approach, Issues, Test strategies for Object oriented system, Levels of testing- Unit testing, Integration Testing, Validation testing, System testing, Debugging, Black Box testing, White box testing techniques.

Case study:The Design and development of a software application using OODM and SDM. [2 Hours]

REFERENCES:

1. Roger S.Pressman "Software Engineering A practitioner's approach"- McGraw Hill, 6th edition,2005
2. James Rumbaug, "Object Oriented Modeling and design,", Prentice-Hall of India Pvt. Ltd., 8th Reprint, 2000.
3. Grady Booch, James Rumbaugh, Ivar Jacobson, "The Unified Modeling Language User Guide", Pearson Education, 2nd Edition, 2005.
4. Ian Somerville, "Software engineering", Addison Wesley,7th Edition, 2006.

***** *** OPEN ELECTIVE-I [3 0 0 3]**

ICT-210 SOFTWARE ENGINEERING LAB [0 1 3 2]

Familiarization of Software engineering process & activities (Emphasis on activities – Requirement engineering , System Design, Implementation, Coding, and Testing) .

ICT--212 MICRO PROCESSOR SYSEMS LAB [0 0 3 1]

1. Programs on Addition, multiplication division, unpacked BCD arithmetic, Packed BCD arithmetic, Sorting, Searching, String handling, Code conversion, GCD, LCM, Recursive functions.
2. Modular programming, Macro, Conditional Assembly.
3. Programs using BIOS and DOS interrupts, File Handling, Video RAM, Menu Driven Programs..
4. Interfacing 8086 using emu8086: Robot, Stepper Motor, Thermometer, Traffic Lights, LED Display, Printer

ICT--214 DATABASE SYSTEMS LAB [0 1 3 2]

The lab exercises comprises of a mini project development using VC# programming language with support of oracle.
The execution of SQL commands & PL/SQL programming constructs using oracle.

V Semester B.E.(IT)

ICT--301 OPERATING SYSTEMS [4 0 0 4]

Introduction
Batch systems, multiprogrammed systems, multiprocessor systems, distributed systems, time-sharing & real time systems, hardware protection. **[4 Hours]**

CPU Scheduling
Process concept, process state transitions, process control block, operations on processes, inter process communication, threads overview, multithreading models, threading issues, scheduling criteria, scheduling algorithms, multilevel feedback queues. **[7Hours]**

Concurrent Process
Mutual exclusion, critical section, Dekker's algorithm, hardware solution to mutual exclusion, semaphores, process synchronization with semaphores, monitors. **[9Hours]**

Memory Management
Address binding, dynamic loading, dynamic linking, Overlays, swapping, contiguous allocation, paging, segmentation, segmentation with paging. **[5Hours]**

Virtual Memory
Demand paging, page replacement algorithms, thrashing. **[8 Hours]**

Deadlocks
Deadlock characterization, resource allocation graph, deadlock prevention, deadlock avoidance, deadlock detection, banker's algorithm and recovery from deadlock. **[6 Hours]**

File Systems
Free space management, allocation methods, Directory structure, Disk scheduling methods, RAID structure. **[6Hours]**

Case study: The LINUX operating System
Design principles, file systems, Process Management, memory management, I.O. systems, inter-process communication. **[3Hours]**

TEXT BOOKS:
1. A Silberschartz and Galvin, "Operating Systems Concepts ", 6th edition, Addison Wesley, 2004.

REFERENCE :
1. H.M.Deitel "An Introduction to Operating Systems" Addison Wesley, 2000.
2. Milan Milankovic" Operating systems Concepts and Design" McGraw Hill, 2000.

ICT-- 303 EMBEDDED SYSTEMS [4 0 0 4]

Introduction to an embedded systems design: Introduction to Embedded system, processor in the System, Microcontroller, Memory Devices, Embedded System Project Management, ESD and Co-design issues in System development Process, Design cycle in the development phase for an embedded system, Use of target system or its emulator and In-circuit emulator, Use of software tools for development of an ES. [**5 Hours]**

Intel 8051 Microcontroller:

Microcontroller and Embedded Processors, Overview of 8051 Microcontroller family: Architecture, basic assembly language programming concepts, The program Counter and ROM Spaces in the 8051, Data types, 8051 Flag Bits ad PSW Register, 8051 Register Banks and Stack, Addressing modes, Instruction set, Accessing memory using various addressing modes, Arithmetic and logical instructions and programs, BCD and ASCII application programs, Single-bit instruction programming, Reading input pins vs. port Latch [**12 Hours]**

Timers, Counter Programming , Serial Communication, Interrupt programming, 8051 C programming. **[12 Hours]**

Interfacing : Keyboard, Stepper Motor, ADC, DAC, Sensor, LCD, External memory. **[8 Hours]**

Real Time Systems

Typical Real-Time Applications , Hard Versus Soft Real-Time Systems , A Reference Model of Real-Time Systems , Commonly Used Approaches to Hard Real-Time Scheduling , Clock-Driven Scheduling , Priority-Driven Scheduling of Periodic Tasks ,Scheduling Aperiodic and Sporadic Jobs in Priority-Driven Systems , Resources and Resource Access Control, Introduction to Real Time Operating Systems, RTOS-Case study. **[11 Hours]**

TEXT BOOKS:

1. Muhammad Ali Mazidi: The 8051 Microcontroller and Embedded Systems using Assembly and C-Prentice Hall of India Pvt Ltd New Dehli-2006.
2. Raj Kamal, "Embedded Systems", TMH, 2004.
3. Kenneth Ayala, "8051 Microcontroller and Embedded Systems using Assembly and C", Delmar Cengage, 2010
4. Liu, "Real Time Systems", Pearson Education, 2000

ICT-305 COMPUTER NETWORKS [4 0 0 4]

Review of Data Communications: [1Hours]

Introduction to Computer Networks: Definition, Uses, Classification of Networks, Network topology and Topography. **[2 Hours]**

Layered Architecture: Layers, Protocols and services, ISO/OSI Reference Model, Overview of TCP/IP architecture, Application Protocols and TCP/IP utilities. **[4Hours]**

Media Access sublayer and LANS : Approaches to sharing transmission Medium, Random Access Protocols, Token Passing protocols, IEEE LAN standards, Bridges, MAN[IEEE802.6], FDDI. **[6 Hours]**

Network Layer: Internal Organization of NL, Routing Algorithms, Congestion control algorithms. **[4 Hours]**

IP addressing: Decimal Notation, Classes, Special Addresses, Unicast multicast and broadcast addresses, applying for IP address, Private networks. **[3 Hours]**

Subnetting and Supernetting:Subnetting, Masking, Variable length subnetting, supernetting. **[2 Hours]**

Delivery Forwarding, and Routing of IP Packets: Connection – oriented Vs. connectionless services. Direct Vs. Indirect Delivery, Forwarding, Routing methods, Static Vs. Dynamic routing, Routing module and Routing table design. **[3Hours]**

Internet Protocol: Datagram, Fragmentation, Options, Checksum & IP Design. **[3Hours]**

ARP and RARP :ARP, ARP design & RARP. **[2Hours]**

Internet Control Message Protocol : Types of messages, message format, error reporting, query, Checksum& ICMP Design. **[2 Hours]**

Internet Group Management Protocol: Multicasting, IGMP, Encapsulation, Multicast backbone & IGMP design. **[2 Hours]**

User Datagram Protocol: Process-To-ProcessCommunication, User datagram, UDP operation, Uses of UDP. **[3 Hours]**

Transmission Control Protocol:TCP services, A TCP connection**,** State Transition Diagram, Flow control, Error Control, Congestion control, TCP Timer. **[5 Hours]**

Stream Control Transmission Protocol:SCTP Services, SCTP features, Packet format, An SCTP association, State Transition Diagram. **[3 Hours]**

Introduction to Routing Protocols : Interior and Exterior routing, RIP, RIP Version 2, OSPF & BGP. **[3 Hours]**

TEXT BOOKS :

1. Tannenbaum, A.S. – "COMPUTER NETWORKS", Prentice Hall of India [EE Edition],4th edition, 2003.
2. Alberto Leon – Garcia –"Communication Networks "Tata McGraw Hill, Second Edition, 2004.
3. Behroua A. Forouzan – "TCP/IP PROTOCOL SUITE, Tata McGraw Hill, Third Edition,2010.

ICT-307 SYSTEMS PROGRAMMING [4 0 0 4]

Introduction

Language Processors, assemblers, loaders, macros, linkers, compilers, operating systems. (2 hrs)

Compilers

Lexical analysis-Scanning, recognition of tokens, symbol tables, LEX programming. (6 hrs)

Syntax analysis-Parse trees, Top Down Parsing, Backtracking, Recursive decent parsers, LL(1) parsers, Bottom Up Parsing, LR parsers, error recovery strategies, YACC programming. (12 hrs)

Syntax directed translation and Type checking- Syntax-directed definitions, Type systems, Type conversions, Specification of a simple type Checker. (4 hrs)

Intermediate code generation- 3-address codes, generating intermediate codes for declarations, assignment statements, and Boolean expressions. (4 hrs)

Code generation- Issues in the design of a code generator, The target machine, run-time storage management, Register allocation and assignment, Peephole optimization, a simple code generation algorithm. (6 hrs)

Code optimization- The principal sources of optimization, Optimization of basic blocks, Data-flow analysis, flow graphs. (6 hrs)

Assemblers

Elements of Assembly Language Programming, Pass structure of assemblers, Two pass assemblers. (4 hrs)

Macros

Macro Definition call, Macro expansion, Nested macro calls, Advanced macro facilities. (2 hrs)

Linkers and Loaders

Relocation and linking concepts, Self-relocation programs, Linking for overlays, Loaders, Compile and Go-loaders, general loader scheme, absolute loaders. (4 hrs)

Text Books

1. **Alfred V. Aho, Ravi Sethi, Jeffrey D. Ullman**, " Compilers, Principles, Techniques and Tools", Pearson Education Asia.

2. **Dhamdhere D.M**, "Systems Programming and Operarting Systems", Tata MCGraw-Hill, Second revised edition.

Reference books

1. **Donovan J.J., "**Systems Programming", McGraw Hill, 1972
2. **Barron D.W.,** " Assemblers and Loaders", McDonald and Javes, 1978.
3. **Ullman J.D.,** "Fundamental Concepts of Programming Systems", Addision Wesley, 1976.
4. **Aho A.V. & Ullman J.D.,** "Principles of Compiler Design", Addison-Wesley, 1985.

ICT--309 DESIGN & ANALYSIS OF ALGORITHMS [4 0 0 4]

1. Introduction

Program Performance : Space and Time complexity, Asymptotic Notations, Practical Complexities and Performance Measurement. **[6 Hours]**

2. Graphs

Definitions, Applications, Properties, The Graph & Digraph as ADTs, Representation of graphs & Digraphs, Graph Search Methods – Breadth First Search, Depth-First Search, Applications – Finding a path, Connected Graphs & Components, Spanning trees. **[6 Hours]**

3. Algorithm Design Techniques

The Greedy Method

Greedy method, Optimization problems, Applications – container loading, 0/1 Knapsack problem, Topological sorting, Bipartite cover, Single-Source Shortest paths, Minimum cost spanning Trees – Kruskal's Algorithm, Prim's Algorithm, Sollin's Algorithm. **[8 Hours]**

Divide and Conquer

Divide and Conquer method, Minimum and Maximum, Strassen's matrix multiplication, Applications – Merge Sort, Quick sort, Selection problem, Closest pair of points, Solving Recurrence Equations, Lower Bounds on Complexities. **[8 Hours]**

Dynamic Programming

Dynamic Programming method, Applications – 0/1 Knapsack problem, Matrix Multiplication Chains, All pairs shortest paths. **[6 Hours]**

Backtracking

Backtracking Method , Applications – 0/1 Knapsack problem, Max clique, Travelling salesperson, Container Loading, **[5 Hours]**

Branch and Bound

Branch and Bound Method , Applications – 0/1 Knapsack problem, Max clique, Travelling salesperson, Container loading. **[4 Hours]**

4. NP-Completeness and Approximation Algorithms

Polynomial Time and verification, NP-Completeness and Reducibility, Approximate Algorithms for the Vertex-cover problem and the traveling salesperson problem. **[5 Hours]**

TEXT BOOKS :

1. Sartaj Sahni " Data Structures, Algorithms and Applications in C++", McGraw- Hill 2000.
2. Mark Allen Weiss, " Data Structures and Algorithm Analysis in C", Pearson Education, Second Edition.

3. Thomas H Cormen, Charles E Leiserson & Ronald L Rivest, "Introduction to Algorithms", Prentice – Hall India, 1988.

ICT--311 SYSTEM PROGRAMMING LAB [0 1 3 2]

LEX and YACC programming, design of a compiler as a mini project for a C program.
Linking and Loading, Dynamic Loading.
Process control: creating and terminating processes, process control, signals. System-level Input/Output: read, write files, file metadata, sharing files.

ICT--313 EMBEDDED SYSTEMS LAB [0 1 3 2]

1. Familiarization of 8051 Simulation Software edsim51 and Raisonance, Programs on Block transfer in the memory, Addition, Subtraction Code conversions, Sorting, GCD,LCM, Palindrome, Timers and Counters, Interfacing 7 Segment Display, DAC and ADC Interfacing, Keyboard Interfacing, DC Motor Interfacing, LCD Interfacing,
2. Mini Project: Students are required to develop mini project using 8051 microcontroller. And they can use assembly or Embedded C language for coding..

ICT --315 LINUX OS LAB [0 1 3 2]

Implementation of CPU scheduling algorithms, Banker's algorithm, Page replacement algorithms, Inter Process Communication and Shell scripts.

VI Semester B.E.(IT)

ICT--302 INTERNET TECHNOLOGY & APPLICATIONS [4 0 0 4]

Internet and world wide web [5 Hours]
Overview of Internet, Web System Architecture, HTTP, Generation of Dynamic Webpages, e-Commerce Basics, Models and Architecture.

Client side programming [8 Hours]
Web page design and production, Overview of HTML, XHTML, DHTML(cascading style sheets, DOM, rollovers pseudo-classes, pseudo-elements)

Server side programming [12 Hours]
Three Tier Model, CGI with Perl, Introduction to ASP, VBScript, DBconnectivity, Servlets, Session Tracking Techniques

Advanced technologies for E-commerce [7 Hours]
XML, XML DOM , XSL, Namespaces and Schemas, XSLT Transformations.

Web services [8 Hours]

Introduction to Web services: Web services description language(WSDL), Business Process Execution Language(BPEL), Simple Object Access Protocol (SOAP), Web Services Flow Language(WSFL), Web Services Conversation Language(WSCL).

Support tools for application development **[8 Hours]**

Applets: various interfaces and listeners,printgraphics, use of gridbaglayout, simulation of paint brush color choosers and array buffering. Usage of DreamWeaver, Active X pad publishing human computer interaction, presentability, aesthetics.

REFERENCES:

1. Deitel& Deitel Goldberg, "*Internet and world wide web*" - 3rd Edition, Prentice Hall Publisher, 2008.
2. David Hunter, "*Beginning XML*"-4th Edition, Wrox, 2007.
3. Green, "*DreamWeaver MX:Hot*" -2nd Edition, Addison-Wesley,2003.
4. G. Winfield Treese, "*Designing systems for Internet commerce*"- 2nd Edition, Pearson, 2003.
5. Herbert Schildt, "*Java Complete Reference*"-5th edition, PHI Publisher, 2002.

ICT-- 304 ADVANCED COMPUTER NETWORKS [4 0 0 4]

Applications Layer Protocols: BOOTP, DHCP, DNS, Telnet, SMTP and SNMP **[10 Hours]**

Circuit-Switched Networks: Fiber to the Home, Digital Subscriber Line, Intelligent Networks, CATV**.** **[5 Hours]**

Optical Networks: Optical Links, WDM Systems,DWDM, Optical Cross-Connects, Optical LANs, Optical paths and Networks. **[8 Hours]**

Synchronous Optical Network: Architecture, SONET Layers, SONET Frames, STS Multiplexing**,** SONET Networks. **[5 Hours]**

Switching: Switch Performance Measures, Time and Space-Division Switching, Modular switch designs, Packet Switching and Distributed Buffer**.** **[8 Hours]**

Asynchronous Transfer Mode: Overview of ATM, ATM protocol Stack, Traffic Management, Signaling, Addressing and Routing, ATM Internetworking Standards. **[12 Hours]**

TEXT BOOKS:

1. Jean Walrand and Pravin Variya, "*High Performance Communication Networks*" Harcourt Asia Pte. Ltd., 2nd Edition, 2006.
2. Leon Garcia and Widjala, "*Communication Networks*", Tata McGraw Hill, 2nd Edition, 2004.
3. Behrouz A. Forouzan, "*TCP/IP Protocol Suite*", Tata McGraw Hill, 4rd Edition, 2010.
4. Sumit Kasear and Pankaj Sethi, "*ATM Networks Concepts and Protocols*", Tata McGraw Hill, 2005.

REFERENCE BOOKS:

2. William Stalings, "*High Speed Networks and Internet*", Pearson Education, 2nd Edition, 2008.
3. Atul Kahate, "*Cryptography and Network Security*", TMH-2003 edition
4. Behrouz A. Forouzan, "*Data Communications and Networking*", Fourth Edition, Tata McGraw Hill, 4th Edition, 2010.

ICT--306 DATA WAREHOUSING AND DATA MINING [4 0 0 4]

Data Warehousing [6 Hours]

Introduction, Data warehouse definition, Multi dimensional data model, OLAP operations, Warehouse schema, Data Warehousing Architecture, Warehouse server, Metadata, OLAP Engine, Data Warehouse Backend Process.

Data Preprocessing [8 Hours]

Data cleaning, Data Integration and transformation, Data reduction, Data cube, Dimensionality reduction, Sampling, Discretization and concept hierarchy generation, Segmentation by natural partitioning.

Data mining [12 Hours]

Introduction, Association rules mining, market based analysis, Apriori Algorithm, Partition Algorithm, Pincer – Search Algorithm, Dynamic item set counting algorithm, FP-tree growth Algorithm,PC Tree, Multilevel association rules, Approaches to mining multilevel association rules, correlation analysis, Issues and challenges in Data mining.

Clustering Techniques [10 Hours]

Introduction, Clustering paradigms, Partitioning Algorithms, k – Medoid & k- means Algorithms, CLARA, CLARANS, Hierarchical Clustering, DBSCAN.

Classification and Prediction [9 Hours]

Introduction, Tree Construction principle, Best Split, Splitting Indices, Splitting Criteria, Decision Tree Construction Algorithm, Tree pruning.

Web Mining [3 Hours]

Introduction, web content mining, web usage mining, web structure mining.

REFERENCES:

Jiawei Han and Micheline Kamber, " Data Mining Concepts And Techniques", Morgan Kauffmann Publishers, 2nd Edition, , 2008

Arun K Pujari, " Data Mining Techniques", , Universities Press India, 1st Edition, 2001.

ICT-* PROGRAM ELECTIVE-I [4 0 0 4]**

**** *** OPEN ELECTIVE II [3 0 0 3]**

ICT--308 INTERNET TECHNOLOGY & APPLICATIONS LAB [0 1 3 2]

The application development exercises based on the following concepts:

HTML, XHTML, DHTML programs , CGI with perl, ASP, VBscript programs , The XML browser experience, CSS scripts and XSL- CSS scripts .

Programs on advanced applet animations .

Using a HTML editor like Dreamweaver to manage web content presentability and aesthetics and hit component .

SOAP as a web service case study using VB.net

ICT--310 COMPUTER NETWORK LAB [0 1 3 2]

Socket programming in unix c/c++, Client Server simple message transfer using TCP and UDP, Chat server using fork, programs using system calls fopen, popen, fsleek, lseek, inet_ntoa, ntohs, gethostbyname, Programs on File transfer , Integer transfer, Palindrome, Sorting, Database programs, Programs to display universal time, Introduction to the network simulator NS-2, Programs on TCL script.

ICT--312 DATA WAREHOUSING AND DATA MINING LAB [0 1 3 2]

Developing physical data model, performing data pre-processing, data transformation, and data cube creation by using standard warehouse tools. Implementing data mining algorithm which includes association rule mining, clustering and classification. Mini project implementation by referring good journals or conference papers related to data warehouse and data mining.

VII Semester B.E.(IT)

ICT--401 MOBILE COMMUNICATIONS [4 0 0 4]

Introduction: Evolution of mobile radio communication, Examples of mobile radio systems: paging systems, cordless telephone, cellular telephone systems [**2Hours**]

Transmission Fundamentals: Signals for conveying information, Analog and digital transmission, Channel capacity, Transmission media **[4 Hours]**

Antenna & Wave Propagation: Antennas, Propagation modes, Line-of-sight transmission, Fading in the mobile environment [**4 Hours**]

Modulation Techniques: Signal encoding criteria, Overview of ASK, PSK, FSK, MSK, Spread spectrum modulation, FHSS, DSSS, FH-CDMA, DSSS-CDMA, [**4 Hours**]

Error Correcting Codes **[2 Hours]**

Cellular Concepts : Frequency reuse, Channel assignment strategies, Handoff strategies, Interference and system capacity, Trunking and GOS, Improving capacity in cellular system. **[4 Hours]**

Multiple Access in Wireless Systems: Multiple access schemes, FDMA, TDMA, CDMA and SDMA. **[4 Hours]**

Wireless MAC: General network concepts, Wireless MAC issues, Performance metrics, Distributed MAC protocols, Centralized MAC protocols, Hybrid access protocols. **[8 Hours]**

GSM: Mobile services, System architecture, Radio interface, Protocols, Localization and calling, Handovers, Security, New data services. **[6 Hours]**

Mobility Management in Wireless Networks: Introduction, Mobility management functions, Mobile location management, Mobile registration, Handoff **[2 Hours]**

Mobile IP and WAP: Introduction to Mobile IP, WAP **[2 Hours]**

Wireless LAN: Types of WLAN, IEEE 802.11: architecture and services, MAC **[3 Hours]**

Wireless Personal Area Network-Bluetooth: Introduction, Bluetooth (IEEE 802.15.1), Bluettoth: Protocol stack, Link types, Security, Network connections, Bluetooth usage models, Bluetooth applications **[3 Hours]**

REFERENCES BOOKS:

1. T.S. Rappaport, "Wireless Communications- Principle and Practice", 2nd Edition, Prentice-Hall, 2005.
2. William Stallings,"Wireless Communication and Networks" 2nd Edition, PHI, 2004.
3. Vijay Garg, "Wireless Communication and Networking", 1st Edition, Morgan-Kaufman, 2007.
4. Jochen Schiller, "Mobile Communication", 2nd Edition, Pearson Education, 2004.
5. Gummalla Ajay Chandra V, Limb John O,"Wireless Medium Access Control Protocols", IEEE Communication Surveys and Tutorials, Vol.3, no.2, pp.2-15, 2000.

ICT—* PROGRAM ELECTIVE II [4 0 0 4]**

ICT—* PROGRAM ELECTIVE-III [4 0 0 4]**

ICT--* PROGRAM ELECTIVE –IV [4 0 0 4]**

ICT--403 ADVANCED JAVA PROGRAMMING LAB [0 1 3 2]

The Advaced Java Lab is designed for students to familiarize with the following areas.

- Understanding of Java Database Connectivity(JDBC) and Remote Method Invocation
- Servlet Programming
- Working with Java APIs like XML and Email
- Developing Web applications using J2EE or Struts Framework.

ICT—405 ADVANCED TECHNOLOGY LAB [0 1 3 2]

The lab exercises are designed to familiarize students with the more recent trend in the software Industries . The recent technologies such as : J2ME , android, etc., can be considered.

ICT—407 SEMINAR [0 0 3 1]

Students have to select a topic related to IT engineering preferably not included in the regular syllabus. They have to talk for 1hour on the selected topic. (Seminar will be conducted in 7^{th} semester.)

VIII Semester B.E.(IT)

ICT-402 INDUSTRIAL TRAINING / TOUR [0 0 0 1]

Students should undergo 3 to 4 weeks industrial training.

ICT-499 PROJECT WORK/PRACTICE SCHOOL [0 0 0 20]

Students have to do a project work from conception through implementation & testing of a prototype. The emphasis in this course is given to analysis and design. A formal design of the report & presentations are required.

OPEN ELECTIVES

ICT--340 DATA STRUCTURES [3 0 0 3]

Introduction [**3 Hours]**
Overview of C/C++, Introduction to Algorithms, Algorithm Specification, Performance Analysis and Measurements – Asymptotic notations.

Arrays **[4 Hours]**
The Array as Abstract Data type, Sparse Matrix – Representation, Transpose of a sparse matrix, Representation of multidimensional arrays, The String abstract data type- Pattern matching.

Stacks **[4 Hours]**
Definition, operations on stacks, implementations, Applications of stacks-Evaluation of Arithmetic Expressions, Conversion of arithmetic expressions, Recursion.

Queues **[2 Hours]**
Definition, operations and implementations of queues, circular queues, applications.

Linked Lists **[8 Hours]**
Introduction to pointers and Dynamic memory allocation, Singly linked lists-Insertion, traversal and deletion operations , Circular lists, Polynomial representation and polynomial operations using singly linked list, singly circular linked list, Doubly linked lists.

Trees **[8 Hours]**
Introduction, Binary trees- Abstract Data type, Properties, Binary tree representations, Binary Tree Traversals[both recursive and non-recursive] algorithms, Threaded Binary Trees, Heaps, Binary Search Trees.

Graphs **[3 Hours]**
The Graph Abstract Data type- Definitions and Representations, Elementary Graph Operations- Depth First Search, Breadth First Search.

Sorting: **[3 Hours]**
Insertion Sort, Quick Sort, Merge sort, Heap sort, Radix sort

Searching **[1 Hours]**
Linear search and Binary search

TEXT BOOKS :

1. Ellis Horowitz, Sartaj Sahni, Dinesh Mehta“ Fundamentals of Data Structures in C++”, Galgotia Publications, Reprint2004
2. Mark Allen Weiss: “Data Structures and Algorithm Analysis in C++” , Second Edition, Pearson Education, 2005.

REFERENCES :

1. Lipschutz – Data Structures – Schaum Outline Series
2. Michael T, Goodrich, Roberto Tamassia, David Mount , “Data Structures and Algorithms in C++”, John Wiley & Sons, 2004

ICT – 342 COMPUTER GRAPHICS AND ANIMATION [3 0 0 3]

Graphics Hardware [3 Hours]
Introduction to Computer Graphics, Advantages of computer Graphics, Hardcopy technologies, Display technologies, Input devices.

Basic Raster Graphics Algorithms for drawing 2D primitives [7Hours]
Scan converting lines, Scan converting circles, filling polygons, clipping lines, antialiasing.

Geometrical Transformations: [7 Hours]
2D transformations, composition of 2D transformations, 3D transformations, window to view port transformation, Problems on 2D and 3D transformations.

3D Viewing [5 Hours]
Viewing Pipeline, Viewing coordinates projections, View volumes and general projection transformations, Problems on projections.

Animation [7 Hours]
Design of Animation Sequences, General Computer Animation Functions, Computer Animation Languages, Key-Frame Systems, Motion Specifications.

Graphics Programming using openGL [**7 Hours**]
Why OpenGL, Features in OpenGL, OpenGL operations, Abstractions in OpenGL – GL, GLU & GLUT, a few examples and demos of OpenGL programs.

TEXT BOOKS:

1. Van Dam, Foley, Feiner, Hughes "Computer Graphics, Principles and Practice", Addison Wesley Publishers, 1993, 2nd Edition
2. Donald Hearn and M. Pauline Baker : "Computer Graphics", Prentice-Hall of India, 2000, 2nd Edition,
3. *F. S. Hill Jr., Computer Graphics using OpenGL, Pearson Education, 2003.*

REFERENCES:

1. David F. Rogers: "PROCEDURAL ELEMENTS FOR COMPUTER GRAPHICS", Tata McGraw Hill International Editions,1985.
2. Roy A. Plastock& Gordon Kelly : "Schaum's outlines of Theory and Problems of Computer Graphics", McGraw Hill 1986,International Edition
3. Rick Parent: Computer Animation, 2nd edition, Morgan Kenymann Publisher, 2002.

ICT --344 **NETWORKING WITH TCP/IP** **[3 0 0 3]**

Review of Data Communications: [**1Hours]**

Introduction to Computer Networks and layered Architecture: Definition, Uses, Classification of Networks, Network topology and Topography, Layers, Protocols and services, ISO/OSI Reference Model, Overview of TCP/IP architecture, MAC, Application Protocols and TCP/IP utilities. **[3 Hours]**

IP Addresses: Classful Addresses, Subnetting and supernetting and subnet supernet mask in classful, Special addressing , Variable length blocks, subnetting and subnetmask in classless addressing**. [3 Hours]**

Internet Protocol : Datagram, Fragmentation, Options, Address Translation(NAT) **[2 Hours]**

Internet Control Message Protocol : Types of protocol, Message format, Error reporting, Query **[3 Hours]**

Internet Group Management Protocol: Group management, IGMP Messages, IGMP operation, Encapsulation **[3 Hours]**

User Datagram Protocol and Transmission Control Protocol : Relationship between Transport and Network layer, Overview of Transport layer in the Internet, Process to Process Communication, User datagram Segment Structure, TCP services, TCP Features, Segment, TCP connection, State Transition diagram, Flow Control, Error control, Congestion Control, TCP Timers **[5 Hours]**

Stream Control Transmission Protocol: SCTP Services, SCTP features, Packet format, SCTP association, Flow control, Error Control, Congestion control **[4 Hours]**

Unicast Routing Protocol: Intra and Inter domain Routing, Distance Vector Routing, RIP, Link State Routing, OSPF, Path Vector Routing, BGP **[4Hours]**

Application Layer: Principle of Network Applications, The Web and HTTP: Non persistent and Persistent connection, HTTP Message Format, User-Server Interaction: Cookies, HTTP content, Web Caching, The conditional GET, FTP: FTP commands and replies, Electronic Mail in the Internet: SMTP, Comparison with HTTP, Mail Message Format and MIME, Mail Access Protocol, DNS: Services Provided by the DNS, Overview of How DNS works, DNS record and Messages, TELNET: Concept, NVT, NVT character set, Embedding, Options, Option Negotiation, Suboption Negotiation, Mode of operation **[8 Hours]**

REFERENCES :

1. Behroz A. Forouzan: TCP/IP Protocol Suite – Tata McGraw –Hill Edition Newdelhi-2004
2. Andrew S. Tanenbaum: Computer Network- , Prentice Hall of India Pvt Ltd., New Delhi-2005
3.James F. Kurose :Computer Networking A top-Down Approach Featuring the Internet – Pearson Education Inc-2006.

ICT--346 **PARALLEL ALGORITHMS** [**3 0 0 3]**

Introduction **[6 Hours]**
Sequential model, need for an alternative model, parallel computational models such as PRAM, LMCC, Hypercube, Cube Connected Cycle, Butterfly, Perfect Shuffle Computers, Tree model, Pyramid model, Fully Connected model, PRAM-CREW, EREW models, simulation of models.

Performance Measures **[6 Hours]**

Performance Measures of Parallel Algorithms, speed-up and efficiency of PA, Cost optimality, An example to illustrate Cost-optimal algorithm-such as summation, Min/Max on various models.

Searching, Merging, and Sorting **[10 Hours]**
Parallel Sorting Networks, Parallel Merging Algorithms on CREW/EREW/MCC/Parallel Sorting Networks on CREW/EREW/MCC/, linear array, Parallel Searching Algorithm, K^{th} element, K^{th} element in X+Y on PRAM, Parallel Matrix Transportation and Multiplication Algorithm on PRAM, MCC, Vector-Matrix Multiplication, Solution of Linear Equation, Root finding.

Graphs **[7 Hours]**
Graph Algorithms - Connected Graphs, search and traversal, Combinatorial Algorithms-Permutation, Combinations, Derrangements.

Realistic Models of Parallel Computation **[7 Hours]**
Graph Algorithms - Connected Graphs, search and traversal, Combinatorial Algorithms-Permutation, Combinations, Derangements.

TEXTBOOK:

1. M.J. Quinn, "Designing Efficient Algorithms for Parallel Computer",Mc Graw Hill, 2001.
2. S.G. Akl, "Design and Analysis of Parallel Algorithms", Prentice Hall, 1992.
3. S.G. Akl, "Parallel Sorting Algorithm" by Academic Press,1985

PROGRAM ELECTIVES

ICT-320 VISUAL PROGRAMMING [4 0 0 4]

Introduction to Visual programming, The Structure of a Windows Program, Dealing with Windows Messages, Drawing the Window Client Area, Integrated Development Enviornment, User interface design including graphics, sound and vedio. **[4 Hours]**

Overview of ADO controls. Use and configuring ODBC. Concept of OLE. Data reporting, Windows registry, DLL and ActiveX. **[5 Hours]**

Case study: VC++
Windows Programming with VC++: The Microsoft Foundation classes, Windows Programming with Visual C++. **[2 Hour]**

Working with Menus and Toolbars: Communicating with windows, Elements of a Menu, Using class wizard for Menu Messages, Adding Toolbar Buttons. **[3 Hours]**
Drawing in a window: Basic of Drawing in a window, The Drawing Mechanism in Visual C++, Drawing Graphics in Practice, Programming the Mouse. **[4 Hours]**

Creating the Document and improving the view: Collection classes. Using the CList Template class, creating the document, Improving the view, Deleting and Moving shapes, Dealing with Masked elements. **[5 Hours]**

Working with Dialogs and controls: Understanding Dialogs, understanding controls, Creating a Dialog Resource, Programming for a Dialog, Supporting the Dialog Controls, Completing Dialog operations, using a spin Button control, using a List Box, using an Edit Box control. **[5 Hours]**

Writing your own DLLs: Understanding DLLs, Deciding what to put in a DLL, writing DLLs. **[4 Hours]**

Connecting to Data Sources: Database Support in MFC, creating a Database Application. **[4 Hours]**

Updating Data Sources: Update operations, A simple update Example, Managing the update process, Adding Rows to a Table. **[3 Hours]**

Understanding OLE Documents: Object linking and Embedding, Implementing a OLE container, Implementing an OLE server, executing the server. **[3 Hours]**

ActiveX controls: ActiveX and OLE, OLE controls, Working of OLE controls, implementing an ActiveX control. **[2 Hours]**

Using the Active Template Library: Working of COM, Understanding the Active Template Library, Building and using the Component, Using ATL to Create an ActiveX Control **[4 Hours]**

REFERENCES:

1. Beginning Visual C++ 6, Ivor Horton, Wrox Press Lt. Publishers, 1998 [Chapter 1, 8, 13 to 24]
2. Mastering Visual C++ 6 – Michael J Young, BPB Publishers.
3. The Complete Reference Visual C++ 6 Pappas, Chris H, TMH Publishers, 1998.

ICT-322 STATISTICAL ANALYSIS AND APPLICATIONS [4 0 0 4]

Probability and Random Variables:
Definition of Probability, The axioms of Probability, Conditional Probability, Total Probability Theorem, Bayes' Theorem and Applications. **[8 Hours]**

Concept of Random Variable: Introduction to One dimensional random variables, Distribution and Density Functions, Continuous and Discrete distributions.
Specific Random Variables: Normal distribution, Exponential distribution, Gamma distribution, Chi-square distribution, Rayleigh distribution, Uniform distribution, Bernoulli, Binomial distribution, Poisson approximation, Geometric distribution, Conditional distributions, Total probability and Bayes' theorem. **[8Hours]**

Functions of One Random Variable, Mean and Variance, Moments using expectation operators, Chebyshev inequality, Markov inequality.
Two dimensional random variables, mean, variance, co-variance, correlation coefficient. **[8 Hours]**

Sampling distribution of mean, Central Limit Theorem, Sampling distribution of variance, Interference concerning Means, Point estimation, MLE Interval estimation. **[8 Hours]**

Inferences concerning Variances, Inferences concerning Proportions, Non Parametric Tests: significance level, certain best tests. **[8 Hours]**

Curve Fitting, Analysis of variance, Introduction to Bayesian Analysis. **[8 Hours]**

REFERENCES :

1. Miller & Freund's Probability and Statistics for Engineers, by Johnson Richard A, 6th Edition, Pearson Education, Delhi 2005.
2. Probability, Random Variables and Stochastic Processes, by Papoulis Athanasios and S. Unnikrishna Pillai, 4th Edition, McGraw Hill, New Delhi, 2008.
3. Introductory Probability and Statistical Applications, by Paul L. Meyer, 2nd Edition, Addison Wesley, Amsterdam, 1970
4. Probability and Statistics for Engineers by G.S.S. Bhishma Rao, Scitech Pub, 2008
5. Probability and Statistics with reliability Queuing and computer science applications, by Shridhar Bhai and K.S.Trivedi - 2nd edition, John Wiley and Sons, New Delhi, 2005.

ICT-- 324 DIGITAL SIGNAL PROCESSING [4 0 0 4]

Introduction, Overview of Signals and signal processing, characterization and classification of signals, typical signal processing operations, examples of typical signals, typical signal processing applications, need for digital signal processing. **[4 Hours]**

Review of Discrete Time linear system, Sequences, arbitrary sequences, linear time invariant system, causality, stability. Difference equation, relation between continuous and discrete system. Classifications of sequence, recursive and non-recursive system. **[4Hours]**

Review of Mathematical operations on sequences: Convolution, graphical and analytical techniques, overlap and add methods, matrix method, some examples and solutions of LTI systems, MATLAB examples. **[4 Hours]**

Z-transform: Definition, relation between Z transform and Fourier transform of a sequence, properties of Z transform, mapping between S-plane and Z-plane. Unit circle, convergence and ROC, Inverse Z-transform, solution of difference equation using the one sided Z-transform MATLAB examples. **[8 Hours]**

Discrete Fourier transform: Definition, inverse discrete Fourier transform (IDFT) Twiddle factor, linear transformation, basic properties, circular convolution, multiplication of DFT, linear filtering using DFT, filtering of long data sequences, overlap add and save method. Computation of DFT, Fast Fourier transform (FFT), FFT algorithm, Radix 2 algorithm. Decimation-in-time and decimation-in- frequency algorithm, signal flow graph, butterflies, Chirp z-transform algorithm, MATLAB examples. **[14 Hours]**

Digital filter realization: Principle of digital filter realization, structures of All-zero filters. Design of FIR (Finite impulse response) filters, linear phase, windows-rectangular, Berlitt, Hanning, Hamming and Blackman. Design of infinite impulse response filters (IIR) from analog filters. Bilinear transformation, Butterworth, Chebyshev, Elliptic filters. Optimisation method of IIR filters. Some example of practical filter design. Computer aided filter design, MATLAB examples . **[14 Hours]**

TEXT BOOKS:

1. S.K.Mitra, "Digital Signal Processing - A Computer based approach", TMH, 3rd Edition, 2006, New Delhi.
2. Ifeachor Emmanuel and Jervis Barrie W, "Digital Signal Processing", Pearson Education, 2nd Edition, 2005, New Delhi.
3. J.G. Proakis and D.G. Manolakis, "Digital Signal Processing, Principles, Algorithms and Applications", Pearson Education, 4th Edition, 2009, New Delhi.

REFERENCE:

1. R.G. Lyons, Understanding Digital Signal Processing, Pearson Education, 2nd Edition, 2005, Delhi.
2. L.R. Rabiner and B. Gold, Theory and Application of Digital Signal Processing, PHI, 2005, Delhi.

3. Baese Uwe Meyer, Digital Signal Processing with FPGA, Spriger, 3rd Edition, 2009, Berlin.

ICT--326 SIMULATION AND MODELING [4 0 0 4]

Introduction to simulation: when simulation is an appropriate tool? , Advantages and disadvantages of simulation, areas of applications, steps in simulation study. **[3 Hours]**

System Models: the concepts of a systems, system environment, stochastic activities, continuous and discrete system, system modeling, types of models, static physical model, dynamic physical model, static mathematical model, dynamic mathematical model, principle used in modeling. **[6 Hours]**

Random number generation: properties of random numbers, generation of pseudo random number, techniques of generating : linear congruential method, combined liner congruetial method, combined linear congruetial method, test for random numbers-frequency test, runs test, test of autocorrelation, gap test, poker test, goodness of fit test, chi-square test, che-square test with equal probabilities. **[6 Hours]**

Random Variate Generation: inverse transform technique-Exponential and uniform distribution, discrete distribution, acceptancy-rejection techniques, Poisson and Gamma Distribution. **[5 Hours]**

Queuing Models: Characteristics of queuing system-the calling population, system capacity, arrival process, queue behavior and queue discipline, service times and service mechanism, queuing notation. **[5 Hours]**

Parallel process modeling: Using Petri nets and finite automata in simulation. [**4 Hours**]

Monte Carlo Methods: Monte Carlo Simulation of Communication Systems, Semi-analytic technique. [**5 Hours]**

Verification and Validation of simulation models: Model building verification and validation of simulation models, calibration and validation of models face validity, validation of model assumption, validating input-output transformation, input-output validation: using historical input data, input-output validation: using turning test. **[6 Hours]**

Simulation Software: Factors in selection of discrete system simulation languages, Characteristics of SIMSCRIPT, GPSS, SIMULA, SIMLIB/C++. Sample programming in GPSS and SIMLIB/C++. [**8 Hours**]

REFERENCES:

1. Averil Law, "Simulation Modeling & Analysis" ,4th Edition, MacGraw-Hill Publication, 2006.
2. Jerry Banks, John S Carson, Barry L.Nelson & David M.Nicol, "Discrete-Event System Simulation ", 5th Edition, Prentice-Hall, 2009.
3. Devender K. Chaturvedi,"Modeling and Simulation of Systems using MATLAB and Simulink", CRC Press, 2009.
4. Geoffery Gordon , "System Simulation & Modeling" 2 nd Edition, PHI Publisher,2002.

ICT--328 ARTIFICIAL INTELLIGENCE AND APPLICATIONS [4 0 0 4]

Introduction

Artificial Intelligence - The AI problems, The underlying Assumption, AI Technique, The level of the Model; Problems, Problem spaces and search – Defining the problem as a state space search, Production systems, Problem characteristics, Production system characteristics, Issues in the Design of Search

Programs. **[12 Hours]**

Heuristic search

Generate–and –Test, Hill climbing, Best – First search, Problem Reduction, Constraint satisfaction, Means-Ends Analysis. **[12 Hours]**

Knowledge Representation

Using Predicate Logic – Representing simple facts in Logic, Representing Instance and Isa Relationships, computable functions and Predicates, Resolution.

Symbolic Reasoning under uncertainty – Introduction to Nonmonotonic reasoning, Logics for Nonmonotic Reasoning; Statistical Reasoning – Probability and Baye's Theorem; Semantic Nets, Frame, Conceptual Dependency, Scripts. **[12 Hours]**

Advanced Topics

Game Playing – The minimax search procedure, Adding Alpha-Beta Cutoffs.

Planning – Overview, An example Domain : The blocks world, Components of a planning system, goal stack planning , Brief Introduction to understanding, Natural Language Processing, Learning. **[12 Hours]**

TEXTBOOK:

1. Stuart Russell, Peter Norvig, "Artificial Intelligence – A Modern Approach", 2nd Edition, Pearson Education / Prentice Hall of India, 2004.

REFERENCES:

1. Nils J. Nilson, "Artificial Intelligence, a New synthesis", Patterson, "Introduction to Artificial Intelligence and Expert Systems', Prentice Hall, 2002. 2. Elaine Rich and Kevin Knight, "Artificial Intelligence", 2nd Edition, Tata McGraw-Hill, 2003.

ICT-- 330 PRINCIPLES OF PROGRAMMING LANGUAGES [4 0 0 4]

Introduction

What is Programming Language? Abstractions in Programming Languages, Computational Paradigms, Language Definition,Language Translation, Language Design. **[4 Hours]**

History

Development of earlier languages Role of programming languages, Characteristics of programming languages. **[5 Hours]**

Language Design Principles

History and Design Criteria, Efficiency, Generality, Orthogonality, Uniformity,Language Design Principles. **[5Hours]**

Syntax

Lexical Structure of Programming Languages, Context free grammars and BNFs, Parse trees and abstract syntax trees, Ambiguity, associativity and precedence, EBNFs and syntax diagrams. **[6 Hours]**

Basic Semantics

Attributes, Binding and Semantic functions. Declarations, Blocks and Scope, The Symbol Table, Allocations, Extent and the Environment, Variables and Constants, Aliases, Dangling Reference and Garbage, Expression Evaluation. **[5 Hours]**

Data Types

Data types and type information, Simple types, Type Constructors, Type nomenclatures in Pascal like languages, Type equivalence, Type checking, Type Conversion **[4 Hours]**

Control

Guarded Commands and conditionals, Loops and Variations on WHILE, The GOTO Controversy Procedures and Parameters, Procedure Environments, Activations and Allocation, Exception Handling.

[5 Hours]

Abstract Data Type

The Algebraic specification of Abstract Data Types, Abstract data type in Modula, Overloading and Polymorphism, Problems with Abstract Data type Mechanisms, The Mathematics of ADT's. **[3 Hours]**

Object oriented Programming and JAVA

Software reuse and Independence, Objects, Classes and Methods, Inheritances, Dynamic Bindings Design issues in Object Oriented Languages, Implementation Issues in Object Oriented Languages. Features of JAVA Classes, Objects and Methods,Arrays, Strings and vectors, Inheritance and Interfaces. **[5 Hours]**

Functional Programming

Programs as Functions, Functional Programming in a procedural Language. Scheme: A Dialect of LISP, Delayed Evolution, The Mathematics of Functional Programming Recursive Functions. Dynamic memory Management for Functional Languages. [**3 Hours]**

Logic Programming

Logic and Logic Programs, Horn Clauses, Resolution and unification, The Language Prolog Problems with Logic Programming. **[3Hours]**

TEXT BOOKS:

1. **Kenneth C. Louden** . " Programming Languages Principles and Practice", First Reprint 2003, PWS Publishers
2. **E. Balaguruswamy**,"Programming in JAVA", A Primer, 2nd Edition, Tata McGraw Hill.

REFERENCES:

1. **Terrance w. Pratt marvin –**v- Zelkowitz. "Programming languages design and implementation", 1999, 3rdEdition,PHI publication.

ICT – 332 NETWORK TECHNOLOGIES [4 0 0 4]

Prerequisite: Data Communication, Network Reference models, Switching, Introduction to routing, Cryptography and Firewalls, LAN and WAN fundamentals

1. **Voice over IP (VOIP)** : PSTN, Basics And Signalling :Analog Circuit, Basic Call Setup, ISDN, VoIP, Role Of DSP, Role Of Microprocessor, Network Problems, IP Signalling Protocol, SIP, RTP/RTCP , SDP, Voice Over IP Applied, PSTN Numbering Plan, Dial-Peer, Cisco Voice Products.

   (8 hours.)

2. **Advanced Routing & Switching:** Review of networking devices, routing and switching, VLAN, VTP, STP, Distance vector routing: RIP, algorithm, routing table format, routing update format, Link state Routing: OSPF, algorithm, routing table format, routing update format. **(8 hours)**

3. **Wireless Networks:** Review of Wireless LAN & WAN Fundamentals, Planning and Operation of Wireless Networks, Voice over Wireless, Location Based Services **(8 hours)**

4. **Data centers** : Introduction, Data center Architecture, Data center Operations, Data center IP Infrastructure, Data center security, Application networking & optimization, Business Continuance

(8 hours)

5. **Virtualization**: Basics of Virtual Machine (VM), Preparing Virtual Machine Host, Installing & Deploying VM, VM's on PC, Enterprise, Using Virtual File system, Failover Clusters, Load balancer & VM – Clusters, Virtualizing storage. **(8 hours)**

6. **Cloud Computing** : Cloud Computing Architecture, Amazon Cloud Computing, Service levels for Cloud Computing, Data and Network security, Disaster Recovery Planning & Management, Practical examples – Rackspace. **(8 hours)**

Text Books:

1. Jonathan Davidson "VoIP Fundamentals by Jonathan Davidson", 2nd Edition, Published by Cisco Press, 2006.
2. "CCNA Cisco Certified Network Associate Study Guide", 7th Edition, Published by Cisco Press, 2011
3. "Wireless Networks First-Step, CCNA Wireless Guide", Published by Cisco Press, 2004
4. Mauricio Arregocess "Datacenter Fundamentals", Published by Cisco Press, 2003
5. Danielle Ruest, Nelson Ruest "Virtualization, A Beginner's Guide", Published by McGraw Hill, 2009
6. Anthony T. Velte, Toby J. Velte and Robert "Cloud Computing, A Practical Approach", Published by McGraw – Hill, 2010.

ICT--411 DISTRIBUTED SYSTEMS [4 0 0 4]

Characterization of Distributed Systems and System Models : [6 Hours]
Introduction, Examples of Distributed Systems, Challenges, Architectural models.

Processes and Communication : **[8 Hours]**
Introduction, Client and server process design and issues, External data representation and marshalling. Communication types/patterns ,Case study, Unix inter process communication. Distributed objects and Remote Invocation - Communication between distributed objects, Remote procedure call.
Case study: Java RMI, SUN RPC.

Distributed File systems and Name services : **[8 Hours]**
Introduction, File service architecture, Recent advances., Name services and the domain name system, Directory and discovery services.
Case study : SUN NFS, GNS (Global Name Service)

Time and Global States, Coordination and agreement : **[7 Hours]**
Clocks, Logical time and logical clocks, Distributed mutual exclusion, global positioning of nodes .

Consistency and Replication : [9 Hours]
Introduction, consistency models- Data- centric and client centric models, Replica management, consistency management protocols.

Fault Tolerance: [4 Hours]
Introduction , process resilience, reliable Client-server communication.

Distributed object based systems: [6 Hours]
CORBA : Introduction to CORBA, CORBA service.

REFERENCES:

1. Andrew S. Tanenbaum ” Distributed Systems: Principles and Paradigms” II Edition Pearson Education Asia, 2006 .
2. George Coulouries, Jean Dollimore, Tim Kindberg “Distributed Systems Concepts and design” III Edition Pearson Education Asia, 2004.
3. M. Singhal, N. Shivaratri, Advanced Concepts in Operating Systems, II Edition TMH, 2004

ICT-- 413 WIRELESS SENSOR NETWORKS [4 0 0 4]

Introduction and overview: Overview of sensor network protocols, Architecture and applications, Simulation and experimental platforms, Main features of WSNs; Research issues and trends**. [5 Hours]**

Enabling technologies: Fundamentals of 802.15.4, Bluetooth, and UWB, Physical and MAC layers. **[8 Hours]**

Sensor node hardware and software: Hardware: mica2, micaZ, telosB, cricket, Imote2, tmote, btnode, and Sun SPOT, Software (OS): tinyOS, MANTIS, Contiki, and RetOS, Programming tools: C, nesC, Mate. [**8 Hours]**

Localization, connectivity, and topology: Sensor deployment mechanisms; Coverage issues; Node discovery protocols. [**8 Hours]**

Network layer protocols: Data dissemination and processing; Multi-hop and cluster based protocols; Routing. **[8 Hours]**

Middleware and application layers: Data dissemination; Data storage; Query processing; sensorWeb; sensorGrid. **[8 Hours]**

Open issues for future research: Energy preservation and efficiency; Security challenges; fault-tolerance; **[3 Hours]**

TEXT BOOK:

1. *Protocols and Architectures for Wireless Sensor Networks*. H. Karl and A. Willig. John Wiley & Sons, June 2005.
2. *Wireless Sensor Networks: Technology, Protocols, and Applications*. K. Sohraby, D. Minoli, and T. Znati. John Wiley & Sons, March 2007.
3. *Wireless Sensor Networks*. C. S. Raghavendra, K. M. Sivalingam, and T. Znati, Editors. Springer Verlag, Sep. 2006.
4. *Wireless Sensor Networks: Architectures and Protocols*. E. H. Callaway, Jr. AUERBACH, Aug. **2003.**

REFERENCE BOOKS:

1. *Networking Wireless Sensors*. B. Krishnamachari. Cambridge University Press, Dec. 2005.
2. *Wireless Sensor Networks: An Information Processing Approach*. F. Zhao and L. Guibas. Morgan Kaufmann, Jul. 2004.
3. *Sensor Networks and Configuration: Fundamentals, Standards, Platforms, and Applications*. N. P. Mahalik. Springer Verlag, Nov. 2006.
4. *Wireless Sensor Networks: A Systems Perspective*, N. Bulusu and S. Jha, Editors, Artech House, August 2005.

ICT--415 ADVANCED OPERATING SYSTEMS [4 0 0 4]

Introduction to distributed systems: Goals – Advantages of distributed systems over centralized systems – disadvantages of distributed systems, Hardware & Software Concepts, loosely coupled systems, network operating systems, Network file systems, design Issues –transparency – Flexibility – performance – scalability, limitations of DS - absence of shared memory and global clock - Lamport's Logical clocks - vector clocks - causal ordering of messages **[4 Hours]**

Remote procedure calls: Introduction, Features of RPC, User package, Design issues, Classes of RPC system, Interface definition language, exception handling, delivery guarantees, implementation, interface processing, binding, locating the binder, RPC in UNIX system. **[6 Hours]**

Distributed Mutual Exclusion and deadlock: Mutual exclusion algorithms, token-based and non-token-based algorithms, Deadlock models and algorithms, deadlock detection and prevention. **[7 Hours]**

Distributed File Systems and Shared Memory: architecture of Distributed file systems, design issues, replication algorithms, cache coherence, case study: coda. **[5 Hours]**

Distributed Scheduling: Motivation and issues, load distribution, balancing and sharing algorithms, nd balancing, Load distribution algorithms, load scheduler, task migration, case study: Amoeba. [**6 Hours]**

Failure Recovery and Fault Tolerance: introduction and basic concepts, classification of failures, backward and forward recovery, check pointing and recovery, issues in fault tolerance, Commit and **voting** protocols **[5 Hours]**

Real-Time OS: Characteristics of real time OS,Hard Versus Soft Real-Time Systems, Real-Time communications – reliability strategies – real time communication requirements – enforcing a bounded transmission delay –handling omission failures – low level protocols – decentralized control of real time systems – advanced real time communication, Real-Time Scheduling – clock driven approach – weighted round robin approach – priority driven approach, case study: Windows CE, PalmOS **[6 Hours]**

Multiprocessor Operating System: Basic Multiprocessor System Architecture, Structures of multiprocessor operating systems, design issues, threads, synchronization, processor scheduling. **[4 Hours]**

Database Operating System: Requirement of a Database Operating System, A concurrency control model of database systems, problem of concurrency control, serializability theory, distributed database systems, concurrency control algorithms. **[5 Hours]**

REFERENCES:

1. M. Singhal& N.G. Shivaratri, "Advanced concepts in operating systems", TMH, 2001**.**
2. A. S. Tanenbaum, "Distributed Operating Systems", Second edition, PHI, 2008.
3. SapeMullender, "Distributed Systems", Second edition, Addison Wesley, 1995.
4. Jane W. S. Liu, "Real Time Systems", second edition, PHI, 2004.

ICT-- 417 STORAGE DEVICE TECHNOLOGY [4 0 0 4]

Storage devices & I/O Subsystems [10 Hours]
Traditional Backup devices, Disk arrays, Disk physical structure- components, properties, performance, and specifications, Tape drives.
JBODs, RAIDs, Hot spares, Storage I/O & Storage subsystems, Connectivity protocols.

Intelligent Storage Systems **[8 Hours]**

Components of intelligent storage system, Intelligent Storage Arrays, Case study: EMC CLARiiON and Symmetrix.

Introduction to Networked Storage **[6 Hours]**

Discussion of Direct Attached Storage (DAS), Storage Area Networks (SAN), Network Attached Storage (NAS) and Content Addressable Storage(CAS). Case study: EMC Connectrix, EMC Celera, EMC Centera.

Introduction to Information availability **[10 Hours]**

Principles of Business Continuity and Disaster Recovery, Automated back up methodologies. Local and Remote business continuity techniques, Disaster Recovery solutions., Case study: EMC Powerpath.

Storage Area Networks (SAN) **[8 Hours]**

Discussion of Fiber channel protocol.

SAN components & Building blocks, data access over SAN.

SAN topologies, Elements of SAN design, scalability, availability, performance, security, capacity, and manageability issues. Studies and critiques of existing SAN design scenarios (partial mesh, full mesh, core/edge, & tiered designs). Discussion of FCIP and IFCP.

Storage Virtualization **[6 Hours]**

Forms of virtualization, Virtualization taxonomy, Virtualization configuration, Challenges, Types of virtualization, Case study: EMC Invista.

TEXT BOOKS:

1. G. Somasundaram, Alok Shrivastava, " Information Storage and Management-Storing, Managing, and Protecting Digital Information", EMC Education Services, Wiley India Edition, 2009.
2. Marc Farley, "Storage Networking Fundamentals", CISCO Systems, First edition, 2004
3. Gupta Meena, "Storage Area Network Fundamentals", Pearson Ed.
4. Robert Spalding, "Storage Networks: The Complete Reference", Tata Mcgraw Hill, 2003.
5. Marc Farley Osborne, "Building Storage Networks", Tata McGraw Hill, Second edition, 2001.

ICT--419 COMPONENT OBJECT TECHNOLOGY AND APPLICATIONS [4 0 0 4]

Introduction

The evolution of component Technology, understanding OLE, an overview of Active X objects & classes, looking at objects from a COM perspective. **[6 Hours]**

Building COM objects & Interfaces

Clients & servers, remote servers, local servers, GUID's, generating GUIDs **[8 Hours]**

Implementing a COM client & server

Building Interfaces, unicode & Internationalized strings, building the client, Registering server **[6Hours]**

COM Programming with MFC

Introduction to MFC, MFC & OLE/ActiveX, ActiveX template library, multiple interfaces & Multiple Inhertance, macros. **[10Hours]**

Building COM objects using Active X

Template Library, Implementing ATL classes, building local server, Registry scripting & Registrar . **[6 Hours]**

A Distributed Object overview
The evolution of Distributed system, Distributed COM, Optimizing DCOM. **[6Hours]**

Using Different COM threading Models
Thread functions, thread types, thread pools, window thread, Thread synchronization, The COM Threading model. **[6 Hours]**

REFERENCES:

1. C. Corry, J. Cadman, V. Mayfield, R.C. Morin "**COM/DCOM** Primer Plus" Sams publishing, published 1998-11
2. David S. Platt "The Essence of COM with Active X " Prentice-Hall publication, 2nd edition,1998.
3. Roger Sessions "COM and DCOM", John Wiley & sons publication, 1998.

ICT--421 NEURAL NETWORKS AND FUZZY LOGIC [4 0 0 4]

1. Basic of Artificial Networks: Characteristics, historical development, terminology, models of neuron, topology, basic learning laws. **[4 Hours]**

2. Action & Synaptic Dynamics : Introduction, Activation dynamic models, synaptic dynamic models, learning methods, stability and convergence, recall in neural networks. **[8Hours]**

3. Functional Units of Artificial Neural Networks for Pattern Recognition Tasks : Pattern recognition problem, basic functional units, pattern recognition tasks by the functional units. **[4 Hours]**

4. Feed forward Neural Networks : Introduction, analysis of pattern association networks, analysis of pattern classification networks, analysis of pattern mapping networks. **[5 Hours]**

5. Feedback Neural Networks : Introduction, analysis of linear associative feed forward networks, analysis of pattern storage networks, stochastic networks and simulated annealing, Boltzman m/c. **[5 Hours]**

6. Competitive Learning Neural Networks : Introduction, components of a competitive learning neural network, analysis of feedback layer for different output functions, analysis of pattern clustering networks, analysis of feature mapping network. **[6Hours]**

7. Applications of Artificial Neural Networks **:** Introduction, direct application areas. **[4 Hours]**

8. Fuzzy logic **:** Propositional logic, membership function, fuzzy logic & rule generation crisp & fuzzy logic, temporal fuzzy logic, Applying temporar fuzzy logic, Defuzzification of temporal fuzzy logic. **[8 Hours]**

9. Fuzzy Neural Networks **:** Fuzzy Artificial Neural Network(FANN), Fuzzy Neural example, traditional control, Neural controls, fuzzy control, fuzzy – neural control, fuzzy neural nets. **[4 Hours]**

TEXT BOOKS :

1. Artificial Neural Networks by Yegnarayana.
2.Understanding Neural Networks & fuzzy logic by Stamatios V. Kartalopoulos (Chapter 2,3,4,5) _ Prentice Hall of India Pvt. Ltd.

REFERENCE BOOKS :

1. Introduction to Artificial Neural Networks by Jacek M. Zurada, Jaico Publications.
2. neural Networks & Fuzzy System by Bart Korko.

3. Neural Networks – by Simon Haykin (Chapter 1,2,3,4) – Addison Weslay Longman Pte. Ltd.
4. Understanding Neural Networks and Fuzzy Logic: Basic Concepts and Applications (IEEE Press Understanding Science & Technology Series)

ICT--423 EXPERT SYSTEMS [4 0 0 4]

Introduction
The nature of expertise, The characteristics of an expert system, Fundamental topics in expert systems, Acquiring knowledge, Controlling reasoning, Explaining solutions. **[4 Hours]**

An overview of Artificial Intelligence
The classical Period : game playing and theorem proving, State space search, Heuristic search, The Romantic Period : computer understanding, SHRDLU, Knowledge representation schemes, The Modern period : techniques and applications, Knowledge is power. **[4 Hours**]

Knowledge Representation
The representation of knowledge : principles and techniques, The STRIPS planner, Operator tables and means – ends analysis, Assessment of STRIPS representation and control, Subgoaling in MYCIN, Treating blood infections, MYCIN's knowledge base, MYCIN's control structure, Evaluating and comparing expert systems, Evaluation of MYCIN, Comparison with STRIPS. [**4 Hours]**

Rule – Based Systems
Canonical systems, Production systems for problem solving, The syntax of rules, The working memory, Controlling the behavior of the interpreter, Conflict resolution, Forward and backward chaining, Rules and meta-rules. **[4 Hours]**

Associative Nets and Frame Systems
Graphs, trees and networks, Associative networks, The type-token distinction and cognitive economy, Assessing the adequacy of associative nets, Representing typical objects and situations, Introduction to frame concepts, Complex nodes in a network, Defaults and demons, Multiple inheritance and ambiguity, Comparing nets and frames. **[4 Hours]**

Representing Uncertainty
Sources of uncertainty, Expert systems and probability theory, Conditional probabilities, Certainty factors, Certainty factors versus conditional probabilities, Vagueness and possibility, Fuzzy sets, Fuzzy logic, Possibility theory, The uncertain state of uncertainty. **[4 Hours]**

Knowledge Acquisition
Theoretical analysis of knowledge acquisition, Stages of knowledge acquisition, Different levels, in the analysis of knowledge, Ontological analysis, Expert system shells, EMYCIN as architecture and abstraction, Maintaining and debugging knowledge bases in TEIRESIAS, Knowledge acquisition methods, Knowledge elicitation by interview in COMPASS, Automating knowledge elicitation in OPAL, A graphical interface to a domain model, Efficacy of OPAL and related efforts, Knowledge-based knowledge acquisition.**[4 Hours]**

Heuristic Classification
Classifications of expert system tasks, Classification problem solving, Heuristic matching, The generality of heuristic classification, Classification versus construction. **[4 Hours]**

Constructive Problem Solving
Motivation and overview, A case study R1/XCON, Components and constraints, Using contexts to impose task structure, Reasoning with constraints: the Match method, Elicitation, Evaluation and extensibility, Knowledge elicitation in R1/XCON, The evaluation and extension of R1/XCON. **[4 Hours]**

Designing for Explanation

Rule based explanation, MYCIN's explanation system, Explanation in MYCIN derivatives : EMYCIN and NEOMYCIN, Frame based explanation, Explanation in CENTAUR, Multimedia interfaces for explanation, Explanation and automatic programming, Automatic programming in XPLAIN, The explainable expert system project, Text plans and user models in PEA. **[4 Hours]**

Tools for Building Expert Systems

Overview of expert system tools, Expert system shells, matching shells to tasks, Shells and inflexibility, High level programming languages, Constraints of production rule languages, Evaluating Object oriented approaches, Logic Programming for expert systems, Multiple paradigm programming environments, Additional modules, Potential Implementation Problems, More maxims on expert system development.

[4 Hours]

Summary and Conclusion

The riddle of artificial intelligence, AI programming languages, Practical problem solving, Expert system architecture, Expert system Research. **[4 Hours]**

TEXT BOOKS

Peter Jackson, "Introduction to Expert Systems", Addison Wesley, Third Edition 2000.

REFERENCE BOOKS:

Donald A. Waterman, "A Guide to Expert System", Addison Wesley, 1986.

ICT--425 SOFTWARE TESTING AND QUALITY ASSURANCE [4 0 0 4]

Introduction: Software engineering –process models /life cycle models ,Software Quality, Role of testing, verification and validation, objectives and issues of testing, Testing activities and levels, Sources of Information for Test Case Selection, White-Box and Black-Box Testing , Test Planning and Design, Monitoring and Measuring Test Execution, Test Tools and Automation, Test Team Organization and Management. **[6 Hours]**

Functional Testing: Partitions, Equivalence Class Partitioning, Boundary Value Analysis, Decision Tables. **[4 Hours]**

Control Flow Testing: Outline of Control Flow Testing, Control Flow Graph, Paths in a Control Flow Graph, Path Selection Criteria, All-Path Coverage Criterion , Statement Coverage Criterion, Branch Coverage Criterion, Predicate Coverage Criterion, Generating Test Input, Examples of Test Data Selection. **[5 Hours]**

Data Flow Testing: Data Flow Anomaly,. Overview of Dynamic Data Flow Testing, Data Flow Graph, Data Flow Terms, Data Flow Testing Criteria, Comparison of Data Flow Test Selection Criteria, Feasible Paths and Test Selection Criteria, Test sensitization. **[4 Hours]**

System Testing: Concept of Integration Testing, Different Types of Interfaces and Interface Errors, System Integration Techniques, System Test Categories- Functionality Tests, Robustness Tests, Interoperability Tests, Performance Tests, Scalability Tests, Stress Tests, Load and Stability Tests, Reliability Tests, Regression Tests, Documentation Tests. System Test Planning and Automation. Acceptance Testing: Types of Acceptance Testing, Acceptance Criteria, Selection of Acceptance Criteria, Acceptance Test Plan. **[8 Hours]**

Unit Testing: Concept of Unit Testing , Static Unit Testing , Defect Prevention , Mutation Testing, Debugging , Unit Testing in eXtreme Programming**.** **[5 Hours]**

Defect Prevention: Defect prevention and Process Improvement: Basic concepts and generic approaches, Root cause analysis for defect prevention, Analysis and modeling for defect prevention, Technologies, Standards, and methodologies for defect prevention, Software tools to block defect injection. **[5 Hours]**

Software Quality: Five Views of Software Quality, McCall's Quality Factors and Criteria, Quality Factors Quality Criteria, Relationship between Quality Factors and Criteria, Quality Metrics, ISO 9126 Quality Characteristics, ISO 9000:2000 Software Quality Standard ISO 9000:2000 Fundamentals, ISO 9001:2000 Requirements**.** **[6 Hours]**

Software Process: Basic Idea in Software Process, Capability Maturity Model -CMM Architecture, Five Levels of Maturity and Key Process Areas, Common Features of Key Practices, Application of CMM, Capability Maturity Model Integration (CMMI). **[5 Hours]**

REFERENCES:

1. Sagar Naik, Piyu Tripathy, "Software Testing and Quality Assurance: Theory and Practice", Wiley, 2008.
2. Jeff Tian, "Software Quality Engineering: Testing, Quality Assurance, and Quantifiable Improvement", - John Wiley and Sons Inc., and IEEE Computer Society Press, 2005.
3. Roger S. Pressman, "Software Engineering A Practitioner's Approach", McGraw Hill Publication , 4th Edition , 2004.
4. Srinivasan Desikan, Gopalaswamy Ramesh, "Software Testing-Principles and practices", Pearson Education, 2011.
5. Ron Patton, "Software Testing", Pearson Education, 2nd Edition, 2007.
6. William Perry, "Effective methods for Software Testing", Wiley.
7. Boris Beizer, Van Nostrand Reinhold, "Software Testing Techniques", 2nd Edition, 1990.

ICT-427 ENTERPRISE RESOURCE PLANNING SYSTEM [4 0 0 4]

Introduction To ERP
Evolution of ERP, Reasons for the growth of ERP, Secnario and Justification of ERP in India, Evaluation Of ERP, Various Modules Of ERP, Advantage of ERP. **[8 Hours]**

An overview of Enterprise, Integrated Management Information, Business Modelling, ERP for Small Business, ERP for make to order companies, Business Process Mapping for ERP Module Design, Hardware Environment and its Selection for ERP Implementation. **[8 Hours]**

ERP and Related Technologies, Business Process Reengineering (BPR), Management Information System (MIS), Executive Information System (EIS), Decision Support System (DSS), Supply Chain Management (SCM). **[8 Hours]**

ERP Modules, Introduction, Finance, Plant Maintainance, Quality Management, Materials Management **[6 Hours]**

ERP Market, Introduction, SAP AG, Baan Company, Oracle Corporation, People Soft, JD Edwards World Solutions Company, System Software Associates, Inc. (SSA) QAD, A Comparative Assessment and Selection of ERP Packages and Modules. **[6 Hours]**

ERP implementation lifecycle, issues in implementing ERP packages, pre-evaluation screening, package evaluation, project planning phase, gap analysis, reengineering, configuration, implementation, team training, testing, going live, end-user training, post implementation (Maintenance mode). **[8 Hours]**

Future Directions in ERP, New markets, new channels, faster implementation methodologies, business modules and BAPIs, convergence on windows NT, Application platform. **[4 Hours]**

1. Ellen Monk and Bret Waner," Concepts in Enterprise Resource Planning", Third Edition publisher Course Technology ,Feb 4, 2008, ISBN: 978-1423901792
2. Vinod Kumar Garg & N K Venkatakrishna, "Enterprise Resource Planning – Concepts and Practices " II Edition PHI,2006
3. S Sadagopan, "Enterprise Resource Planning" ,I edition PHI, 2006
4. Alexis Leon "Enterprise Resource Planning ",Tata McGrew Hill,1/e, 2003
5. F. Robert Jacobs and D. Clay Whybark, "Why ERP? A primer on SAP Implementation", McGraw-Hill Higher Education, 2000
6. , by Jeanne W. Ross, Peter Weill, David Robertson,"Enterprise Architecture as Strategy" Publisher: Harvard Business School Press ,Aug 8, 2006, ISBN: 1591398398.

ICT—429 INFORMATION RETRIEVAL [4 0 0 4]

Basics
Introduction to IR – need and comparison with data retrieval. [**4 Hours]**

Modeling
Formal specifications of IR systems. Set theoretic model - Boolean, Vector and Probabilistic based IR systems. Comparison between searching and browsing. [**6 Hours]**

Performance Measures
Recall, Precision, R-precision, Single Value Summaries. User oriented measures: coverage, novelty, expected search length [**6 Hours]**

Query Languages

Single and multi word queries, phrase based queries, structural queries, contextual queries, Structured text: Form based, Hierarchical and Link based. **[6 Hours]**

Text Processing

Information processing, entropy measure, Zipf's Law, Heap's Law, growth of vocabulary, Logical view of documents, Lexical analysis: handling stop-words, punctuations, use of thesaurus, Stemming techniques - Porter's algorithm, Text compression: Statistical and Dictionary schemes, Huffman coding. Inverted lists compression. **[8Hours]**

Indexing and Searching

Suffix Tries, Supra indices, B+ trees and Hashing construction techniques. Substring matching: Brute Force, KMP, Regular Expression, Shift-Or technique, Suffix Automaton. **[6 Hours]**

Query Operations

User Relevance feedback, Query expansion and term re-weighting for Vector model. Automatic Local Analysis. **[6Hours]**

Web search

Issues handling web documents, Web Crawling, Web documents ranking - PageRank ranking algorithm. LSI model **[6 Hours]**

REFERENCES :

1. Ricardo Baeza Yates and Berthier Ribeiro Neto, "Modern Information Retrieval", 2nd Edition, ACM Press Books, 2011.
2. Christopher D Manning, Prabhakar Raghavan & Hinrich Schutze, "Introduction to Information Retrieval", 1st Edition, Cambridge University Press, 2008.

ICT--431 SATELLITE COMMUNICATIONS [4 0 0 4]

Over view of Satellite Systems: Introduction, frequency allocation, INTEL Sat. **[5 Hours]**

Orbits: Introduction, Kepler laws, definitions, orbital element, apogee and perigee heights, orbit perturbations, inclined orbits, calendars, universal time, sidereal time, orbital plane, local mean time and sun clyndronous orbits, Geostationary orbit: Introduction, antenna, look angles, polar mixantenna, limits of visibility, earth eclipse of satellite, sun transit outage, laendiag orbits. **[10 Hours]**

Propagation impairments and space link: Introduction, atmospheric loss, ionospheric effects, rain attenuation, other impairments. Space link: Introduction, EIRP, transmission losses, link power budget, system noise, CNR, uplink, down link, effects of rain, combined CNR. **[5 Hours]**

Space Segment: Introduction, power supply units, altitude control, station keeping, thermal control, TT&C, transponders, antenna subsystem. **[5 Hours]**

Earth Segment: Introduction, receive only home TV system, outdoor unit, indoor unit, MATV, CATV, Tx – Rx earth station. **[5 Hours]**

Interference and Satellite Access: Introduction, interference between satellite circuits, satellite access, single access, pre-assigned FDMA, SCPC [spade system], TDMA, pre-assigned TDMA, demand assigned TDMA, down link analysis, and comparison of uplink power requirements for TDMA & FDMA, on board signal processing satellite switched TDMA. **[8 Hours]**

Direct Broadcast Satellite Services: Introduction, Orbital Spacings, Power Rating and Number of Transponders, Frequencies and Polarization, Transponder Capacity, Bit Rates for Digital Television, MPEG Compression Standards, Forward Error Correction , Home Receiver Outdoor Unit (ODU), Home Receiver Indoor Unit (IDU), Downlink Analysis – Uplink -Problems - Satellite Mobile Services – VSATs – Radarsat – Global Positioning Satellite System – Orbcomm. **[10 Hours]**

REFERENCES:

1. Dennis Roddy, "Satellite Communications", 4th Edition, McGraw-Hill Professional, 2006.
2. Gerand Maral, Michel Bousquet and Zhilli Sun, "Satellite Communication Systems", 5th Edition, Wiley, 2010.
3. Timothy Pratt, Charles Bostian and Jeremy Allnutt, "Satellite Communications", 2nd Edition, John Wiley & Sons, 2003.

ICT-- 433 IMAGE PROCESSING AND PATTERN RECOGNITION [4 0 0 4]

Basic Image processing system, Image source, characteristics, image representation, hardware & software requirements. **[4 Hours]**

Two dimensional systems: Properties of 2D sequences & systems, 2D Fourier transform, 2D Z-transform, 2D sampling theory. **[6 Hours]**

Image Quantization, Image perception, Quality measures **[4 Hours]**

Image transforms 2D-DFT, 2D-DCT, sine transform, Hadamard, Harr, Slant and KL transforms. **[6 Hours]**

Image Compression algorithms, pixel coding ,PCM, run length coding, predictive techniques DPCM, transform coding – DCT, vector Quantization, VQ in image coding, interface coding, standards for image compression JPEG, MPEG. **[8 Hours]**

Image segmentation: Feature extraction, edge detection, Boundary Extraction, Region representation, Moment representation, shape featuring, scene matching image segmentation, classification techniques – supervised and non-supervised. **[7 Hours]**

Image enhancement and Restoration: point operations, Histogram modeling, spatial operations, transform operations, image filtering and restoration deblurring, color image processing. **[7 Hours]**

Object Recognition: Patterns and Pattern Classes, Recognition Based on Decision-Theoretic Methods, Matching, Optimum Statistical Classifiers, Structural Methods, Matching Shape Numbers, String Matching, Syntactic Recognition of Strings, Syntactic Recognition of Trees. **[6 Hours]**

TEXT BOOKS:

1. Anil K. Jain, "Fundamentals of Digital Image Processing", PHI, 2004, New Delhi.
2. R.C. Gonzalez and R.E. Woods, "Digital Image processing", PHI, 3rd Edition, 2008, New Delhi.

REFERENCE BOOKS:

1. Maher A, Sid Ahmed, "Image Processing Theory, Algorithms and Architectures", McGraw Hill, 1995, New York.
2. Roy A. Plastock, Gardon Kalley, "Theory and Problems of Computer Graphics", Schaum's Outline series, 2001, New York.

ICT-435 MULTIMEDIA COMMUNICATIONS [4 0 0 4]

Introduction: Branch –Overlapping Aspects of Multimedia, Global Structure. **[2 Hours]**

Media and Data Streams: Medium, Main Properties of a Multimedia System, Multimedia Information Units. [**4 Hours]**

Overview of Multimedia Processes and Coding: Overview of multimedia services and applications, Video coding fundamentals, Lossy and lossless compression, Transform coding, Motion compensated predictive coding. [**12 hours]**

Multimedia Coding Standards: JPEG/JPEG 2000, H.26X, MPEG-1/4/7, AVC, Scalable video coding. [**14 Hours**]

Multimedia Networking: End-to end QoS for video delivery, Wireless video, Error control in video streams, Cross-layer video adaptation. [**10 Hours**]

Multimedia Operating systems : Introduction, Real time, Resource Management, Process Management, File Systems, System Architecture, MDBMS [**6 Hours]**

REFERENCE BOOKS:

1. K.R. Rao, Zoran S. Bojkovic, and D.A. Milovanovic, " Multimedia Communication Systems", Prentice Hall, 2002.
2. M.Ghanbari,"Standard Codecs", IET, 2003.
3. Yao Wang, Jorn Ostermann and Ya-Qin Zhang,"Video Processing and Communications", Prentice Hall, 2001.

4. John W.Woods (Editor),"Multidimensional Signal, Image and Video Processing and Coding", 2nd Edition, Academic Press, 2011.
5. Ming-Ting Sun,"Compressed Video over Networks", CRC Press, 2000.

ICT-- 437 ERROR CONTROL AND CODING [4 0 0 4]

Introduction: Basics of Data transmission, Types of Error control, Types of codes, Binary modulation Maximum likelihood decoding, Types of errors **[4 Hours]**

Abstract Algebra: Groups, Fields, Binary field arithmetic, Construction of Galois Field GF(2^m), Properties of Galois Field GF(2^m), GF(2^m) arithmetic, Vector spaces over fields, Matrices over fields**. [6 Hours]**

Block Codes: Linear Block Codes: Encoding, Decoding, Syndrome and error detection, Distance and error detection and correction properties, Standard Array and syndrome decoding, Probability of error, Hamming codes, Modified linear codes, Punctured codes. **[6 Hours]**

Cyclic codes: Properties, Encoding and decoding, CRC codes, Majority logic decoding, **[6 Hours]**

BCH and Reed-Solomon Codes, Block Code Performance Analysis [5 Hours]

Convolutional and Related Codes: Linear, Nonrecursive Convolutional Codes, Encoding, Properties, Graphs, state diagrams, and trellises, Distance properties, Maximum likelihood decoding (Viterbi decoding), Performance analysis, **[7 Hours]**

Low-Density Parity-Check Codes, Belief propagation, Gallagher Decoding **[6 Hours]**

Turbo Codes: Recursive, systematic convolutional codes, MAP decoding, Distance properties, Performance bounds, Interleaver design **[4 Hours]**

Trellis Codes: M-ary signaling, Set partitioning, Distance properties, Multiple TCM, Decoding and performance. **[4 Hours]**

TEXT BOOK:

1. Shu Lin and Daniel J. Costello Jr., "Error Control Coding: Fundamentals and Applications", 2nd Edition, Pearson Education, New Jersey 2005.

REFERENCES:

1. "Error Correction Coding,", by Todd K. Moon, Wiley India, New Delhi 2009.
2. "Error Control Systems for Digital Communication and Storage", by Stephen B. Wicker, Prentice Hall, New Jersey 1995.
3. "Finite Fields for Computer Scientists and Engineer", by Robert J. McEliece, Kluwer Academic Publishers, 1987
4. "Low-Denisty Parity-Check Codes", by Robert G. Gallager, MIT Press, 1963.
5. "Telecommunications: Protocols and Design", by John D. Spragins, Joseph L. Hammond, and Krzysztof Pawlikowski, Addison-Wesley, 1991
"Turbo Codes: Principles and Applications", by Branka Vucetic and Jinhong Yuan, Kluwer Academic Publishers, Boston 2000.

ICT-439 E-COMMERCE & N/W SECURITY [4 0 0 4]

Cryptography: Introduction, Symmetric Key and Asymmetric Key cryptography algorithms. **[10 Hours]**

Network Security-Part 1: Authentication Applications: Kerberos, x.509 Directory Authentication service, Electronic Mail Security: Pretty Good Privacy, S/MIME, IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating security payload, Combining security associations, Key management. **[10 Hours]**

Network Security-Part 2: Web Security requirements, Secure Sockets Layer and Transport Layer Security, Secure Electronic Transaction, Intruders, Viruses and Worms, Firewalls: Firewall design principles, Trusted Systems **[10 Hours]**

Legal Aspects of E-Commerce: Digital Signatures, Digital copyrights, Digital Documents. **[6 Hours]**

Electronic Payment Systems: Digital tokens, e-cash, smart cards, credit cards, risk in design of Electronic payment systems. **[6 Hours]**

B2B Commerce : Macroforces, Customization, Supply-Chain Management**.** **[6 Hours]**

TEXT BOOKS :

1.William Stallings: Cryptography and Network Security: second edition, prentice-Hall,1998
2. Kalakota & Andrew Whinston " Frontiers of Electronic Commerce", Pearson Education, 2006.
3. Vivek & Rajiv Sharma "Developing E-Commerce Sites – An Integrated Approach", Adison-Wesley Professional, 2000.

REFERENCE BOOKS :

1. Chapmaw, D & Zwicky, E: Building Internet Firewalls, O 'Reilly, 1995.
2. Derek Atkins et al : Internet Security, Professional Reference (Second Edition), Techmedia, 1997.

ICT-441 Cloud Computing [4 0 0 4]

Overview of Distributed Systems, Introduction of cloud computing, cloud architecture and service models, the economics and benefits of cloud computing, Infrastructure as a Service (IaaS)- Introduction to IaaS, Resource Virtualization: Server, Storage, Network, Case studies. Platform as a Service (PaaS)- Introduction to PaaS, Clout platform and Management: Computation, Storage, Case studies, Software as a Service (SaaS)- Introduction to SaaS, Web services, Web 2.0, Web OS, Case studies.

Horizontal/vertical scaling, thin client, multimedia content distribution, multiprocessor and virtualization, distributed storage, security and federation/presence/identity/privacy in cloud computing, security, disaster recovery, free cloud services and open source software, and example commercial cloud services.

Text Books

1. John Rhoton, "Cloud Computing Explained", Recursive Press, 2nd Edition, 2010, ISBN: 978-0956355607.
2. John W. Rittinghouse and James F. Ransome, "Cloud Computing, Implementation, Management and Security", ISBN: 978-1-4398-0680-7, CRC Press, 2010

References

1. Andrew S. Tanenbaum, “Modern Operating Systems, 3rd Edition”, ISBN: 01360-06639, Prentice Hall, 2007
2. George Reese, “Cloud Application Architectures”, ISBN: 978-0-596-15636-7, O’Reilly, 2009
3. David S. Linthicum, “Cloud Computing and SOA Convergence in Your Enterprise: A Step-by-Step Guide”, ISBN: 978-0-1360-0922-1, Addison Wesley, 2009