

B.Tech Programme  
COMPUTER SCIENCE AND ENGINEERING  
CURRICULUM  
AND  
SYLLABUS (III Semester to VIII Semester)

Pondicherry University  
B.Tech - Curriculum  
Computer Science and Engineering

Effective from 2009-2010

I Semester

Code No.	Name of the Subjects	Periods			Credits	Marks		
		L	T	P		IA	UE	TM
	<u>Theory</u>							
T101	Mathematics – I	3	1	-	4	25	75	100
T102	Physics	4	-	-	4	25	75	100
T103	Chemistry	4	-	-	4	25	75	100
T104	Basic Electrical and Electronics Engineering	3	1	-	4	25	75	100
T105	Engineering Thermodynamics	3	1	-	4	25	75	100
T106	Computer Programming	3	1	-	3	25	75	100
	<u>Practical</u>							
P101	Computer Programming Laboratory	-	-	3	2	50	50	100
P102	Engineering Graphics	2	-	3	2	50	50	100
P103	Basic Electrical & Electronics Laboratory	-	-	3	2	50	50	100
	Total	22	4	9	29	300	600	900

II Semester

Code No.	Name of the Subjects	Periods			Credits	Marks		
		L	T	P		IA	UE	TM
	<u>Theory</u>							
T107	Mathematics – II	3	1	-	4	25	75	100

T108	Material Science	4	-	-	3	25	75	100
T109	Environnemental Science	4	-	-	3	25	75	100
T110	Basic Civil and Mechanical Engineering	4	-	-	4	25	75	100
T111	Engineering Mechanics	3	1	-	4	25	75	100
T112	Communicative English <u>Practical</u>	4	-	-	3	25	75	100
P104	Physics Laboratory	-	-	3	2	50	50	100
P105	Chemistry Laboratory	-	-	3	2	50	50	100
P106	Workshop Practice	-	-	3	2	50	50	100
P107	NSS / NCC *	-	-	-	-	-	-	-
	Total	22	2	9	27	300	600	900

\* To be completed in I and II semesters, under Pass / Fail option only and not counted for CGPA calculation.

### III Semester

Code No.	Name of the Subjects	Periods			Credits	Marks		
		L	T	P		IA	UE	TM
	<u>Theory</u>							
MA T31	Mathematics – III	3	1	-	4	25	75	100
CS T32	Electronics Devices and Circuits	4	-	-	3	25	75	100
CS T33	Electrical Engineering	4	-	-	3	25	75	100
CS T34	Digital System Design	3	1	-	3	25	75	100
CS T35	Data Structures	3	1	-	4	25	75	100
CS T36	Principles of Programming and Languages	4	-	-	3	25	75	100
	<u>Practical</u>							
CS P31	Electrical and Electronics Laboratory	-	-	3	2	50	50	100
CS P32	Digital Laboratory	-	-	3	2	50	50	100

CS P33	Data Structures Laboratory	-	-	3	2	50	50	100
	Total	21	3	9	26	300	600	900

#### IV Semester

Code No.	Name of the Subjects	Periods			Credits	Marks		
		L	T	P		IA	UE	TM
	<u>Theory</u>							
MA T41	Discrete Mathematics and Graph Theory	4	-	-	3	25	75	100
CS T42	Microprocessors and Microcontrollers	4	-	-	4	25	75	100
CS T43	Automata Languages and Computations	4	-	-	3	25	75	100
CS T44	Design and Analysis of Algorithms	3	1	-	4	25	75	100
CS T45	Object Oriented Programming Languages	3	1	-	4	25	75	100
CS T46	Computer Organization and Architecture	4	-	-	3	25	75	100
	<u>Practical</u>							
CS P41	Microprocessors and Microcontrollers Laboratory	-	-	3	2	50	50	100
CS P42	Design and Analysis of Algorithms Laboratory	-	-	3	2	50	50	100
CS P43	Object Oriented Programming Languages Laboratory	-	-	3	2	50	50	100
SP P44	Physical Education*	-	-	3	1	100	-	100
	Total	22	2	12	28	400	600	1000

\* Under Pass/Fail option only and not accounted for CGPA calculation

V Semester

Code No.	Name of the Subjects	Periods			Credits	Marks		
		L	T	P		IA	UE	TM
	<u>Theory</u>							
CS T51	Operating Systems	3	1	-	3	25	75	100
CS T52	Language Translators	3	1	-	3	25	75	100
CS T53	Computer Networks	4	-	-	4	25	75	100
CS T54	Platform Technology	3	1	-	4	25	75	100
CS T55	Graphics and Image Processing	3	1	-	3	25	75	100
CS T56	Embedded Systems	3	1	-	3	25	75	100
	<u>Practical</u>							
CS P51	Computer Networks Laboratory	-	-	3	2	50	50	100
CS P52	Platform Technology Laboratory	-	-	3	2	50	50	100
CS P53	Operating Systems Laboratory	-	-	3	2	50	50	100
HS P54	General Proficiency - I	-	-	3	2	100	-	100
	Total	19	5	12	28	400	600	1000

VI Semester

Code No.	Name of the Subjects	Periods			Credits	Marks		
		L	T	P		IA	UE	TM
	<u>Theory</u>							
CS T61	Database Management Systems	3	1	-	4	25	75	100
CS T62	Software Engineering	3	1	-	4	25	75	100
CS T63	Web Technology	3	1	-	3	25	75	100
CS T64	Wireless Communication and Networks	3	1	-	4	25	75	100

	Elective – I	4	-	-	3	25	75	100
	Elective – II	4	-	-	3	25	75	100
	<u>Practical</u>							
CS P61	Database Management Systems Laboratory	-	-	3	2	50	50	100
CS P61	Web Technology Laboratory	-	-	3	2	50	50	100
CS P61	Mini Project using CASE Tools	-	-	3	2	50	50	100
HS P64	General Proficiency - II	-	-	3	2	100	-	100
	Total	20	4	12	29	400	600	1000

#### VII Semester

Code No.	Name of the Subjects	Periods			Credits	Marks		
		L	T	P		IA	UE	TM
	<u>Theory</u>							
CS T71	Artificial Intelligence	4	-	-	4	25	75	100
CS T72	Hardware and Trouble Shooting	3	1	-	3	25	75	100
CS T73	Distributed Computing	4	-	-	3	25	75	100
	Elective – III	4	-	-	3	25	75	100
	Elective – IV	4	-	-	3	25	75	100
	<u>Practical</u>							
CS P71	Hardware and Trouble Shooting Laboratory	-	-	3	2	50	50	100
CS P72	Distributed and Intelligent Computing Laboratory	-	-	3	2	50	50	100

CS P73	Seminar	-	-	3	1	100	-	-
CS P74	Project Work (Phase I)	-	-	3	2	100	-	100
CS P75	Industrial Visits/Training	-	-	-	1	100	-	100
	Total	19	1	12	24	525	475	900

### VIII Semester

Code No.	Name of the Subjects	Periods			Credits	Marks		
		L	T	P		IA	UE	TM
	<u>Theory</u>							
HS T81	Engineering Economics and Management	4	-	-	3	25	75	100
CS T82	High Performance Computing	4	-	-	3	25	75	100
CS T83	Information Security	3	1	-	4	25	75	100
	Elective – V	4	-	-	3	25	75	100
	Elective – VI	4	-	-	3	25	75	100
	<u>Practical</u>							
CS P81	Advanced Computing Laboratory	-	-	3	2	50	50	100
CS P82	Project Work (Phase-II)	-	-	3	6	50	50	100
CS P83	Comprehensive Viva-Voce	-	-	3	2	50	50	100
HS P84	Professional Ethics Practice	-	-	3	1	100	-	100
	Total	19	1	12	27	375	525	900

### **Electives for Sixth Semester**

1. CS E61 Object Oriented Analysis and Design
2. CS E62 Network Design and Management
3. CS E63 E-Business
4. CS E64 Bio Informatics
5. CS E65 Information Theory and Coding Techniques
6. CS E66 Language Technologies
7. CS E67 Unix Internals
8. CS E68 Data Mining and Warehousing
9. CS E69 Advanced Databases
10. CS E610 Resource Management Techniques
11. CS E611 Agile Technologies
12. CS E612 Java Script

### **Electives for Seventh Semester**

1. CS E71 Software Quality Assurance and Testing
2. CS E72 Component Engineering
3. CS E73 Client Server Computing
4. CS E74 Real Time Computing and Communication
5. CS E75 Software Architecture
6. CS E76 High Speed Networks
7. CS E77 N/W Protocols
8. CS E78 Modeling and Simulation
9. CS E79 Principles of Communication
10. CS E710 Software Project Management
11. CS E711 Radio Frequency Identification Technology
12. CS E712 Rational Unified Process

### **Electives for Eighth Semester**

1. CS E81 Intelligent Information Retrieval
2. CS E82 Soft Computing
3. CS E83 Optical Networks
4. CS E84 Mobile Computing
5. CS E85 Grid Computing
6. CS E86 Agent Technology
7. CS E87 Organizational Behavior
8. CS E88 Digital System Design using VHDL
9. CS E89 Model Driven Architecture
10. CS E810 Refactoring Techniques





## MA T31 MATHEMATICS – III

### UNIT I

**Laplace Transform:** Definitions - Laplace transform of unit impulse and step functions - Laplace transform of periodic functions - Exponential shift formula- Initial and final value theorems - Laplace transform of derivatives and integrals - Convolution theorem - Inverse Laplace transform - Methods of determining inverse Laplace transform -Solution of linear differential equations using Laplace transforms. (12 Hours)

### UNIT II

**Function of a Complex Variable:** Functions of a complex variable - continuity, derivative and analytic function - Cauchy - Riemann equations – Necessary and sufficient conditions for analyticity - Harmonic and orthogonal properties of real and imaginary parts - Conformal mapping - Bilinear transformations. (12 Hours)

### UNIT III

**Complex Integration:** Cauchy's theorem -Cauchy's integral formula - Taylor's and Laurent series - Residue theorem - Contour integration round the unit circle and semi-circular contour. (12 Hours)

### UNIT IV

**Fourier Series:** Dirichlet's conditions - Expansion of periodic functions into Fourier series- Change of interval- Half-range Fourier series. (10 Hours)

### UNIT V

Complex form of Fourier series - Root mean square value - Parseval's theorem on Fourier coefficients - Harmonic analysis.

**Fourier Transform:** Definition and properties - Fourier Integral theorem - statement - Fourier sine transform and cosine transforms - Inverse Fourier transform.

(12 Hours)

## **TEXT BOOKS**

1. M.K.Venkataraman, “Engineering Mathematics, Vol. II”, National Publishing Co., Madras, 2009. (UNITs I, II, & III )
2. M.K.Venkataraman, “Engineering Mathematics, Vol. III”, National Publishing, Co., Madras, 2009. (UNITs IV & V)

## **REFERENCES**

1. N.P. Bali and Manish Goyal, “A Text Book of Engineering Mathematics”, Laxmi Publications, New-Delhi, 2008.
2. Erwin Kreyszig, “Advanced Engineering Mathematics”, John-Wiley Sons, New-York, 2005.
3. B. S. Grewal, “Higher Engineering Mathematics”, Khanna Publishers, New-Delhi, 2008.

## CS T32 ELECTRONIC DEVICES AND CIRCUITS

### UNIT I

**Diode and its Applications :** Diode equivalent circuits – diode as a switch – applications – Half wave and full wave rectifiers – Filters – Ripple factor and rectification efficiency – Clippers and clampers – Voltage doubler and tripler – Voltage regulation – Series and shunt voltage regulators.

### UNIT II

**Small Signal Amplifiers:** BJT – Transistor biasing and bias circuits – operating point – transistor modelling – ‘h’ parameters – Analysis of low frequency transistor amplifier circuits for CE – CB and CC configuration – FET biasing and bias circuits – FET small signal model – Analysis of common drain and common source amplifier configuration.

### UNIT III

**Large Signal Amplifiers:** Amplifier types – Class A amplifier – Series fed and transformer coupled – Class B and Class AB amplifiers – Conversion efficiency – Amplifier distortion – Class C amplifier.

### UNIT IV

**Feedback Amplifiers:** Feedback concept, general characteristics of negative feedback amplifiers, Types of feedback, comparison of parameters.

**Oscillators:** Barkhausen Criterion - Hartley, Colpitts and Wein bridge oscillators, crystal oscillator - Frequency stability.

### UNIT V

**Operational Amplifier:** Introduction to op-amp, Characteristics of op-amp. Differential and common mode operation, op-amp parameters - Equivalent circuit - Applications : Inverting and non-inverting amplifier, summer, subtractor, differentiator, integrator, comparator, analog multipliers, first order low pass and high pass active filters, regulators using op-amp.

## **TEXT BOOKS**

1. Jacob Millman, C. Halkias and Satya brata Jit, “Electronic Devices and Circuits”, McGraw Hill Publications, Second edition, 2007.
2. Jacob Millman and Arvin Grabel, “Micro-Electronics”, McGraw Hill, Fifth edition, 1998.

## **REFERENCES**

1. R. Boystled and Louis Nishalsky, “Electronic Devices and Circuit Theory”, Prentice Hall, Tenth edition, 2008.

## CS T33 ELECTRICAL ENGINEERING

### UNIT I

**Analysis of Electrical Circuits:** Loop and mesh method of analysis Theorems - Thevenin's and Norton's theorem – superposition theorem - maximum power transfer theorem – Applications to DC and AC circuits.

### UNIT II

**Resonance and Coupled Circuits:** AC Networks – resonance-series - parallel-series - parallel combinations - coupled circuits effect of variation of  $Q$  on resonance - dot conversions - single tuned, double tuned circuits. Simple RL, RC and RLC transients (DC Excitation) - transient analysis using Laplace Transformation method.

### UNIT III

**Transformers:** Single phase transformer - construction-principle of operation - EMF equation - phasor diagram - OC and SC test – Equivalent circuit-losses - all day efficiency – regulation - Elementary treatment of three phase transformer.

### UNIT IV

**DC Machines:** DC generator – construction - principle of operation - EMF equation – classification of DC generators - DC motors - Torque equation - commutation starters - Swinburne's test - Losses and Efficiency of DC machines - Speed control applications of DC machines.

### UNIT V

**Special Machines:** Single phase induction motor - construction-principle of operation - condition for starting equivalent circuit - Applications. Stepper motor - Universal motor - Reluctance motor - Introduction to UPS – types, operation (block diagram approach) – Batteries – types, capacitor, Amp-hour calculator, backup time calculator - Applications.

## **TEXT BOOKS**

1. B.L. Theraja and A.K. Theraja “A Textbook of Electrical Technology: Volume II”, S. Chand & Company Ltd, New Delhi, 2008.
2. M. Arumugam and N. Premakumaran, “Electric Circuit Theory”, Kama Publishers, New Delhi, 2003.

## **REFERENCES**

1. Stephen J. Chapman, “Electric Machinery Fundamentals”, McGraw-Hill, International edition, 2002.
2. Ned Mohan, M. Underland and William P. Robins, “Power Electronic Converters Application and Design”, John Wiley & Sons, Singapore, 2001.

## CS T34 DIGITAL SYSTEM DESIGN

### UNIT I

**Number Systems and Boolean Algebra:** Revision of RTL, DTL, I<sup>2</sup>L, TTL, ECL, MOS, CMOS logic families - Binary number systems and conversion - Binary arithmetic-Binary codes - Boolean algebra - Basic operations - Basic Theorems - Boolean functions-Canonical forms - Simplification of Boolean functions-Karnaugh maps - Tabulation method.

### UNIT II

**Combinational Logic:** Adders – subtractors – code converters – binary parallel adder – decimal adder – magnitude comparator – encoders – decoders – multiplexers – demultiplexers- Binary Multiplier – Parity generator and checker.

### UNIT III

**Sequential Circuits:** latches – flip flops – analysis of clocked sequential circuits – state reduction and assignments.

**Registers and Counters:** Registers – shift registers – ripple counters – synchronous counters – other counters.

### UNIT IV

**Memory and Programmable Logic:** Random access memory – memory decoding - error detection and correction – Read only memory – Programmable Logic Array – Programmable Array Logic. Introduction to CPLDs, FPGAs

**Asynchronous Sequential Logic :** Analysis procedure – circuits with Latches – Design procedure – Reduction of state and Flow tables – Race-Free state assignment – Hazards.

### UNIT V

**Introduction to VHDL (Very High Speed Integrated Circuit Hardware Description Language):** Introduction – VHDL Design flow, program structure, types and constants, functions and procedures, libraries and packages – VHDL for combinational circuits, Sequential Circuits, Registers and Counters, VHDL description for binary multiplier.



## **TEXT BOOK**

1. M. Morris Mano, “Digital Design”, Prentice-Hall of India, Pvt. Ltd., Third edition, 2004.
2. J. Bhasker “VHDL Primer” ,Prentice-Hall of India, Pvt. Ltd, Third Edition, 2006.

## **REFERENCES**

1. Thomas L. Floyd and R.P. Jain, “Digital Fundamentals”, Pearson Education, Tenth edition, 2008.
2. Leach Malvino, “Digital Principles and Applications”, Tata McGraw Hill, Fifth edition, 2005.
3. Charles H. Roth, “Fundamentals of Logic Design”, Thomson Brooks/Cole, Fifth edition, 2003.
4. Thomas C Bartee, “Computer Architecture and Logic Design”, McGraw Hill, Singapore, 2002.
5. Charles H. Roth Jr, “Digital System Design Using VHDL”, PWS Publications, 1998.
6. Stephen Brown, Zvonko Vranesic “Fundamentals of Digital Logic with VHDL Design”, McGraw Hill, Second edition, 2004.

## CS T35 DATA STRUCTURES

### UNIT I

**Introduction:** Algorithmic notation – Programming principles – Creating programs- Analyzing programs.

**Arrays:** One dimensional array, multidimensional array, pointer arrays.

**Searching:** Linear search, Binary Search, Fibonacci search.

### UNIT II

**Stacks:** Primitive operations, Application of stacks.

**Queues:** Primitive operations - Priority queues - De queues – Applications.

**Linked list:** Singly Linked List, Doubly Linked List, Circular Linked List, linked stacks, Linked queues, Applications of Linked List –Dynamic storage management – Generalized list - Garbage Collection and Compaction.

### UNIT III

**Trees:** Binary tree, Terminology, Representation, Traversal, Types, Applications.

**Graph:** Terminology, Representation, Traversals – Applications - spanning trees, shortest path and Transitive closure, Topological sort.

**Sets:** Representation - Operations on sets – Applications.

### UNIT IV

**Tables:** Rectangular tables - Jagged tables – Inverted tables - Symbol tables – Static tree tables - Dynamic tree tables - Hash tables.

**Sorting techniques:** Internal sorting - Insertion Sort, Selection Sort, Shell Sort, Bubble Sort, Quick Sort, Heap Sort, Merge Sort, Radix Sort.

**External sorting:** External storage devices – Sorting with tapes and disks.

## **UNIT V**

**Files:** queries - Sequential organization – Index techniques.

**B Trees:** B Tree indexing, operations on a B Tree, Lower and upper bounds of a B Tree -

B + Tree Indexing – Trie Tree Indexing.

## **TEXT BOOKS**

1. Ellis Horowitz and Sartaj Sahni “Fundamentals of Data Structures” Galgotia Book Source, Pvt. Ltd., 2004. (UNITs I to V)
2. D. Samanta, “Classic Data Structures”, Prentice-Hall of India, Pvt. Ltd., India 2003. (UNITs III, IV, & V)

## **REFERENCES**

1. Robert Kruse, C.L. Tondo and Bruce Leung, “Data Structures and Program Design in C”, Prentice-Hall of India, Pvt. Ltd., Second edition, 2007.
2. Jean Paul Tremblay and Paul G. Sorenson, “An Introduction to Data Structures with Applications”, Tata McGraw-Hill, Second edition, 2001.
3. Aaron M Tanenbaum, Moshe J Augenstein and Yedidyah Langsam, "Data Structures using C and C++", Pearson Education, 2004.
4. Mark Allen Weiss,” Data Structures and Algorithm Analysis in C”, Pearson Education, Second edition, 2006

## CS T36 PRINCIPLES OF PROGRAMMING AND LANGUAGES

### UNIT I

**Program Design:** Introduction- fundamental Design Concepts - Modules and Modularization Criteria - Design notation: Procedure Template, Pseudo Code - Structured Flow Chart - Decision Tables - Design techniques: Stepwise refinement, Levels of abstraction, Top down- Test Plans- Design Guidelines.

**Implementation Issues:** Introduction – Structured Coding techniques: single entry and single exit constructs, Efficiency consideration, Validation of single entry and single exit, Coding Style.

### UNIT II

**Introduction:** Characteristics of programming Languages, Factors influencing the evolution of programming language, Development in programming methodologies, desirable features and design issues.

**Programming Language processors:** Structure and operations of translators, software simulated computer, syntax, semantics, structure, virtual computers, binding and binding time.

### UNIT III

**Data types:** Properties of types and objects – elementary data types – structured data types.

**Abstraction:** Abstract data types – encapsulation by subprograms – type definition – storage management.

### UNIT IV

**Sequence Control:** Implicit and explicit sequence control – sequencing with arithmetic and non-arithmetic expressions – sequence control between statements. **Subprograms Control:** Subprogram sequence control – attributes of data control – shared data in.

### UNIT V

**Object Oriented Programming:** The class notion - Information hiding and data abstraction using classes, derived classes and inheritance, Polymorphism, Parameterized types.

**Logic Programming:** Formal logical systems – PROLOG.

**Functional Programming:** Features of functional languages – LISP – Applications of functional and logic programming languages.

## **TEXT BOOK**

1. Richard Fairley,” Software Engineering Concepts”, Tata Macgraw Hill, 2006 (UNIT I)
2. Terrance W. Pratt, and Marvin V. Zelkowitz, “Programming Languages, Design and Implementation”, Prentice-Hall of India, Fourth edition, 2002 (UNIT II to V)

## **REFERENCES**

1. Ravi Sethi, “Programming Languages – Concepts and Constructs”, Addison-Wesley, Second edition, 1996.
2. Allen B. Tucker, Robert Noonan, Programming Languages: Principles and Paradigms, Tata McGraw-Hill, 2006.
3. E. Horowitz, “Fundamentals of Programming Languages”, Galgotia Publishers, 1984.
4. A.B. Tucker, Robert, Noonan, “Programming Languages”, McGraw-Hill, 2002.
5. Robert W. Sebesta, “Concepts of Programming Languages”, Addison Wesley, Sixth edition, 2003.

## **CS P31 ELECTRICAL AND ELECTRONICS LABORATORY**

### **LIST OF EXPERIMENTS**

#### **ELECTRICAL**

1. OC and SC test on transformers
2. Load test on single phase transformers
3. Load test on 3-phase transformers
4. Power measurement through two wattmeter method
5. Load test on DC shunt motor and Speed control of DC shunt motor
6. Load test on single phase induction motor
7. RLC series resonance
8. Verification of theorems (Thevenin, Norton, super position, reciprocity)

#### **ELECTRONICS**

1. VI characteristics of Semiconductor and Zener diodes
2. Application of Diodes (clippers, clampers, rectifiers)
3. Static characteristics of common emitter transistor configuration and determination of h parameters.
4. Drain characteristics of FET and determination of Drain resistance, Mutual conductance and Amplification factor.
5. V.I. Characteristics of silicon controlled rectifier and Uni-Junction transistor.
6. R.C. Coupled amplifier: Determination of  $Z_{in}$ ,  $Z_{out}$  and frequency response.
7. Class B push – pull power amplifier and to find the efficiency as a function of load.
8. Applications of Operational amplifier
  - a) Adder and subtractor
  - b) Integrator and differentiator
  - c) Wien's bridge oscillator and R.C Phase shift.

## **CS P32 DIGITAL LABORATORY**

### **I. Implementation of logic circuits using gates**

1. Adders/Subtractors
2. Implementation of logic functions using universal gates only
3. Design of Priority Encoder
4. Design of Mux, Demultiplexer
5. Code Converters
6. Parity Generator and Checker

### **II. Implementation of circuits using MSI**

1. Decimal Adder
2. Binary Multiplier
3. Design of Arithmetic unit
4. Synchronous Counters
5. Asynchronous Counters
6. Universal Shift Register

### **III. Interface experiments with MSI**

1. Design of ALU
2. Interface of ALU with Memory

### **IV. Implementation of logic circuits using Very High Speed Integrated Circuit Hardware Description Language**

1. Combinational Circuits – Adders/Subtractors, Binary Multiplier.
2. Sequential Circuits – Counters, Shift Registers.

## CS P33 DATA STRUCTURES LABORATORY

### LIST OF EXPERIMENTS

1. Searching algorithms - sequential, binary and Fibonacci search algorithms on an ordered list (any two). Compare the number of key comparisons made during the searches
2. Sorting algorithms (any five): Insertion Sort, Selection Sort, Shell Sort, Bubble Sort, Quick Sort, Heap Sort, Merge Sort, and Radix Sort.
3. Sparse matrix representation and find its transpose.
4. Evaluation of arithmetic expression.
5. Queue, circular queue, priority queue, Dequeue.
6. Singly Linked List, Doubly Linked List, Circular Linked List.
7. Tree traversal techniques.
8. The graph traversal techniques.
9. Dijkstra's algorithm to obtain the shortest paths.
10. Use of hash tables.
11. B -Tree Indexing.



## **MA T41 DISCRETE MATHEMATICS AND GRAPH THEORY**

### **UNIT I**

Connectives, Statement formulae, Equivalence of Statement formulae, Functionally complete set of connectives - NAND and NOR connectives, implication, Principal conjunctive and disjunctive normal forms.

### **UNIT II**

Inference calculus - Derivation process - Conditional proof - Indirect method of proof- Automatic theorem proving - Predicate calculus.

### **UNIT III**

Partial ordering – Lattices – Properties - Lattices as algebraic system - sub lattices - Direct product and homomorphism - Special lattices - Complemented and Distributive lattices.

### **UNIT IV**

Graphs - Applications of graphs – degree - pendant and isolated vertices - isomorphism-sub graphs – walks - paths and circuits - connected graphs – Euler graphs - operations on graphs - More on Euler graphs – Hamilton paths and circuits - complete graph.

### **UNIT V**

Trees - properties of Trees - Pendant vertices in a Tree - Distance and Center in a Tree – rooted and binary trees - spanning trees - Fundamental Circuits - Distance between spanning trees shortest spanning trees - Kruskal algorithm.

## **TEXT BOOKS**

1. J.P. Tremblay and R. Manohar, "Discrete Mathematical Structures with applications to Computer Science", Tata McGraw-Hill Publishing Company Pvt. Ltd., New Delhi, 1997.
2. Narsingh Deo, "Graph Theory with Applications to Engineering and Computer Science", Prentice-Hall of India, Pvt. Ltd., New Delhi, 1987.

## **REFERENCES**

1. Kenneth H. Rosen, "Discrete Mathematics and its Applications", Tata McGraw-Hill Publishing Company, Pvt. Ltd., Fifth edition, New Delhi, 2003.
2. C.L. Liu, "Elements of Discrete Mathematics", Second edition, McGraw-Hill Book Company, New York, 1988.
3. F. Harary, "Graph Theory", Narosa Publishing House, New Delhi – Chennai-Mumbai, 1988.
4. Douglas B. West, "Introduction to Graph Theory", Pearson Education, Second edition (Indian), 2002.

## CS T42 MICROPROCESSORS AND MICROCONTROLLERS

### UNIT I

**Intel 8085 Microprocessor:** Introduction - Need for Microprocessors – Evolution – Intel 8085 Hardware - Architecture – Pin description - Internal Registers – Arithmetic and Logic Unit – Control Unit – Instruction word size - Addressing modes – Instruction Set – Assembly Language Programming - Stacks and Subroutines - Timing Diagrams.

### UNIT II

**Intel 8085 Interrupts and DMA:** 8085 Interrupts – Software and Hardware Interrupts – 8259 Programmable Interrupt Controller - Data Transfer Techniques – Synchronous, Asynchronous and Direct Memory Access (DMA) and 8237 DMA Controller- 8253 Programmable Interval Timer.

### UNIT III

**Memory & I/O Interfacing:** Types of memory – Memory mapping and addressing – Concept of I/O map – types – I/O decode logic – Interfacing key switches and LEDs – 8279 Keyboard/Display Interface - 8255 Programmable Peripheral Interface – Concept of Serial Communication – 8251 USART – RS232C Interface.

### UNIT IV

**Intel 8086 Microprocessor:** Introduction-Intel 8086 Hardware – Pin description – External memory Addressing – Bus cycles. – Addressing modes - Instruction set – Directives – Assembly Language Programming.- Evolution of Microprocessors – 8-bit, 16-bit and 32-bit microprocessors

### UNIT V

**Microcontroller:** Intel 8051 Microcontroller: Introduction – Architecture – Memory Organization – Special Function Registers – Pins and Signals – Timing and control – Port Operation – Memory and I/O interfacing – Interrupts – Instruction Set and Programming.

## **TEXT BOOKS**

1. Ramesh S.Gaonkar, “Microprocessor Architecture, Programming and Applications with 8085”, Penram International Publications, Fifth Edition. [UNIT I to III]
2. Krishna Kant, “Microprocessors and Microcontrollers – Architectures, Programming and System Design 8085, 8086, 8051, 8096”, PHI, 2008. (UNIT IV & V)

## **REFERENCE BOOKS**

1. Douglas V.Hall, “Microprocessors and Interfacing Programming and Hardware”, Tata Mc Graw Hill, 2003.
2. A. P. Godse and D.A Godse, “Microprocessors and Microcontrollers”, Technical Publications, Fourth Edition, 2008.
3. Barry B. Brey, “The Intel Microprocessors 8086/8088, 80186/80188, 80286, 80386 and 80486, Pentium, Pentium Pro Processor, Pentium II, Pentium III Pentium 4 – Architecture, Programming and Interfacing, 7<sup>th</sup> Edn., PHI, 2008.

## CS T43 AUTOMATA LANGUAGES AND COMPUTATION

### UNIT I

**Finite Automata and Regular Expressions:** Formal Languages and Regular expressions, Deterministic and Non-Deterministic Finite Automata, Finite Automata with  $\epsilon$ -moves, Equivalence of NFA and DFA, Minimization of finite automata, Two-way finite automata, Moore and Mealy machines, Applications of finite automata.

### UNIT II

**Regular Sets and Context Free Grammars:** Properties of regular sets, Context-Free Grammars – Derivation trees, Chomsky Normal Forms and Greibach Normal Forms, Ambiguous and unambiguous grammars.

### UNIT III

**Pushdown Automata and Parsing Algorithms:** Pushdown Automata and Context-Free Languages; Top-down parsing and Bottom-up parsing, Properties of CFL, Applications of Pumping Lemma, Closure properties of CFL and decision algorithms.

### UNIT IV

**Turing machines:** Turing machines (TM) – computable languages and functions – Turing Machine constructions – Storage in finite control – variations of TMs – Recursive and Recursive enumerable languages, Recursive Function, Partial and Total Recursive Function, Primitive Recursive Function.

### UNIT V

**Introduction to Computational Complexity:** Time and Space complexity of TMs – Complexity classes – Introduction to NP-Hardness and NP-Completeness.

## **TEXT BOOK**

1. John E. Hopcroft and Jeffrey D. Ullman, "Introduction to Automata Theory, Languages and Computation", Narosa Publishers, 2002.

## **REFERENCES**

1. Michael Sipser, "Introduction to the Theory of Computations", Brooks/Cole, Thomson Learning, 1997.
2. John C. Martin, "Introduction to Languages and the Theory of Computation", Tata McGraw-Hill, 2003.

## CS T44 DESIGN AND ANALYSIS OF ALGORITHMS

### UNIT I

**Algorithms:** Definitions and notations: standard notations - asymptotic notations – worst case, best case and average case analysis; big oh, small oh, omega and theta notations; Recursive algorithms, analysis of non-recursive and recursive algorithms, solving recurrence equations, analyzing control structures.

**Analysis of Sorting and Searching:** Heap, shell, radix, insertion, selection and bubble sort; sequential, binary and Fibonacci search.

### UNIT II

**Divide and Conquer Method:** General Method – binary search – finding maximum and minimum – merge sort and quick sort – Strassen's Matrix multiplication.

**Greedy Method:** General method – knapsack problem – minimum spanning tree algorithms – single source shortest path algorithm – scheduling, optimal storage on tapes, optimal merge patterns.

### UNIT III

**Dynamic Programming:** General method – multi-stage graphs – all pair shortest path algorithm – 0/1 Knapsack and Traveling salesman problem – chained matrix multiplication – approaches using recursion – memory functions.

**Basic Search and Traversal technique:** Techniques for binary trees and graphs – AND/OR graphs – biconnected components – topological sorting.

### UNIT IV

**Backtracking:** The general method – 8-queens problem – sum of subsets – graph coloring – Hamiltonian cycle – Knapsack problem.

### UNIT V

**Branch and Bound Method:** Least Cost (LC) search – the 15-puzzle problem – control abstractions for LC-Search – Bounding – FIFO Branch-and-Bound - 0/1 Knapsack problem – traveling salesman problem. Introduction to NP-Hard and NP-Completeness.

## **TEXTBOOK**

1. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, “Fundamentals of Computer Algorithms”, Galgotia Publications Pvt. Ltd., 2008.

## **REFERENCES**

1. Paneerselvam, “Design and Analysis of Algorithms”, Prentice-Hall of India, 2006
2. Anany Levitin, “Introduction to The Design and Analysis of Algorithms”, Pearson Education, 2005.
3. Gilles Brassard and Paul Bratley, “Fundamentals of Algorithms”, Prentice-Hall of India, 1997. (UNIT I)
4. Thomas H. Corman, Charles E. Leiserson, Ronald and L. Rivest, “Introduction to Algorithms”, Prentice-Hall of India, Second edition, 2003.
5. Richard Johnsonbaugh and Marcus Schaefer, “Algorithms”, Pearson Education, 2004. (UNIT V)



## CS T45 OBJECT ORIENTED PROGRAMMING LANGUAGES

### UNIT I

Review of object oriented programming concepts – data types – constructs – pointers – arrays – structures – functions – Classes – Objects.

### UNIT II

Operator overloading – String Handling - Inheritance – Polymorphism – Manipulators - Templates – Exception Handling – I/O Streams.

### UNIT III

Introduction to JAVA – Features – Data Types –Classes, Objects and methods – Inheritance.

GUI Components – Swing Components – Adapter Handling - Event Handling – Layout Managers – Graphics and Java2D - Packages - Files and Streams – Exception Handling.

### UNIT IV

Multithreading – Applets - JDBC database programming – Introduction to Servlets – Network Programming – RMI.

### UNIT V

Byte code Interpretation - Customizing application - Data Structures - Collection classes. Activation - Object serialization -Distributed garbage collection - JINI overview.

**Note :** UNIT I and UNIT II have to be dealt in C++ and remaining three units are to be dealt in JAVA.

## **TEXT BOOKS**

1. P.J. Deitel, “C++ How to Program”, Prentice-Hall of India Pvt. Ltd., Sixth edition, 2008,
2. H.M. Deitel and P.J. Deitel, “Java™ How to Program”, Prentice-Hall of India, Seventh edition, 2007.

## **REFERENCES**

1. Herbert Schildt, “Java SE 6: The Complete Reference”, McGraw-Hill, Seventh edition, 2006.
2. E. Balagurusamy, “Object-Oriented Programming with C++”, Tata McGraw-Hill, Third edition, 2006.
3. Bjarne Stroustrup, “The C++ Programming Language”, Addison-Wesley, Third and Special edition, 2004.

# CS T46 COMPUTER ORGANISATIONS AND ARCHITECTURE

## UNIT I

**Basic Computer Organization and Design:** Instruction Codes – Computer Registers – Computer Instructions – Computer Instructions – Timing and Control – Instruction Cycle – Memory reference Instructions - Input – Output and Interrupt Design of Basic Computer – Design of Accumulator logic.

## UNIT II

**Micro programmed Control:** Control Memory-Address sequencing- Micro program Example – Design of control unit.

**Processor Organization:** general register organization – stack organization – instruction formats – addressing modes – data transfer and manipulation – program control.

**Computer Arithmetic:** Addition, Subtraction, Multiplication, Division algorithms- Floating point arithmetic operations- Decimal arithmetic operations.

## UNIT III

**Memory Organization:** Memory hierarchy – main memory – auxiliary memory –Associate memory – Cache memory – Virtual memory.

## UNIT IV

**Input-Output Organization:** Input-output interface – asynchronous data transfer - modes of transfer – priority interrupt – DMA – IOP – serial communication.

## UNIT V

**Parallel Processing:** Multiple processor organizations – Symmetric Multi processors – Cache coherence and MESI protocol – Clusters – Non Uniform Memory Access – Vector Computation.

## **TEXT BOOKS**

1. M. Morris Mano, “Computer System Architecture”, Prentice-Hall of India, Pvt. Ltd., Third edition, 2007 (UNITs I, II, III & IV)
2. William Stallings “Computer Organization and Architecture”, Prentice-Hall of India, Pvt. Ltd., Seventh edition, 2005. (UNIT V)

## **REFERENCES**

1. Carl Hamacher, Zvonko G. Vranesic and Safwat G. Zaky, “Computer Organization”, McGraw-Hill, Fifth edition, 2001.
2. John P. Hayes, “Computer Architecture and Organisation”, McGraw Hill, 1998.
3. P. Pal Chaudhuri, “Computer Organization and Design”, Prentice-Hall of India, Pvt. Ltd., Second edition, 2002.
4. Vincent P. Heuring and Harry F. Jordan, “Computer System Design and Architecture”, Prentice-Hall of India, Pvt. Ltd., Second edition, 2003.

## **CS P41 MICROPROCESSORS AND MICROCONTROLLERS LABORATORY**

### **LIST OF EXPERIMENTS**

#### **Experiment Using 8085 Microprocessor**

1. Study of 8085 Microprocessor Trainer Kit
2. 8-bit Arithmetic Operations  
(Addition, Subtraction, Multiplication and Division)
3. Block Operations  
(Move, Exchange, Compare, Insert and Delete)
4. Code Conversions
5. Digital Clock simulation
6. Moving Display
7. Printer interfacing
8. Serial Communication
9. Interrupt Programming
10. Elevator Simulation
11. Traffic Light Control

#### **Experiments Using 8086 Microprocessor with MASM**

12. Arithmetic Operations
13. Sorting and Searching

#### **Experiments Using 8051 Microcontroller**

15. Arithmetic operations
16. ADC & DAC Interfacing
17. Stepper Motor and DC Motor Interface



## **CS P42 DESIGN AND ANALYSIS OF ALGORITHMS LABORATORY**

### **LIST OF EXPERIMENTS**

1. Implementation of sorting algorithms with analysis of time and space complexity.
2. Implementation of searching algorithms with analysis of time and space complexity
3. Solving problems using Divide-and-Conquer technique.
4. Solving problems using Greedy technique.
5. Solving problems using Dynamic Programming technique.
6. Implementation of Traversal techniques.
7. Implementation of Backtracking.
8. Implementation of Branch-and-Bound technique.
9. Solving NP-Complete problems (using heuristics).

## **CS P43 OBJECT ORIENTED PROGRAMMING LANGUAGES LABORATORY**

Cycle 1: Experiments to be implemented in C++

1. Classes, objects and namespaces
2. Constructors & destructors
3. Operator overloading
4. Inheritance
5. Polymorphism & Virtual functions,
6. Exception handling
7. Templates
8. I/O streams

Cycle 2: Experiments to be implemented in JAVA

9. Inheritance
10. Package and Interfaces
11. Exception Handling
12. Collections
13. Multithreaded Programming
14. Files and Sockets
15. AWT and Applets
16. Swing
17. Event Handling
18. RMI



## **SP P 44 PHYSICAL EDUCATION**

Physical Education is compulsory for all the Undergraduate students

1. The activities will include games and sports / extension lectures.
2. Two Hrs. / Week will be allocated for physical education in the third and fourth semesters. Minimum of 75% attendance is mandatory.
3. These activities will be monitored by the Director of Physical Education.
4. Pass /Fail will be determined on the basis of participation, attendance, and performance. If a candidate Fails, he/she has to repeat the course in the subsequent years
5. Pass in this course is mandatory for the award of degree.

# CS T51 OPERATING SYSTEMS

## UNIT I

**Introduction:** Mainframe Systems – Desktop Systems – Multiprocessor Systems – Distributed Systems – Clustered Systems - Real Time Systems – Hardware Protection – System Components – Handheld Systems - Operating System Services – System Calls – System Programs - Process Concept – Process Scheduling – Operations on Processes – Cooperating Processes – Inter-process Communication.

## UNIT II

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

## UNIT III

**System Model:** Deadlock Characterization – Methods for handling Deadlocks -Deadlock Prevention – Deadlock avoidance – Deadlock detection – Recovery from Deadlocks - Storage Management – Swapping – Contiguous Memory allocation – Paging – Segmentation – Segmentation with Paging - Virtual Memory – Demand Paging – Process creation – Page Replacement – Allocation of frames – Thrashing.

## UNIT IV

**File Concept:** Access Methods – Directory Structure – File System Mounting – File Sharing – Protection - File System Structure – File System Implementation – Directory Implementation – Allocation Methods - Free-space Management - Kernel I/O Subsystems - Disk Structure – Disk Scheduling – Disk Management – Swap-Space Management.

## UNIT V

**Linux overview:** Kernel Architecture – Process, memory, file and I/O management – Interprocess communication and synchronization – Security.

**Windows XP:** System architecture – system management mechanisms – process, thread, memory and file management – I/O subsystem – Interprocess communication – Security.

## **TEXT BOOKS**

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts”, John Wiley & Sons (ASIA) Pvt. Ltd, Seventh edition, 2005. (UNITs I to IV)
2. Harvey M. Deitel, Paul J. Deitel, and David R. Choffnes, “Operating Systems”, Prentice Hall, Third edition, 2003. (UNIT V)

## **REFERENCES**

1. William Stallings, Operating Systems: Internals and Design Principles, Prentice -Hall of India, Sixth edition, 2009.
2. Gary J. Nutt, “Operating Systems: A Modern Perspective”, Addison-Wesley, Second edition, 2001.

## CS T52 LANGUAGE TRANSLATORS

### UNIT I

**Introduction to System Software and Machine Structure:** System programs – Assembler, Interpreter, Operating system. Machine Structure – instruction set and addressing modes.

**Assemblers:** Basic assembler functions, machine – dependent and machine independent assembler features. Assembler design – Two-pass assembler with overlay structure, one – pass assembler and multi-pass assembler.

### UNIT II

**Loaders and Linkers:** Basic loader functions, machine – dependent and machine – independent loader features. Loader design – Linkage editors, dynamic linking and bootstrap loaders.

### UNIT III

**Source Program Analysis:** Compilers – Analysis of the Source Program – Phases of a Compiler – Cousins of Compiler – Grouping of Phases – Compiler Construction Tools.  
**Lexical Analysis:** Role of Lexical Analyzer – Input Buffering – Specification of Tokens – Recognition of Tokens – A Language for Specifying Lexical Analyzer.

### UNIT IV

**Parsing:** Role of Parser – Context free Grammars – Writing a Grammar – Predictive Parser – LR Parser.

**Intermediate Code Generation:** Intermediate Languages – Declarations – Assignment Statements – Boolean Expressions – Case Statements – Back Patching – Procedure Calls.

### UNIT V

**Basic Optimization:** Constant-Expression Evaluation – Algebraic Simplifications and Re-association – Copy Propagation – Common Sub-expression Elimination – Loop-Invariant Code Motion – Induction Variable Optimization.

**Code Generation:** Issues in the Design of Code Generator – The Target Machine – Runtime Storage management – Next-use Information – A simple Code Generator – DAG Representation of Basic Blocks – Peephole Optimization – Generating Code from DAGs.

## **TEXT BOOKS**

1. Alfred Aho, V. Ravi Sethi, and D. Jeffery Ullman, "Compilers Principles, Techniques and Tools", Addison-Wesley, 1988. (UNITs III, IV & V)
2. Leland L. Beck, "System Software – In Introduction to System Programming", Addison-Wesley, 1990 (UNITs I & II - Chapters: 1, 2 & 3).

## **REFERENCES**

1. Allen Holub, "Compiler Design in C", Prentice-Hall of India, 1990.
2. Charles N. Fischer and Richard J. Leblanc, "Crafting a Compiler with C", Benjamin Cummings, 1991.
3. Steven S. Muchnick, "Advanced Compiler Design Implementation", Morgan Koffman, 1997.
4. Damdhare, "Introduction to System Software", McGraw Hill, 1986.

## CS T53 COMPUTER NETWORKS

### UNIT I

**Introduction to Computer Networks:** Need for Networking - Service Description – Connectionless and Connection-Oriented Services – Circuit and Packet Switching – Access Networks and Physical Media – Wireless Links and Characteristics – Queuing Delay and Packet Loss – Internet Protocol stack – OSI Reference Model - Service Models – History of Computer Networking and the Internet.

### UNIT II

**Application Layer:** Principles of Network Applications – The Web and HTTP – FTP – Electronic Mail – SMTP – Mail Message Formats and MIME – DNS – Socket Programming with TCP and UDP. **Multimedia Networking:** Internet Telephony – RTP – RTCP – RTSP. **Network Security:** Principles of Cryptography – Firewalls – Application Gateway – Attacks and Countermeasures.

### UNIT III

**Transport Layer:** Transport Layer Services – Multiplexing and Demultiplexing – UDP – Reliable Data Transfer – Go-Back-N and Selective Repeat. **Connection-Oriented Transport:** TCP – Segment Structure – RTT estimation – Flow Control – Connection Management - Congestion Control – TCP Delay Modeling – SSL and TLS. **Integrated and Differentiated Services:** Intserv – Diffserv.

### UNIT IV

**Network Layer:** Forwarding and Routing – Network Service Models – Virtual Circuit and Datagram Networks – Router – Internet Protocol (IP) – IPv4 and IPv6 – ICMP – Link State Routing – Distance Vector Routing – Hierarchical Routing – RIP – OSPF – BGP – Broadcast and Multicast Routing – MPLS - Mobile IP – IPsec.

### UNIT V

**Link Layer:** Layer Services – Error Detection and Correction Techniques – Multiple Access Protocols – Link Layer Addressing – ARP – DHCP – Ethernet – Hubs, Bridges, and Switches – PPP - ATM Networks - MPLS.

Ring Topology - Physical Ring – Logical Ring.

**TEXT BOOK**

1. James F. Kurose and Keith W. Ross, “Computer Networking: A Top-Down Approach Featuring the Internet”, Pearson Education, Third edition, 2006.

**REFERENCES**

1. Andrew S. Tanenbaum, “Computer Networks”, Prentice-Hall of India, Fourth edition, 2003.
2. Larry L. Peterson and Bruce S. Davie, “Computer Networks: A Systems Approach”, Elsevier, Fourth edition, 2007.

## CS T54 PLATFORM TECHNOLOGY

### UNIT I

**Introduction:** NET Framework - Common Language Runtime (CLR) - .NET Framework Class Library - .NET Windows Forms – Uses of Web Forms & Web Services - Common Language Runtime (CLR) – Common Type System - Microsoft Intermediate Language (MSIL) - Components of the CLR - Distinguish Between the .NET Compilers – Organising and Executing Managed Code. NET Framework Class Library – Namespace – Input and Output - Serialisation – Working with XML – Remoting – Enterprise Services – Interoperability – GUIs.

### UNIT II

**.NET Languages:** C# Language Fundamentals – Classes and Objects – Methods – Fields and Properties - Inheritance and Polymorphism – Operator Overloading – Struts - Interfaces – Arrays – Indexers and Collections – Strings and Regular Expressions – Handling Exceptions – Delegates and Events.

### UNIT III

**VB .NET:** Language Fundamentals – Classes and Objects – Methods – Fields and Properties - Inheritance and Polymorphism – Operator Overloading – Interfaces – Arrays – Indexers and Collections – Strings and Regular Expressions.

### UNIT IV

**VB .NET:** Handling Exceptions – Delegates and Events - Accessing Data – ADO.NET Object Model- .NET Data Providers – Direct Access to Data – Accessing Data with Datasets.

### UNIT V

**J2EE:** Enterprise Edition Overview - Multi-Tier Architecture - Best Practices-Comparison between J2EE and .NET



## **TEXT BOOKS**

1. David Chappell, “Understanding .NET – A Tutorial and Analysis”, Addison Wesley, 2002. (UNIT I)
2. Herbert Schildt, “C# 3.0 The Complete Reference”, McGraw-Hill Professional, Third Edition, 2008. (UNIT II)
3. Harvey M. Deitel, Paul J. Deitel, Tem R. Nieto, Contributor Paul J. Deitel, and Tem R. Nieto, “Visual Basic .NET – How to Program”, Prentice Hall, Second edition, 2001. (UNITs III & IV)
4. Keogh, “J2EE The Complete Reference”, Tata McGraw-Hill, 2008. (UNIT V)

## CS T64 GRAPHICS AND IMAGE PROCESSING

### UNIT I

**Graphics Systems and Graphical User Interface:** Pixel, Resolution, video display devices - types – Graphical devices: input devices – output devices – Hard copy devices – Direct screen interaction – Logical input function –GKS. User dialogue – Interactive picture construction techniques.

### UNIT II

**Geometric Display Primitives and Attributes:** Geometric display primitives: Points, Lines and Polygons. Point display method – Line drawing: DDA

**2D Transformations and Viewing:** Transformations - types – matrix representation – Concatenation - Scaling, Rotation, Translation, Shearing, Mirroring. Homogeneous coordinates – Window to view port transformations.

**Windowing And Clipping:** Point, Lines, Polygons - boundary intersection methods

### UNIT III

**Digital Image Fundamentals:** Image Formation – Image Transforms – Fourier Transforms – Walsh – Hadamard – Discrete Cosine – Hotelling Transforms.

### UNIT IV

**Image Enhancement and Restoration:** Histogram Modification Techniques – Image Smoothing – Image Sharpening – Image Restoration – Degradation Model – Noise Models – Spatial Filtering – Frequency Domain Filtering.

### UNIT V

**Image Compression and Segmentation:** Compression Models – Elements of Information Theory – Error Free Compression –Image Segmentation – Detection of Discontinuities – Edge Linking and Boundary Detection – Thresholding – Region Based Segmentation – Morphology.

### **TEXTBOOK**

1. Donald Hearn & M. Pauline Baker, "Computer Graphics", Prentice-Hall of India, Second edition, 2000 (UNIT I & II)
2. Rafael C. Gonzalez, Richard E. Woods, and Steven L. Eddins, "Digital Image Processing Using MATLAB®", Pearson Education, First edition, 2004. (UNIT III, IV &V)

### **REFERENCES**

1. Anil Jain K, "Fundamentals of Digital Image Processing", Prentice-Hall of India, 1989.
2. Sid Ahmed, "Image Processing", McGraw-Hill, 1995.
3. Gonzalez R. C and Woods R.E., "Digital Image Processing", Pearson Education, Second edition, 2002.
4. Newmann W.M. and Sproull R.F., "Principles of Interactive Computer Graphics", Tata McGraw-Hill, Second edition, 2000.
5. Foley J.D., Van Dam A, Fiener S.K. and Hughes J.F., "Computer Graphics", Second edition, Addison-Wesley, 1993.

## CS T56 EMBEDDED SYSTEMS

### UNIT I

**Introduction to Embedded System:** Components of Embedded System – Classification - Characteristic of embedded system- Microprocessors & Micro controllers- Introduction to embedded processors - Embedded software architectures: Simple control loop - Interrupt controlled system - Cooperative multitasking - Preemptive multitasking or multi-threading - Micro kernels and exokernels - Monolithic kernels - Exotic custom operating systems.

### UNIT II

**Embedded Hardware Architecture – 32 Bit Microcontrollers:** ARM 2 TDMI core based 32 Bit microcontrollers and family of processors, Register, Memory and Data transfer, Arithmetic and Logic instructions, Assembly Language, I/O operations interrupt structure, ARM cache. ARM Bus, Embedded systems with ARM. **Networks for Embedded systems:** Serial bus protocols: The CAN bus, and the USB bus, Parallel bus protocols: The PCI Bus and GPIB bus,

### UNIT III

**Software Development:** Embedded Programming in C and C++ - Source Code Engineering Tools for Embedded C/C++ - Program Modeling Concepts in Single and Multiprocessor Systems - Software Development Process - Software Engineering Practices in the Embedded Software Development – Hardware / Software Co-design in an Embedded System.

### UNIT IV

**Real Time Operating Systems:** Tasking Models, Task States, Services and Transitions - Real-Time Scheduling Algorithms: Round-Robin, FIFO, Priority-Based Preemptive Scheduling - Rate-Monotonic Scheduling - Priority Inversion and Priority Ceiling - Deadlocks - Process Synchronization – IPC - Shared Memory, Memory Locking, Memory Allocation - Signals – Semaphore Flag or mutex as Resource key – Message Queues – Mailboxes – Pipes – Virtual Sockets.

### UNIT V

**Study of Micro C/OS-II or Vx Works:** RTOS System Level Functions – Task Service Functions – Time Delay Functions – Memory Allocation Related Functions – Semaphore Related Functions – Mailbox Related Functions – Queue Related Functions – Case Studies of Programming with RTOS.

**TEXT BOOKS**

1. Rajkamal, "Embedded System: Architecture, Programming and Design" Tata McGraw-Hill, 2003. (UNITs I, III, IV & V)
2. Wayne Wolf, "Computers as Components – Principles of Embedded Computing System Design", Harcourt India Pvt. Ltd., Morgan Kaufmann Publishers, First Indian Reprint, 2001. (UNIT II)

**REFERENCES**

1. Steve Heath, "Embedded Systems Design", Newnes, Second edition, 2003.
2. Sriram Iyer and Pankaj Gupta, "Embedded Real Time Systems Programming", Tata McGraw-Hill, 2004.
3. Noergaard, "Embedded System Architecture", Elsevier India Private Limited, 2005

## CS P51 COMPUTERN NETWORKS LABORATORY

### LIST OF EXPERIMENTS

1. Implementation of a socket program for Echo/Ping/Talk commands.
2. Creation of a socket (TCP) between two computers and enable file transfer between them.
3. Implementation of a program for Remote Command Execution (Two M/Cs may be used).
4. Implementation of a program for CRC and Hamming code for error handling.
5. Writing a code for simulating Sliding Window Protocols.
6. Create a socket for HTTP for web page upload & Download.
7. Write a program for TCP module Implementation.(TCP services).
8. Write a program for File Transfer in client-server architecture using following methods:
  - a) TCP/IP
  - b) UDP
9. Write a program to implement RMI (Remote Method Invocation).
10. Implementation (using ns2/Glomosim) and Performance evaluation of the following routing protocols:
  - a) Shortest path routing
  - b) Flooding
  - c) Link State
  - d) Hierarchical
11. Broadcast /Multicast routing.
12. Implementation of ARP.
13. Study of IEEE 802.3 protocol.
14. Throughput comparison between 802.3 and 802.11.
15. Study of Key distribution and Certification schemes.

## **CS P52 PLATFORM TECHNOLOGY LABORATORY**

### **Programs using C#.NET**

1. Classes and Objects, Inheritance, Polymorphism
2. Interfaces, Operator Overloading, Delegates and Events
3. Exception Handling, Multi-Threading
4. ADO .NET

### **Program using VB .NET**

5. Console & Windows Forms
6. Layout Managers & Containers
7. SDI & MDI
8. Database Controls

### **Application any one of the following or similar application using .NET framework**

- Inventory Control
- Retail Shop Management
- Employee Information System
- Personal Assistant Program
- Students' Information System
- Ticket Reservation System
- Hotel Management System
- Hospital Management System

## **CS P53 OPERATING SYSTEMS LABORATORY**

### **LIST OF EXPERIMENTS**

10. Study of basic UNIX/Linux commands.
11. Shell Programming.
12. Programs using the following system calls of UNIX/Linux operating system:  
fork, exec, getpid, exit, wait, close, stat, opendir, readdir.
13. Programs using the I/O system calls of UNIX operating system:  
open, read, write, etc).
14. Simulations of UNIX/Linux commands like ls, grep, etc.
15. Simulation of processes scheduling algorithms.
16. Simulation of synchronization problems using Semaphore.
17. Simulation of basic memory management schemes.
18. Simulation of virtual memory management schemes.
19. Simulation of disk scheduling algorithms
20. Simulation of file systems.
21. Develop an application using any RTOS.





## HS P54 GENERAL PROFICIENCY - I

### UNIT I

**Art of Communication:** Verbal and Non-verbal Communication – Barriers to Communication – Importance of Body Language – Effective Listening – Feedback.

### UNIT II

**Introduction to Soft Skills:** Attitude – Self-Confidence – Leadership Qualities – Emotional Quotient – Effective Time Management Skills – Surviving Stress – Overcoming Failure – Professional Ethics – Interpersonal Skills.

### UNIT III

**Writing:** Importance of Writing – Written Vs Spoken Language – Formal and Informal Styles of writing – Resources for improving writing – Grammar and Usage – Vocabulary Building – SWOT analysis.

### UNIT IV

**Speaking Practice:** Dialogue – Telephone Etiquette – Public Speaking – Debate – Informal Discussions – Presentations.

### UNIT V

**Aptitude:** Verbal and Numerical Aptitude.

## REFERENCES

1. Nicholls and Anne, "Mastering Public Speaking", Jaico Publishing House, 2003.
2. Aggarwal, R.S, "Quantitative Aptitude", S. Chand & Co., 2004.
3. Leigh Andrew and Michael Maynard, "The Perfect Leader", Random House Business Books, 1999.
4. Whetton A. David and Kim S. Cameron, "Developing Management Skills", Pearson Education, 2007.
5. K.R. Lakshminarayan, "Developing Soft Skills", SciTech, 2009.
6. Sherfield M Robert, "Developing Soft Skills", Pearson Education, 2005.
7. Hair O' Dan, Friedrich W. Gustav and Lynda Dee Dixon, "Strategic Communication in Business and the Professions", Pearson Education, 2008.
8. Chaney Lilian and Jeanette Martin, "Intercultural Business Communication", Pearson Education, Fourth edition, 2008.

## CS T61 DATABASE MANAGEMENT SYSTEMS

### UNIT I

**Relational Databases:** Relational Model – SQL – Advanced SQL – Other Relational Languages.

### UNIT II

**Database Design:** Database Design and E-R Model – Relational Database Design – Application Design and Development.

### UNIT III

**Data Storage and Querying:** Storage and File Structure – Indexing and Hashing – Query Processing – Query Optimization.

### UNIT IV

**Transaction Management:** Transactions – Concurrency Control – Recovery System.

### UNIT V

**Case Studies:** PostgreSQL – Oracle – IBM DB2 Universal Database – My SQL - Microsoft SQL Server.

(Only the concepts that are covered in UNITs I to IV).

## **TEXT BOOK**

1. Abraham Silberschatz, Henry F. Korth and S.Sudarshan, “Database System Concepts”, McGraw-Hill International Inc., Fifth edition, 2006.

**Note:** Chapters 2-8, 11 - 17, 26 - 29 (Only the portions that are relevant to the concepts covered in chapters 2 - 8 and 11 - 17) and Appendix C

## **REFERENCES**

1. Fred R McFadden, Jeffery A. Hoffer and Mary B. Prescott, “Modern Database Management”, Addison-Wesley, 2000.
2. Elmasri and Navathe, “Fundamentals of Database Systems”, Addison-Wesley, Fifth edition, 2007.
3. Jeffrey D.Ulman and Jenifer Widom, “A First Course in Database Systems”, Prentice-Hall, 2007.
4. Bipin C Desai, “An Introduction to Database Systems”, Galgotia Publications Pvt. Ltd., 1990.

## CS T62 SOFTWARE ENGINEERING

### UNIT I

Introduction - Socio-technical Systems – Emergent System properties – systems engineering – organizations, people and computer systems – legacy systems – Software Processes – process models, iteration and activities – Rational Unified Process – CASE - Project Management- activities – planning – scheduling – risk management.

### UNIT II

Software Requirements - functional – nonfunctional – user – system – interface requirements – software requirements document - RE Processes - feasibility studies – elicitation – analysis – validation – management of requirements - Systems Models - context – behaviour – data – object models – structured methods - Architectural Design – decisions – system organization – styles – reference architecture.

### UNIT III

Distributed Systems Architecture - Multi processor - Client Server - Distributed Object - Inter-Organizational Distributed Computing - Application Architectures – data – transaction – event – language processing systems - Object-oriented Design-Objects and object classes- An Object-oriented design Process- Design Evolution - User Interface Issues – The UI Design Process – User Analysis- User Interface Prototyping- Interface Evaluation.

### UNIT IV

Agile Methods – Extreme Programming – Rapid Application development – Software Prototyping - Software Reuse – The Reuse Landscape – Design Patterns – Generator-Based Reuse – Application Frameworks – Application System Reuse - Software Evolution – Program Evolution Dynamics – Software Maintenance – Evolution Processes – Legacy system evolution - Planning Verification and Validation – Software Inspections – Automated Static analysis – Verification and Formal methods - Software Testing – System Testing – Component Testing – Test case Design – Test automation.

### UNIT V

Software Cost Estimation – productivity – Estimation Techniques – Algorithmic Cost Modeling – Project Duration and Staffing - Process and Product Quality – Quality Assurance and Standards –Planning – Control – Software Measurement and Metrics - Process Improvement – Process Classification –Measurement –Analysis and Modeling –Change – The CMMI process improvement Framework - Configuration Management. –Planning – Change Management – Version and Release Management – System Building – CASE tools for configuration management.

**TEXT BOOK**

2. Ian Sommerville, “Software Engineering”, Pearson Education, Eighth edition, 2008.

**REFERENCE BOOKS**

1. Roger S. Pressman, “Software Engineering: A Practitioner's Approach”, McGraw-Hill International Edition, Seventh edition, 2009.
2. S. L. Pfleeger and J.M. Atlee, “Software Engineering Theory and Practice”, Pearson Education, Third edition, 2008.
3. Pankaj Jalote, “An Integrated Approach to Software Engineering”, Narosa, Third edition, 2008.

## CS T63 WEB TECHNOLOGY

### UNIT I

**Internet Principles and Components:** History of the Internet and World Wide Web- – HTML - protocols – HTTP, SMTP, POP3, MIME, IMAP. Domain Name Server, Web Browsers and Web Servers, Dynamic HTML.,

### UNIT II

**Client Side and Server Side Programming:** Introduction to JAVA Scripts and VB Scripts– Object Based Scripting for the web. Programming Java Script and VB Script - Structures – Functions – Arrays – Objects, Regular Expression in java script. Java Server Pages - Session and Application management - Session tracking and cookies – Access a database from JSP – Developing N-tier web application.

### UNIT III

**XML and ActiveX:** Anatomy of xml document - XML markup-working with elements and attributes - creating valid documents-xml objects and DOM. ActiveX controls: OLE and ActiveX -ActiveX Documents, Server side Active-X Components, ActiveX DLL and ActiveX Exe.

### UNIT IV

**Multimedia and Web Application:** Multimedia in web design, Audio and video speech synthesis and recognition - Electronic Commerce – E-Business Model – E-Marketing – Online Payments and Security – N-tier Architecture. Search and Design: Working of search engines -optimization-Search interface.

### UNIT V

**Web Services:** Introduction to Web Services, UDDI, SOAP, WSDL, Web Service Architecture, Developing and deploying web services. Ajax – Improving web page performance using Ajax, Programming in Ajax.



## **TEXT BOOKS**

1. Deitel and Deitel, Goldberg, “Internet and World Wide Web – How to Program”, Pearson Education Asia, 2001. (UNIT I)
2. Rajkamal, “Web Technology”, Tata McGraw-Hill, 2001. (UNITs II & IV)
3. John Paul Mueller, “Active X from the Ground Up”, Tata McGraw-Hill, 1997. (UNIT III)
4. Eric Newcomer, “Understanding Web Services: XML, WSDL, SOAP, and UDDI”, Addison-Wesley, 2002. (UNIT V)

## **REFERENCES**

- 1 Phillip Hanna, “JSP 2.0 - The Complete Reference”, McGraw-Hill, 2003.
2. Mathew Eernisse, “Build Your Own AJAX Web Applications”, SitePoint, 2006.

## **CS T64 WIRELESS COMMUNICATION AND NETWORKS**

### **UNIT I**

**Introduction:** Transmission Fundamentals - Communication Networks - Protocols and the TCP/IP Suite.

### **UNIT II**

Antennas and Propagation - Signal Encoding Techniques - Spread Spectrum - Coding and Error Control - Error Detection - Block Error Correction Codes - Convolution Codes - Automatic Repeat Request.

### **UNIT III**

Satellite Communications - Cellular Wireless Networks - Cordless Systems and Wireless Local Loop - Mobile IP and Wireless Access Protocol.

### **UNIT IV**

Wireless LAN Technology - IEEE 802.11 Wireless LAN Standard - Bluetooth.

### **UNIT V**

Standards and Standard - Setting Organizations – Traffic analysis – Design of Wireless networks: Case Studies.

**TEXT BOOK**

1. William Stallings, “Wireless Communications and Networks”, Prentice Hall, Second edition, 2005.

**REFERENCES**

1. Theodore S. Rappaport, “Wireless Communications”, Pearson Education, 2002.
2. John G. Proakis, “Digital Communications”, McGraw-Hill International, Fourth edition, 2000.

## CS P61 DATABASE MANAGEMENT SYSTEMS LABORATORY

**Experiments are to be carried out in DB2 / ORACLE and VB/ Open source DBMS package with the required front end software**

1. **Study of Database Concepts:** Relational model – table – operations on tables – index – table space – clusters – synonym – view – schema – data dictionary – privilege – role – transactions.
2. **Study of SQL:** Primitive Data Types – User Defined data Types – Built-in Functions – Parts of Speech of create, alter, drop, select, insert, delete, update, commit, rollback, save point, grant, revoke.
3. **Study of Query Types:** Queries involving Union, Intersection, Difference, Cartesian product, Divide Operations – Sub Queries – Join Queries – Nested Queries – Correlated Queries – Recursive Queries.
4. **Study of Procedural Query Language:** Blocks, Exception Handling, Functions, Procedures, Cursors, Triggers, Packages.
5. **Application:** Design and develop any two of the following:
  - Library Information System
  - Logistics Management System
  - Students' Information System
  - Ticket Reservation System
  - Hotel Management System
  - Hospital Management System
  - Inventory Control
  - Retail Shop Management
  - Employee Information System
  - Payroll System
  - Any other Similar System

Clearly mention the scope of the system. Use standard tools for expressing the design of the systems.

## **CS P61 WEB TECHNOLOGY LABORATORY**

### **LIST OF EXPERIMENTS**

1. Creation of HTML Files
2. Working with Client Side Scripting
  - 2.1 VBScript
  - 2.2 JavaScript
3. Configuration of web servers
  - 3.1 Apache Web Server
  - 3.2 Internet Information Server (IIS)
4. Working with ActiveX Controls in web documents.
5. Experiments in Java Server Pages
  - 5.1 Implementing MVC Architecture using Servlets
  - 5.2 Data Access Programming (using ADO)
  - 5.3 Session and Application objects
  - 5.4 File System Management
6. Working with other Server Side Scripting
  - 6.1 Active Server Pages
  - 6.2 Java Servlets
  - 6.3 PHP
7. Experiments in Ajax Programming
8. Developing Web Services
9. Developing any E-commerce application (Mini Project)

## CS P61 Mini Project using CASE Tools

The following documents for the Mini Project are to be prepared. Implementation is to be done by adopting software engineering methodology. For preparing documents and implementation the CASE tools are to be used wherever applicable. Use any open source CASE tool. Many of them are available at [www.sourceforge.net](http://www.sourceforge.net). Other CASE tool, as per choice can also be used. Object oriented design approach is to be adopted. After implementation a report is to be prepared and submitted.

1. **Project Planning:** Thorough study of the problem, Identification project scope , objectives, Infrastructure and cost estimation
2. **Software requirement Analysis: Feasibility study -** Documentation of all the requirements as specified by customer in convention Software Requirement Specification-
3. **Design and Development:** Preparation of use case, collaboration or sequence, class, object, package, deployment diagrams and coding of the project.
4. **Software Testing:** Prepare test plan, perform validation testing, Coverage analysis ,memory leaks develop test case hierarchy and Site check and Site monitor.

## **HS P64 GENERAL PROFICIENCY – II**

### **UNIT I**

**Composition Analysis:** Technical and Non-Technical Passages (GRE Based) – Differences in American and British English – Analyzing Contemporary issues – Expanding Terminology.

### **UNIT II**

**Writing:** Job Application Letter Writing – Resume Writing.

### **UNIT III**

**Oral Skills:** Group Discussion – Introduction and Practice – Team Work – Negotiation Skills – Organizing and Attending Meetings – Facing Interviews

### **UNIT IV**

**Adapting To Corporate Life:** Corporate Etiquette – Grooming and Dressing.

### **UNIT V**

**Aptitude:** Verbal and numerical aptitude.

## **REFERENCES**

1. Pushplata and Sanjay Kumar, "Communicate or Collapse: A Handbook of Effective Public Speaking", Group Discussions and Interviews. Prentice-Hall, Delhi, 2007.
2. Thorpe, Edgar, "Course in Mental Ability and Quantitative Aptitude", Tata McGraw-Hill, 2003.
3. Thorpe, Edgar, "Test of Reasoning", Tata McGraw-Hill, 2003.
4. Prasad, H.M, "How to prepare for Group Discussion and Interview", Tata McGraw-Hill, 2001.
5. "Career Press Editors. 101 Great Resumes", Jaico Publishing House, 2003.
6. Aggarwal, R.S, "A Modern Approach to Verbal and Non-Verbal Reasoning", S. Chand & Co., 2004.
7. Mishra Sunita and Muralikrishna, "Communication Skills for Engineers", Pearson Education, First edition, 2004.



# CS T71 ARTIFICIAL INTELLIGENCE

## UNIT I

**Introduction:** History of AI - Intelligent agents – Structure of agents and its functions - Problem spaces and search - Heuristic Search techniques – Best-first search - Problem reduction - Constraint satisfaction - Means Ends Analysis.

## UNIT II

**Knowledge Representation:** Approaches and issues in knowledge representation- Knowledge - Based Agent- Propositional Logic – Predicate logic – Unification – Resolution - Weak slot - filler structure – Strong slot - filler structure.

## UNIT III

**Reasoning under uncertainty:** Logics of non-monotonic reasoning - Implementation- Basic probability notation - Bayes rule – Certainty factors and rule based systems-Bayesian networks – Dempster - Shafer Theory - Fuzzy Logic.

## UNIT IV

**Planning and Learning:** Planning with state space search - conditional planning-continuous planning - Multi-Agent planning. Forms of learning - inductive learning - Reinforcement Learning - learning decision trees - Neural Net learning and Genetic learning

## UNIT V

**Advanced Topics: Game Playing:** Minimax search procedure - Adding alpha-beta cutoffs.

**Expert System:** Representation - Expert System shells - Knowledge Acquisition.

**Robotics:** Hardware - Robotic Perception – Planning - Application domains.

**Swarm Intelligent Systems** – Ant Colony System, Development, Application and Working of Ant Colony System.

## **TEXT BOOKS**

1. Elaine Rich, Kevin Knight and Shivashankar B.Nair, “Artificial Intelligence”, Tata McGraw-Hill, Third edition, 2009. (UNITs I, II, III & V)
2. Stuart J. Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", Pearson Education Asia, Second edition, 2003. (UNIT IV)
3. N. P. Padhy, “Artificial Intelligence and Intelligent System”, Oxford University Press, Second edition, 2005. (UNIT V)

## **REFERENCES**

1. Rajendra Akerkar, “Introduction to Artificial Intelligence”, Prentice-Hall of India, 2005.
2. Patrick Henry Winston, “Artificial Intelligence”, Pearson Education Inc., Third edition, 2001.
3. Eugene Charniak and Drew Mc Dermott, “Introduction to Artificial Intelligence”, Addison-Wesley, ISE Reprint, 1998.
4. Nils J.Nilsson, “Artificial Intelligence - A New Synthesis", Harcourt Asia Pvt. Ltd., Morgan Kaufmann, 1988.

## CS T72 COMPUTER HARDWARE AND TROUBLESHOOTING

### UNIT I

**Personal Computer:** Introduction – History of the PC – Data flow inside the PC – Design guides – DOS memory organization - Microprocessor types and specifications – Over clocking – Cache memory. **Processor features:** Power Management – Super scalar execution – Dual independent bus architecture – Hyper threading – Dual core technology – Processor code names.

### UNIT II

**Mother board components:** Chip sets - North/South Bridge. **Bus standards:** ISA – PCI – MCA. **Power Supply:** SMPS – Power specifications - Connectors – Switches – RTC/NVRAM batteries – Troubleshooting Power supply problems. **BIOS:** Shadowing – Upgrading – CMOS setup – Plug and Play – Error messages.

### UNIT III

**Memory:** Basics- RAM types and performance – Memory modules: SIMM, DIMM, DDR – Troubleshooting memory problems – logical memory layout. **Secondary Storage:** Floppy disk drive - Hard disk drive – parallel ATA – SATA – SCSI bus standard - CD, DVD – Troubleshooting secondary storage problems.

### UNIT IV

**Input and Output Devices:** Keyboard – Data transfer - Connector types - Mouse: mechanical and optical – Joystick – RS 232C – USB: system, data transfer, and controller – Parallel port: SPP, EPP, ECP – Network Interface Card – MODEMS. **Display:** Video basics – Controllers – SVGA – AGP. **Printers:** dot matrix – laser jet - ink jet – Pen plotters – BIOS services for I/O devices – Troubleshooting I/O related problems.

### UNIT V

**Installing Operating Systems:** Hard disk partitioning and formatting – Windows – UNIX – Linux – Networking - Spyware and Virus scanners – DOS interrupt services - Device Drivers. **Troubleshooting tools:** Multimeter – Oscilloscope – Logic Analyzer – In-Circuit Emulator – PC Diagnostics – Testing – Maintenance.

**TEXT BOOKS**

1. Scott Mueller, “Upgrading and Repairing PCs”, Pearson Education, Seventeenth edition, 2007. (UNITs I – V)
2. Hans Peter Messmer, “The Indispensable PC Hardware Book”, Addison-Wesley, Fourth edition, 2001. (UNITs II – IV)

**REFERENCES**

1. Meyers Jernigan, “A Guide to Managing and Troubleshooting PCs”, Tata McGraw-Hill, 2004.
2. N. Mathivanan, “Microprocessors, PC Hardware and Interfacing”, Prentice-Hall of India, 2003.

## CS T73 DISTRIBUTED COMPUTING

### UNIT I

**Introduction:** Goals – Types of Distributed systems – Architecture styles – System Architecture. Architectures Versus Middleware – Self Management in distributed systems - Processes – Threads – Virtualization – Clients – Servers – Code Migration.

### UNIT II

**Communication:** Fundamentals - Remote Procedure Call – Stream oriented communication – Message oriented communication – Multicast communication.

**Naming** – Names, Identifiers, and addresses – Flat Naming - Structured Naming – Attribute based Naming.

### UNIT III

**Synchronization:** Clock Synchronization – Logical clocks - Mutual Exclusion – Global positioning of nodes - Election Algorithms.

**Consistency and Replication:** Introduction – Data centric consistency models – Client centric consistency models – Replica management – Consistency protocols.

### UNIT IV

**Fault Tolerance:** Introduction – Process resilience – Reliable client server communication – Reliable group communication – Distributed commit - Recovery Security – Introduction – Secure channels – Access control – Security management.

### UNIT V

Distributed File Systems – Distributed web based systems – Distributed object based systems.

## **TEXT BOOK**

1. Andrew S. Tanenbaum and Maarten Van Steen, “Distributed Systems – Principles and Paradigms”, Prentice- Hall of India, Pvt. Ltd, Second edition, 2008.

## **REFERENCES**

1. Pradeep K Sinha, “Distributed Operating Systems, Prentice-Hall of India, NewDelhi, 2001.
2. Jean Dollimore, Tim Kindberg, George Coulouris, “Distributed Systems -Concepts and Design”, Pearson Education, Fourth edition, 2005.
3. M.L. Liu, “Distributed Computing Principles and Applications”, Pearson Education, 2004.

## CS P71 HARDWARE AND TROUBLESHOOTING LABORATORY

### LIST OF EXPERIMENTS

1. Assembling of a Personal Computer:
  - a. Identifying parts of mother board, power connections and locating other connectors.
  - b. Interconnection of disk drive units, keyboard, mouse and monitor.
  
2. Hard disk partitioning and OS installation:
  - a. Partitioning the hard disk using FDISK/ Partition Magic/ Disk Manager
  - b. Installation of Windows 98/XP/2000
  - c. Installation of Linux kernel (possibly with dual boot option).
  
3. Study of In-Circuit Emulator:
  - a. The target processor could be 8085/8088/8031 depending on the availability.
  - b. Learn the different commands and their usages.
4. Study of Logic Analyser:
  - a. Standalone or PC based with multiple channels depending on availability.
  - b. Capture important signals and perform timing/state analysis with a known processor environment.
5. Circuit Tracing: Using Multimeter and continuity test mode, to trace a given circuit board and draw the schematic.
  
6. Serial Communication: To establish serial communication (RS232C) between a pair of PCs. The program shall be developed using C/C++/MASM with functions provided by BIOS and DOS interrupt services.
  
7. Parallel port interfacing:
  - a. To interface two PCs via ECP and perform file transfer using Direct Cable Connection feature of Windows OS
  - b. To configure the 8255 ports of a given microprocessor trainer kit and interface with a printer.
  
8. Design of I/O interface: (With a microprocessor trainer kit)
  - a. To design an output port to interface a given set of discrete LEDs/ 7-segment LEDs.
  - b. To design an input port to interface a given set of switches.

9. Troubleshooting a given microprocessor trainer kit (with faults introduced) using Logic State/Timing analyzer and Multimeter.
10. Troubleshooting a given microprocessor trainer kit (with faults introduced) using In-Circuit Emulator, Multimeter, and CRO.
11. Simulation of a given circuit using PSPICE circuit simulator.
12. Design of IC tester: To test a given digital IC. (Either a PC's parallel port or 8255 port of a microprocessor trainer kit may be used for interfacing)
13. Floppy Disk Drive Interfacing: To interface the control signals of a given FDD and test their functionality either using a PC or a microprocessor trainer kit. (Drive Select test, Motor enable test, Track seek test, Write protect test)
14. Networking PCs: Installing NICs, configuring IP addresses, and interconnection using switches and cables.
15. Load testing of SMPS: Testing the given SMPS of a PC using a multimeter.



## **CS P72 DISTRIBUTED AND INTELLIGENT COMPUTING LABORATORY**

### **Distributed Computing Experiments**

1. Simple exercises to learn the concept of RMI, Servlets, CORBA, COM and DCOM.
2. Finding Simple and Compound interest using RMI.
3. RMI-based implementation of Airline Reservation system.
4. Servlet-based implementation of Airline Reservation system.
5. Implementation of Mail Server.

### **Intelligent Computing Experiments**

The following problems are to be solved using PROLOG /LISP.

1. Water Jug Problem (Using DFS and BFS).
2. Two Player Game (Using Heuristic Function).
3. A\* Algorithm.
4. AO\* Algorithm.
5. Syntax Checking of English sentences - English Grammar.
6. Develop any Rule based system for an application of your choice.

## **CS P73 SEMINAR**

Each one of the students will be assigned a Seminar Topic in the current and frontier areas. The student has to conduct a detailed study/survey on the assigned topic and prepare a report. The student will make an oral presentation followed by a brief question and answer session. The Seminar (presentation and report) will be evaluated by an internal assessment committee for a total of 100 marks.

## **CS P74 PROJECT WORK (PHASE-I)**

The objective of the project is to enable the students to work in groups of not more than four members in each group on a project involving analytical, experimental, design or combination of these in the area of Computer Science and Engineering. Each project shall have a guide. The student is required to do literature survey, formulate the problem and form a methodology of arriving at the solution of the problem. The evaluation is based on continuous internal assessment by an internal assessment committee for 100 marks.

### **CS P75 INDUSTRIAL VISITS /TRAINING**

During the course of study from 3rd to 7th semester each student is expected to undertake a minimum of four industrial visits or undertake a minimum of two weeks of industry/field training. The students are expected to submit a report, which shall be evaluated by an internal assessment committee at the end of seventh semester for 100 marks.

## **HS T81 ENGINEERING ECONOMICS AND MANAGEMENT**

### **UNIT I**

Introduction – Micro Economics – Macro Economics – Economic decisions and Technical Decisions – Demand and Supply Concepts – Elasticity of Demand – Cost of Products – Price of products – Break-Even Analysis – Nature of Functioning of Money –

Notional Income – GNP and Savings – Inflation and Deflation Concepts.

### **UNIT II**

Introduction – Elementary Economic Analysis – Interest Formulas and their Applications

- Comparisons – Present Worth Method – Future Worth Method – Annual Equivalent Method – Rate of Return Method

### **UNIT III**

Replacement and Maintenance Analysis – Depreciation – Evaluation of Public alternatives

– Inflation Adjusted Decisions

### **UNIT IV**

Nature and Importance of Management - Development of Management Thought - Ethical and Environmental Foundations - Decision Making - Organizing and Staffing - Planning and Strategic Management – Leadership - Communicating and Controlling Managing Information

### **UNIT V**

Operations Management - Marketing Management - Financial Management – Multinational Management - Entrepreneurship and Small Business - Management of Public Organizations

## **TEXT BOOK**

1. R. Panneerselvam, “Engineering Economics”, Prentice-Hall of India, Pvt. Ltd, 2001.

## **REFERENCES**

1. S.K. Jain, “Applied Economics for Engineers and Managers”, Vikas Publications House, New Delhi, 1997.
2. Joseph L. Massie, “Essentials of Management”, Prentice-Hall of India, Third edition, 1979.

## CS T82 HIGH PERFORMANCE COMPUTING

### UNIT I

**Introduction:** Need of high speed computing – increase the speed of computers – history of parallel computers and recent parallel computers; solving problems in parallel – temporal parallelism – data parallelism – comparison of temporal and data parallel processing – data parallel processing with specialized processors – inter-task dependency.

The need for parallel computers - models of computation - analyzing algorithms -expressing algorithms.

### UNIT II

**Parallel Programming Platforms:** Trends in microprocessor architectures - limitations of memory system performance – parallel computing platforms – communication costs in parallel machines – routing mechanisms for interconnection networks.

**Principles of Parallel Algorithm Design:** Preliminaries – decomposition techniques – characteristics of tasks and interactions – mapping techniques for load balancing – methods for containing interaction overheads – parallel algorithm models.

**Basic Communication Operations:** One-to-all broadcast and all-to-one reduction – all-to-all broadcast reduction – all-reduce and prefix-sum operations – scatter and gather – all-to-all personalized communication – circular shift – improving the speed of some communication operations.

### UNIT III

**Analytical Modeling of Parallel Programs:** Sources of overhead in parallel programs – performance metrics for parallel systems – scalability of parallel systems – minimum execution time and minimum cost-optimal execution time.

**Programming using the Message-Passing Paradigm:** principles of message-passing programming – the building blocks – MPI – topologies and embedding – overlapping communication with computation – collective communication and computation operations – groups and communicators.

**Programming Shared Address Space Platforms:** Thread basics – synchronization primitives in Pthreads – controlling thread and synchronization attributes – composite synchronization constructs – tips for designing asynchronous programs – OpenMP.

## UNIT IV

**Dense Matrix Algorithms:** Matrix-vector multiplication – matrix-matrix multiplication – solving a system of linear equations – FFT.

**Sorting:** Issues in sorting on parallel computers – sorting networks – bubble sort and its variants – Quicksort – bucket and sample sort – other sorting algorithms.

**Graph Algorithms:** Definitions and representation – minimum spanning tree – single-source shortest paths – all-pairs shortest paths.

## UNIT V

**Search Algorithms for Discrete for Discrete Optimization Problems:** Definitions and examples, sequential search algorithms, search overhead factor, parallel depth-first search, parallel best-first search, speedup anomalies in parallel search algorithms.

**Dynamic Programming:** Overview.

## TEXT BOOKS

1. Ananth Grama, Anshul gupta, George Karypis and Vipin Kumar, “Introduction to Parallel Computing”, Pearson Education, Second edition, 2004. (UNITs II to V)
2. V. Rajaraman and C. Siva Ram Murthy, “Parallel Computers – Architecture and Programming”, Prentice-Hall of India, 2003. (UNIT I)

## REFERENCES

1. Selim G. Akl, “The Design and Analysis of Parallel Algorithms”, Prentice-Hall of India, 1999. (UNITs I, IV & V - as Reference)
2. M.J. Quinn, “Parallel Computing – Theory and Practice”, McGraw-Hill, 1994.
3. Michael Jay Quinn, “Parallel Programming in C with MPI and OpenMP”, McGraw-Hill, 2003.



# CS T83 INFORMATION SECURITY

## UNIT I

**Introduction:** Security problem in computing – Elementary Cryptography – DES – AES – Public Key Encryption – Uses of Encryption.

## UNIT II

**Program Security:** Security Programs – Non-malicious Program Errors – Virus and other Malicious Code – Targeted Malicious Code – Control against program Threats.

## UNIT III

**Security in Operating Systems:** Protected Objects and Methods of Protection – Memory and Address Protection – Control of Access generated Objects – File Protection Mechanisms – User Authentication – Trusted Operating Systems – Models of Security.

## UNIT IV

**Database and Network Security:** Database Security Requirements – reliability and integrity – Sensitive Data – Inference – Multilevel Databases and Multilevel Security – Threats in Networks – Network Security Controls – Firewalls – Intrusion Detection Systems – Secure Email.

## UNIT V

**Administering Security and Ethical Issues:** Security Planning – Risk Analysis – Organizational Security Policies – Physical Security – Protecting Programs and Data – Information and the Law – Software Failures – Computer Crime – Privacy – Ethical Issues.

## **TEXT BOOK**

1. Charles B. Pfleeger, and Shari Lawrence Pfleeger, “Security in Computing”, Pearson Education, Third edition, 2003.

## **REFERENCES**

1. Matt Bishop, “Computer Security – Art and Science”, Pearson Education, First edition, 2003.
2. William Stallings, “Cryptography and Network Security – Principles and Practices”, Prentice-Hall of India, Third edition, 2003.
3. Atul Kahate, “Cryptography and Network Security”, Tata McGraw-Hill, 2003.

## **CS P81 ADVANCED COMPUTING LABORATORY**

Software to be used for the experiments: OpenMP, Matlab and ns2 and any programming language.

### **LIST OF EXPERIMENTS**

1. Implementation of Dynamic Multicasting with Concurrency Control
2. Implementation of a Producer-Consumer framework.
3. Parallel implementation of Iterative Deepening A\*.
4. Implementation of D\* algorithm with spatial data structures.
5. Implementation of Deadlock Detection/Avoidance/Prevention in Distributed Systems.
6. Implementation of 2D transformation: Translation, Scaling, Rotation, Mirror Reflection and Shearing with a menu driven program.
7. Implementation of Real-Time Scheduling over the existing Network/Distributed Systems
8. Implement various Image Compression Algorithms.
9. Performing operations on image using any Image Editing Software.
10. Implementation of VOIP.

## **CS P82 PROJECT WORK (PHASE II)**

Project work phase II will be an extension of the project work started in the seventh semester. On completion of the work, a project report should be prepared and submitted to the department. The project work and the report will be evaluated by an internal assessment committee for 50 marks. The external university examination, which carries a total of 50 marks, will have report evaluation and viva voce examination conducted by a committee of one external examiner and one internal examiner appointed by the University.

## **CS P83 COMPREHENSIVE VIVA-VOCE**

The student will be tested for his understanding of basic principles of the core Computer Science and Engineering subjects. The internal assessment for a total of 50 marks will be made by an internal assessment committee. The committee will conduct two written examinations of objective or short questions type from all the core subjects. The external university examination, which carries a total of 50 marks, will be a Viva Voce examination conducted by a committee of one external examiner and one internal examiner appointed by the University.

## **HS P84 PROFESSIONAL ETHICAL PRACTICE**

The course should cover the following topics by way of Seminars, Expert Lectures and Assignments:

1. Engineering Ethics – Moral issues, Ethical theories and their uses
2. Engineering as Experimentation – Code of Ethics
3. Engineer's responsibility for safety
4. Responsibilities and rights
5. Global issues of engineering ethics

### **REFERENCE**

1. Charles D. Fleddermann, "Engineering Ethics", Prentice Hall, New Mexico, 1999.

## CS E61 OBJECT ORIENTED ANALYSIS AND DESIGN

### UNIT I

**Introduction:** The system life cycle - Traditional life cycle models - The object-oriented approach - The Rational Unified Process (RUP) - The Unified Modeling Language (UML) - UML models - Introduction to the case study - Requirements for the Wheels case study system - Requirements engineering - Requirements elicitation - List of requirements for the Wheels system - Use cases - Use case diagram - Use case descriptions- Actors and actor descriptions - Use case relationships: communication association, include and extend - Boundary - Using the use case model in system development.

### UNIT II

**Objects and Classes:** Basics – Object – classes - Relationships between classes - The class diagram - Stages in building a class diagram - Packages - Using the class diagram in system development.

### UNIT III

**Identifying functionality:** Introduction - CRC cards and interaction diagrams - Identifying operations using the CRC card technique - Interaction diagrams - Specifying operations - Using the CRC cards and interaction diagrams in system development - State Diagrams - States and events - Constructing a state diagram - Using state diagrams in system development.

### UNIT IV

**Activity Diagrams:** Introduction - Modeling a sequence of activities - Modeling alternative courses of action - Modeling iteration of activities - Modeling activities that are carried out in parallel – Swimlanes - Design - Architecture - Implementation diagrams The user interface Dealing with persistent data.

### UNIT V

**Designing Objects and Classes:** Introduction - class diagram - Interaction diagrams. Implementation of class diagram - The code - Sequence diagram.

**TEXT BOOK**

3. Carol Britton and Jill Doake, “A Student Guide to Object - Oriented Development”, Elsevier, Butterworth – Heinemann, Eighth edition, 2007.

**REFERENCES**

- a. Brett McLaughlin, Gary Pollice and David West, “Head First Object-Oriented Analysis and Design: A Brain Friendly Guide to OOA&D”, O’Reilly, Shroff Publishers & Distributors Pvt. Ltd., 2008.
4. Mahesh P. Matha, “Object Oriented Analysis and Design using UML”, Prentice-Hall of India, 2008.



## CS E62 NETWORK DESIGN AND MANAGEMENT

### UNIT I

**Network Design:** Design Principles - Determining Requirements - Analyzing the Existing Network - Preparing the Preliminary Design - Completing the Final Design Development - Deploying the Network - Monitoring and Redesigning – Maintaining - Design Documentation - Modular Network Design - Hierarchical Network Design - The Cisco Enterprise Composite Network Model.

### UNIT II

**Technologies - Switching Design:** Switching Types - Layer 2 and 3 Switching - Spanning-Tree Protocol - Redundancy in Layer 2 Switched Networks - STP Terminology and Operation - Virtual LANs – Trunks - Inter-VLAN Routing - Multilayer Switching - Cisco Express Forwarding - Switching Security - Switching Design Considerations - **IPv4 Routing Design:** IPv4 Address Design - Private and Public Addresses – NAT - Subnet Masks - Hierarchical IP Address Design - IPv4 Routing Protocols – Classification - Metrics - Routing Protocol Comparison - IPv4 Routing Protocol Selection.

### UNIT III

**Network Security Design:** Hacking – Vulnerabilities - Design Issues - Human Issues - Implementation Issues – Threats - Reconnaissance Attacks - Access Attacks - Information Disclosure Attacks - Denial of Service Attacks - Threat Defense - Secure Communication - Network Security Best Practices - SAFE Campus Design.

### UNIT IV

**Wireless LAN Design:** Wireless Technology Overview - Wireless Standards - Wireless Components - Wireless Security - Wireless Security Issues - Wireless Threat Mitigation - Wireless Management - Wireless Design Considerations - Site Survey - WLAN Roaming - Wireless IP Phones - Quality of Service Design - QoS Models – IntServ - DiffServ154 - QoS Tools - Policing and Shaping - Congestion Avoidance - Congestion Management - Link-Specific Tools1 - QoS Design Guidelines.

### UNIT V

**Network Management Design:** ISO Network Management Standard - Protocols and Tools – SNMP – MIB – RMON - Cisco NetFlow – Syslog – CiscoWorks - Network Management Strategy - SLCs and SLAs - IP Service-Level Agreements – Content Networking Design – Case Study – Venti Systems.

**TEXT BOOK**

1. Diane Tiare and Catherine Paquet, “Campus Network Design Fundamentals”, Pearson Education, 2006.

**REFERENCE**

1. Craig Zacker, “The Complete Reference: Upgrading and Troubleshooting Networks”, Tata McGraw-Hill, 2000.

## CS E63 E-BUSINESS

### UNIT I

**Electronic Commerce Environment and Opportunities:** Background – The Electronic Commerce Environment – Electronic Marketplace Technologies – Modes of Electronic Commerce: Overview – Electronic Data Interchange – Migration to Open EDI – Electronic Commerce with WWW/Internet – Commerce Net Advocacy – Web Commerce going forward.

### UNIT II

**Approaches to Safe Electronic Commerce:** Overview – Secure Transport Protocols – Secure Transactions – Secure Electronic Payment Protocol(SEPP) – Secure Electronic Transaction (SET)- Certificates for Authentication – Security on Web Servers and Enterprise Networks – Electronic cash and Electronic payment schemes: Internet Monetary payment and security requirements – payment and purchase order process - Online Electronic cash.

### UNIT III

**Internet/Intranet Security Issues and Solutions:** The need for Computer Security – Specific Intruder Approaches – Security strategies – Security tools – Encryption – Enterprise Networking and Access to the Internet – Antivirus programs – Security Teams.

### UNIT IV

**MasterCard/Visa Secure Electronic Transaction:** Introduction – Business Requirements – Concepts – Payment processing – E-mail and secure e-mail technologies for electronic commerce. Introduction – The Mean of Distribution – A model for message handling – Working of Email - MIME: Multipurpose Internet Mail Extensions – S/MIME: Secure Multipurpose Internet Mail Extensions – MOSS: Message Object Security Services.

### UNIT V

**Internet and Website Establishment:** Introduction – Technologies for web servers – Internet tools relevant to Commerce – Internet Applications for Commerce – Internet charges – Internet Access and Architecture – Searching the Internet- Case study.

**TEXT BOOK**

1. Daniel Minoli and Emma Minoli, “Web Commerce Technology Handbook”, Tata McGraw-Hill, 2005.

**REFERENCES**

1. Andrew B. Whinston, Ravi Kalakota, K. Bajaj and D. Nag, “Frontiers of Electronic Commerce”, Tata McGraw-Hill, 2004.
2. Bruce C. Brown, “How to Use the Internet to Advertise, Promote and Market Your Business or Website with Little or No Money”, Atlantic Publishing Company, 2006.

## CS E64 BIOINFORMATICS

### UNIT I

**Introductory Concepts:** The Central Dogma – The Killer Application – Parallel Universes – Watson’s Definition – Top Down Versus Bottom up – Information Flow – Convergence – Databases – Data Management – Data Life Cycle – Database Technology – Interfaces – Implementation – Networks – Geographical Scope – Communication Models – Transmissions Technology – Protocols – Bandwidth – Topology – Hardware – Contents – Security – Ownership – Implementation – Management.

### UNIT II

**Search Engines and Data Visualization:** The search process – Search Engine Technology – Searching and Information Theory – Computational methods – Search Engines and Knowledge Management – Data Visualization – sequence visualization – structure visualization – user Interface – Animation Versus simulation – General Purpose Technologies.

### UNIT III

**Statistics and Data Mining:** Statistical concepts – Microarrays – Imperfect Data – Randomness – Variability – Approximation – Interface Noise – Assumptions – Sampling and Distributions – Hypothesis Testing – Quantifying Randomness – Data Analysis – Tool selection statistics of Alignment – Clustering and Classification – Data Mining – Methods – Selection and Sampling – Preprocessing and Cleaning – Transformation and Reduction – Data Mining Methods – Evaluation – Visualization – Designing new queries – Pattern Recognition and Discovery – Machine Learning – Text Mining – Tools.

### UNIT IV

**Pattern Matching:** Pairwise sequence alignment – Local versus global alignment – Multiple sequence alignment – Computational methods – Dot Matrix analysis – Substitution matrices – Dynamic Programming – Word methods – Bayesian methods – Multiple sequence alignment – Dynamic Programming – Progressive strategies – Iterative strategies – Tools – Nucleotide Pattern Matching – Polypeptide pattern matching – Utilities – Sequence Databases.

### UNIT V

**Modeling and Simulation:** Drug Discovery – Components – Process – Perspectives – Numeric considerations – Algorithms – Hardware – Issues – Protein structure – AbInitio Methods – Heuristic methods – Systems Biology – Tools – Collaboration and Communications – Standards - Issues – Security – Intellectual property.

**TEXT BOOK**

1. Bryan Bergeron, "Bio Informatics Computing", Pearson Education, Second edition, 2003.

**REFERENCE**

1. T.K. Attwood and D.J. Perry Smith, "Introduction to Bio Informatics", Longman Essen, 1999.

## CS E65 INFORMATION THEORY AND CODING TECHNIQUES

### UNIT I

**Source Coding:** Introduction to Information Theory, uncertainty and information, average mutual information and entropy, source coding theorem, Shannon-Fano coding, Huffman coding, Arithmetic coding, Lempel-Ziv algorithm, run-length encoding and rate distortion function.

### UNIT II

**Channel Capacity and Coding:** Channel models, channel capacity, channel coding, information capacity theorem, random selection of codes. Error control coding: linear block codes and their properties, decoding of linear block code, perfect codes, hamming codes, optimal linear codes and MDS codes.

### UNIT III

**Cyclic Codes:** Polynomials, division algorithm for polynomials, a method for generating cyclic codes, matrix description of cyclic codes, burst error correction, fire codes, golay codes, CRC codes, circuit implementation of cyclic codes. BCH codes: minimal polynomials, generator polynomial for BCH codes, decoding of BCH codes, Reed-Solomon codes and nested codes.

### UNIT IV

**Convolution Codes:** Tee codes and trellis codes, polynomial description of convolutional codes, distance notions for convolutional codes, generation function, matrix description of convolutional codes, viterbi decoding of convolutional codes, distance bounds for convolutional codes, turbo codes and turbo decoding.

### UNIT V

**Trellis Coded Modulation:** Concept of coded modulation, mapping by set partitioning, Ungerboeck's TCM design rules, TCM decoder, Performance evaluation for Additive White Gaussian Noise (AWGN) channel, TCM for fading channels.

**TEXT BOOK**

1. Ranjan Bose, “Information Theory, Coding and Cryptography”, Tata McGraw- Hill, 2002.

**REFERENCES**

1. Viterbi, “Information Theory and Coding”, McGraw-Hill, 1982.
2. John G. Proakis, “Digital Communications”, McGraw-Hill, New edition, 2000.
3. Gareth A. Jones and J. Mary Jones, “Information and Coding Theory”, Springer Undergraduate Mathematics Series, 2000.



## CS E66 LANGUAGE TECHNOLOGIES

### UNIT I

**Introduction:** Natural Language Processing – Linguistic Background – Spoken Language Input and Output Technologies – Written Language Input – Mathematical Methods – Statistical Modeling and Classification Finite State Methods Grammar For Natural Language Processing – Parsing – Semantic and Logic Form – Ambiguity Resolution – Semantic Interpretation.

### UNIT II

**Information Retrieval:** Information Retrieval Architecture – Indexing– Storage – Compression Techniques – Retrieval Approaches – Evaluation – Search Engines – Commercial Search Engine Features– Comparison– Performance Measures – Document Processing – NLP Based Information Retrieval – Information Extraction.

### UNIT III

**Text Mining:** Categorization – Extraction Based Categorization – Clustering – Hierarchical Clustering – Document Classification and Routing – Finding and Organizing Answers From Text Search – Use Of Categories and Clusters For Organizing Retrieval Results – Text Categorization and Efficient Summarization Using Lexical Chains – Pattern Extraction.

### UNIT IV

**Generic Issues:** Multilinguality – Multilingual Information Retrieval and Speech Processing – Multimodality – Text and Images – Modality Integration – Transmission and Storage – Speech Coding – Evaluation Of Systems – Human Factors and User Acceptability.

### UNIT V

**Applications:** Machine Translation – Transfer Metaphor – Interlingua and Statistical Approaches – Discourse Processing – Dialog and Conversational Agents – Natural Language Generation – Surface Realization and Discourse Planning.

## **TEXT BOOKS**

1. Daniel Jurafsky and James H. Martin, “Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition”, Prentice Hall, Second edition, 2008.
2. Christopher D. Manning and Hinrich Schütze, “Foundations of Statistical Natural Language Processing”, MIT Press, Sixth edition, 2003.

## **REFERENCES**

1. James Allen, “Natural Language Understanding”, Benjamin/Cummings Publishing Company, 1995.
2. Gerald J. Kowalski and Mark T. Maybury, “Information Storage and Retrieval Systems”, Kluwer Academic Publishers, 2000.
3. Tomek Strzalkowski, “Natural Language Information Retrieval”, Kluwer Academic Publishers, 1999.
4. Christopher D. Manning and Hinrich Schutze, “Foundations of Statistical Natural Language Processing”, MIT Press, 1999.
5. Giovanni Battista Varile, Ronald Cole and Antonio Zampolli, “Survey of the State of the Art in Human Language Technology”, Cambridge University Press, 1997.
6. Michael W. Berry, “Survey of Text Mining: Clustering, Classification and Retrieval”, Springer Verlag, 2003.



## CS E67 UNIX INTERNALS

### UNIT I

**Introduction to the Kernel:** Architecture of the UNIX operating system – Introduction to the system concepts – Kernel Data Structures; The Buffer Cache: Buffer Headers – Structure – Retrieval of a buffer – Reading and writing disk blocks – Advantages and Disadvantages; Internal Representation of Files: Inode – Structure of a regular file – Directories – Conversion of a path name to an Inode – Super Block – Inode Assignment – Allocation of disk blocks.

### UNIT II

**File System Frame Work:** The Vnode / Vfs Architecture – Objectives – Lessons from device I/O – Vnode / Vfs Interface – Implementation – Objectives – Vnode and Open files – The Vnode – Vnode Reference Count – The Vfs Object; Linux ext2fs and Proc file systems; System Calls for the file system: Open – Read – Write – File and record locking – lseek – Close – file creation – creation of special files – change directory and change root – change owner and change mode – Stat and Fstat – Pipes – Dup – Mounting and unmounting file systems – Link – unlink – File system abstractions – file system maintenance.

### UNIT III

**The Structure of Processes:** Process states and transitions – Layout of system memory – The context – saving the context – manipulation of the process address space – sleep; Process Control: Process creation – Signals – Process Termination – Awaiting Process Termination – Invoking other programs – The user ID of a process – The shell – System Boot and the INIT Process.

### UNIT IV

**Process Scheduling and Time:** Process scheduling – System calls for Time – Clock – Scheduler goals – Process priorities – Scheduler Implementation – Run Queue Manipulation – The SVR4 Scheduler; Memory Management Policies: Swapping – Demand Paging – A Hybrid System with swapping and demand paging.

### UNIT V

**Inter Process Communication:** Process Tracing – System V IPC – Network Communications - Sockets – Messages – Message Data Structures – Message Passing Interface – Ports – Name Space – Data Structures – Port Translations – Message Passing – Transferring port rights – Out – of – Line Memory – Control Flow – Notifications – Port Operations – Destroying a Port – Backup Ports – Port Sets – Port Implementation; Device Drivers and I/O: Device Driver Frame work – The I/O Subsystem – The poll System Call-Block I/O – The DDI / DKI Specification.

**TEXT BOOKS**

1. Maurice J. Bach, “The Design of the UNIX Operating System”, Prentice-Hall of India, 2004.
2. Uresh Vahalia, “UNIX Internals: The New Frontiers”, Pearson Education Asia, 2002.

**REFERENCES**

1. Silberschatz, Galvin and Gagne, “Operating System Concepts”, Wiley, Sixth edition, 2003.
2. Graham Glass and King Ables, “The New Frontiers”, Pearson Education, 2001.
3. William Stallings, “Operating System Internals and Design principles”, Prentice-Hall of India, Fourth edition, 2003.

## CS E68 DATA MINING AND DATA WAREHOUSING

### UNIT I

**Data Preprocessing, Language, Architectures, Concept Description:** Preprocessing, Cleaning, Integration, Transformation, Reduction, Discretization, Concept Hierarchy Generation, Data Mining Primitives, Query Language, Graphical User Interfaces, Architectures, Concept Description, Data Generalization, Characterizations, Class Comparisons, Descriptive Statistical Measures.

### UNIT II

**Association Rule:** Association Rule Mining, Single-Dimensional Boolean Association Rules from Transactional Databases, Multi-Level Association Rules from Transaction Databases-mining multidimensional Association rules –association mining to correlation analysis-constraint based association mining.

### UNIT III

**Classification and Prediction:** Classification and Prediction, Issues, Decision Tree Induction, Bayesian Classification, Association Rule Based, Other Classification Methods, Prediction, Classifier Accuracy.

### UNIT IV

**Cluster Analysis:** Cluster Analysis, Types of data, Categorization of methods, Partitioning methods, hierarchical methods, density based methods, grid based methods - Outlier Analysis. Recent trends - Multidimensional Analysis and Descriptive Mining of Complex Data Objects, Spatial Databases, Multimedia Databases, Time Series and Sequence Data, Text Databases, World Wide Web, Applications and Trends in Data Mining

### UNIT V

**Data Warehousing:** Introduction, Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Implementation - Data Warehousing to Data Mining -Data warehousing components-building a data warehouse – mapping the data warehouse to an architecture - data extraction - cleanup- transformation tools- metadata – OLAP - Patterns and models - Data visualization principles.

**TEXT BOOKS**

1. J. Han and M. Kamber, “Data Mining: Concepts and Techniques”, Harcourt India /Morgan Kauffman, 2001. (UNITs 1 to IV)
2. Alex Berson and Stephen J. Smith, “Data Warehousing, Data mining and OLAP”, Tata McGraw-Hill, 2004. (UNIT V)

**REFERENCES**

1. Margaret H. Dunham, “Data Mining: Introductory and Advanced Topics”, Pearson Education, 2004.
2. Sam Anahory and Dennis Murry, “Data Warehousing in the Real World”, Pearson Education, 2003.

## CS E69 ADVANCED DATABASES

### UNIT I

**DBLC:** Information system- SDLC- DBLC- Database Administration- Database administration

**Object-Based databases and XML:** Object Based Databases – XML.

### UNIT II

**Data Mining and Information Retrieval:** Data Analysis and Mining – Information Retrieval.

### UNIT III

**System Architecture:** Database-System Architectures – Parallel Databases – Distributed Databases.

### UNIT IV

**Other Topics:** Advanced Application Development – Advanced Data Types and New Applications – Advanced Transaction Processing.

### UNIT V

**Case Studies:** PostgreSQL – Oracle – IBM DB2 Universal Database – Microsoft SQL Server.

(Only the concepts that are covered in UNITs I to IV)



## **TEXT BOOK**

1. Abraham Silberschatz, Henry F. Korth and S. Sudarshan, “Database System Concepts”, Fifth edition, McGraw-Hill, International Edition, 2006. (Chapters 9, 10, 18 - 25, 26 - 29) (UNIT I to V)
2. Peter Rob, Coronel Crockett Rob, Carlos Coronel, Keeley Crockett,”Database Systems: Design, Implementation and Management”, Cengage Learning EMEA, 2008. (UNIT I)

## **REFERENCES**

1. Rajesh Narang, “Object Oriented Interfaces and Databases”, Prentice-Hall of India, Pvt. Ltd., 2004.
2. Jeffrey A. Hoffer, Mary B. Prescott and Fred R. McFadden, “Modern Database Management”, Prentice Hall, 2007.
3. Ramez Elmasri, Sham Navathe, “Fundamentals of database Systems”, Addison-Wesley, 2000.
4. C.S.R. Prabhu, “Data Warehousing – Concepts, Techniques, Products and Applications”, Prentice-Hall of India, Pvt. Ltd., 2004.
5. C.S.R. Prabhu, “Object-Oriented Database Systems: Approaches and Architectures”, Prentice-Hall of India, Pvt. Ltd., Second edition, 2005.

## **CS E610 RESOURCE MANAGEMENT TECHNIQUES**

### **UNIT I**

Transportation problem: Introduction - mathematics model-types-methods-transshipment model-modeling of quantity discounts.

### **UNIT II**

Inventory control: introduction-models of inventory-operations- discount-purchase inventory model-shortest limitation-purchase model-EOQ model-determination of stock level.

### **UNIT III**

Production scheduling: introduction-single machine scheduling-flow shop scheduling-job shop scheduling.

### **UNIT IV**

Decision theory: introduction - certainty – risk – uncertainty - Decision tree Project management: introduction – phases – CPM – CRM - Gantt Chart – PERT - crashing of project work - constrained resources.

### **UNIT V**

Queuing theory: introduction-terminologies-empirical queuing models-simulation.

**TEXT BOOK**

1. Paneerselvam, “Operation Research”, Prentice-Hall of India Pvt. Ltd., Second edition, 2006

**REFERENCE**

1. H.A. Taha, “Operation Research: An Introduction”, Prentice-Hall of India Pvt. Ltd., Eighth edition, 2007.

## CS E611 AGILE TECHNOLOGIES

### UNIT I

**Iterative and Evolutionary:** Definition – comparison - major activities.

**Agile:** Basic concepts - Major activities - available agile methods.

**Story:** Overview-estimated hours remaining.

### UNIT II

**Motivation:** Change on software projects – key motivation-requirement challenge –problems of water fall.

**Evidence:** Research and early historical – standard and though leader-business case -water fall validity.

### UNIT III

**Scrum:** Concepts – deliverable and methods.

**Extreme Programming:** Concepts – deliverable – methods.

### UNIT IV

**Unified Process:** Concepts – deliverable - methods.

**EVE:** Concepts – methods – deliverable.

### UNIT V

**Practice Tips:** Project – management – environment – requirements – tests - Frequently raised questions and answers.

**TEXT BOOK**

1. Craig Larman, “Agile and Iterative Development A Manger’s Guide” Pearson Education, First Edition, India, 2004.

**REFERENCE**

1. Shore, “Art of Agile Development”, Shroff Publishers & Distributors, 2007.

## CS E612 JAVA SCRIPT

### UNIT I

**Introduction:** Introduction to JavaScript - JavaScript Core Features – Overview. Core Language: Data Types and Variables - Operators, Expressions, and Statements - Functions.

### UNIT II

**Core Language:** Objects - Array, Date, Math, and Type-Related Objects - Regular Expressions.

**Fundamental Client-Side JavaScript:** JavaScript Object Models - The Standard Document Object Model - Event Handling.

### UNIT III

**Using JavaScript:** Controlling Windows and Frames - Handling Documents - Form Handling

### UNIT IV

**Using JavaScript:** Dynamic Effects: Rollovers, Positioning, and Animation - Navigation and Site Visit Improvements - Browser and Capabilities Detection.

### UNIT V

**Advanced Topics:** JavaScript and Embedded Object - Remote JavaScript - JavaScript and XML.

**TEXT BOOK**

1. Thomas A. Powell, Fritz Schneider, “JavaScript: The Complete Reference” , Tata McGraw-Hill, Second edition, 2004

**REFERENCES**

1. Rohit Khurana, “Java Script”, Aph Publishing Corporation, 2003.
2. John Pollock, “Java Script - A Beginner’s Guide”, Tata McGraw-Hill, 2001.

## CS E71 SOFTWARE QUALITY ASSURANCE AND TESTING

### UNIT I

**Software Testing Principles:** Need for testing - SDLC and Testing - Psychology of testing - Testing economics – Verification and Validation - Testing levels - Unit, Integration and System Testing. Types of Testing: White box, Black box, Grey box testing – Weyuker's adequacy axioms.

### UNIT II

**Testing Strategies:** White box testing techniques - Statement coverage – Branch Coverage - Condition coverage - Decision/Condition coverage - Multiple condition coverage - Dataflow coverage - Mutation testing - Automated code coverage analysis - Black box testing techniques - Boundary value analysis – Robustness testing - Equivalence partitioning - Syntax testing - Finite state testing.

### UNIT III

**Testing Object Oriented Software:** Challenges - Differences from testing non-OO Software - Class testing strategies - Class Modality - State-based Testing - Message Sequence Specification.

### UNIT IV

**Software Quality and Testing:** Introduction to software quality and quality control – Benefits of quality control - Quality assurance - quality circles and quality improvement team – Introduction to quality cost – Measuring quality cost – Total Quality Management (TQM).

### UNIT V

**Testing Tools and Standards:** Automated Tools for Testing - Static code analyzers - Test case generators - GUI Capture/Playback – Stress Testing - Testing Client – server applications - Testing compilers and language processors - Testing web-enabled applications. CMM Model and its stages – Introduction to PCMM, CMMI and Six Sigma concept – ISO 9000.



## **TEXT BOOKS**

1. Glenford J. Myers, Tom Badgett, Corey Sandler, and Todd M. Thomas, “The Art of Software Testing”, John Wiley & Sons, Second edition, 2004.
2. Roger S. Pressman, “Software Engineering. A Practitioners Approach”, McGraw-Hill International Edition, Seventh edition, 2009.

## **REFERENCES**

1. William E. Perry, “Effective Methods for Software Testing”, John Wiley & Sons, Second edition, 2000.
2. Boris Beizer, “Techniques for Functional Testing of Software and Systems”, John Wiley & Sons, 1995.
3. P.C. Jorgensen, “Software Testing - A Craftman's Approach”, CRC Press, 1995.
4. Boris Beizer, “Software Testing Techniques”, Van Nostrand Reinhold, Second edition, 1990.

## CS E72 COMPONENT ENGINEERING

### UNIT I

**Introduction:** Software Components – objects – fundamental properties of Component technology – modules – interfaces – callbacks – directory services – component architecture – components and middleware – aspect oriented programming.

### UNIT II

**Java Based Component Technologies:** Threads – Java Beans – Events and connections – properties – introspection – JAR files – reflection – object serialization – Enterprise Java Beans – Distributed Object models – RMI and RMI-IIOP.

### UNIT III

**Corba Component Technologies:** Java and CORBA – Interface Definition language – Object Request Broker – system object model – portable object adapter – CORBA services – CORBA component model – containers – application server – model driven architecture.

### UNIT IV

**.Net Based Component Technologies:** COM – Distributed COM – object reuse – interfaces and versioning – dispatch interfaces – connectable objects – OLE containers and servers – Active X controls – .NET components - assemblies – appdomains – contexts – reflection – remoting.

### UNIT V

**Component Frameworks and Development:** Connectors – contexts – EJB containers – CLR contexts and channels – Black Box component framework – directory objects – cross-development environment – component-oriented programming – Component design and implementation tools – testing tools- vector CAST, Wind runner, load runner - assembly tools.

**TEXT BOOK**

1. Clemens Szyperski, "Component Software: Beyond Object-Oriented Programming", Pearson Education, 2004.

**REFERENCES**

1. Ed Roman, "Mastering Enterprise Java Beans", John Wiley & Sons Inc., 1999.
2. Mowbray, "Inside CORBA", Pearson Education, 2003.
3. Freeze, "Visual Basic Development Guide for COM and COM+", BPB Publication, 2001.
4. Hortsamann, Cornell, "CORE JAVA Vol-II", Sun Press, 2002.

## CS E73 CLIENT SERVER COMPUTING

### UNIT I

**Basic Concepts:** Characteristics - File Server - Database Server - Transaction Server - Groupware Server - Object Server – Middleware - Building Blocks.

**Client Server Operating System:** Anatomy of server program - Server needs from OS - Server Scalability - Client Anatomy - Client need from OS - Client OS trends - Server OS trends.

### UNIT II

**Client Server Middleware:** NOS Middleware – Transparency - Global Directory Services - Distributed Time Service - Distributed Security Service - RPC, Messaging and Peer to Peer - Peer to Peer Communication - RPC-Messaging and Queuing (MOM)- MOM Vs RPC-NOS trends.

### UNIT III

**SQL Database Server:** Stored Procedure, Triggers and Rules - Database Connectivity Solutions - ODBC – Architecture – Components of ODBC.

**Data Warehouse:** Elements- Warehouse Hierarchies- Replication Vs Direct Access – Mechanics of Data Replication – Cleansing and Transforming the Raw Data - EIS/DSS.

**Client Server Groupware:** Groupware - Component of Groupware.

### UNIT IV

**Client Server Transaction Processing:** ACID properties - Transaction Model - TP Monitor and Operating System - TP Monitor and Transaction Management - TP Monitor Client Server interaction types - Transactional RPCs, Queues and Conversations - TP lite or TP Heavy - TP lite Vs TP Heavy.

### UNIT V

**Client Server with Distributed Objects:** Distributed Objects and Components - From Distributed Objects to Components - CORBA-Distributed objects CORBA style - Object Management Architecture - Intergalactic ORB - Object Services - Common Facilities - Business Objects - Next Generation - COM+ - Other Component bus - COM short history - COM 101 -OLE/DCOM.

**Client Server and Internet:** Web Client Server interaction – 3 Tier client Server web style – CGI – Server side of the web.

**TEXT BOOK**

1. Robert Orfali, Dan Harkey and Jerri Edwards, “Essential Client Server Survival Guide”, John Wiley & Sons, Third edition, 2007.

**REFERENCES**

1. Goldman, James E Rawles, Philip T Mariga and Julie R, “Client Server Information Systems: A Business Oriented Approach”, Wiley, 1999.
2. Eric Johnson, Susan McDermott, “The Complete Guide to Client Server Computing”, Prentice Hall, 2001.
3. Smith and Steven L Guengerich, “Client Server Computing”, Prentice-Hall of India, 2002.

## CS E74 REAL-TIME COMPUTING AND COMMUNICATION

### UNIT I

**Introduction to Real-Time System:** Characteristics – Types of Real-Time tasks – Timing constraints – Real-Time Scheduling - Basic concepts and classification of Algorithms – Clock-Driven Scheduling – Event-Driven Scheduling – Hybrid schedulers – EDF Scheduling – RM Scheduling and its Issues.

### UNIT II

**Resource Sharing and Dependencies among Real-Time Tasks:** Resource sharing in Real Time tasks, Priority Inversion, Priority Inheritance Protocol, Highest Locker Protocol, Priority Ceiling Protocol, Handling Task dependencies – Scheduling Real-Time Tasks in Multiprocessor and Distributed Systems – Resource Reclaiming in Multiprocessor Real-Time Systems – Fault-Tolerant Task Scheduling in Multiprocessor Real-Time Systems.

### UNIT III

**Real-Time Operating System (RTOS):** Features of RTOS, Commercial Real-Time Operating Systems, Real-Time Databases - Applications, Design issues, Characteristics of Temporal Data, Concurrency control, Commercial Real-Time Databases.

### UNIT IV

**Real-Time Communication in Wide Area Networks:** Introduction, Service and Traffic Models and Performance Requirements, Resource Management, Switching Subsystem, Route Selection in Real-Time Wide Area Networks - Basic Routing Algorithms, Routing during Real-Time Channel Establishment, Route Selection Approaches, Dependable Real-Time Channels

### UNIT V

**Real-Time Communication in a LAN:** Soft Real-Time Communication in a LAN – Hard Real-Time Communication in a LAN – Bounded Access Protocols for LANs – Real-Time Communications over Packet Switched Networks – QoS requirements – Routing and Multicasting.

**TEXT BOOKS**

1. C. Siva Ram Murthy and G. Manimaran, “Resource Management in Real-Time Systems and Networks”, Prentice-Hall of India, 2005. (UNITs I, II, IV & V)
2. Jane W.S. Liu, “Real-Time Systems”, Prentice Hall, USA, 2000. (UNIT III)

**REFERENCES**

1. Rajib Mall, “Real-Time Systems Theory and Practice”, Pearson Education, India, 2007.
2. C.M. Krishna and Kang G. Shin, “Real-Time Systems”, McGraw-Hill International Editions, 1997.

## CS E75 SOFTWARE ARCHITECTURE

### UNIT I

**Understanding Software Architecture:** Introduction - Software Architecture - Architecture Defines Structure - Architecture Specifies Component Communication -Architecture Addresses Non-functional Requirements - Architecture is an Abstraction - Architecture Views - Architectures and Technologies - General Architecture - Architecture Requirements - Architecture Patterns - Technology Comparisons - Introducing the Case Study - Requirements Overview - Project Context - Business Goals - Constraints -Software Quality Attributes - Design Trade-Offs.

### UNIT II

**Styles and Evaluation:** Architectural Styles – Key word in context case study - Architectural modeling – Subsystem – Closed layered – Open layered Architecture – Partitioning – Broker Architecture for distributed systems - Model view controller architecture – Design Patterns – Frameworks – Pattern Catalogues – Pattern Languages – Creational - Singleton – Factory – Structural – Adapter – Bridge – Behavioural – Observer – Visitor – Advantages and disadvantages of Patterns – Evaluation of Architectures - Need – Stakeholders – Results of Evaluation – Benefits of Evaluation – ATAM – Case study – Understanding Quality attributes – SAAM- Case study.

### UNIT III

**Case Study Design:** Overview - ICDE Technical Issues - ICDE Architecture Requirements - ICDE Solution - Architecture Analysis - The Challenges of Complexity Software Product Lines - Product Lines for ICDE - Software Product Lines - Benefiting from SPL Development - Product Line - Adopting Software Product Line Development - Product Line Adoption Practice Areas - Ongoing Software Product Line Development.

### UNIT IV

**Aspect Oriented Architectures:** Aspects for ICDE Development - Aspect-Oriented Architectures - State-of-the-Art - Performance Monitoring of ICDE with Aspect Werkz - Model-Driven Architecture - Model-Driven Development for ICDE MDA - State-of-Art Practices and Tools - MDA and Software Architecture - MDA for ICDE Capacity Planning - Service-Oriented Architectures and Technologies - Service-Oriented Architecture for ICDE - Service-Oriented Systems - Web Services - SOAP and Messaging – UDDI - WSDL and Metadata - Security, Transactions and Reliability - Web Services and the Future of Middleware - ICDE with Web Services.

### UNIT V

**The Semantic Web:** ICDE and the Semantic Web - Adaptive, Automated, and Distributed - The Semantic Web - Ontologies in ICDE - Semantic Web Services - Cautious Optimism - Software Agents: An Architectural Perspective - Agents in the ICDE Environment - An Example Agent Technology - Architectural Implications - Agent Technologies.



### **TEXT BOOKS**

1. Ian Gorton, “Essential Software Architecture”, Springer – Verlag, Berlin Heidelberg, 2008. (UNITs I, III, IV & V)
2. Paul Clements, Rick Kazman and Mark Klein, “Evaluating Software Architectures – Methods and Case Studies”, Pearson Low Price Edition, India, 2008. (UNIT II)
3. Mary Shaw and David Garlan, “Software Architecture – Perspectives of an Emerging Discipline”, Prentice-Hall of India, 2008. (UNIT II)
4. Mahesh P. Matha, “Object Oriented Analysis and Design using UML”, Prentice-Hall of India, 2008. (UNIT II)

### **REFERENCES**

1. Raphael Malveau, Thomas J. Mowbray, “Software Architect Bootcamp”, Prentice Hall Professional Technical Reference, Second edition, 2008.
2. Stephen T. Albin, “The Art of Software Architecture, Design Methods and Techniques”, Wiley – Dreamtech, India, 2008.

## CS E76 HIGH SPEED NETWORKS

### UNIT I

**ISDN and Frame Relay:** Introduction to High Speed networks - Basics: OSI/ISO reference model - ISDN: Conceptual view – Standards – Transmission structure – BISDN - Frame Relay: Frame mode protocol architecture – Call control – LAPF – Congestion – Traffic rate management – Explicit congestion avoidance – Implicit congestion control.

### UNIT II

**Asynchronous Transfer Mode:** Asynchronous transfer mode - ATM Protocol Architecture, ATM logical Connection, ATM Cell - ATM Service Categories – AAL - Traffic and Congestion control in ATM - Requirements - Attributes - Traffic Management Frame work, Traffic Control – ABR traffic Management - ABR rate control, RM cell formats, ABR Capacity allocations - GFR traffic management.

### UNIT III

**Congestion Control and QoS in IP Networks:** Congestion Control in Packet Switching Networks: – The Need for Flow and Error Control – Link Control Mechanisms – ARQ Performance – TCP Flow Control – TCP Congestion Control – Performance of TCP Over ATM – Integrated Services Architecture – Queuing Discipline – Random Early Detection – Differentiated Services – Resource Reservation : RSVP – Multi protocol Label Switching – Real Time Transport Protocol.

### UNIT IV

**WDM Optical Networks:** Introduction to Optical Networks – Wavelength Division Multiplexing (WDM) – Introduction to broadcast and select networks – switch architectures – channel accessing – Wavelength routed networks – switch architectures – Routing and wavelength assignment – Virtual topology design – IP over ATM over WDM – IP over WDM.

### UNIT V

**SONET and SDH:** High Speed LAN's: Fast Ethernet – Switched fast Ethernet - Gigabit Ethernet – FDDI: Network configuration – Physical Interface – Frame transmission and reception – SONET: Introduction – Layers – Frames – STS multiplexing – SONET networks – Virtual tributaries - Payload mappings – Packet over SONET – Generic Framing Procedure – Transport services – SONET over WDM – Traffic Grooming.

## **TEXT BOOKS**

1. William Stallings, “ISDN and Broadband ISDN with Frame Relay and ATM”, Prentice-Hall of India, Fourth edition, 2004. (UNIT I)
2. William Stallings, “High Speed Networks and Internets”, Pearson Education, Second edition, 2002. (UNITs II & III)
3. C. Siva Ram Murthy and Mohan Gurusamy, “WDM Optical Networks: Concepts, Design and Algorithms”, Prentice-Hall of India, 2002. (UNITs IV & V)
4. Fred Halsall, “Multimedia Communications – Applications, Networks, Protocols”, Pearson Edition, 2001. (UNIT V)

## **REFERENCES**

1. Greg Bemstein, Bala Rajagopalan and Debanjan Saha, “Optical Network Control – Architecture, Protocols and Standards”, Pearson Education, 2004.
2. Behrouz A Forouzan, “Data Communications and Networking”, Tata McGraw-Hill, Fourth edition, 2006.
3. Behrouz A. Forouzan and Sophia Chung Fegan, “Local Area Networks”, Tata McGraw-Hill, 2001.
4. Rajiv Ramaswami and Kumar N. Sivarajan, “Optical Networks: A Practical Perspective”, Morgan Kaufmann, Second edition (Elsevier Indian Edition), 2004. (UNITs IV & V)
5. Uless Black, “Optical Networks - Third Generation Transport Systems”, Pearson Education, 2002.

## **CS E77 NETWORK PROTOCOL**

### **UNIT I**

**Network Architectures:** Introduction – OSI Model – TCP/IP Model – ATM Model.

**Application Layer Protocols:** BOOTP – DHCP – DHCP – DNS – FTP – HTTP – SMTP – NNTP – Telnet – RMON – SNMP.

### **UNIT II**

**Presentation Layer Protocol:** LPP.

**Session Layer protocols:** RPC, SDP, SIP.

**Transport Layer protocols:** TCP, UDP, RDP, and RUDP.

### **UNIT III**

**Network Layer Protocols:** IP, IPv6, ICMP, ICMPv6, MobileIP, OSPF, RIP, Multicasting protocols – BGMP, DVMRP, IGMP, and MPLS protocols.

### **UNIT IV**

**Data Link Layer Protocols:** ARP, IPCP, RARP, SLIP, IEEE 802.3, IEEE 802.5, IEEE 802.11, FDDI, ISDN, xDSL, PPP, LCP, HDLC, PNNI – LANE – SONET/SDH Protocols..

### **UNIT V**

**Network Security Protocols:** SSH, RADIUS, SSL, Kerberos, TLS, IPSec, Voice over IP.

### **TEXT BOOKS**

1. A. Leon-Garcia and Indra Widjaja, "Communication Networks", Tata McGraw-Hill, 2000.
2. Willian Stallings, "Data and Computer Communications", Prentice-Hall of India, Seventh edition, 2005.
3. Andrew S. Tanenbaum, "Computer Networks", Prentice-Hall of India, Fourth edition, 2003.
4. W. Richard Stevens, "TCP/IP Illustrated Vol. I: The Protocols", Pearson Education, Asia, 2000.
5. Douglas Comer, "Intenetworking with TCP/IP Vol. I: Principles, Protocols and Architecture, Prentice Hall, Fourth edition, 2000.

### **REFERENCES**

1. Behrouz A. Forouzan, "TCP/IP Protocol Suite", Tata McGraw-Hill, Second edition, 2004.
2. Charles M. Kozierok, "The TCP/IP Guide: A Comprehensive, Illustratead Internet Protocols Reference", No Starch Press, 2005.

## CS E78 MODELING AND SIMULATION

### UNIT I

**Introduction:** Principles of Modeling and Simulation – Monte Carlo Simulation – Nature of Modeling and Simulation – Limitations of Simulation – Areas of Application – System and environment – Components of System – Discrete and Continuous Systems – Models of a System – Modeling approaches.

### UNIT II

**Random Numbers:** Random Number generation – Techniques of generating Random Numbers – Mid-square Method – Mid-product Method – Constant Multiplier Method – Additive Congruencies Method – Linear Congruencies Method – Tauswarthe Method – Tests for Randomness – Kolmogorov Smirnov test – Chi-square test – Random variable generation – Inverse Transform Technique – Exponential distribution – Uniform distribution – Weibull distribution – Empirical continuous distribution – Generating approximate normal variates – Erlang distribution.

### UNIT III

**Discrete Numbers:** Empirical Discrete distribution – Discrete uniform distribution – Poisson distribution – Geometric distribution – Acceptance Technique for Poisson distribution – Rejection Technique for Poisson distribution – Gamma distribution.

### UNIT IV

**Discrete Event Simulation:** Design and Evaluation of Simulation experiments – Input and Output Analysis – Variance Reduction Technique – Antithetic variables – Verification and Validation of simulation models – Discrete event simulation – Concepts in Discrete event simulation – Manual simulation using event scheduling – Single server Queue – Two server Queue – Case study of Inventory Problem of one or more items.

### UNIT V

**Simulation Languages:** Simulation Languages – GPSS – SIMSCRIPT – SIMULA – SIMPLE-1 – Programming for Discrete event Systems using GPSS, SIMPLE-1 and C – Case study of LAN Simulation, Manufacturing system and Hospital system.

**TEXT BOOKS**

1. Jerry Banks, John Carson, Barry L. Nelson and David Nicol, “Discrete - Event System Simulation”, Prentice Hall, Fourth edition, 2005.
2. Narasing Deo, “System Simulation with Digital Computer”, Prentice-Hall of India, 2004.

**REFERENCES**

1. Averill. M. Law and W. David Kelton, “Simulation Modeling and Analysis”, McGraw-Hill Inc., 2000.

## CS E79 PRINCIPLES OF COMMUNICATION

### UNIT I

**Amplitude Modulation Systems:** External and internal noise - Noise figure - Need for modulation - Amplitude modulation – Frequency spectrum of AM wave – Representation of AM – Power relation – Generation of AM waves – Diode and balanced modulators – Suppression of carrier – SSB and DSB -Demodulation of AM waves – Linear detectors – Synchronous and envelope detectors.

### UNIT II

**Angle Modulation System:** Frequency modulation and phase modulation – Mathematical representation of FM – Frequency spectrum of FM wave – Generation of FM wave – Direct and Indirect methods – Demodulation of FM waves – Slope detector –Balanced slope detector – Foster-Seeley discriminator – Ratio detector.

### UNIT III

**Transmitters and Receivers:** Low level and high level AM transmitter – FM transmitter – Super heterodyne AM receiver – Receiver characteristics - Communication receiver – Diversity reception – FM receivers.

### UNIT IV

**Pulse and Digital Modulation Systems:** Principles of pulse modulation – sampling theorem, PAM – PWM – PPM – Conversion of PWM wave to PPM wave – Generation of PAM, PPM and PWM waves – Demodulation of PAM, PWM, PPM – An introduction to digital modulation systems – PCM, ASK, FSK and PSK.

### UNIT V

**Antennas (Qualitative Analysis):** Basic antenna operation, Definition of antenna parameters -radiation pattern, radiation resistance, directive and power gain, directivity, beam width, polarization and bandwidth - UHF and microwave antenna types - Dipole antenna, horn and its types, parabolic reflector, micro strip antenna, Yagi Uda and array antenna.

### TEXT BOOKS

1. Kennedy Davis, “Electronic Communication Systems”, Tata McGraw-Hill, New Delhi, 1999.
2. Wayne Tomasi, “Electronic Communication Systems”, Pearson Education Pvt. Ltd., Delhi, 2002.

### REFERENCE

1. Roddy D and Coolen J, “Electronic Communications”, Prentice-Hall of India, Pvt. Ltd., 1987.



## **CS E710 SOFTWARE PROJECT MANAGEMENT**

### **UNIT I**

Introduction to software project management – Stepwise: an overview of project planning - project valuation.

### **UNIT II**

Selection of appropriate project approach - software effort estimation - activity planning.

### **UNIT III**

Risk management – resource allocation - monitoring and control.

### **UNIT IV**

Managing contracts - managing people and organizing teams – software quality.

### **UNIT V**

Small projects - BS:6079:1996 - an overview – ISO 12207: an overview.

### **TEXT BOOK**

1. Bob Hughes and Mike Cotterell , “Software Project Management”, Tata McGraw-Hill, Third Edition, 2004

### **REFERENCES**

1. Andrew Stellman, Jennifer Greene, “Applied Software Project Management”, O' Reilly, 2005.
2. Pankaj Jalote, “Software Project Management in Practice”, Addison-Wesley, Second edition, 2002.

## **CSE E711 RADIO FREQUENCY IDENTIFICATION TECHNOLOGY**

### **UNIT I**

**Basics:** radio waves, EIRP, communication protocol.

**The EPC global Network:** Introduction, RFID, Electronic Product Code.

### **UNIT II**

**Components of an RFID System:** Smart labels, middleware, dipole antenna.

**Bar Codes and RFID Tags:** UPC-A, Code 39, numeric digit.

### **UNIT III**

**Applications:** Express Pay, track and trace, Wal-Mart.

**RFID in defense applications:** Department of Defense, Military logistics, CAGE code.

### **UNIT IV**

**Pharmaceutical Industry:** Supply Chain Management, bullwhip effect, Tesco.

**Project:** Application Software, Middleware, cross-docking.

### **UNIT V**

**Planning a Project:** SKUDD, data element, application software.

**Tag-and-Ship:** Introduction - Tag-and-Ship, Warehouse Management System, data integrity.

**TEXT BOOK**

1. Dennis E. Brown, "RFID Implementation", Tata McGraw-Hill, 2006.

**REFERENCES**

1. Bill Glover, Himanshu Bhatt, "RFID Essentials", O'Reilly, 2006.
2. Klaus Finkenzeller and Rachel Waddington, "RFID Handbook: Fundamentals and Applications in Contactless Smart Cards and Identification", Translated by Rachel, John Wiley & Sons, Second edition, 2003.

## **CSE E712 RATIONAL UNIFIED PROCESS**

### **UNIT I**

The Process-Value of software - Development Problems - Best practices - Manage Requirements - Visually Model Software – Continuously Verify Software Quality - Control Changes to software – The Rational Unified Process - The Rational Unified Process as a Product - Software Best Practices in the Rational Unified Process – A brief History of the Rational Unified Process -A Model of the Rational Unified Process - Roles – Activities – Artifacts - Disciplines – Workflows - Additional Process Elements – A process Framework.

### **UNIT II**

Dynamic Structure – Iterative Development – The Sequential Process – Overcoming Difficulties – Gaining Control – A shifting focus across the cycle - Phases Revisited - Benefits of an Iterative approach – Architecture - centric Process – Architecture - The importance of architecture - Definition of architecture – Architecture Representation – Purpose of Architecture - Component based development – Other architectural concepts - A use case driven Process - Identifying use cases – Evolving use cases – Organizing use cases – uses cases in the process.

### **UNIT III**

Project Management discipline – Purpose – Planning an iterative project - The concept of risk -The concept of Measurement - Roles and artifacts – Workflow - Building an interaction plan -Business modeling discipline – business modeling – business modeling scenarios - From the business models to the systems - modeling the software development business - Tool support -The Requirement discipline – Types of requirements – capturing and managing requirements –Roles in Requirements.

### **UNIT IV**

Analysis and Design Discipline – Analysis versus Design – Designing a user centered interface –design model – analysis model – Role of interfaces – Artifacts of real time systems – Component based design The implementation discipline – Builds – Integration – Prototypes – The test Discipline – Testing in the iterative lifecycle - Dimensions in testing.

### **UNIT V**

The configuration and Change management discipline – The CCM cube – The Environment Discipline Purpose – Roles and artifacts. The Deployment Discipline Purpose - Typical Iteration plans – Defining the Product vision and the Business case - Building an architectural Prototype – implementing the system – Implementing the rational unified process - Introduction – Effect of Implementing a Process – Implementing the Rational unified process step by step – Implementing a process is a project.

**TEXT BOOK**

5. Philippe Kruchten, "The Rational Unified Process - An Introduction", Pearson Education, Third edition, India, 2008.

**REFERENCE**

1. Ahmad K. Shuja and Jochen Krebs, "IBM Rational Unified Process Reference and Certification Guide", Pearson Education, India, 2008.

## CS E81 INTELLIGENT INFORMATION RETRIEVAL

### UNIT I

**Knowledge Representation:** Knowledge representation - Basics of Propositional logic - Predicate logic - reasoning using first order logic-unification - forward chaining -backward chaining – resolution - Production rules – frames - semantic networks - scripts.

### UNIT II

**Ontology Development:** Description logic-taxonomies -Topic maps – Ontology -Definition - expressing ontology logically - ontology representations – XML – RDF –RDFS – OWL – OIL - ontology development for specific domain - ontology engineering - Semantic web services.

### UNIT III

**Information Retrieval Modeling:** Information retrieval – taxonomy-formal characterization - classic information retrieval - set theoretic model - algebraic model -probabilistic model - structured text retrieval models - models for browsing -retrieval performance evaluation - keyword based querying - pattern matching - structural queries - query operations.

### UNIT IV

**Text and Multimedia Languages and Properties:** Introduction – metadata - markup languages - multimedia. **Text operations:** document preprocessing - document clustering - text Compression - basic concepts - statistical methods. **Indexing and searching:** inverted files - suffix trees - signature files - boolean queries - sequential searching -pattern matching.

### UNIT V

**Recent Trends in IR:** Parallel and distributed IR - multimedia IR - data modeling - query languages - A generic Multimedia indexing Approach - one dimensional time series - two dimensional colour images - Automatic feature extraction. Web Searching - Characterizing the Web - Search Engines – Browsing – Meta searchers - Searching using hyperlinks.

## **TEXT BOOKS**

1. Stuart Russell and Peter Norvig, "Artificial Intelligence – A Modern Approach", Pearson Education, Second edition, 2003. (UNIT I)
2. Michael C. Daconta, Leo J. Obart and Kevin J. Smith, "Semantic Web – A Guide to the Future of XML, Web Services and Knowledge Management", Wiley Publishers, 2003. (UNIT II)
3. Ricardo Baeza-Yates, Berthier Ribeiro-Neto, "Modern Information Retrieval", Addison Wesley, 1999. (UNITs III, IV & V)

## **REFERENCES**

1. Elain Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw-Hill, Third edition, 2003.
2. Christopher D. Manning, Prabhakar Raghavan and Hinrich Schutze, "Introduction to Information Retrieval", Cambridge University Press, 2008.

## **CS E82 SOFT COMPUTING**

### **UNIT I**

Introduction - Soft Computing Concept Explanation - Importance of Tolerance of Imprecision and Uncertainty - Biological and Artificial Neuron - Neural Networks - Adaline - Perceptron - Back Propagation Neural Networks - Feed forward Multilayer Networks.

### **UNIT II**

Types of Neural Networks - Competitive Learning - Kohonen Maps - CPN - ART - Neocognitron Neural Networks - Neural Networks as Associative Memories: Hopfield and Bidirectional Associative Memory.

### **UNIT III**

Fuzzy Systems – Fuzzy Sets – Operations and Properties - Fuzzy Rules and Reasoning - Fuzzy Inference Systems – Fuzzy Models.- Adaptive Neuro-Fuzzy Inference Systems.

### **UNIT IV**

Derivative-based Optimization – Derivative-free Optimization – Genetic Operations – Crossover – Mutation – Fitness Scaling – Inversion - Genetic Algorithms.

### **UNIT V**

Applications: Printed Character Recognition – Inverse Kinematics Problems - Automobile Fuel Efficiency Prediction – Soft Computing for Color Recipe Prediction.



## **TEXT BOOKS**

1. J.S.R. Jang, C.T. Sun and E. Mizutani, “Neuro-Fuzzy and Soft Computing”, Prentice-Hall of India, 2007.
2. Aliev, R.A and Aliev, R.R, “Soft Computing and its Application”, World Scientific Publishing Co. Pvt. Ltd., 2001.
3. S. Rajasekaran and G.A.V. Pai, “Neural Networks, Fuzzy Logic and Genetic Algorithms”, Prentice-Hall of India, 2003.

## CS E83 OPTICAL NETWORKS

### UNIT I

Introduction to optical networks – Principles of optical transmission – Evolution of optical networks – Components and enabling technologies – Wavelength division multiplexing (WDM) – WDM network architectures, broadcast-and-select networks, linear lightwave networks, and wavelength routed networks – Issues in broadcast-and-select networks.

### UNIT II

Static traffic routing in wavelength routed networks – Virtual topology design – problem formulation and algorithms - design of multi-fiber networks – Virtual topology reconfiguration – problem formulation - reconfiguration due to traffic changes - reconfiguration for fault restoration – Network provisioning.

### UNIT III

Dynamic traffic routing in wavelength routed networks – Routing and wavelength assignment algorithms – Centralized and distributed control – Introduction to Wavelength convertible networks – Wavelength rerouting.

### UNIT IV

Control and Management – Functions – Framework – Information Model – Protocols – Optical layer Services and Interfacing – Network Survivability – Protection in SONET / SDH – Protection in IP Networks – Optical Layer Protection – Schemes.

### UNIT V

Next generation optical Internets – burst switching – packet switching (IP-over-WDM) – Multicast traffic routing – source rooted trees - Access Networks – PON, FTTC, FTTH – Traffic Grooming – Optical Burst Switching.

## **TEXTBOOKS**

1. C. Siva Ram Murthy and Mohan Gurusamy, “WDM Optical Networks: Concepts, Design, and Algorithms”, Prentice-Hall of India, 2002. (UNITs I, II, III, and V)
2. B. Mukherjee, “Optical WDM Networks”, Springer, 2006. (UNITs I and V)
3. Rajiv Ramaswami and Kumar N. Sivarajan, “Optical Networks: A Practical Perspective, Morgan Kaufmann (Elsevier Indian Edition), Second edition, 2004. (UNITs IV and V).

## **REFERENCES**

1. Greg Bemstein, Bala Rajagopalan and Debanjan Saha, “Optical Network Control – Architecture, Protocols and Standards”, Pearson Education, 2004.
2. Uless Black, “Optical Networks - Third Generation Transport Systems”, Pearson Education, 2002.

## CS E84 MOBILE COMPUTING

### UNIT I

**Introduction:** Wireless and Mobile Computing Architecture – Limitations of wireless and mobile communication – Wireless Telecommunication Networks: Digital cellular Systems, TDMA - CDMA – Wireless Networking Techniques – Mobility Bandwidth Tradeoffs – Portable Information Appliances.

### UNIT II

**Emerging Wireless Network Standards:** 3 G Wireless Networks – State of Industry – Mobility support Software – End User Client Application – Mobility Middleware – Middleware for Application Development - Adaptation and Agents - Service Discovery Middleware - Finding Needed Services - Interoperability and Standardization.

### UNIT III

**Mobile Networking:** Virtual IP Protocols - Loose Source Routing Protocols - Mobile IP – CDPD – GPRS – UMTS - Security and Authentication – Quality of Service – Mobile Access to the World Wide Web.

### UNIT IV

**Mobile Data Management:** Mobile Transactions - Reporting and Co Transactions – Kangaroo Transaction Model - Clustering Model – Isolation only transaction – 2 Tier Transaction Model – Semantic based nomadic transaction processing.

### UNIT V

**Mobile Computing Models:** Client Server model – Client/Proxy/Server Model – Disconnected Operation Model – Mobile Agent Model – Thin Client Model – Tools: Java, Brew, Windows CE, WAP, Sybian, and EPOC.

## **TEXT BOOKS**

1. Reza B Fat and Roy.T. Fielding, “Mobile Computing Principles”, Cambridge University Press, 2005.
2. Abdelsalam A Helal, Richard Brice, Bert Haskel, Marek Rusinkiewicz, Jeffery L Caster and Darell Woelk, “Anytime, Anywhere Computing, Mobile Computing Concepts and Technology”, Springer International Series in Engineering and Computer Science, 2000.

## **REFERENCES**

1. Golden Richard, Frank Adelstein, Sandeep KS Gupta, Golden Richard and Loren Schwiebert, “Fundamentals of Mobile and Pervasive Computing”, McGraw-Hill Professional Publishing”, 2005.
2. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, “Principles of Mobile Computing”, Springer, 2003.

## CS E85 GRID COMPUTING

### UNIT I

**IT Infrastructure Evolution:** Introduction - Technologies - Global Internet Infrastructure - World Wide Web and Web Services - Open-Source Movement.

**Productivity Paradox and Information Technology:** Productivity Paradox - Return on Technology Investment - Information Technology Straitjacket - Consolidation - Outsourcing - Toward a Real-Time Enterprise - Operational Excellence.

**Business Value of Grid Computing:** Grid Computing Business Value Analysis - Risk Analysis - Grid Marketplace.

### UNIT II

**Grid Computing Technology - An Overview:** High Performance computing – cluster Computing – Peer-to-peer Computing – Internet Computing – Grid Computing – Grid Computing Models – Grid protocols – Types of Grids: Desktop Grids - Cluster Grids - HPC Grids - Data Grids.

### UNIT III

The Open Grid Services Architecture - Creating and Managing Grid Services - Desktop Supercomputing: Native Programming for Grids - Grid-Enabling Software – Applications.

### UNIT IV

Application Integration - Grid-Enabling Network Services - Managing Grid Environments.

### UNIT V

Grid Computing Adoption in Research and Industry - Grids in Life Sciences - Grids in the Telecommunications Sector - Grids in other Industries - Hive Computing for Transaction Processing Grids - Grid Computing Toolkit.

**Case Studies:** Sun Grid Engine – National Grid Project – Garuda.

## **TEXTBOOK**

1. Ahmar Abbas, "Grid Computing: A Practical Guide to Technology and Application", Charles River Media, 2005.

## **REFERENCES**

1. Joshy Joseph and Craig Fellenstein, "Grid Computing", Pearson Education, 2003.
2. Ian Foster and Carl Kesselman, "The Grid2: Blueprint for a New Computing Infrastructure", Morgan Kaufman, 2004.

## CS E86 AGENT TECHNOLOGY

### UNIT I

**Agents Overview:** Agent definition – agent programming paradigms – Agents Vs objects – aglets – mobile agents – agent frame works – agent reasoning.

### UNIT II

**Agents Implementation:** Processes – threads – daemons – components – Java Beans – ActiveX – Sockets, RPCs – distributed computing – aglets programming – JINI architecture – actors and agents – typed and proactive messages.

### UNIT III

**Multi Agent Systems:** Interaction between agents – reactive agents – cognitive agents – interaction protocols – agent coordination – agent negotiation – agent cooperation – agent organization – self –interested agents in electronic commerce applications.

### UNIT IV

**Intelligent Software Agents:** Interface Agents – Agent Communication Languages – Agent Knowledge Representation – Agent Adaptability – Belief Desire Intension – Mobile Agent Applications.

### UNIT V

**Agents and Security:** Agent Security Issues – Mobile Agents Security – Protecting Agents Malicious Hosts – Untrusted Agents – Black box Security – Authentication for Agents – Security issues for Aglets.



## **TEXT BOOKS**

1. Joseph P. Bigus and Jennifer Bigus, “Constructing Intelligent Agents Using Java: Professional Developer's Guide”, Wiley, Second edition, 2001. (UNIT II)
2. Bradshaw, “Software Agents”, MIT Press, 2000 (UNITs I, III IV and V)

## **REFERENCES**

1. Stuart Jonathan Russell, Peter Norvig, John F. Canny Contributor, Peter Norvig and John F. Canny, “Artificial Intelligence: A Modern Approach”, Prentice Hall, Second edition, 2003.
2. Richard Murch and Tony Johnson, “Intelligent Software Agents”, Prentice Hall, 2000.

## **CS E87 ORGANIZATIONAL BEHAVIOUR**

### **UNIT I**

What is Organizational Behaviour? – Foundations of Individual Behaviour – Attitudes and Job Satisfaction – Personality and Values – Perception and Individual Decision making – Motivation Concepts – Motivation: From Concepts to Applications – Emotions and Moods.

### **UNIT II**

Foundations of Group Behaviour – Understanding Work Teams – Communication – Basic Approaches to Leadership – Contemporary Issues in Leadership – Power and Politics – Conflict and Negotiation.

### **UNIT III**

Foundations of Organization Structure – Organizational Culture – Human Resource Policies and Practices.

### **UNIT IV**

Organizational Change and Stress Management.

### **UNIT V**

Case Studies and Current Issues in Organizational Behaviour.

**TEXT BOOK**

1. Stephen P. Robbins and Timothy A. Judge, “Organizational Behaviour”, Prentice-Hall of India, Twelfth edition, 2007.

**REFERENCES**

1. Kondalkar V.G, “Organizational Behaviour”, New Agen International (P) Ltd, 2007.
2. Jayantee Mubhrjee Saha, “Management and Organizational Behaviours”, Excel Books, 2006.

## CS E88 DIGITAL SYSTEM DESIGN USING VHDL

### UNIT I

**Introduction to HDLs:** Difference between HDL and other software languages – Different HDLs in vogue. Overview of digital system design using HDL.

**Basic VHDL Language Elements:** Identifiers, Data objects, scalar and composite data types, Operators.

**Behavioural Modeling with examples:** Entity declaration, Architecture body, Process statement and sequential statements. Inertial and transport delay models, creating signal waveforms, signal drivers, effect of transport and inertial delays on signal drivers.

### UNIT II

**Data Flow Modeling with examples:** Concurrent signal assignment statement, Concurrent versus sequential signal assignment, Delta delays, Multiple drivers, Conditional signal assignment statement, selected signal assignment statement, concurrent assertion statement.

**Structural Modeling with examples:** Component declaration, Component instantiation and examples, Direct instantiation of component.

### UNIT III

**Subprograms and Overloading:** Functions and procedures with simple examples - subprogram overloading, Operator overloading.

**Packages and Libraries:** Package declaration, package body, design file, design libraries, order of analysis, implicit visibility, explicit visibility, library clause and use clause.

### UNIT IV

**Advanced Features:** Entity statements, Generate statements, Attributes, Aggregate targets, ports and their behaviour.

**Model Simulation:** Simulation – Writing a Test Bench for a Half and a Full adder.

### UNIT V

**Hardware Modeling Examples:** Modeling entity interfaces, Modeling simple elements, Different styles of modeling, Modeling regular structures, Modeling delays, Modeling conditional operations, Modeling a clock divider and a pulse counter.

## **TEXT BOOKS**

1. J.Bhasker, “A VHDL Primer”, Prentice-Hall of India, Third edition, 2007.
2. Volnei Pedroni, “Circuit Design with VHDL”, Prentice-Hall of India, New Delhi, 2007.
3. Charles H. Roth, “Digital Systems Design using VHDL”, PWS Publishers, 1998.

## **REFERNCES**

1. Sudhakar Yalamanchili, “Introductory VHDL: From Simulation to Synthesis”, Pearson Education Asia, 2001.
2. Douglas L. Perry, “VHDL Programming by Example”, Tata McGraw Hill, Fourth edition, 2002.
3. Stephen Brown and Zvonko Vranesic, “Fundamentals of Digital Logic with VHDL Design”, Tata McGraw-Hill, 2002.
4. Zainalabedin Navabi, “VHDL – Analysis and Modeling of Digital Systems”, Second edition, Tata McGraw-Hill, 1998.
5. Peter J. Ashenden, “The Designer’s Guide to VHDL”, Harcourt India Pvt. Ltd., Second edition (First Indian Reprint) 2001.

## CS E89 MODEL DRIVEN ARCHITECTURE

### UNIT - I

Raising the Level of Abstraction - Raising the Level of Reuse - Design-Time Interoperability - Models as Assets - Models. – Meta models and Platforms - Mapping Between Models - Marking Models - Building Languages - Model Elaboration - Executable Models - Agile MDA - Building an MDA Process - Executing an MDA Process - Why Model? - Abstraction, Classification, and Generalization - Subject Matter and Language Abstraction - Model Projections - Models and Platforms - Using Models.

### UNIT II

Why Met models? – Meta models - The Four-Layer Architecture - MOF: A Standard For Met modeling-Using Meta models - Why Mappings? - An Informal Example - Mapping Functions - Query, Views, and Transformations (QVT) - Scenarios for Mappings - Merging Mappings for Weaving - Using Mappings - Why Marks? - Marks and Marking Models - Applying Marks and Marking Models - Relating Marks and Model Elements - Other Marks.

### UNIT-III

Mark and Marking Model Implementations - The Theory of Marking Models - Using Marks - Why Build a Language? - Who Defines a Language? – What IS In a Language? - Building a Language Using MOF.

Building a Language Using Profiles - Building Graphical Notations - Using Languages - Why Elaborate Models? - Managing Manual Changes to Generated Models - Reversibility of Mappings - Incorporating Legacy Code - Using Elaboration.

### UNIT-IV

Why Executable Models? - Executable UML - The Execution Model - Translating Models - Model Compilers.

Using Executable UML - Why Agile MDA? - Agile Methods – Models - Design-Time Interoperability Revisited - Using Agile MDA - Why Build an MDA Process? - How to Approach the Problem - Charting the MDA Process - Identifying Models - Identifying the Metamodels and Marking Models - The Long and the Short of Mapping Chains.

### UNIT-V

Constraint Propagation and Verification- Using an MDA Process - Formalizing Knowledge-Building Bridges - An Example Model-Driven Process - Iterating the Process - Testing the System - Executing an MDA Process - Why Not MDA? - The Importance of Standards - Building a Tool Chain - Working with Models-as-Assets - Beyond UML - Back from the Future.

## **TEXT BOOK**

1. Kendell Scot," MDA Distilled", Addison Wesley Professional, 2008

## CS E810 REFACTORING TECHNIQUES

### UNIT-I

**Refactoring, a First Example:** The Starting Point.-The First Step-Decomposing and Redistributing- Conditional Logic Vs on Price Code-Final Thoughts.

**Principles in Refactoring:** Defining Refactoring-need-problem-Design and Performance-evolution

**Bad Smells in Code:** Code requiring refactoring

### UNIT-II

**Building Tests:** The Value of Self-testing Code- JUnit -More Tests.

**Toward a Catalog of Refactorings:** Format - References- Maturity.

**Composing Methods :** Extract Method- Inline-query- Explaining Variable- Split-Remove Assignment -Media Object-Substitute

**Moving Features Between Objects :** Moving, Hiding, removing and introducing code

### UNIT -III

**Organizing Data :**Data related refactoring

**Simplifying Conditional Expressions.** Refactoring required for conditional expression

**Making Method Calls Simpler.** Refactoring rules for methods of objects and classes

### UNIT-IV

**Dealing with Generalization.** Refactoring rules for inheritance involving super and subclasses,delegation

**Big Refactorings :** Tease Apart Inheritance.-Convert Procedural Design to Objects-Separate Domain from Presentation-Extract Hierarchy.

### UNIT -V

**Refactoring, Reuse, and Reality:** A Reality Check –reluctance - reality check-Resources and references-software reuse

**Refactoring Tools:** Refactoring with a Tool-Technical Criteria for a Refactoring Tool-Practical Criteria for a Refactoring Tool.



## **TEXT BOOKS**

1. Martin Fowler, Kent Beck, John Brant, William Opdyke, Don Roberts, “Refactoring Improving The Design Of Existing Code, Dorling Kindersley (India) Pvt Ltd , 2008

## **REFERNCE**

1. William C. Wake,” Refactoring Workbook”, Addison-Wesley Professional,2003

**Pondicherry University**

**Infrastructure and Faculty Requirements for**

**B.Tech (Computer Science and Engineering)**

**Programme**

**II<sup>nd</sup>, III<sup>rd</sup> and IV<sup>th</sup> Year**

**(With effect from 2009-2010)**

**Pondicherry University**

**Infrastructure and Faculty Requirements**

**B.Tech (Computer Science and Engineering) Programme**

**II<sup>nd</sup>, III<sup>rd</sup> and IV<sup>th</sup> Year**

**(With effect from 2009-2010)**

**I. SPACE REQUIREMENTS:**

**(a) Class Room:**

Sl.No	Laboratory	Maximum Batch size	Area (Sq. m)	No. of Class rooms required
1	Number of class rooms required for each year	66	66	Round of to Next Higher Integer Number ( Number students in the year of course /66)

**(b) Laboratory:**

Sl.No	Laboratory+*	Area in Sqm for the Batch size of 33	Area in Sqm for the Batch size of 22
1	Lab 1/ Computing Lab1	110	73
2	Lab 2/ Hardware and Microprocessor Lab.	165	110
3	Lab 3 / Computing Lab 2	110	73
4	Lab 4 / Computing Lab 3	110	73

+A lab in the list may be arranged as more than one laboratory. In such a case that they should satisfy the area and other facility requirements that are required to conduct the laboratory courses

\*All the laboratories are required from second year onwards. Year wise need of equipments is listed in section IV.

**II. FACULTY REQUIREMENTS:**

**(a) Teaching Staff Strength:**

The number of faculty members required as per AICTE norms and course curriculum

Faculty : student ratio= 1:15

Additional faculty members are required for handling the subjects of the other departments and first year as per the AICTE recommended workload.

Cadre ratio: Professor, Assistant Professor and Lecturer should be in the ratio of 1:2:6.

**(b) Non-teaching Staff Strength:**

Total number of non-teaching staff (includes technical & ministerial) shall be in the ration of Teaching: Non-Teaching = 1:1.2 considering at the institute level. Each lab should have minimum of one laboratory attendant. Additionally, one senior level technical staff is required for each of the two laboratories.

**(c) Faculty Qualification:**

A first class B.E/B.Tech degree in Computer Science and Engineering

**OR**

A first Class M.E/M.Tech degree in any one of the specialization in Computer Science and Engineering

**The above eligibility criteria are applicable only for the faculties who have been recruited after 30.06.2009.**

**III. LIBRARY REQUIREMENTS**

The norms are same as that of the norms given by AICTE for the institute level. The number of books and journals that are required for B.Tech/B.E Computer Science and Engineering may be inferred from the following norms in concurrence with the requirements at the institute level.

The central library for an admission of 240 students per year will have a carpet area of 400 Sq m. At the time of establishing a technical institution with three branches, there should be a minimum of 4000 volumes in the Library distributed as below:

- i. Each branch will have 250 titles with four multiple copies.
- ii. In subjects like Mathematics, Humanities, Physics, Chemistry, etc. there should be total of 1000 volumes.

There should be a minimum of 12 technical journals - 6 Indian and 6 International for each branch of engineering. While this is essential for institutions offering P.G. programme, the number of International Journals may be relaxed, though preferred for those offering only U.G. Programmes.

Accordingly, the norms for the initial stock of books, yearly addition of books and the number of journals to be subscribed are as given below:

SNo	Item	Minimum
1.	Initial Stock of Books for three branches in Institution	4000
2.	a. Each Branch of Engg. (A) b. Mathematics, Applied Physics Applied Chemistry, Humanities, Social Science and Management Science (B)	1000 (in each branch)

3.	Yearly addition of Books (Average) a. For (A) 1 title per student admitted to the branch b. For (B) 0.2 title per student admitted per year	
4.	Number of Tech. Journals a. For (A) 12 (6 National + 6 International) b. For (B) 12 (6 National + 6 International)	

#### **IV. LIST OF EQUIPMENTS REQUIRED (Lab wise)**

##### **(a) Equipments required for the Second year**

##### **(i) Computing Lab I,II and III**

Each of the computing lab should have following:

		<b>Batch size of 22 students</b>	<b>Batch size of 33 students</b>
Hardware	Computer System: Server	1No.	1No.
	Computer systems: nodes (networked and connected with server)	25 No.	35 No.
	UPS	Minimum of 5 KVA	Minimum of 7 KVA
	Printer	2 No.	3 No.
User License required for software (proprietary)		Minimum 22 No.	33 No.
Software	Licensed Microsoft Server OS/ Linux Server OS/ Any other open source server OS / any other proprietary Server OS software with server configuration and language packages.		
	Microsoft client OS/ open source client OS (Unix/Linux based)/any other proprietary client OS. Depending upon the requirements of the laboratory course dual boot option		
	Proprietary/open source C compiler		
	MS office / any other open source word processor, spreadsheet and presentation software		

**(ii) Equipments Needed for Hardware and Microprocessor Lab:**

S.NO	Name of equipment/ component	Quantity Required	
		batch of 33 students (2 per batch)	batch of 22 students (2 per batch)
1	Digital IC Trainer (10 bit)	17	12
2	Multi meter	6	4
3	Required Integrated Circuits	80 No. in each of the IC	60 No.. in of the IC
4	Seven segment display	40	30
5	Assembled LED board/LEDs	40/200	25/200
6	FPGA Kit	17	12
7	Pentium IV (or higher) Based Computers with dual boot options of Windows 98/XP/2000 and Linux OS VHDL and FPGA software with License. <b>(The computers in any one of the computing lab may be used)</b>	17	11
8	8085 Trainer Kit with onboard 8255, 8253, 8279 and 8251 – 15 nos.	17	12
9	TASM/MASM simulator in Desk top computers (8086 programs) <b>.(The computers in any one of the computing lab may be used)</b>	17	12
10	8051 trainer kit	17	12
11	Stepper motor interfacing module	6	5
12	DC motor interface module	6	5
13	Traffic light controller interfacing module	6	5
14	ADC, DAC interfacing module .	6	5
15	Elevator interface module	6	5
16	Dot Matrix Printer	3	2
17	UPS	5 KVA	5KVA

**(b) Additional equipments required for third year**

**(i) Computing Labs I,II, III**

Subject specific computer servers 3 No. (1 for each of the Lab). These servers are to be installed with Linux / UNIX /Any open source OS software /Red hat Linux/ any Proprietary Unix Clone OS software with server configuration with language packages **depending upon the requirements laboratory courses.**

**(c) Additional equipments required for fourth year**

**(i) Equipments Needed for Hardware and Microprocessor Lab:**

S.NO	Name of equipment/ component	Quantity Required	
		batch of 33 students (2 per batch)	batch of 22 students (2 per batch)
1	PC mother Board	5	3
2	Disk drive units	5	3
3	Key boards	5	3
4	Mouse	5	3
5	monitor		
7	In-circuit emulator	3	2
8	. Logic Analyzer –PC based	2	2
9	Multimeter	5	3
10	C/C++,MASM (Open source or Proprietary software) <b>.(The computers in any one of the computing lab may be used)</b>	5 No each	3 No each
12	Dot Matrix Printer	2 No	2 No
13	7 segment LED and LDs	10 No, 100	10 No, 100
14	C.R.O	10	7
15	Circuit board	5 No.	5 No.
16	In-Circuit emulator	3 no.	3 no.
17	PSPICE Circuit simulator	10 user License	7 user License
18	Floppy disks Drive	5 No.	3 No.
19	SMPS	5 No.	3 No.
20.	Required ICs	50 No.Each	40 No. each
21	Passive and other components( Resistor, Capacitor, Diode and Transistor)	50 each	50 each

22	PAL/EPROM/PROM Programmer	1	1
23	IC tester	1	1
24	Bread Boards	17	12
25	Network Interface cards	5	3
27	NS2/Glomosim/any other proprietary network simulation software <b>.(The computers in any one of the computing lab may be used)</b>	17	12

**(d)The other software :**

In addition the department must have each one of the following software (with the required number of user licenses) in any one or more of the computing labs in which the respective laboratory course is conducted.

Sl.No.	software	Made available from the year
1	Proprietary/open source C++ compiler	2 <sup>nd</sup> year
2	Java Development Kit (Latest Version)	
3	Glomosim/Ns2 /any other network simulation software	2 <sup>nd</sup> year
4	PHP and Ajax	3 <sup>rd</sup> year
5	VB/VC++ / D2K/ or any other open source front end software\	3 <sup>rd</sup> year
6	Rational Suite/ Win Runner/Describe or equivalent	3 <sup>rd</sup> year
7	Visual Basic/Open source front end software	3 <sup>rd</sup> year
8	DB2 Server / ORACLE server/ SQL Server/ Open source DBMS server software	3 <sup>rd</sup> year
9	Apache Web Server, Internet Information Server (IIS) Microsoft Visual Studio With .Net Framework	3 <sup>rd</sup> year
10	J2ME, J2SE	3 <sup>rd</sup> year
11	CORBA Framework	4 <sup>th</sup> year
12	Open source or Proprietary LISP and PROLOG Compiler	4 <sup>th</sup> year
13	OpenMP, Matlab and NS2	4 <sup>th</sup> year



## V. LIST OF EQUIPMENTS REQUIRED (Lab course wise)

### Third Semester

#### Digital Laboratory:

S.NO	Name of equipment/ component	Quantity Required	
		batch of 33 students (2 per batch)	batch of 22 students (2 per batch)
1	Digital IC Trainer (10 bit)	17	12
2	Multi meter	6	4
3	Required Integrated Circuits	80 No. in each of the IC	60 No.. in of the IC
4	Seven segment display	40	30
5	Assembled LED board/LEDs	40/200	25/200
6	FPGA Kit	17	12
7	Computers with Pentium IV or above processor with VHSICHDL and FPGA software with License.	17	11

#### Data Structures Laboratory

	Batch size of 22 students	Batch size of 33 students
<b>Hardware</b>		
Computer System : Server	1 No.	1 No.
Computer systems: node	25 No.	35 No.
UPS	Minimum of 5 KVA	Minimum of 6 KVA
Printer	2 No.	3 No.
Server 1	1 No.	
<b>Software</b>		
User License required for software (proprietary)	Minimum 22 No.	33 No.
Software	1. Microsoft Server OS/ Linux Server OS/ UNIX Server OS/Any open source server OS / any Proprietary Server OS software 2. Proprietary/ open source client OS 3. Borland C Compiler / Microsoft C compiler/ any open source C compiler/ any Proprietary C compiler	

## IVth Semester

### **Microprocessors and Microcontrollers Laboratory**

S.NO	Name of equipment/ component	Quantity Required	
		batch of 33 students (2 per batch)	batch of 22 students (2 per batch)
1	8085 Trainer Kit with onboard 8255, 8253, 8279 and 8251 – 15 nos.	17	12
2	TASM/MASM simulator in Desk top computers (8086 programs) (computers in Computing Laboratories may be utilized)	17	12
3	8051 trainer kit	17	12
4	Stepper motor interfacing module	6	5
	DC motor interface module	6	5
5.	Traffic light controller interfacing module	6	5
6	ADC, DAC interfacing module .	6	5
7.	Elevator interface module	6	5
8	Dot Matrix Printer	3	2
9	UPS	5 KVA	5KVA

### **Design and Analysis of Algorithms Laboratory**

	Batch size of 22 students	Batch size of 33 students
<b>Hardware</b>		
Computer System : Server	1 No.	1 No.
Computer systems: node	25 No.	35 No.
UPS	Minimum of 5 KVA	Minimum of 6 KVA
Printer	2 No.	3 No.
<b>Software</b>		
User License required for software (proprietary)	22 No.	33 No.
Software	<ol style="list-style-type: none"> <li>1. Microsoft Server OS/ Linux Server OS/ UNIX Server OS/Any open source server OS / any Proprietary Server OS software</li> <li>2. Proprietary/ open source client OS</li> <li>3. Borland C or C++ compiler / Microsoft C or C++ compiler/ any open source C or C++ compiler/ any Proprietary C or C++ compiler /</li> </ol>	

## Object Oriented Programming Languages Laboratory

	Batch size of 22 students	Batch size of 33 students
<b>Hardware</b>		
Computer System : Server	1 No.	1 No.
Computer systems: node	25 No.	35 No.
UPS	Minimum of 5 KVA	Minimum of 6 KVA
Printer	2 No.	3 No.
<b>Software</b>		
User License required for software (proprietary)	22 No.	33 No.
Software	<ol style="list-style-type: none"> <li>1. Microsoft Server OS/ Linux Server OS/ UNIX Server OS/Any open source server OS / any Proprietary Server OS software</li> <li>2. Proprietary/ open source client OS Compatible with server OS</li> <li>3. Borland C++ Compiler / Microsoft C ++compiler/ any open source C++ compiler/ any other Proprietary C++ compiler</li> <li>4. Java development Kit (Latest Version)</li> </ol>	

### Vth semester

#### Computer Networks Laboratory

	Batch size of 22 students	Batch size of 33 students
<b>Hardware</b>		
Computer System : Server	1 No.	1 No.
Computer systems: node	25 No.	35 No.
UPS	Minimum of 5 KVA	Minimum of 6 KVA
Printer	2 No.	3 No.
<b>Software</b>		
User License required for software (proprietary)	22 No.	33 No.
Software	<ol style="list-style-type: none"> <li>1. Microsoft Server OS/ Linux Server OS/ UNIX Server OS/Any open source server OS / any Proprietary Server OS software</li> <li>2. Microsoft Windows Client OS and or open source client OS compatible with server OS and with dual boot option</li> </ol>	

	<ol style="list-style-type: none"> <li>3. Java Development Kit (Latest Version)</li> <li>4. Glomosim/Ns2 /any other network simulation software</li> <li>5. open source/ Proprietary C and C++ Compiler</li> <li>6. J2ME, J2SE</li> <li>7. Apache Web Server, Internet Information Server (IIS)</li> </ol>
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### Platform Technology Laboratory

	Batch size of 22 students	Batch size of 33 students
<b>Hardware</b>		
Computer System : Server	1 No.	1 No.
Computer systems: node	25 No.	35 No.
UPS	Minimum of 5 KVA	Minimum of 6 KVA
Printer	2 No.	3 No.
<b>Software</b>		
User License required for software (proprietary)	22 No.	33 No.
Software	<ol style="list-style-type: none"> <li>1. Microsoft Server OS</li> <li>2. Proprietary/ open source client OS</li> <li>3. Microsoft Visual Studio With .Net Framework</li> </ol>	

### Operating Systems Laboratory

	Batch size of 22 students	Batch size of 33 students
<b>Hardware</b>		
Computer System : Server	1 No.	1 No.
Computer systems: node	25 No.	35 No.
UPS	Minimum of 5 KVA	Minimum of 6 KVA
Printer	2 No.	3 No.
<b>Software</b>		
User License required for software	22 No.	33 No.

(proprietary)	
Software	<ol style="list-style-type: none"> <li>Linux / UNIX /Any open source OS software /Red hat Linux/ any Proprietary Unix Clone OS software with server configuration with language packages</li> <li>Ubuntu/ Fedora/ Linux / UNIX or UNIX clone /Any open source OS software /Red hat Linux/ /Microsoft OS for clients with language packages</li> </ol>

### Database Management Systems Laboratory

	Batch size of 22 students	Batch size of 33 students
<b>Hardware</b>		
Computer System : Server	1 No.	1 No.
Computer systems: node	25 No.	35 No.
UPS	Minimum of 5 KVA	Minimum of 6 KVA
Printer	2 No.	3 No.
<b>Software</b>		
User License required for software (proprietary)	22 No.	33 No.
Software	<ol style="list-style-type: none"> <li>Microsoft Server OS/ Linux Server OS/ UNIX Server OS/Any open source server OS / any Proprietary Server OS software</li> <li>Proprietary/ open source client OS compatible with serv OS</li> <li>DB2 Server / ORACLE server/ SQL Server/ Open source DBMS server software</li> <li>Visual Basic/Open source front end software</li> </ol>	

### Web Technology Laboratory

	Batch size of 22 students	Batch size of 33 students
<b>Hardware</b>		
Computer System : Server	1 No.	1 No.
Computer systems: node	25 No.	35 No.
UPS	Minimum of 5 KVA	Minimum of 6 KVA
Printer	2 No.	3 No.
<b>Software</b>		
User License required for	22 No.	33 No.

software (proprietary)		
Software	<ol style="list-style-type: none"> <li>1. Microsoft Server OS/ Linux Server OS/ UNIX Server OS/Any open source server OS / any Proprietary Server OS software</li> <li>2. Proprietary/ open source client OS Compatible with server OS (Xp is compulsory) XAMP server (to run PHP)</li> <li>3. Borland C++ Compiler / Microsoft C ++compiler/ any open source C++ compiler/ any other Proprietary C++ compiler</li> <li>4. Java development Kit (Latest Version)</li> <li>5. Apache Web Server, Internet Information Server (IIS)</li> <li>6. PHP</li> <li>7. Ajax</li> </ol>	

### Mini Project using CASE Tools

	Batch size of 22 students	Batch size of 33 students
<b>Hardware</b>		
Computer System : Server	1 No.	1 No.
Computer systems: node	25 No.	35 No.
UPS	Minimum of 5 KVA	Minimum of 6 KVA
Printer	2 No.	3 No.
<b>Software</b>		
User License required for software (proprietary)	22 No.	33 No.
Software	<ol style="list-style-type: none"> <li>1. Microsoft Server OS/ Linux Server OS/ UNIX Server OS/Any open source server OS / any Proprietary Server OS software</li> <li>2. Proprietary/ open source client OS Compatible with server OS</li> <li>3. Borland C++ Compiler / Microsoft C ++compiler/ any open source C++ compiler/ any other Proprietary C++ compiler</li> <li>4. Java development Kit (Latest Version)</li> <li>5. Rational Suite/ Win Runner/Describe or equivalent</li> <li>6. JDK, JSDK</li> <li>7. VB/VC++ / D2K/ or any other open source front end software</li> <li>8. Oracle/MySQL/ an other open source or proprietary software or equivalent</li> </ol>	

### Distributed and Intelligent Computing Laboratory

	Batch size of 22 students	Batch size of 33 students
<b>Hardware</b>		

Computer System : Server	1 No.	1 No.
Computer systems: node	25 No.	35 No.
UPS	Minimum of 5 KVA	Minimum of 6 KVA
Printer	2 No.	3 No.
<b>Software</b>		
User License required for software (proprietary)	22 No.	33 No.
Software	<ol style="list-style-type: none"> <li>1. Microsoft Server OS</li> <li>2. Proprietary/ open source client OS</li> <li>3. Microsoft Visual Studio With .Net Framework</li> <li>4. CORBA Framework</li> <li>5. Java Development Kit (Latest Version)</li> <li>6. Open source or Proprietary LISP and PROLOG Compiler</li> </ol>	

### Seminar

Sl. No.	Equipment	No.
1	Computer with client OS (Proprietary/Open source) and Microsoft Office/ any other open source office package.	1 No.
2	Multimedia Projector	2 No.

### Project Work - Phase I & CS P81 Project Work - Phase II

	Batch size of 22 students	Batch size of 33 students
<b>Hardware</b>		
Computer System : Server	1 No.	1 No.
Computer systems: node	25 No.	35 No.
UPS	Minimum of 5 KVA	Minimum of 6 KVA
Printer	2 No.	3 No.
<b>Software</b>		
User License required for software (proprietary)	22 No.	33 No.
Software	<ol style="list-style-type: none"> <li>1. Microsoft Server OS/ Linux Server OS/ UNIX Server OS/Any open source server OS / any Proprietary Server OS software</li> <li>2. Proprietary/ open source client OS Compatible with server OS</li> </ol>	

	<ol style="list-style-type: none"> <li>3. Borland C++ Compiler / Microsoft C ++compiler/ any open source C++ compiler/ any other Proprietary C++ compiler</li> <li>4. Java development Kit (Latest Version)</li> <li>5. Rational Suite/ Win Runner/Describe or equivalent</li> <li>6. JDK, JSDK</li> <li>7. VB/VC++ / D2K/ or any other open source front end software</li> <li>8. Oracle/MySQL/ an other open source or proprietary software or equivalent</li> <li>9. Java development Kit (Latest Version)</li> <li>10. Apache Web Server, Internet Information Server (IIS)</li> <li>11. PHP and Ajax</li> <li>12. Ajax</li> </ol>
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### HARDWARE AND TROUBLESHOOTING LABORATORY

S.NO	Name of equipment/ component	Quantity Required	
		batch of 33 students (2 per batch)	batch of 22 students (2 per batch)
1	PC mother Board	5	3
2	Disk drive units	5	3
3	Key boards	5	3
4	Mouse	5	3
5	monitor		
6	Pentium IV (or higher) Based Computers with dual boot options of Windows 98/XP/2000 and Linux OS C (computers in Computing Laboratories may be utilized)	17 number with license for OS	12 number with license for OS
7	In-circuit emulator	3	2
8	. Logic Analyzer –PC based	2	2
9	Multimeter	5	3
10	C/C++,MASM (Open source or Proprietary software)	5 No each	3 No each
11	8031/ 8085 Micorprocessot Kit	5 No	3 No
12	Dot Matrix Printer	2 No	2 No
13	7 segment LED and LDs	10 No, 100	10 No, 100
14	C.R.O	10	7



15	Circuit board	5 No.	5 No.
16	In-Circuit emulator	3 no.	3 no.
17	PSPICE Circuit simulator	10 user License	7 user License
18	Floppy disks Drive	5 No.	3 No.
19	SMPS	5 No.	3 No.
20.	Required ICs	50 No.Each	40 No. each
21	Passive and other components( Resistor, Capacitor, Diode and Transistor)	50 each	50 each
22	PAL/EPROM/PROM Programmer	1	1
23	IC tester	1	1
24	Bread Boards	17	12
25	Network Interface cards	5	3
26	Digital Multimeter	6	4
27	NS2/Glomosim/any other preparatory network simulation software	17	12

### Advanced Computing Laboratory

	Batch size of 22 students	Batch size of 33 students
<b>Hardware</b>		
Computer System : Server	1 No.	1 No.
Computer systems: node	25 No.	35 No.
UPS	Minimum of 5 KVA	Minimum of 6 KVA
Printer	2 No.	3 No.
<b>Software</b>		
User License required for software (proprietary)	22 No.	33 No.
Software	<ol style="list-style-type: none"> <li>1. Microsoft Server OS/ Linux Server OS/ UNIX Server OS/Any open source server OS / any Proprietary Server OS software</li> <li>2. Proprietary/ open source client OS Compatible with server OS</li> <li>3. Borland C C++ Compiler / Microsoft C ++compiler/ any open source C++ compiler/ any other Proprietary C++ compiler</li> <li>4. Borland C C Compiler / Microsoft C compiler/ any open source C compiler/ any other Proprietary C compiler</li> </ol>	

	<ul style="list-style-type: none"><li><b>5. Java development Kit (Latest Version)</b></li><li><b>6. OpenMP, Matlab and NS2</b></li></ul>
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