DUMKA ENGINEERING COLLEGE
(ESTD BY GOVT. OF JHARKHAND AND RUN BY TECHNO INDIA UNDER PPP)
DUMKA, JHARKHAND-814101
(AFFILIATED TO SKMU, JHARKHAND)

Syllabus to be implemented from the Academic Year 2014

COMPUTER SCIENCE ENGINEERING SEMESTER -V

Sl. No.	Field	Theory	Contact Hours/Week				Credit Points
			L	T	P	Total	
1	**HU501**	Economics for Engineers	3	0	0	3	3
2	**CS501**	Design & Analysis of Algorithm	3	1	0	4	4
3	**CS502**	Microprocessors & Microcontrollers	3	1	0	4	4
4	**CS503**	Discrete Mathematics	3	0	0	3	3
5	**Free Elective CS504A CS504B CS504C CS504D**	Circuit Theory & Network (ECE) Data Communication (ECE) Digital Signal Processing (ECE) Object Oriented Programming (IT)	3	0/1	0	3/4	3/4
	Total of Theory					**17/18**	**17-18**

B.   PRACTICAL

6	**CS591**	Design & Analysis of Algorithm	0	0	3	3	2
7	**CS592**	Microprocessors & Microcontrollers	0	0	3	3	2
8	**CS593**	Programming Practices using C++	1	0	2	3	2
9	**F.E.** **CS594A** **CS594B** **CS594C** **CS594D**	 Circuit Theory & Network (ECE) Data Communication (ECE) Digital Signal Processing (ECE) Object Oriented Programming (IT)	0	0	3	3	2
	Total of Practical					12	8
	Total of Semester					29/30	25-26

SEMESTER – V

Theory

Economics for Engineers
HU-501
Contracts: 3L
Credits- 3

Module-I

1. Economic Decisions Making – Overview, Problems, Role, Decision making process.
2. Engineering Costs & Estimation – Fixed, Variable, Marginal & Average Costs, Sunk Costs, Opportunity Costs, Recurring And Nonrecurring Costs, Incremental Costs, Cash Costs vs Book Costs, Life-Cycle Costs; Types Of Estimate, Estimating Models - Per- Unit Model, Segmenting Model, Cost Indexes, Power-Sizing Model, Improvement & Learning Curve, Benefits.

Module-II

3. Cash Flow, Interest and Equivalence: Cash Flow – Diagrams, Categories & Computation, Time Value of Money, Debt repayment, Nominal & Effective Interest.

4. Cash Flow & Rate Of Return Analysis – Calculations, Treatment of Salvage Value, Annual Cash Flow Analysis, Analysis Periods; Internal Rate Of Return, Calculating Rate of Return, Incremental Analysis; Best Alternative Choosing An Analysis Method, Future Worth Analysis, Benefit-Cost Ratio Analysis, Sensitivity And Breakeven Analysis. Economic Analysis In The Public Sector - Quantifying And Valuing Benefits & drawbacks.

Module-III

5. Inflation And Price Change – Definition, Effects, Causes, Price Change with Indexes, Types of Index, Composite vs Commodity Indexes, Use of Price Indexes In Engineering Economic Analysis, Cash Flows that inflate at different Rates.

6. Present Worth Analysis: End-Of-Year Convention, Viewpoint Of Economic Analysis Studies, Borrowed Money Viewpoint, Effect Of Inflation & Deflation, Taxes, Economic Criteria, Applying Present Worth Techniques, Multiple Alternatives.

7. Uncertainty In Future Events - Estimates and Their Use in Economic Analysis, Range Of Estimates, Probability, Joint Probability Distributions, Expected Value, Economic Decision Trees, Risk, Risk vs Return, Simulation, Real Options.

Module-IV

8. Depreciation - Basic Aspects, Deterioration & Obsolescence, Depreciation And Expenses, Types Of Property, Depreciation Calculation Fundamentals, Depreciation And Capital Allowance Methods, Straight-Line Depreciation Declining Balance
Depreciation, Common Elements Of Tax Regulations For Depreciation And Capital Allowances.

9. Replacement Analysis - Replacement Analysis Decision Map, Minimum Cost Life of a New Asset, Marginal Cost, Minimum Cost Life Problems.

10. Accounting – Function, Balance Sheet, Income Statement, Financial Ratios Capital Transactions, Cost Accounting, Direct and Indirect Costs, Indirect Cost Allocation.

Readings

1. James L.Riggs,David D. Bedworth, Sabah U. Randhawa : Economics for Engineers 4e , Tata McGraw-Hill
2. Donald Newnan, Ted Eschembach, Jerome Lavelle : Engineering Economics Analysis, OUP
3. John A. White, Kenneth E.Case,David B.Pratt : Principle of Engineering Economic Analysis, John Wiley
4. Sullivan and Wicks: Engineering Economy, Pearson
5. R.Paneer Seelvan: Engineering Economics, PHI
6. Michael R Lindeburg : Engineering Economics Analysis, Professional Pub

Design & Analysis of Algorithm
Code: CS501
Contact: 3L + 1T

Credits: 4

Complexity Analysis:[2L]
Time and Space Complexity, Different Asymptotic notations – their mathematical significance
Algortihm Design Techniques:
Divide and Conquer: [3L]
Basic method, use, Examples – Binary Search, Merge Sort, Quick Sort and their complexity.
Heap Sort and its complexity [1L]
Dynamic Programming: [3L]
Basic method, use, Examples – Matrix Chain Manipulation, All pair shortest paths, single source shortest path. Backtracking: [2L]
Basic method, use, Examples – 8 queens problem, Graph coloring problem. Greedy Method: [3L]
Basic method, use, Examples – Knapsack problem, Job sequencing with deadlines, Minimum cost spanning ree by Prim's and
Kruskal's algorithm.

Lower Bound Theory: [1L]
O(nlgn) bound for comparison sort

Disjoint set manipulation: [2L]
Set manipulation algorithm like UNION-FIND, union by rank.

Graph traversal algorithm: Recapitulation [1L]
Breadth First Search(BFS) and Depth First Search(DFS) – Classification of edges - tree, forward, back and
cross edges – complexity and comparison

String matching problem: [3L]
Different techniques – Naive algorithm, string matching using finite automata, and Knuth, Morris, Pratt (KMP) algorithm with
their complexities.

Amortized Analysis: [3L]
Aggregate, Accounting, and Potential Method.

Network Flow: [3L]
Ford Fulkerson algorithm, Max-Flow Min-Cut theorem (Statement and Illustration)

Matrix Manipulation Algorithm: [3L]

Strassen's matrix manipulation algorithm; application of matrix multiplication to solution of simultaneous linear equations using LUP decomposition, Inversion of matrix and Boolean matrix multiplication

Notion of NP-completeness: [3L]
P class, NP class, NP hard class, NP complete class – their interrelationship, Satisfiability problem, Cook's
theorem (Statement only), Clique decision problem

Approximation Algorithms: [3L]
Necessity of approximation scheme, performance guarantee, polynomial time approximation schemes,
vertex cover problem, travelling salesman problem.

Text Book:

1. T. H. Cormen, C. E. Leiserson, R. L. Rivest and C. Stein, "Introduction to Algorithms"

2. A. Aho, J.Hopcroft and J.Ullman "The Design and Analysis of Algorithms"
D.E.Knuth "The Art of Computer Programming", Vol. 3

Jon Kleiberg and Eva Tardos, "Algorithm Design"

Reference:
2.5 K. Mehlhorn , "Data Structures and Algorithms" - Vol. I & Vol. 2.
2.6 S.Baase "Computer Algorithms"
2.7 E.Horowitz and Shani "Fundamentals of Computer Algorithms"
2.8 E.M.Reingold, J.Nievergelt and N.Deo- "Combinational Algorithms- Theory and Practice",
Prentice Hall, 1997

Microprocessors & Microcontrollers
Code: CS502
Contact: 3L + 1T
Credits: 4

Module -1:   [8L]

Introduction to Microcomputer based system. History of evolution of Microprocessor and
Microcontrollers and their advantages and disadvantages.   [1L]
Architecture of 8085 Microprocessor, Pin description of 8085.   [2L]
Address/data bus Demultiplexing , Status Signals and the control signals. [1L]
Instruction set of 8085 microprocessor, Addressing modes,   [3L]
Timing diagram of the instructions (a few examples).   [1L]

Module -2:
Assembly language programming with examples, Counter and Time Delays, [9L]

Stack and Subroutine, [6L]

Interrupts of 8085 processor(software and hardware), I/O Device Interfacing-I/O Mapped I/O and Memory Mapped I/O , Serial (using
SID and SOD pins and RIM, SIM Instructions) and Parallel data transfer, [3L]

Module 3: [10L]

The 8086 microprocessor- Architecture, Addressing modes, Interrupts [3L]
Introduction to 8051 Microcontroller –Architecture, Pin Details. [3L]
Addressing modes, Instruction set, Examples of Simple Assembly Language. [4L]

Module -4: [9L]

Memory interfacing with 8085, 8086 [2L]
Support IC chips- 8255 ,8251,8237/8257,8259 [4L]
Interfacing of 8255 PPI with 8085 and Microcontroller 8051. [2L]
Brief introduction to PIC microcontroller (16F877) [1L]

Learning Outcome:
Additional Tutorial Hours will be planned to meet the following learning outcome

Through this course, the students will be exposed to hardware details of 8085 microprocessor with the related signals and their implications. They will also learn programming and interfacing of 8085. The students will understand the difference between the architecture of 8085 and 8086. They will also be aware of the 8051 architecture and its programming. Lastly the students will have a basic idea on PIC microcontroller (16F877)

TEXTS :
1. Microprocessors and microcontrollers - N. Senthil Kumar, M. Saravanan and Jeevananthan (Oxford university press)
2. 8051 Microcontroller – K. Ayala (Cengage learning)
3. MICROPROCESSOR architecture, programming and Application with 8085 - R.Gaonkar (Penram international Publishing LTD.)
4.Microcontrollers:Principles&Applications , Ajit Pal, PHI 2011.
5.Naresh Grover, "Microprocessor comprehensive studies Architecture, Programming and Interfacing"Dhanpat Rai, 2003
6. 8051 Microprocessor –V. Udayashankara and M.S Mallikarjunaswami (TMH).
7. Microprocessor 8085 and its Interfacing—S Mathur (PHI)
8. An Introduction to Microprocessor and Applications –Krishna Kant (Macmillan)

Reference:
1. 8086 Microprocessor –K Ayala (Cengage learning)
2. The 8085 Microprocessor, Architecture, Programming and Interfacing- K Uday Kumar, B .S Umashankar (Pearson)
3. The X-86 PC Assembly language, Design and Interfacing - Mazidi, Mazidi and Causey (PEARSON)
4. The 8051 microcontroller and Embedded systems - Mazidi, Mazidi and McKinley (PEARSON)
5. Microprocessors – The 8086/8088, 80186/80386/80486 and the Pentium family – N. B. Bahadure (PHI).
6. The 8051 microcontrollers – Uma Rao and Andhe Pallavi (PEARSON).

Discrete Mathematics
Code: CS503
Contact: 3L
Credits: 3

Module I: Introduction to Propositional Calculus: Propositions, Logical Connectives, Conjunction, Disjunction, Negation and their truth table. Conditional Connectives, Implication, Converse, Contrapositive, Inverse, Biconditional statements with truth table, Logical Equivalence, Tautology, Normal forms-CNF, DNF; Predicates and Logical Quantifications of propositions and related
examples.   [10L]

Module II: Theory of Numbers: Well Ordering Principle, Divisibility theory and properties of divisibility; Fundamental theorem of Arithmetic; Euclidean Algorithm for finding G.C.D and some basic properties of G.C.D with simple examples; Congruences,

Residue classes of integer modulo $n(Z_n)$ and its examples.Order, Relation and Lattices: POSET, Hasse Diagram, Minimal , Maximal, Greatest and Least elements in a POSET, Lattices and its properties, Principle of Duality, Distributive and Complemented Lattices.   [10L]

Module III: Counting Techniques: Permutations, Combinations, Binomial coefficients, Pigeon-hole Principle, Principles of inclusion and exclusions; Recurrence relations: Formulation/Modelling of different counting problems in terms of recurrence relations, Solution of linear recurrence relations with constant coefficients (upto second order) by (i) The iterative method (ii) Characteristic roots method (iii) Generating functions method.   [10L]

Module IV: Graph Coloring: Chromatic Numbers and its bounds, Independence and Clique Numbers, Perfect Graphs-Definition and examples, Chromatic polynomial and its determination, Applications of Graph Coloring. Matchings: Definitions and Examples of Perfect Matching, Maximal and Maximum Matching, Hall's Marriage Theorem (Statement only) and related
problems.   [6L]

Texts:
1. Russell Merris, Combinatorics, Wiley-Interscience series in Discrete Mathematics and Optimisation
2. N. Chandrasekaran and M. Umaparvathi, Discrete Mathematics, PHI
3. Gary Haggard, John Schlipf and Sue Whitesides, Discrete Mathematics for Computer Science, CENGAGE Learning
4. Gary Chartrand and Ping Zhang – Introduction to Graph Theory, TMH
References:
8. J.K. Sharma, Discrete Mathematics, Macmillan
9. Winfried Karl Grassmann and Jean-Paul Tremblay, Logic and Discrete Mathematics, PEARSON.
10. S. K. Chakraborty and B. K. Sarkar, Discrete Mathematics, OXFORD University Press.
11. Douglas B. West, Introduction to graph Theory, PHI

<u>Free Elective</u>

Circuit Theory & Network
Code: CS504A
Contact: 3L + 1T
Credits: 4

Module	Content	Hrs
1.	**a)** *Resonant Circuits*: Series and Parallel resonance [1L], (*) *Impedance and Admittance Characteristics, Quality Factor, Half Power Points, Bandwidth [2L], Phasor diagrams, Transform diagrams [1L], Practical resonant and series circuits, Solution of Problems [Tutorial - 1L]*.	**4**
	b) Mesh Current Network Analysis: Kirchoff's Voltage law, Formulation of mesh equations [1L], Solution of mesh equations by Cramer's rule and matrix method [2L], Driving point impedance, Transfer impedance [1L], Solution of problems with DC and AC sources [1L].	**6**
2	**a) Node Voltage Network Analysis**: Kirchoff's Current law, Formulation of Node equations and solutions [2L], driving point admittance, transfer Admittance [1L], Solution of problems with DC and AC sources [1L].	**4**
	b) Network Theorems: Definition and Implication of Superposition Theorem [1L], Thevenin's theorem, Norton's theorem [1L], Reciprocity theorem, Compensation theorem [1L], maximum Power Transfer theorem [1L], Millman's theorem, Star delta transformations [1L], Solutions and problems with DC and AC sources [1L].	**6**
3	*Graph of Network*: Concept of Tree and Branch [1L], tree link, junctions, (*) *Incident matrix, Tie set matrix [2L], Determination of loop current and node voltages [2L].*	**4**

	Coupled Circuits: Magnetic coupling, polarity of coils, polarity of induced voltage, concept of Self and mutual inductance, Coefficient of coupling, Solution of Problems.	**4**
	Circuit transients: DC transients in R-L and R-C Circuits with and without initial charge, *(*) R-L-C Circuits, AC Transients in sinusoidal R-L, R-C and R-L-C Circuits, Solution of Problems [2L].*	**2**
4	**Laplace transform**: Concept of Complex frequency [1L], transform of f(t) into F(s) [1L], transform of step, exponential, over damped surge, critically damped surge, damped and un-damped sine functions [2L], properties of Laplace transform [1L], linearity, real differentiation, real integration, initial value theorem and final value theorem [1L], inverse Laplace transform [1L], application in circuit analysis, Partial fraction expansion, Heaviside's expansion theorem, Solution of problems [1L].	**8**
	(*) Laplace transform and Inverse Laplace transform [2L]. **Two Port Networks**: Relationship of Two port network variables, short circuit admittance parameters, open circuit impedance parameters, transmission parameters, relationship between parameter sets, network functions for ladder network and general network	**4**

Old module 9 viz. SPICE deleted for consideration in Sessional Subject.

Problems for Module 1a:

Ex. 1. A parallel RLC Circuit has R= 100 K Ohms, L= 10 mH, C= 10 nF. Find resonant frequency, bandwidth and Quality factor.

Ex. 2. Two coils one of R= 0.51 Ohms, L= 32 mH, other of R= 1.3 Ohms, L= 15 mH, and two capacitors of 25 micro F and 62 micro F are in series with a resistance of 0.24 Ohms. Determine resonance frequency and Q of each coil.

Ex. 3. In a series circuit with R= 50 Ohms, l= 0.05 Ohms and C= 20 micro F, frequency of the source is varied till the voltage across the capacitor is maximum. If the applied voltage is 100 V, find the maximum voltage across the capacitor and the frequency at which this occurs. Repeat the problem with R= 10 Ohms.

Problems for Module 1b and 2:

Examples for mesh current in networks like T, π, bridged T and combination of T and π.

See Annexure-1 for the figures

Problems for Module- 2a:

Ex.1. The network of Fig.1 – Mod.4 is in the zero state until t= 0when switch is closed. Find the current i1(t) in the resistor R3. Hints: the Fig.1 – Mod.4 shows the same network in terms of transform impedance with the Thevenin equivalent network.

Ex.2. Find the Norton's equivalent circuit for the circuit Fig.2 – Mod.4. Hints: As a 1st. step, short the terminals ab. This results in the Circuit of Fig.2.(a). By applying KCL at node a, we have, (0-24)/4+ isc = 0; i.e isc= 9 A. To find out the equivalent Norton's impedance RN, deactivate all the independent sources, resulting in a circuit of Fig.2.(b), RN= (4x12)/(4+12) = 3 Ohms. Thus we obtain Norton equivalent circuit of Fig.2 (c).

Problems for Module – 2b:
Ex.1. Draw the graph, one tree and its co tree for the circuit shown in Fig.1 – mod.5.
Hints: In the circuit there are four nodes (N= 4) and seven branches (B= 7). The graph is so drawn and appears as in Fig. 1 (a). Fig.1(b) shows one tree of graph shown in Fig. 1(a). The tree is made up of branches 2, 5 and 6. The co tree for the tree of Fig.1 (b) is shown in Fig. 1(c). The co tree has L= B-N+1 = 7-4+1 = 4 Links.
Ex.2. (a). For the circuit shown in Fig.2- Mod.5, construct a tree so that i1 is a link current. Assign a complete set of link currents and find i1 (t).
(b). Construct another tree in which v1 is a tree branch voltage. Assign a complete set of tree branch voltages and v1 (t).
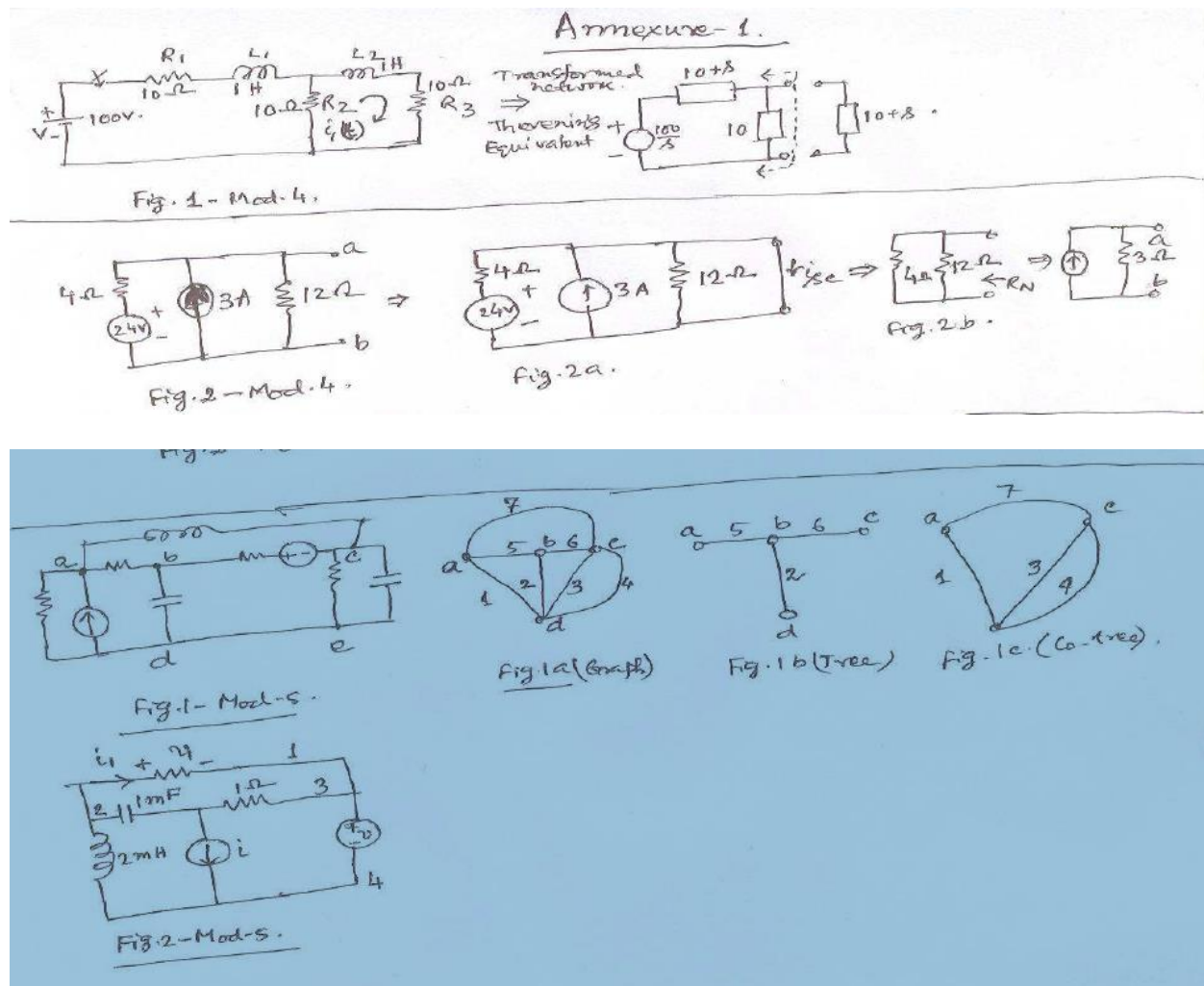Take i(t) = 25 sin 1000t A, v(t)= 15 cos 1000t.

Tutorials: (*):Bold and Italics.
Text Books:
1. Valkenburg M. E. Van, "Network Analysis", Prentice Hall./Pearson Education
2. Hayt "Engg Circuit Analysis" 6/e Tata McGraw-Hill
3. D.A.Bell- Electrical Circuits- Oxford
Reference Books:
1. A.B.Carlson-Circuits- Cenage Learning
2. John Bird- Electrical Circuit Theory and Technology- 3/e- Elsevier (Indian Reprint)
3. Skilling H.H.: "Electrical Engineering Circuits", John Wiley & Sons.
4. Edminister J.A.: "Theory & Problems of Electric Circuits", McGraw-Hill Co.
5. Kuo F. F., "Network Analysis & Synthesis", John Wiley & Sons.
6. R.A.DeCarlo & P.M.Lin- Linear Circuit Analysis- Oxford
7. P.Ramesh Babu- Electrical Circuit Analysis- Scitech
8. Sudhakar: "Circuits & Networks:Analysis & Synthesis" 2/e TMH
9. M.S.Sukhija & T.K.NagSarkar- Circuits and Networks-Oxford
10. Sivandam- "Electric Circuits and Analysis", Vikas
11. V.K. Chandna, "A Text Book of Network Theory & Circuit Analysis",Cyber Tech
12. Reza F. M. and Seely S., "Modern Network Analysis", Mc.Graw Hill .
13. M. H. Rashid: "Introduction to PSpice using OrCAD for circuits and electronics", Pearson/PHI
14. Roy Choudhury D., "Networks and Systems", New Age International Publishers.
15. D.Chattopadhyay and P.C.Rakshit: "Electrical Circuits" New Age

Fig. 1 – Mod. 4.

Fig. 2 – Mod. 4.

fig. 2a.

Fig. 2.b.

Fig. 1 – Mod - 5.

Fig. 1a (Graph)

Fig. 1b (Tree)

Fig. 1c. (Co-tree).

Fig. 2 – Mod - 5.

Data Communication
Code: CS504B
Contact: 3L + 1T
Credits: 4
Module I:
Data Communication Fundamentals: Layered Network Architecture; Mode of communication, topology, Data and Signal; Transmission Media: Guided, Unguided; Transmission Impairments and Channel Capacity; Transmission of Digital Data: Interfaces- DTE-DCE, MODEM, Cable MODEM; The telephone network system and DSL technology; **[10L]**

Module II:
Data Link Control: Interfacing to the media and synchronization; Error Control: Error Detection and Correction (Single bit, Multi bit); Flow control: Stop-and-Wait ARQ, Go-Back-N ARQ, Selective-Repeat ARQ Data Link Protocols: Synchronous, Asynchronous Protocols, Point-to-Point Protocol(PPP). **[12L]**

Module III:
Switching Communication Networks: Circuit switching; Packet switching; Routing in packet switched networks; X.25; Frame Relay; ATM, SONET. **[07L**]

Module IV:
Communication Network: Topology; Medium Access Control Techniques; IEEE CSMA/CD based LANs; IEEE Ring LANs; High Speed LANs – Token Ring Based(FDDI); High Speed LANs – CSMA/CD based; Wireless LANs: Bluetooth; **[07L]**

Network Security: Introduction to Cryptography; User Authentication; Firewalls. **[04L]**

References:
a) Data Communications and Networking, Behrouz A. Forouzan, TMH
b) Data and Computer Communications, William Stallings, PHI
c) Computer Networks, Andrew S. Tanenbaum, PHI

Digital Signal Processing
Code: CS504C
Contact: 3L + 1T
Credits: 4
MODULE – I: 9L
Discrete-time signals:
Concept of discrete-time signal, basic idea of sampling and reconstruction of signal, sampling theorem, sequences – periodic, energy, power, unit-sample, unit-step, unit-ramp, real & complex exponentials, arithmetic operations on sequences. 3L
LTI Systems:
Definition, representation, impulse response, derivation for the output sequence, concept of convolution, graphical, analytical and overlap-add methods to compute convolution supported with examples and exercises, properties of convolution, interconnections of LTI systems with physical interpretations, stability and causality conditions, recursive and non-recursive systems. 6L

MODULE –II: 11L
Z-Transform:
Definition, mapping between s-plane and z-plane, unit circle, convergence and ROC, properties of Z-transform, Z-transform on sequences with examples and exercises, characteristic families of signals along with ROCs, convolution, correlation and multiplication using Z-transform, initial value theorem, Perseval's relation, inverse Z-transform by contour integration, power series & partial-fraction expansions with examples and exercises. 6L
Discrete Fourier Transform:
Concept and relations for DFT/IDFT, Twiddle factors and their properties, computational burden on direct DFT, DFT/IDFT as linear transformations, DFT/IDFT matrices, computation of

DFT/IDFT by matrix method, multiplication of DFTs, circular convolution, computation of circular convolution by graphical, DFT/IDFT and matrix methods, linear filtering using DFT, aliasing error, filtering of long data sequences – Overlap-Save and Overlap-Add methods with examples and exercises. 5L

Fast Fourier Transform:

Radix-2 algorithm, decimation-in-time, decimation-in-frequency algorithms, signal flow graphs, Butterflies, computations in one place, bit reversal, examples for DIT & DIF FFT Butterfly computations and exercises.   4L

MODULE – III: 5L

Filter Design:

Basic concepts of IIR and FIR filters, difference equations, design of Butterworth IIR analog filter using impulse invariant and bilinear transforms, design of linear phase FIR filters, no. of taps, rectangular, Hamming and Blackman windows.   5L

MODULE – IV: 7L

Digital Signal Processor:

Elementary idea about the architecture and important instruction sets of TMS320C 5416/6713 processor, writing of small programs in Assembly Language.   4L

FPGA:

Architecture, different sub-systems, design flow for DSP system design, mapping of DSP algorithms onto FPGA.   3L

TEXT BOOKS:

3. Digital Signal Processing – Principles, Algorithms and Applications, J.G.Proakis & D.G.Manolakis, Pearson Ed.
4. Digital Signal processing – A Computer Based Approach, S.K.Mitra, TMH Publishing Co.
5. Digital Signal Processing Signals, Systems and Filters, A. Antoniou, TMH Publishing Co.
6. VLSI Digital Signal Processing Systems Design and Implementation, Wiley International Publication.
7. Digital Signal Processing with Field Programmable Gate Arrays, U.Meyer-Baese, Springer.

REFERENCE BOOKS:

3. Digital Signal Processing, P. Rameshbabu, Scitech Publications (India).
4. Digital Signal Processing, S.Salivahanan, A.Vallabraj & C. Gnanapriya, TMH Publishing Co.
5. Digital Signal Processing; A Hands on Approach, C. Schuler & M.Chugani, TMH Publishing Co.
6. Digital Signal Processing, A. Nagoor Kani, TMH Education
7. Digital Signal Processing S. Poornachandra & B. Sasikala, MH Education
8. Digital Signal Processing; Spectral Computation and Filter Design Chi-Tsong Chen, Oxford University Press
9. Texas Instruments DSP Processor user manuals and application notes.
10. Digital Signal Processing – A practical Approach (second Edition) – Emmanuel C. Ifeacher & Barrie W. Jervis, Pearson Education
11. Xilinx FPGA user manuals and application notes.

Object Oriented Programming
Code: CS504D
Contact: 3L + 1T
Credits: 4
Object oriented design [10 L]
Concepts of object oriented programming language, Major and minor elements, Object, Class, relationships among objects, aggregation, links, relationships among classes-association, aggregation, using, instantiation, meta-class, grouping constructs.
Object oriented concepts [4 L]
Difference between OOP and other conventional programming – advantages and disadvantages. Class, object, message passing,inheritance, encapsulation, polymorphism
Basic concepts of object oriented programming using Java [22 L]
Implementation of Object oriented concepts using Java.
Language features to be covered:
Class & Object proprieties [6L]
Basic concepts of java programming – advantages of java, byte-code & JVM, data types, access specifiers, operators, control statements & loops, array, creation of class, object, constructor, finalize and garbage collection, use of method overloading, this keyword, use of objects as parameter & methods returning objects, call by value & call by reference, static variables & methods, garbage collection, nested & inner classes, basic string handling concepts- String (discuss charAt() , compareTo(), equals(), equalsIgnoreCase(), indexOf(), length() , substring(), toCharArray() , toLowerCase(), toString(), toUpperCase() , trim() , valueOf() methods) & StringBuffer classes (discuss append(), capacity(), charAt(), delete(), deleteCharAt(), ensureCapacity(), getChars(), indexOf(), insert(), length(), setCharAt(), setLength(), substring(), toString() methods), concept of mutable and immutable string, command line arguments, basics of I/O operations – keyboard input using BufferedReader & Scanner classes.
Reusability properties[6L] – Super class & subclasses including multilevel hierarchy, process of constructor calling in inheritance, use of super and final keywords with super() method, dynamic method dispatch, use of abstract classes & methods, interfaces. Creation of packages, importing packages, member access for packages.
Exception handling & Multithreading [6L] – Exception handling basics, different types of exception classes, use of try & catch with throw, throws & finally, creation of user defined exception classes. Basics of multithreading, main thread, thread life cycle, creation of multiple threads, thread priorities, thread synchronization, interthread communication, deadlocks for threads, suspending & resuming threads.
Applet Programming (using swing) [4L] – Basics of applet programming, applet life cycle, difference between application & applet programming, parameter passing in applets, concept of delegation event model and listener, I/O in applets, use of repaint(), getDocumentBase(), getCodeBase() methods, layout manager (basic concept), creation of buttons (JButton class only) & text fields.
Textbooks/References:

1. Rambaugh, James Michael, Blaha – "Object Oriented Modelling and Design" – Prentice Hall, India
2. Ali Bahrami – "Object Oriented System Development" – Mc Graw Hill
3. Patrick Naughton, Herbert Schildt – "The complete reference-Java2" – TMH
4. R.K Das – "Core Java For Beginners" – VIKAS PUBLISHING
5. Deitel and Deitel – "Java How to Program" – 6th Ed. – Pearson
6. Ivor Horton's Beginning Java 2 SDK – Wrox
7. E. Balagurusamy – " Programming With Java: A Primer" – 3rd Ed. – TMH

Practical

Design & Analysis Algorithm Lab
Code: CS591
Contact: 3P
Credits: 2
Programming Language used :C
Lab :1 : Divide and Conquer :
> Implement Binary Search using Divide and Conquer approach
> Implement Merge Sort using Divide and Conquer approach
Lab :3 : Dynamic Programming :
> Find the minimum number of scalar multiplication needed for chain of matrix
Lab :4 : Dynamic Programming :
>Implement all pair of Shortest path for a graph (Floyed- Warshall Algorithm)
>Implement Traveling Salesman Problem
Lab :5 : Dynamic Programming :
>Implement Single Source shortest Path for a graph (Dijkstra , Bellman Ford Algorithm)
Lab :6 : Brunch and Bound :
>Implement 15 Puzzle Problem
Lab :7 : Backtracking :
>Implement 8 Queen problem
Lab :8 : Backtracking (implement any one of the following problem):
>Graph Coloring Problem
>Hamiltonian Problem
Lab :9 : Greedy method(implement any one of the following problem) :
>Knapsack Problem
>Job sequencing with deadlines
Lab :10 : Greedy method (implement any one of the following problem) :
>Minimum Cost Spanning Tree by Prim's Algorithm
>Minimum Cost Spanning Tree by Kruskal's Algorithm
Lab :11 : Graph Traversal Algorithm :
>Implement Breadth First Search (BFS)
>Implement Depth First Search (DFS)

Microprocessor & Microcontroller Lab
Code: CS592
Contact: 3P
Credits: 2

Sl. No.	Experiment Name	No of Hours
1.	Study of Prewritten programs on 8085 trainer kit using the basic instruction set (data transfer, Load/Store, Arithmetic, Logical). **Or,** Familiarization with 8085 simulator on PC. Programs using basic instruction set (data transfer, Load/Store, Arithmetic, Logical) on the simulator.	3
2.	**Programming using kit or Simulator for:** 5. Table look up 6. Copying a block of memory 7. Shifting a block of memory iv) Packing and unpacking of BCD numbers 8. Addition of BCD numbers 9. Binary to ASCII conversion and vice-versa (Using Subroutine Call) 10. BCD to Binary Conversion and vice-versa vii) String Matching, Multiplication	18
3.	Program using IN/OUT instructions and 8255 PPI on the trainer kit e.g. subroutine for delay, x. Glowing all the LEDs one by one with particular delay xi. Reading switch state and glowing LEDs accordingly	3
4.	Serial communication between two trainer kits	3
5.	Study of Prewritten programs on 8051 Microcontroller Kit using the basic instruction set (data transfer, Load/Store, Arithmetic, Logical). **Or,** Familiarization with 8051 Simulator on PC. Study of prewritten programs using basic instruction	3
	set (data transfer, Load/Store, Arithmetic, Logical).	
	Total 30 hours (10 classes each of 3 periods)	

Programming Practices Using C++
Code: CS593
Contact: 3P(1L+2P)
Credits: 2

Introduction of UNIX/Linux Operating System which includes preliminary commands, start-up & shutdown methodology, file
handling as well as introduction to editors like Vi editor, introduction to GNU C & C++ compiler, as well as introduction to GNU &
GDB script. **[4P]**

Introduction to C++, basic loop control, executing programs, writing functions, selection statements, review of functions and parameters, command line arguments, recursion, I/O streams, arrays and string manipulation, pointers, structures & unions**. [6P]**

Object-Oriented Programming in C++, fundamentals of classes, constructors-destructors. Dealing with member functions, operator overloading and polymorphism (both static & dynamic). **[6P]**

Dealing with inheritance, derived class handling, abstract class, virtual class, overriding, template class, name-space & exception
handling. **[4P]**

Dynamic memory allocation, implementation of Linked Lists, using C++. **[4P]**

Note: GNU C++ can be used for the programming, since it is free and has no licensing anomaly

Circuits and Networks Lab
Code: CS594A
Contacts: 3P
Credits: 2
3. Characteristics of Series & Parallel Resonant circuits
4. Verification of Network Theorems
5. Transient Response in R-L & R-C Networks ; simulation / hardware
6. Transient Response in RLC Series & Parallel Circuits & Networks ; simulation / hardware
7. Determination of Impedance (Z), and Admittance (Y) parameters of Two-port networks
8. Generation of periodic, exponential, sinusoidal, damped sinusoidal, step, impulse, and ramp signals using MATLAB
9. Representation of Poles and Zeros in s-plane, determination of partial fraction expansion in s-domain
and cascade connection of second-order systems using MATLAB
10. Determination of Laplace Transform, different time domain functions, and Inverse Laplace
11. Transformation using MATLAB
Note: An Institution / college may opt for some other hardware or software simulation wherever possible in place of MATLAB

Data Communication Lab
Code:CS594B
Contact: 3P
Credits: 2
List of Experiments
1. To study different types of transmission media
2. Familiarization with Networking cables (CAT5, UTP), Connectors (RJ45, T-connector), Hubs, Switches.
Configuration of a HUB/Switch.
3. PC-to-PC Communication with the Data Communication Trainers for
File Transfer.
Error detection codes, Data Encryption etc.
4. Experiments using LAN Trainer kit for
Point-to-Point Communication
Multicast/Broadcast Communication
Data Encryption and security protocols
5. To make inter-connections in cables for data communication in LAN and install LAN using
(a) Tree topology (b) STAR topology (c) Bus topology (d) Token-Ring topology
6. Study of MODEMs: (a) configure the modem of a computer (b) Study Serial Interface RS-232 and its applications (c) Study the Parallel Interface and its applications.

DSP Lab
Code: CS594C
Contact: 3P
Credits: 2
Simulation Laboratory using standard Simulator:
c) Sampled sinusoidal signal, various sequences and different arithmetic operations.
d) Convolution of two sequences using graphical methods and using commands- verification of the properties of convolution.
e) Z-transform of various sequences – verification of the properties of Z-transform.
f) Twiddle factors – verification of the properties.
g) DFTs / IDFTs using matrix multiplication and also using commands.
h) Circular convolution of two sequences using graphical methods and using commands, differentiation between linear and circular convolutions.
i) Verifications of the different algorithms associated with filtering of long data sequences and Overlap –add and Overlapsave methods.
j) Butterworth filter design with different set of parameters.
k) FIR filter design using rectangular, Hamming and Blackman windows.
Hardware Laboratory using either 5416 or 6713 Processor and Xilinx FPGA:
3. Writing & execution of small programs related to arithmetic operations and convolution using Assembly Language of TMS320C 5416/6713 Processor, study of MAC instruction.
4. Writing of small programs in VHDL and downloading onto Xilinx FPGA.

5. Mapping of some DSP algorithms onto FPGA.

OOP Lab
Code: CS594D
Contact: 3P
Credits: 2
1. Assignments on class, constructor, overloading, inheritance, overriding
2. Assignments on wrapper class, arrays
3. Assignments on developing interfaces- multiple inheritance, extending interfaces
4. Assignments on creating and accessing packages
5. Assignments on multithreaded programming
6. Assignments on applet programming
Note: Use Java for programming
Preferably download "**java_ee_sdk-6u4-jdk7-windows.exe**" from
http://www.oracle.com/technetwork/java/javaee/downloads/java-ee-sdk-6u3-jdk-7u1-downloads-523391.html

Syllabus to be implemented from the Academic Year 2014

COMPUTER SCIENCE ENGINEERING SEMESTER VI

Sl. No.	Field	Theory	Contact Hours/Week				Credit Points
			L	**T**	**P**	**Total**	
A. THEORY							
1	HU601	Principles of Management	2	0	0	2	2
2	CS601	Data Base Management System	3	0	0	3	3
3	CS602	Computer Networks	3	0	0	3	3
4	CS603	Operating System	3	0	0	3	3
5	P.E CS604A CS604B CS604C	Information Theory & Coding Computer Graphics ERP	3	0	0	3	3
6	F. E. CS605A CS605B CS605C	Operation Research (M) Human Resource Management (HSS) Multimedia Technology (IT)	3/3	0/1	0/0	3/4	3/4
		Total of Theory				**17/18**	**17-18**

Sl. No.	Field	Practical	L	T	P	Total	Credit Points
B. PRACTICAL							
7	CS691	8. Data Base Management System Lab	0	0	3	3	2
8	CS692	9. Network Lab	0	0	3	3	2
9	CS693	10.Operating System Lab	0	0	3	3	2
10	CS681	**Seminar**	0	0	3	3	2
		Total of Practical				**12**	**8**
		Total of Semester				**29-30**	**25-26**

SEMESTER – VI

Theory
Principles of Management
HU-601
Contracts: 2L
Credits- 2

Module-I

1. Basic concepts of management: Definition – Essence, Functions, Roles, Level.
2. Functions of Management: Planning – Concept, Nature, Types, Analysis, Management by objectives; Organisation Structure – Concept, Structure, Principles, Centralization, Decentralization, Span of Management; Organisational Effectiveness.

Module-II

3. Management and Society – Concept, External Environment, CSR, Corporate Governance, Ethical Standards.
4. People Management – Overview, Job design, Recruitment & Selection, Training & Development, Stress Management.
5. Managerial Competencies – Communication, Motivation, Team Effectiveness, Conflict Management, Creativity, Entrepreneurship.

Module-III

6. Leadership: Concept, Nature, Styles.
7. Decision making: Concept, Nature, Process, Tools & techniques.
8. Economic, Financial & Quantitative Analysis – Production, Markets, National Income Accounting, Financial Function & Goals, Financial Statement & Ratio Analysis, Quantitative Methods – Statistical Interference, Forecasting, Regression Analysis, Statistical Quality

Control.

Module-IV

9. Customer Management – Market Planning & Research, Marketing Mix, Advertising & Brand Management.
10. Operations & Technology Management – Production & Operations Management, Logistics & Supply Chain Management, TQM, Kaizen & Six Sigma, MIS.

Readings:
1. Management: Principles, Processes & Practices – Bhat, A & Kumar, A (OUP).
2. Essentials for Management – Koontz, Revised edition, Tata McGraw Hill (TMH)
3. Management – Stoner, James A. F. (Pearson)
4. Management - Ghuman, Tata McGraw Hill(TMH)

Database Management System
CS-601
Contact: 3L
Credits: 3

Introduction [4L]
Concept & Overview of DBMS, Data Models, Database Languages, Database Administrator, Database Users, Three Schema architecture of DBMS.

Entity-Relationship Model [6L]
Basic concepts, Design Issues, Mapping Constraints, Keys, Entity-Relationship Diagram, Weak Entity Sets, Extended E-R features.

Relational Model [5L]
Structure of relational Databases, Relational Algebra, Relational Calculus, Extended Relational Algebra Operations, Views, Modifications Of the Database.

SQL and Integrity Constraints [8L]
Concept of DDL, DML, DCL. Basic Structure, Set operations, Aggregate Functions, Null Values, Domain Constraints, Referential Integrity Constraints, assertions, views, Nested Subqueries, Database security application development using SQL, Stored procedures and triggers.

Relational Database Design [9L]
Functional Dependency, Different anamolies in designing a Database., Normalization using funtional dependencies, Decomposition, Boyce-Codd Normal Form, 3NF, Nomalization using multi-valued depedencies, 4NF, 5NF

Internals of RDBMS [7L]
Physical data structures, Query optimization : join algorithm, statistics and cost bas optimization. Transaction processing, Concurrency control and Recovery Management : transaction model properties, state serializability, lock base protocols, two phase locking.

File Organization & Index Structures [6L]
File & Record Concept, Placing file records on Disk, Fixed and Variable sized Records, Types of Single-Level Index (primary, secondary, clustering), Multilevel Indexes, Dynamic Multilevel Indexes using B tree and B+ tree .

Text Books:
1. Henry F. Korth and Silberschatz Abraham, "Database System Concepts", Mc.Graw Hill.
2. Elmasri Ramez and Novathe Shamkant, "Fundamentals of Database Systems", Benjamin Cummings Publishing. Company.
3. Ramakrishnan: Database Management System , McGraw-Hill
4. Gray Jim and Reuter Address, "Transaction Processing : Concepts and Techniques", Moragan Kauffman Publishers.
5. Jain: Advanced Database Management System CyberTech
6. Date C. J., "Introduction to Database Management", Vol. I, II, III, Addison Wesley.
7. Ullman JD., "Principles of Database Systems", Galgottia Publication.

Reference:
1. James Martin, "Principles of Database Management Systems", 1985, Prentice Hall of India, New Delhi
2. "Fundamentals of Database Systems", Ramez Elmasri, Shamkant B.Navathe, Addison Wesley Publishing Edition
3. "Database Management Systems", Arun K.Majumdar, Pritimay Bhattacharya, Tata McGraw Hill

Computer Networks
CS-602
Contact: 3L
Credits: 3

Module I

Overview of Data Communication and Networking: [4L]
Introduction; Data communications: components, data representation (ASCII,ISO etc.), direction of data flow (simplex, half duplex, full duplex); network criteria, physical structure (type of connection, topology), categories of network (LAN, MAN,WAN); Internet: brief history,

Protocols and standards; Reference models: OSI reference model, TCP/IP reference model, their comparative study.

Physical Level: [6L]
Overview of data(analog & digital), signal(analog & digital), transmission (analog & digital) & transmission media (guided & unguided); Circuit switching: time division & space division switch, TDM bus; Telephone Network;

Module II

Data link Layer: [5L]
Types of errors, framing(character and bit stuffing), error detection & correction methods; Flow control; Protocols: Stop & wait ARQ, Go-Back- N ARQ, Selective repeat ARQ, HDLC;

Medium Access sub layer: [5L]
Point to Point Protocol, LCP, NCP, Token Ring; Reservation, Polling, Multiple access protocols: Pure ALOHA, Slotted ALOHA, CSMA, CSMA/CD, CSMA/CA Traditional Ethernet, fast Ethernet(in brief);

Module III

Network layer: [8L]
Internetworking & devices: Repeaters, Hubs, Bridges, Switches, Router, Gateway; Addressing : IP addressing, subnetting; Routing : techniques, static vs. dynamic routing , Unicast Routing Protocols: RIP, OSPF, BGP; Other Procols: ARP, IP, ICMP, IPV6;.

Transport layer: [4L]
Process to Process delivery; UDP; TCP; Congestion Control: Open Loop, Closed Loop choke packets; Quality of service: techniques to improve QoS:
Leaky bucket algorithm, Token bucket algorithm,

Module IV

Application Layer [5L]
Introduction to DNS, SMTP, SNMP, FTP, HTTP & WWW; Security: Cryptography (Public, Private Key based), Digital Signature, Firewalls.

Modern topics: [5L]
ISDN services & ATM, DSL technology, Cable Modem: Architecture & Operation in brief
Wireless LAN: IEEE 802.11, Introduction to blue-tooth.

Text Books:
1. B. A. Forouzan – "Data Communications and Networking (3rd Ed.) " – TMH
2. A. S. Tanenbaum – "Computer Networks (4th Ed.)" – Pearson Education/PHI
3. W. Stallings – "Data and Computer Communications (5th Ed.)" – PHI/ Pearson Education
4. Zheng & Akhtar, Network for Computer Scientists & Engineers, OUP

5. Black, Data & Computer Communication, PHI
6. Miller, data Communication & Network, Vikas
7. Miller, Digital & Data Communication, Jaico
8. Shay, Understanding Data Communication & Network, Vikas

Reference Books:
1. Kurose and Rose – " Computer Networking -A top down approach featuring the internet" – Pearson Education
2. Leon, Garica, Widjaja – "Communication Networks" – TMH
3. Walrand – "Communication Networks" – TMH.
4. Comer – "Internetworking with TCP/IP, vol. 1, 2, 3(4th Ed.)" – Pearson Education/PHI

Operating System
CS-603
Contact: 3L
Credits: 3

Introduction [4L]
Introduction to OS. Operating system functions, evaluation of O.S., Different types of O.S.: batch, multi-programmed, time-sharing, real-time, distributed, parallel.

System Structure[3L]
Computer system operation, I/O structure, storage structure, storage hierarchy, different types of protections, operating system structure (simple, layered, virtual machine), O/S services, system calls.

Process Management [17L]
Processes [3L]: Concept of processes, process scheduling, operations on processes, co-operating processes, inter-process communication.
Threads [2L]: overview, benefits of threads, user and kernel threads.
CPU scheduling [3L]: scheduling criteria, preemptive & non-preemptive scheduling, scheduling algorithms (FCFS, SJF, RR, priority), algorithm evaluation, multi-processor scheduling.
Process Synchronization [5L]: background, critical section problem, critical region, synchronization hardware, classical problems of synchronization, semaphores.
Deadlocks [4L]: system model, deadlock characterization, methods for handling deadlocks, deadlock prevention, deadlock avoidance, deadlock detection, recovery from deadlock.

Storage Management [19L]
Memory Management [5L]: background, logical vs. physical address space, swapping, contiguous memory allocation, paging, segmentation, segmentation with paging.
Virtual Memory [3L]: background, demand paging, performance, page replacement, page replacement algorithms (FCFS, LRU), allocation of frames, thrashing.

File Systems [4L]: file concept, access methods, directory structure, file system structure, allocation methods (contiguous, linked, indexed), free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency & performance.

I/O Management [4L]: I/O hardware, polling, interrupts, DMA, application I/O interface (block and character devices, network devices, clocks and timers, blocking and nonblocking I/O), kernel I/O subsystem (scheduling, buffering, caching, spooling and device reservation, error handling), performance.

Disk Management [3L]: disk structure, disk scheduling (FCFS, SSTF, SCAN,C-SCAN) , disk reliability, disk formatting, boot block, bad blocks.

Protection & Security [4L]

Goals of protection, domain of protection, security problem, authentication, one time password, program threats, system threats, threat monitoring, encryption.

Text Books / References :

1. Milenkovie M., "Operating System : Concept & Design", McGraw Hill.
2. Tanenbaum A.S., "Operating System Design & Implementation", Practice Hall NJ.
3. Silbersehatz A. and Peterson J. L., "Operating System Concepts", Wiley.
4. Dhamdhere: Operating System TMH
5. Stalling, William, "Operating Systems", Maxwell McMillan International Editions, 1992.
6. Dietel H. N., "An Introduction to Operating Systems", Addison Wesley.

Professional Elective
Information Theory & Coding
CS-604A
Contact: 3L
Credits: 3

Source Coding [7L]

Uncertainty and information, average mutual information and entropy, information measures for continuous random variables, source coding theorem, Huffman codes.

Channel Capacity And Coding [7L]

Channel models, channel capacity, channel coding, information capacity theorem, The Shannon limit.

Linear And Block Codes For Error Correction [8L]

Matrix description of linear block codes, equivalent codes, parity check matrix, decoding of a linear block code, perfect codes, Hamming codes.

Cyclic Codes [7L]

Polynomials, division algorithm for polynomials, a method for generating cyclic codes, matrix description of cyclic codes, Golay codes.

BCH Codes [8L]
Primitive elements, minimal polynomials, generator polynomials in terms of minimal polynomials, examples of BCH codes.

Convolutional Codes [8L]
Tree codes, trellis codes, polynomial description of convolutional codes, distance notions for convolutional codes, the generating function, matrix representation of convolutional codes, decoding of convolutional codes, distance and performance bounds for convolutional codes, examples of convolutional codes, Turbo codes, Turbo decoding.

Books:
9. Information theory, coding and cryptography - Ranjan Bose; TMH.
10. Information and Coding - N Abramson; McGraw Hill.
11. Introduction to Information Theory - M Mansurpur; McGraw Hill.
12. Information Theory - R B Ash; Prentice Hall.
13. Error Control Coding - Shu Lin and D J Costello Jr; Prentice Hall.

Computer Graphics
CS-604B
Contact: 3L
Credits: 3

Module I:

Introduction to computer graphics & graphics systems [6L]: Overview of computer graphics, representing pictures, preparing, presenting & interacting with pictures for presentations; Visualization & image processing; RGB color model, direct coding, lookup table; storage tube graphics display, Raster scan display, 3D viewing devices, Plotters, printers, digitizers, Light pens etc.; Active & Passive graphics devices; Computer graphics software.

Scan conversion [8L]: Points & lines, Line drawing algorithms; DDA algorithm, Bresenham's line algorithm, Circle generation algorithm; Ellipse generating algorithm; scan line polygon, fill algorithm, boundary fill algorithm, flood fill algorithm.

Module II:

2D transformation & viewing [15L]: Basic transformations: translation, rotation, scaling; Matrix representations & homogeneous coordinates, transformations between coordinate systems; reflection shear; Transformation of points, lines, parallel lines, intersecting lines. Viewing pipeline, Window to view port co-ordinate transformation, clipping operations, point clipping, line clipping, clipping circles, polygons & ellipse. Cohen and Sutherland line clipping, Sutherland-Hodgeman Polygon clipping, Cyrus-beck clipping method.

3D transformation & viewing [5L]: 3D transformations: translation, rotation, scaling & other transformations. Rotation about an arbitrary axis in space, reflection through an arbitrary plane; general parallel projection transformation; clipping, view port clipping, 3D viewing.

Module III:

Curves [3L]: Curve representation, surfaces, designs, Bezier curves, B-spline curves, end conditions for periodic B-spline curves, rational B-spline curves.

Hidden surfaces [3L]: Depth comparison, Z-buffer algorithm, Back face detection, BSP tree method, the Painter's algorithm, scan-line algorithm; Hidden line elimination, wire frame methods , fractal - geometry.

Color & shading models [2L]: Light & color model; interpolative shading model; Texture.

Introduction to Ray-tracing: [3L]
Human vision and color, Lighting, Reflection and transmission models.

Books:
1. Hearn, Baker – "Computer Graphics (C version 2nd Ed.)" – Pearson education
2. Z. Xiang, R. Plastock – " Schaum's outlines Computer Graphics (2nd Ed.)" – TMH
3. D. F. Rogers, J. A. Adams – "Mathematical Elements for Computer Graphics (2nd Ed.)" – TMH

ERP
CS-604C
Contact: 3L
Credits: 3

Module 1: Overview of ERP (Lectures : 9)

a) The evolution of ERP systems: A historical perspective

Evolution through Payroll system, Inventory Control system, Materials Requirement Planning (MRP I) system, Manufacturing Resource Planning (MRP II) system, Their advantages and disadvantages. Definition and Concept of ERP, Business reasons for rise and popularity of ERP system - Benefits of an ERP system

b) Business processes supported by ERP systems

Various business functions in an Organization – Purchasing, Materials Management, Manufacturing, Sales & Distribution, Plant Maintenance, Quality Management, Finance & Accounting including Costing, Human Resources etc.

ERP market place – SAP, Oracle, PeopleSoft, JD Edwards, Baan, Microsoft's suit of products etc. Business modules in these ERP packages – a brief comparative description of business function modules and sub-modules.

Overview of key end-to-end business processes supported in two major ERP systems (preferably SAP and Oracle) – Order to Cash, Procure to Pay, Plan to Produce and Despatch.

Module 2 : Information Technology and ERP systems (Lectures : 9)

1. The evolution of Information Technology (IT): A historical perspective
Evolution of computer generations (hardware and software) – Operating systems, File systems to Database Management systems, Communication Networks. Enabling of ERP systems by IT evolution.

2. The evolution of ERP systems architecture
Client-Server based architecture, Multi-Tier architecture – Presentation layer, Application layer, and Database layer (Online Transaction Processing – OLTP). Brief discussion on Extended ERP systems - Web-enabled ERP architecture, Service-Oriented Architecture and Cloud Computing. Open Source ERP.

3. Related technology concepts

ERP and Supply Chain Management (SCM), and Customer Relationship Management (CRM), ERP and Business Intelligence (some of the popular tools like Cognos, Business Objects should be mentioned), ERP and Data warehousing (Data Mart, Data Mining and On-line Analytical Processing - OLAP), ERP and E-business.

Module 3 : Implementation of ERP system (Lectures : 11)

Types of services required in implementation – Consulting, Configuration, Customization and Support

1) ERP implementation approach
Single vendor versus Best-of Breed ERP implementation, Big Bang versus
Phased (by module/ site) implementation, Using ERP of Application Service Provider (ASP).

2) ERP implementation life cycle

Planning different aspects (Economic viability, Senior Management commitment, Resource requirements, Change management etc.), Understanding requirements and Process preparation – Gap analysis and Business Process Engineering, User Acceptance criteria, Design, Configuration, Customization (difference between Configuration and Customization, advantages and disadvantages), Extensions, Data migration, End-user training, User Acceptance, Going live, Roll-out. Differences between ERP implementation life cycle and Custom Software development phases. Drawbacks of ERP system.

3) Organizing implementation

Interaction with Vendors, Consultants, and Users. Contracts with Vendors, Consultants, and Employees. Project Management and Monitoring. ERP Project Organization – Formation of Steering Committee and different User Groups. Top Management Commitment and Steering Committee meetings. Change Management, Risks and Challenges in ERP implementation.

4) Post-implementation Support, Review, Maintenance and Security of ERP systems

A typical Support Cycle (Planning, Stabilization, Ongoing and Upgrade phases). Post-implementation Review of ERP systems – measures of review (Efficiency, Effectiveness, and Competitive Advantage), and approaches for review (User attitude survey, Cost/benefit analysis, Compliance audit, Budget performance review, Service level monitoring, Technical review, Product review, Integration review etc.). System maintenance and ERP system maintenance. Software upgrade (patch, release, version). Security and Access control of ERP systems.

Module 4 : Emerging Trends and Future of ERP systems (Lectures : 7)

1. Emerging Technologies and ERP

Service-oriented Architecture (SOA): Enterprise SOA layers – Business processes, Business services, Components and Integration services, Advantages and Drawbacks of SOA, When to use SOA, Difference between multi-layered Client-server architecture and SOA, basic awareness of NetWeaver from SAP, Websphere from Oracle and .Net from Microsoft.

Enterprise Application Integration (EAI): Basic understanding of the concept, Types of EAI (levels) – User Interface, Method (logic), Application Interface, Data.

EAI architecture – Typical framework (Business Processes, Components &Services, Messaging service, and Transport service. Mention of some of the leading EAI vendors – IBM, Microsoft, Oracle, SAP, TIBCO.

Radio Frequency Identification (RFID) and ERP: awareness of RFID technology, Benefits of RFID integrated with ERPs. *M-Commerce*: basic concept and applications, difference with E-Commerce, benefits of integration with ERPs.

2. Future of ERP

Technology transformation to SOA, more E-Commerce features, Growing mobile applications, Economical and Easy models of ERP deployment etc.

Books Recommended:
i) Enterprise Resource Planning – A Managerial Perspective by D P Goyal, Tata McGraw Hill Education, 2011
ii) Enterprise Resource Planning by Ashim Raj Singla, Cengage Learning, 2008
References:
1. Enterprise Resource Planning, 2nd Edition by Alexis Leon, Tata McGraw Hill Education, 2008

Free Elective

Operation Research
CS-605A
Contact: 3L
Credits: 3

Module I

Linear Programming Problems (LPP):
Basic LPP and Applications; Various Components of LP Problem Formulation.

Solution of Linear Programming Problems:
Solution of LPP: Using Simultaneous Equations and Graphical Method;
Definitions: Feasible Solution, Basic and non-basic Variables, Basic Feasible Solution, Degenerate and Non-degenerate Solution, Convex set and explanation with examples. **5L**
Solution of LPP by Simplex Method; Charnes' Big-M Method; Duality Theory. Transportation Problems and Assignment Problems. **12L**

Module II

Network Analysis:
Shortest Path: Floyd Algorithm; Maximal Flow Problem (Ford-Fulkerson); PERT-CPM (Cost Analysis, Crashing, Resource Allocation excluded). **6L**
Inventory Control:
Introduction to EOQ Models of Deterministic and Probabilistic ; Safety Stock; Buffer Stock. **3L**

Module III

Game Theory:
Introduction; 2-Person Zero-sum Game; Saddle Point; Mini-Max and Maxi-Min Theorems (statement only) and problems; Games without Saddle Point; Graphical Method; Principle of Dominance. **5L**

Module IV

Queuing Theory:
Introduction; Basic Definitions and Notations; Axiomatic Derivation of the Arrival & Departure (Poisson Queue). Poisson Queue Models: (M/M/1): (∞ / FIFO) and (M/M/1: N / FIFO) and problems. **5L**

Text Books:
1. H. A. Taha, "Operations Research", Pearson
2. P. M. Karak – "Linear Programming and Theory of Games", ABS Publishing House
3. Ghosh and Chakraborty, "Linear Programming and Theory of Games", Central Book Agency
4. Ravindran, Philips and Solberg - "Operations Research", WILEY INDIA

References:
1. Kanti Swaroop — "Operations Research", Sultan Chand & Sons
2. Rathindra P. Sen—"Operations Research: Algorithms and Applications", PHI
3. R. Panneerselvam - "Operations Research", PHI
4. A.M. Natarajan, P. Balasubramani and A. Tamilarasi - "Operations Research", Pearson
5. M. V. Durga Prasad – "Operations Research", CENGAGE Learning
6. J. K. Sharma - "Operations Research", Macmillan Publishing Company

Human Resource Management (HSS)
CS-605B

Contact: 3L
Credits: 3

Introduction : HR Role and Functions, Concept and Significance of HR, Changing role of HR managers - HR functions and Global Environment, role of a HR Manager.

Human Resources Planning : HR Planning and Recruitment: Planning Process - planning at different levels - Job Analysis - Recruitment and selection processes - Restructuring strategies - Recruitment-Sources of Recruitment-Selection Process-Placement and Induction-Retention of Employees.

Training and Development : need for skill upgradation - Assessment of training needs - Retraining and Redeployment methods and techniques of training employees and executives - performance appraisal systems.

Performance Management System : Definition, Concepts and Ethics-Different methods of Performance Appraisal- Rating Errors- Competency management.

Industrial Relations : Factors influencing industrial relations - State Interventions and Legal Framework - Role of Trade unions - Collective Bargaining - Workers' participation in management.

Case study.
Books :
1. Gary Dessler, Human Resource Management - (8th ed.,) Pearson Education, Delhi
2.Decenzo & Robbins, Personnel / Human Resource Management, 3rd ed., John Wiley & Sons (Pvt.) Ltd.
3. Biswajeet Patanayak, Human Resource Management, PHI, New Delhi
4. Luis R. Gomez, Mejia, Balkin and Cardy, Managing Human Resources PHI, New Delhi.

Multimedia Technology
CS-605C
Contact: 3L
Credits: 3

Introduction [2L]

Multimedia today, Impact of Multimedia, Multimedia Systems, Components and Its Applications

Text and Audio [6L]

Text: Types of Text, Ways to Present Text, Aspects of Text Design, Character, Character Set, Codes, Unicode, Encryption;
Audio: Basic Sound Concepts, Types of Sound, Digitizing Sound, Computer Representation of Sound (Sampling Rate, Sampling Size, Quantization), Audio Formats, Audio tools, MIDI

Image and Video (8L)

Image: Formats, Image Color Scheme, Image Enhancement; Video: Analogue and Digital Video, Recording Formats and Standards (JPEG, MPEG, H.261) Transmission of Video Signals, Video Capture, and Computer based Animation.

Synchronization [4L]

Temporal relationships, synchronization accuracy specification factors, quality of service

Storage models and Access Techniques [(4L]

Magnetic media, optical media, file systems (traditional, multimedia)
Multimedia devices – Output devices, CD-ROM, DVD, Scanner, CCD

Image and Video Database [8L]

Image representation, segmentation, similarity based retrieval, image retrieval by color, shape and texture; indexing- kd trees, R-trees, quad trees; Case studies- QBIC, Virage. Video Content, querying, video segmentation, indexing

Document Architecture and Content Management [9L]

Content Design and Development, General Design Principles
Hypertext: Concept, Open Document Architecture (ODA), Multimedia and Hypermedia Coding Expert Group (MHEG), Standard Generalized Markup Language (SGML), Document Type Definition (DTD), Hypertext Markup Language (HTML) in Web Publishing. Case study of Applications

Multimedia Applications [4L]

Interactive television, Video-on-demand, Video Conferencing, Educational Applications, Industrial Applications, Multimedia archives and digital libraries, media editors.

Books:

1. Ralf Steinmetz and Klara Nahrstedt , Multimedia: Computing, Communications & Applications , Pearson Ed.

2. Nalin K. Sharda , Multimedia Information System , PHI.

3. Fred Halsall , Multimedia Communications , Pearson Ed.

4. Koegel Buford , Multimedia Systems , Pearson Ed.

5. Fred Hoffstetter , Multimedia Literacy , McGraw Hill.

6. Ralf Steinmetz and Klara Nahrstedt , Multimedia Fundamentals: Vol. 1- Media Coding and Content Processing , PHI.

7. J. Jeffcoate , Multimedia in Practice: Technology and Application , PHI.

8. Prabhat K. Andleigh & Kiran Thakrar , Multimedia Systems Design , PHI.

Practical

Database Management System Lab
Code: CS691
Contact: 3P
Credits: 2

Structured Query Language

1. **Creating Database**
   - Creating a Database
   - Creating a Table
   - Specifying Relational Data Types
   - Specifying Constraints
   - Creating Indexes

2. **Table and Record Handling**
   - INSERT statement
   - Using SELECT and INSERT together
   - DELETE, UPDATE, TRUNCATE statements
   - DROP, ALTER statements

3. **Retrieving Data from a Database**
   - The SELECT statement
   - Using the WHERE clause
   - Using Logical Operators in the WHERE clause

➢ Using IN, BETWEEN, LIKE , ORDER BY, GROUP BY and HAVING **Clause**
➢ Using Aggregate Functions
➢ Combining Tables Using JOINS
➢ Subqueries

4. **Database Management**
   ➢ Creating Views
   ➢ Creating Column Aliases
   ➢ Creating Database Users
   ➢ Using GRANT and REVOKE

Cursors in Oracle PL / SQL
Writing Oracle PL / SQL Stored Procedures

Network Lab
Code: CS692
Contact: 3P
Credits: 2

- IPC (Message queue)
- NIC Installation & Configuration (Windows/Linux)
- Familiarization with
  - Networking cables (CAT5, UTP)
  - Connectors (RJ45, T-connector)
  - Hubs, Switches
- TCP/UDP Socket Programming
- Multicast & Broadcast Sockets
- Implementation of a Prototype Multithreaded Server
- Implementation of
  - Data Link Layer Flow Control Mechanism (Stop & Wait, Sliding Window)
  - Data Link Layer Error Detection Mechanism (Cyclic Redundancy Check)
  - Data Link Layer Error Control Mechanism (Selective Repeat, Go Back N)

Operating System Lab
Code: CS693
Contact: 3P
Credits: 2

1. Shell programming [6P]: creating a script, making a script executable, shell syntax (variables, conditions, control structures, functions, commands).

2. Process [6P]: starting new process, replacing a process image, duplicating a process image, waiting for a process, zombie process.

3. Signal [9P]: signal handling, sending signals, signal interface, signal sets.

4. Semaphore [6P]: programming with semaphores (use functions semctl, semget, semop, set_semvalue, del_semvalue, semaphore_p, semaphore_v).

5. POSIX Threads [9P]: programming with pthread functions(viz. pthread_create, pthread_join, pthread_exit, pthread_attr_init, pthread_cancel)

6. Inter-process communication [9P]: pipes(use functions pipe, popen, pclose), named pipes(FIFOs, accessing FIFO)

Syllabus to be implemented from the Academic Year 2014

COMPUTER SCIENCE ENGINEERING , SEMESTER-VII

Sl. No.	Field	Theory	L	T	P	Total	Credit Points
A. THEORY							
						Contact Hours/Week	
			L	T	P	Total	
1.	**CS701**	Software Engg.	3	0	0	3	3
2.	**CS702**	Compiler Design	3	0	0	3	3
3.	**CS703**	A. Pattern Recognition B. Soft Computing C. Artificial Intelligence D. Image Processing	3	0	0	3	3
4.	**CS704**	A. Distributed Operating System B. Cloud Computing C. Data Warehousing and Data Mining D. Sensor Networks E. Mobile Computing	3	0	0	3	3
5.	**CS705**	A.Internet Technology (IT) B. Microelectronics & VLSI Design (ECE) C. Control System (EE) D. Modelling & Simulation (M)	3	0	0	3	3
	TOTAL OF THEORY					15	15
B. PRACTICAL							
6.	**HU781**	Group Discussion	0	0	3	3	2
7.	**CS791**	Software Engg. Lab	0	0	3	3	2
8.	**CS793**	A .PATTERN RECOGNITION B. Soft Computing C. Artificial Intelligence D. Image Processing	0	0	3	3	2
9.	**CS795**	A. Internet Technology (IT) B. Microelectronics & VLSI Design (ECE) C. Control System (EE) D. Modelling & Simulation (M)	0	0	3	3	2

10.	**CS792**	Industrial training	4 wks during 6th -7 th Sem-break				2
11.	**CS794**	Project- 1				3	2
Total of Practical						15	12
						30	27

Syllabus
VII Semester
Theory

Software Engineering
CS701
Contracts: 3L
Credits- 3

Module I

Software Engineering –Objectives, Definitions ,Software Process models - Waterfall Model , Prototype model, RAD, Evolutionary Models ,Incremental, Spiral (**4L)**
Software Project Planning- Feasibility Analysis, Technical Feasibility, Cost- Benefit Analysis, COCOMO model. **[4L]**

Module II

Structured Analysis , Context diagram and DFD, Physical and Logical DFDs ,Data Modelling, ER diagrams, Software Requirements Specification **(5L)**

Module III

Design Aspects :Top-Down And Bottom-Up design; Decision tree, decision table and structured English, Structure chart, Transform analysis Functional vs. Object- Oriented approach. **[3L]**

Unified Modelling Language

Class diagram, interaction diagram: collaboration diagram, sequence diagram, state chart diagram, activity diagram, implementation diagram. **(4L)**

Module V

Coding & Documentation – Structured Programming, Modular Programming, Module Relationship- Coupling, Cohesion, OO
Programming, Information Hiding, Reuse, System Documentation. **[5L]**
Testing – Levels of Testing, Integration Testing, System Testing,**(5L)**
Software Quality, Quality Assurance, Software Maintenance, Software Configuration Management, Software Architecture. **[6L]**

Reference Books:
1. Software Engineering : A practitioner's approach– Pressman(TMH)
2. Software Engineering- Pankaj Jalote (Wiley-India)
3. Software Engineering- Rajib Mall (PHI)

4. Software Engineering –Agarwal and Agarwal (PHI)

Compiler Design
CS702
Contracts: 3L
Credits- 3

Module I
Introduction to Compiling [2L]
Compilers, Analysis-synthesis model , The phases of the compiler, Cousins of the compiler.
Lexical Analysis [5L]
The role of the lexical analyzer, Tokens, Patterns, Lexemes, Input buffering, Specifications of a
token, Recognition of tokens, Finite automata, From a regular expression to an NFA, From a
regular expression to NFA, From a regular expression to DFA, Design of a lexical analyzer
generator (Lex).
Module II
Syntax Analysis [8L]
The role of a parser, Context free grammars, Writing a grammar, Top down Parsing, Non-
recursive Predictive parsing (LL), Bottom up parsing, Handles, Viable prefixes, Operator
precedence parsing, LR parsers (SLR, LALR), Parser generators (YACC). Error Recovery
strategies for different parsing techniques.
Syntax directed translation [4L]
Syntax directed definitions, Construction of syntax trees, Bottom-up evaluation of S attributed
definitions, L attributed definitions, Bottom-up evaluation of inherited attributes.
Module III
Type checking [3L]
Type systems, Specification of a simple type checker, Equivalence of type expressions, Type
conversions
Run time environments [4L]
Source language issues (Activation trees, Control stack, scope of declaration, Binding of names),
Storage organization (Subdivision of run-time memory, Activation records), Storage allocation
strategies, Parameter passing (call by value, call by reference, copy restore, call by name),
Symbol tables, dynamic storage allocation techniques.
Module IV
Intermediate code generation [3L]
Intermediate languages, Graphical representation, Three-address code, Implementation of three
address statements (Quadruples, Triples, Indirect triples).
Code optimization [4L]
Introduction, Basic blocks & flow graphs, Transformation of basic blocks, Dag representation of
basic blocks, The principle sources of optimization, Loops in flow graph, Peephole optimization.
Code generations [3L]
Issues in the design of code generator, a simple code generator, Register allocation &
assignment.

Text books:
1. Aho, Sethi, Ullman - "Compiler Principles, Techniques and Tools" - Pearson Education.
2. Holub - "Compiler Design in C" – PHI
3.Tremblay and Sorenson Compiler Writing-McgrawHill International .
4. Chattopadhyay , S- Compiler Design (PHI)

Pattern Recognition
CS703A
Contracts: 3L
Credits- 3

Module – I	
Introduction – Definitions, data sets for Pattern Recognition	2
Different Paradigms of Pattern Recognition	1
Representations of Patterns and Classes	2
Metric and non-metric proximity measures	2
Module - II	
Feature extraction	2
Different approaches to Feature Selection	1
Nearest Neighbour Classifier and variants	2
Efficient algorithms for nearest neighbor classification	2
Module - III	
Different Approaches to Prototype Selection	2
Bayes Classifier	3
Decision Trees	3
Linear Discriminant Function	3
Module - IV	
Support Vector Machines	2
Clustering	3
Clustering Large datasets	2
Combination of Classifiers	2
Applications – Document Recognition	2

REFERENCES
1. Devi V.S.; Murty, M.N. (2011) Pattern Recognition: An Introduction, Universities Press, Hyderabad.
2. R. O. Duda, P. E. Hart and D. G. Stork, Pattern Classification, Wiley, 2000.

Soft Computing
CS703B
Contracts: 3L

Credits- 3
Module-I [2L]
Introduction: Introduction to soft computing; introduction to fuzzy sets and fuzzy logic systems; introduction to biological and
artificial neural network; introduction to Genetic Algorithm.
Module-II [10L]
Fuzzy sets and Fuzzy logic systems:
Classical Sets and Fuzzy Sets and Fuzzy relations : Operations on Classical sets, properties of classical sets, Fuzzy set operations,
properties of fuzzy sets, cardinality, operations, and properties of fuzzy relations.
Membership functions : Features of membership functions, standard forms and boundaries, different fuzzification methods.
Fuzzy to Crisp conversions: Lambda Cuts for fuzzy sets, fuzzy Relations, Defuzzification methods.
Classical Logic and Fuzzy Logic: Classical predicate logic, Fuzzy Logic, Approximate reasoning and Fuzzy Implication
Fuzzy Rule based Systems: Linguistic Hedges, Fuzzy Rule based system – Aggregation of fuzzy Rules, Fuzzy Inference System-Mamdani Fuzzy Models – Sugeno Fuzzy Models.
Applications of Fuzzy Logic: How Fuzzy Logic is applied in Home Appliances, General Fuzzy Logic controllers, Basic Medical Diagnostic systems and Weather forecasting
Module-III [10L]
Neural Network
Introduction to Neural Networks: Advent of Modern Neuroscience, Classical AI and Neural Networks, Biological Neurons and Artificial neural network; model of artificial neuron.
Learning Methods : Hebbian, competitive, Boltzman etc.,
Neural Network models: Perceptron, Adaline and Madaline networks; single layer network; Back-propagation and multi layer networks.
Competitive learning networks: Kohonen self organizing networks, Hebbian learning; Hopfield Networks.
Neuo-Fuzzy modelling:
Applications of Neural Networks: Pattern Recognition and classification
Module-IV[10L]
Genetic Algorithms: Simple GA, crossover and mutation, Multi-objective Genetic Algorithm (MOGA).
Applications of Genetic Algorithm: genetic algorithms in search and optimization, GA based clustering Algorithm, Image processing and pattern Recognition
Module-V [4L]
Other Soft Computing techniques: Simulated Annealing, Tabu search, Ant colony optimization (ACO), Particle Swarm Optimization (PSO).

Text Books:
1. Fuzzy logic with engineering applications, Timothy J. Ross, John Wiley and Sons.
2. S. Rajasekaran and G.A.V.Pai, "Neural Networks, Fuzzy Logic and Genetic

Algorithms", PHI
3. Principles of Soft Computing , S N Sivanandam, S. Sumathi, John Wiley & Sons
4. Genetic Algorithms in search, Optimization & Machine Learning by David E. Goldberg
5. Neuro-Fuzzy and Soft computing, Jang, Sun, Mizutani, PHI
6. Neural Networks: A Classroom Approach,1/e by Kumar Satish, TMH,
7. Genetic Algorithms in search, Optimization & Machine Learning by David E. Goldberg, Pearson/PHI
8. A beginners approach to Soft Computing, Samir Roy & Udit Chakraborty, Pearson

Reference Books:
1. Fuzzy Sets and Fuzzy Logic: Theory and Applications, George J. Klir and Bo Yuan, Prentice Hall.
2. Neural Networks: A Comprehensive Foundation (2nd Edition), Simon Haykin, Prentice Hall.

Artificial Intelligence
CS703C
Contracts: 3L
Credits- 3
39L
Introduction [2]
Overview of Artificial intelligence- Problems of AI, AI technique, Tic - Tac - Toe problem.
Intelligent Agents [2]
Agents & environment, nature of environment, structure of agents, goal based agents, utility based agents, learning agents.
Problem Solving [2]
Problems, Problem Space & search: Defining the problem as state space search, production system, problem characteristics, issues in the design of search programs.
Search techniques [5]
Solving problems by searching :problem solving agents, searching for solutions; uniform search strategies: breadth first search, depth first search, depth limited search, bidirectional search, comparing uniform search strategies.
Heuristic search strategies [4]
Greedy best-first search, A* search, memory bounded heuristic search: local search algorithms & optimization problems: Hill climbing search, simulated annealing search, local beam search, genetic algorithms; constraint satisfaction problems, local search for constraint satisfaction problems.
Adversarial search [3]
Games, optimal decisions & strategies in games, the minimax search procedure, alpha-beta pruning, additional refinements, iterative deepening.
Knowledge & reasoning [3]
Knowledge representation issues, representation & mapping, approaches to knowledge representation, issues in knowledge representation.
Using predicate logic [2]

Representing simple fact in logic, representing instant & ISA relationship, computable functions & predicates, resolution, natural deduction.

Representing knowledge using rules [3]
Procedural verses declarative knowledge, logic programming, forward verses backward reasoning, matching, control knowledge.

Probabilistic reasoning [3]
Representing knowledge in an uncertain domain, the semantics of Bayesian networks, Dempster-Shafer theory, Fuzzy sets & fuzzy logics.

Planning [2]
Overview, components of a planning system, Goal stack planning, Hierarchical planning, other planning techniques.

Natural Language processing [2]
Introduction, Syntactic processing, semantic analysis, discourse & pragmatic processing.

Learning [3]
Forms of learning, inductive learning, learning decision trees, explanation based learning, learning using relevance information,
neural net learning & genetic learning.

Expert Systems [2]
Representing and using domain knowledge, expert system shells, knowledge acquisition.

Basic knowledge of programming language like Prolog & Lisp. **[3]**

Books:
1. Artificial Intelligence, Ritch & Knight, TMH
2. Artificial Intelligence A Modern Approach, Stuart Russel Peter Norvig Pearson
3. Introduction to Artificial Intelligence & Expert Systems, Patterson, PHI
4. Poole, Computational Intelligence, OUP
5. Logic & Prolog Programming, Saroj Kaushik, New Age International
6. Expert Systems, Giarranto, VIKAS
7. Artificial Intelligence, Russel, Pearson

Image Processing
CS703D
Contracts: 3L
Credits- 3
38L
Introduction [3L]
Background, Digital Image Representation, Fundamental steps in Image Processing, Elements of Digital Image Processing – Image Acquisition, Storage, Processing, Communication, Display.

Digital Image Formation [4L]
A Simple Image Model, Geometric Model- Basic Transformation (Translation, Scaling, Rotation), Perspective Projection, Sampling & Quantization - Uniform & Non uniform.

Mathematical Preliminaries [9L]

Neighbour of pixels, Connectivity, Relations, Equivalence & Transitive Closure; Distance Measures, Arithmetic/Logic Operations, Fourier Transformation, Properties of The Two Dimensional Fourier Transform, Discrete Fourier Transform, Discrete Cosine & Sine Transform.

Image Enhancement [8L]

Spatial Domain Method, Frequency Domain Method, Contrast Enhancement -Linear & Nonlinear Stretching, Histogram Processing; Smoothing - Image Averaging, Mean Filter, Low-pass Filtering; Image Sharpening. High-pass Filtering, High-boost Filtering, Derivative Filtering, Homomorphic Filtering; Enhancement in the frequency domain - Low pass filtering, High pass filtering.

Image Restoration [7L]

Degradation Model, Discrete Formulation, Algebraic Approach to Restoration - Unconstrained & Constrained; Constrained Least Square Restoration, Restoration by Homomorphic Filtering, Geometric Transformation - Spatial Transformation, Gray Level Interpolation.

Image Segmentation [7L]

Point Detection, Line Detection, Edge detection, Combined detection, Edge Linking & Boundary Detection - Local Processing, Global Processing via The Hough Transform; Thresholding - Foundation, Simple Global Thresholding, Optimal Thresholding; Region Oriented Segmentation - Basic Formulation, Region Growing by Pixel Aggregation, Region Splitting & Merging.

Books:
1. Digital Image Processing, Gonzalves,Pearson
2. Digital Image Processing, Jahne, Springer India
3.Digital Image Processing & Analysis,Chanda & Majumder,PHI
4.Fundamentals of Digital Image Processing, Jain, PHI
5.Image Processing, Analysis & Machine Vision, Sonka, VIKAS
6. Getting Started with GIS- Clarke Keith. C; PE.
7. Concepts & Techniques of GIS - Lo C.P, Albert, Yeung K.W- PHI.

Distributed Operating System
CS704A
Contracts: 3L
Credits- 3
[36L]
Introduction to Distributed System [2]
Introduction, Examples of distributed system, Resource sharing, Challenges
Operating System Structures: [3]
Review of structures: monolithic kernel, layered systems, virtual machines. Process based models and client server architecture; The micro-kernel based client-server approach.
Communication [4]
Inter-process communication , Remote Procedure Call, Remote Object Invocation, Tasks and Threads. Examples from LINUX, Solaris 2 and Windows NT.
Theoretical Foundations: [2]
Introduction. Inherent Limitations of distributed Systems. Lamport's Logical clock. Global State
Distributed Mutual Exclusion:[4]

Classification of distributed mutual exclusion algorithm. NonToken based Algorithm:Lamport's algorithm, Ricart-Agrawala algorithm. Token based Algorithm: Suzuki-Kasami's broadcast algorithm.

Distributed Deadlock Detection: [4]

Deadlock handling strategies in distributed systems. Control organizations for distributed deadlock detection. Centralized and Distributed deadlock detection algorithms: Completely Centralized algorithms, path pushing, edge chasing, global state detection algorithm.

Protection and Security: [4]

Requirements for protection and security regimes. The access matrix model of protection. System and user modes, rings of protection, access lists, capabilities. User authentication, passwords and signatures. Use of single key and public key encryption.

Distributed file systems: [6]

Issues in the design of distributed file systems: naming, transparency, update semantics and fault resilience. Use of the Virtual File System layer. Examples of distributed systems including Sun NFS, the Andrew filestore, CODA file system and OSF DCE.

Distributed Shared Memory: [4]

Architecture and motivations. Algorithms for implementing DSM. Memory Coherence

CORBA: [3]

The Common Object Request Broker Architecture model and software and its relationship to Operating Systems.

Books:

1 Andrew S. Tanenbaum and Maarten Van Steen, Distributed Systems Principles and Paradigms, PHI
2. Singhal Mukesh & Shivaratri N. G., Advanced Concepts in Operating Systems, TMH
3. Tanenbaum, A. S. Distributed Operating Systems, (ISBN 0-131-439-340), Prentice Hall 199
4. Tanenbaum, A. S. Modern Operating Systems, 2nd Edition (ISBN 0-13-031358-0), Prentice Hall 2001.
5. Bacon, J., Concurrent Systems, 2nd Edition, (ISBN 0-201-177-676), Addison Wesley 1998.
6. Silberschatz, A., Galvin, P. and Gagne, G., Applied Operating Systems Concepts, 1st Edition, (ISBN 0-471-36508-4), Wiley 2000.
7. Coulouris, G. et al, Distributed Systems: Concepts and Design, 3rd Edition, (ISBN 0-201-61918-0), Addison Wesley 2001.
8. Galli, D.L., Distributed Operating Systems: Concepts and Practice (ISBN 0-13-079843-6), Prentice-Hall 2000.

Cloud Computing
CS704B
Contracts: 3L
Credits- 3

Module 1: Definition of Cloud Computing and its Basics (Lectures : 9)
1. Definition of Cloud Computing:

Defining a Cloud, Cloud Types – NIST model, Cloud Cube model, Deployment models (Public , Private, Hybrid and Community Clouds), Service models – Infrastructure as a Service, Platform as a Service, Software as a Service with examples of services/ service providers, Cloud Reference model Characteristics of Cloud Computing – a shift in paradigm Benefits and advantages of Cloud Computing.

2. Cloud Architecture:
A brief introduction on Composability, Infrastructure, Platforms, Virtual Appliances, Communication Protocols, Applications, Connecting to the Cloud by Clients

3. Services and Applications by Type
IaaS – Basic concept, Workload, partitioning of virtual private server instances, Pods, aggregations, silos
PaaS – Basic concept, tools and development environment with examples
SaaS - Basic concept and characteristics, Open SaaS and SOA, examples of SaaS platform
Identity as a Service (IDaaS)
Compliance as a Service (CaaS)

Module 2 : Use of Platforms in Cloud Computing (Lectures : 12)
1. Concepts of Abstraction and Virtualization
Virtualization technologies : Types of virtualization (access, application, CPU, storage), Mobility patterns (P2V, V2V, V2P, P2P, D2C, C2C, C2D, D2D)
Load Balancing and Virtualization: Basic Concepts, Network resources for load balancing, Advanced load balancing
(including Application Delivery Controller and Application Delivery Network), Mention of The Google Cloud as an example of use of load balancing
Hypervisors: Virtual machine technology and types, VMware vSphere
Machine Imaging (including mention of Open Virtualization Format – OVF)
Porting of applications in the Cloud: The simple Cloud API and AppZero Virtual Application appliance

2. Concepts of Platform as a Service
Definition of services, Distinction between SaaS and PaaS (knowledge of Salesforce.com and Force.com), Application development Use of PaaS Application frameworks

3. Use of Google Web Services
Discussion of Google Applications Portfolio – Indexed search, Dark Web, Aggregation and disintermediation, Productivity
applications and service, Adwords, Google Analytics, Google Translate, a brief discussion on Google Toolkit (including
introduction of Google APIs in brief), major features of Google App Engine service.

4. Use of Amazon Web Services
Amazon Web Service components and services: Amazon Elastic Cloud, Amazon Simple Storage system, Amazon Elastic
Block Store, Amazon SimpleDB and Relational Database Service

5. Use of Microsoft Cloud Services
Windows Azure platform: Microsoft's approach, architecture, and main elements, overview of Windows Azure AppFabric, Content Delivery Network, SQL Azure, and Windows Live services

Module 3 : Cloud Infrastructure (Lectures : 7)
Types of services required in implementation – Consulting, Configuration, Customization and Support

1. Cloud Management
An overview of the features of network management systems and a brief introduction of related products from large cloud vendors, Monitoring of an entire cloud computing deployment stack – an overview with mention of some products, Lifecycle management of cloud services (six stages of lifecycle)

2. Concepts of Cloud Security
Cloud security concerns, Security boundary, Security service boundary Overview of security mapping Security of data: Brokered cloud storage access, Storage location and tenancy, encryption, and auditing and compliance Identity management (awareness of Identity protocol standards)

Module 4 : Concepts of Services and Applications (Lectures : 8)
1. Service Oriented Architecture: Basic concepts of message-based transactions, Protocol stack for an SOA architecture, Event-driven SOA, Enterprise Service Bus, Service catalogs
2. Applications in the Cloud: Concepts of cloud transactions, functionality mapping, Application attributes, Cloud service attributes, System abstraction and Cloud Bursting, Applications and Cloud APIs
3. Cloud-based Storage: Cloud storage definition – Manned and Unmanned
4. Webmail Services: Cloud mail services including Google Gmail, Mail2Web, Windows Live Hotmail, Yahoo mail, concepts of Syndication services

Books Recommended:
1. Cloud Computing Bible by Barrie Sosinsky, Wiley India Pvt. Ltd, 2013
2. Mastering Cloud Computing by Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, McGraw Hill Education
(India) Private Limited, 2013
3. Cloud computing: A practical approach, Anthony T. Velte, Tata Mcgraw-Hill
4. Cloud Computing, Miller, Pearson
5. Building applications in cloud:Concept, Patterns and Projects, Moyer, Pearson
References:
1. Cloud Computing – Second Edition by Dr. Kumar Saurabh, Wiley India

Data Warehousing & Data Mining
CS704C
Contracts: 3L
Credits- 3
Module 1: Overview and Concepts of Data Warehousing (Lectures : 9)
4. Overview of Data warehousing
Strategic information and the need for Data warehousing, Defining a Data warehouse, Evolution of Data warehousing, Data warehousing and Business Intelligence
5. The Building Blocks of Data warehouse

Defining features – Subject-oriented data, Integrated data, Time-variant data, Nonvolatile data, Data granularity Data warehouses and Data marts

Architectural Types – Centralized, Independent data marts, Federated, Hub-and-Spoke, Data mart bus Overview of components - Source Data, Data Staging, Data Storage, Information Delivery, Metadata, and Management and Control components

6. Business Requirements and Data warehouse

Dimensional nature of Business data and Dimensional Analysis, Dimension hierarchies and categories, Key Business Metrics (Facts), Requirement Gathering methods and Requirements Definition Document (contents) Business Requirements and Data Design – Structure for Business Dimensions and Key Measurements, Levels of detail

Business Requirements and the Architecture plan

Business Requirements and Data Storage Specifications

Business Requirements and Information Delivery Strategy

Module 2 : Data warehouse Architecture and Infrastructure (Lectures : 8)

6. Architectural components

Concepts of Data warehouse architecture – Definition and architecture in the areas of Data acquisition, Data storage, and Information delivery Distinguishing characteristics – Different objectives and scope, Data content, Complex analysis for faster response, Flexible and Dynamic, Metadata-driven etc Architectural Framework – supporting flow of data, and the Management and Control module Technical architecture – Data acquisition, Data storage, and Information delivery Overview of the components of Architectural Types introduced in Module 1.

7. Infrastructure for Data warehousing

Distinction between architecture and infrastructure, Understanding of how data warehouse infrastructure supports its architecture Components of physical infrastructure, Hardware and Operating systems for data warehouse, Database Software, Collection of Tools, Data warehouse Appliances – evolution and benefits

8. The role of Metadata

Understanding the importance of Metadata

Metadata types by functional areas – Data acquisition, Data storage, and Information delivery

Business Metadata – overview of content and examples

Technical Metadata – overview of content and examples

Metadata Requirements, Sources of Metadata, Metadata management – challenges, Metadata Repository, Metadata integration and standards

Module 3 : Data Design and Data Preparation (Lectures : 9)

3. Principles of Dimensional Modeling

Data Design – Design decisions, Basics of Dimensional modeling, E-R modeling versus Dimensional modeling

The STAR schema – illustration, Dimension Table, Fact Table, Factless Fact Table, Data granularity

STAR schema keys – Primary, Surrogate, and Foreign

Advantages of the STAR schema, STAR schema examples

4. Data Extraction, Transformation, and Loading

Overview of ETL, Requirements of ETL and steps

Data extraction – identification of sources and techniques

Data transformation – Basic tasks, Transformation types, Data integration and consolidation, Transformation for dimension

Attributes

Data loading – Techniques and processes, Data refresh versus update, Procedures for Dimension tables, Fact tables :

History and incremental loads

ETL Tool options

5. **Data Quality**

Importance of data quality, Challenges for data quality, Data quality tools, Data cleansing and purification, Master Data

Management

Module 4 : Information access and delivery (Lectures : 10)

5. Matching information to classes of users

Information from Data warehouse versus Operational systems, Users of information – their needs and how to provide

information

Information delivery – queries, reports, analysis, and applications

Information delivery tools – Desktop environment, Methodology and criteria for tool selection, Information delivery

framework, Business Activity Monitoring, Dashboards and Scorecards

6. OLAP in Data warehouse

Overall concept of Online Analytical Processing (OLAP), OLAP definitions and rules, OLAP characteristics

Major features and functions of OLAP – General features, Dimensional analysis, Hypercubes, Drill Down and Roll Up,

Slice and Dice, Rotation, Uses and Benefits

Familiarity with OLAP models – Overview of variations, MOLAP, ROLAP, HOLAP, DOLAP, Database OLAP, Web

OLAP

7. Data Warehouse and the web

Web-enabled Data Warehouse – adapting data warehouse for the web

Web-based information delivery – Browser technology for data warehouse and Security issues

OLAP and Web – Enterprise OLAP, Web-OLAP approaches, OLAP Engine design

8. Data Mining

Overview of Data mining – Definition, Knowledge Discovery Process (Relationships, Patterns, Phases of the process),

OLAP versus Data mining

Some aspects of Data mining – Association rules, Outlier analysis, Predictive analytics etc)

Concepts of Data mining in a Data warehouse environment

Major Data Mining techniques – Cluster Detection, Decision Trees, Memory-based Reasoning, Link Analysis, Neural

Networks, Genetic Algorithms etc

Data Mining Applications in industry – Benefits of Data mining, Discussion on applications in Customer Relationship
Management (CRM), Retail, Telecommunication, Biotechnology, Banking and Finance etc
Books Recommended:
Syllabus for B.Tech(Computer Science & Engineering) Up to Fourth Year
Revised Syllabus of B.Tech CSE (for the students who were admitted in Academic Session 2010-2011)
56
7. Data Warehousing Fundamentals for IT Professionals, Second Edition by Paulraj Ponniah, Wiley India
References:
2. Data Warehousing, Data Mining, & OLAP – Second Edition by Alex Berson and Stephen J. Smith, Tata McGraw Hill
Education
3. Data warehouse Toolkit by Ralph Kimball, Wiley India

Sensor Networks
CS704D
Contracts: 3L
Credits- 3
Module I: Introduction and Overview [4L]
Learning Objective: To provide an overview about sensor networks and emerging technologies.
Overview of wireless networks, types, infrastructure-based and infrastructure-less, introduction to MANETs (Mobile Ad-hoc Networks), characteristics, reactive and proactive routing protocols with examples, introduction to sensor networks, commonalities and differences with MANETs, constraints and challenges, advantages, applications, enabling technologies for WSNs.
Module II: Architectures [9L]
Learning Objective: To study about the node and network architecture of sensor nodes and its execution environment.
Single-node architecture - hardware components, design constraints, energy consumption of sensor nodes , operating systems and execution environments, examples of sensor nodes, sensor network scenarios, types of sources and sinks – single hop vs. multi hop networks, multiple sources and sinks – mobility, optimization goals and figures of merit, gateway concepts, design principles for WSNs, service interfaces for WSNs.
Module III: Communication Protocols [9L]
**Learning Objective: To understand the concepts of communication, MAC, routing protocols and also study about the naming
and addressing in WSN.**
Physical layer and transceiver design considerations, MAC protocols for wireless sensor networks, low duty cycle protocols and wakeup concepts - S-MAC , the mediation device protocol, wakeup radio concepts, address and name management, assignment of MAC addresses, routing protocols- classification, gossiping, flooding, energy-efficient routing, unicast protocols,

multi-path routing, data-centric routing, data aggregation, SPIN, LEACH, Directed-Diffusion, geographic routing.

Module IV: Infrastructure Establishment [9L]

Learning Objective: To learn about topology control and clustering in networks with timing synchronization for localization

services with sensor tasking and control.

Topology control, flat network topologies, hierarchical networks by clustering, time synchronization, properties, protocols based on sender-receiver and receiver-receiver synchronization, LTS, TPSN, RBS, HRTS, localization and positioning, properties and approaches, single-hop localization, positioning in multi-hop environment, range based localization algorithms – location services,sensor tasking and control.

Module V: Sensor Network Platforms and Tools [9L]

Learning Objective: To study about sensor node hardware and software platforms and understand the simulation and

programming techniques.

Sensor node hardware, Berkeley motes, programming challenges, node-level software platforms, node-level simulators, state-centric programming, Tiny OS, nesC components, NS2 simulator, TOSSIM.

TEXT BOOKS

1. Holger Karl & Andreas Willig, "Protocols and Architectures for Wireless Sensor Networks", John Wiley, 2005.

2. Feng Zhao & Leonidas J. Guibas, "Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007.

REFERENCES

1. Kazem Sohraby, Daniel Minoli, & Taieb Znati, "Wireless Sensor Networks- Technology, Protocols, and Applications",
John Wiley, 2007.

2. Anna Hac, "Wireless Sensor Network Designs", John Wiley, 2003.

3. Thomas Haenselmann, "Sensor Networks", available online for free, 2008.

4. Edgar Callaway, "Wireless Sensor Networks: Architectures and Protocols", Auerbach, 2003.

Mobile Computing
CS704E
Contracts: 3L
Credits- 3

Introduction to Personal Communications Services (PCS): PCS Architecture, Mobility management, Networks signalling. Global
System for Mobile Communication (GSM) system overview: GSM Architecture, Mobility management, Network signalling. **[5L**
General Packet Radio Services (GPRS): GPRS Architecture, GPRS Network Nodes. Mobile Data Communication: WLANs
(Wireless LANs) IEEE 802.11 standard, Mobile IP.
[5L

Wireless Application Protocol (WAP): The Mobile Internet standard, WAP Gateway and Protocols, wireless mark up Languages

(WML). Wireless Local Loop(WLL): Introduction to WLL Architecture, wireless Local Loop Technologies. **[7L**

Third Generation (3G) Mobile Services: Introduction to International Mobile Telecommunications 2000 (IMT 2000) vision,

Wideband Code Division Multiple Access (W-CDMA), and CDMA 2000, Quality of services in 3G.

[7L

Global Mobile Satellite Systems; case studies of the IRIDIUM and GLOBALSTAR systems. Wireless Enterprise Networks:

Introduction to Virtual Networks, Blue tooth technology, Blue tooth Protocols.

[7L

Server-side programming in Java, Pervasive web application architecture, Device independent example application

[8L

Text :

1. "Pervasive Computing", Burkhardt, Pearson

2. "Mobile Communication", J. Schiller, Pearson

3. "Wireless and Mobile Networks Architectures", Yi-Bing Lin & Imrich Chlamtac, John Wiley & Sons, 2001

4. "Mobile and Personal Communication systems and services", Raj Pandya, Prentice Hall of India, 2001.

Reference :

1. "Guide to Designing and Implementing wireless LANs", Mark Ciampa, Thomson learning, Vikas Publishing House, 2001.

2. "Wireless Web Development", Ray Rischpater, Springer Publishing,

3. "The Wireless Application Protocol", Sandeep Singhal, Pearson .

4. "Third Generation Mobile Telecommunication systems", by P.Stavronlakis, Springer Publishers,

Internet Technology
CS705A
Contracts: 3L
Credits- 3
34L
Module I-6L

Introduction (1L):

Overview, Network of Networks, Intranet, Extranet and Internet.

World Wide Web (1L):

Domain and Sub domain, Address Resolution, DNS, Telnet, FTP, HTTP.

Review of TCP/IP (1L):

Features, Segment, Three-Way Handshaking, Flow Control, Error Control, Congestion control, IP Datagram, IPv4 and IPv6.

IP Subnetting and addressing (1L):
Classful and Classless Addressing, Subnetting. NAT, IP masquerading, IP tables.
Internet Routing Protocol (1L):
Routing -Intra and Inter Domain Routing, Unicast and Multicast Routing, Broadcast.
Electronic Mail (1L): POP3, SMTP.

Module II-9L
HTML (3L):
Introduction, Editors, Elements, Attributes, Heading, Paragraph. Formatting, Link, Head, Table, List, Block, Layout, CSS.
Form, Iframe, Colors, Colorname, Colorvalue.
Image Maps (1L):
map, area, attributes of image area.
Extensible Markup Language (XML) (4L):
Introduction, Tree, Syntax, Elements, Attributes, Validation, Viewing. XHTML in brief.
CGI Scripts (1L):
Introduction, Environment Variable, GET and POST Methods.

Module III-10L
PERL (3L):
Introduction, Variable, Condition, Loop, Array, Implementing data structure, Hash, String, Regular Expression, File
handling, I/O handling.
JavaScript (4L):
Basics, Statements, comments, variable, comparison, condition, switch, loop, break. Object – string, array, Boolean, reg-ex.
Function, Errors, Validation.
Cookies (1L):
Definition of cookies, Create and Store a cookie with example.
Java Applets (2L):
Container Class, Components, Applet Life Cycle, Update method; Parameter passing applet, Applications.

Module IV-4L
Client-Server programming In Java (2L):
Java Socket, Java RMI.
Threats (1L):
Malicious code-viruses, Trojan horses, worms; eavesdropping, spoofing, modification, denial of service attacks.
Network security techniques (2L):
Password and Authentication; VPN, IP Security, security in electronic transaction, Secure Socket Layer (SSL), Secure Shell (SSH).
Firewall (1L):
Introduction, Packet filtering, Stateful, Application layer, Proxy.

Module v-5L
Internet Telephony (1L):

Introduction, VoIP.
Multimedia Applications (2L):
Multimedia over IP: RSVP, RTP, RTCP and RTSP. Streaming media, Codec and Plugins, IPTV.
Search Engine and Web Crawler (2L):
Definition, Meta data, Web Crawler, Indexing, Page rank, overview of SEO.
Reference:
1. Web Technology: A Developer's Perspective, N.P. Gopalan and J. Akilandeswari, PHI Learning, Delhi, 2013. (Chapters 1-
5,7,8,9).
2. Internetworking Technologies, An Engineering Perspective, Rahul Banerjee, PHI Learning, Delhi, 2011. (Chapters
5,6,12)

Microelectronics & VLSI Design
CS705B
Contracts: 3L
Credits- 3
36L

Module	Content	Hour
1	**Introduction to VLSI Design**: VLSI Design Concepts, Moor's Law, Scale of Integration (SSI, MSI, LSI, VLSI, ULSI – basic idea only), Types of VLSI Chips (Analog & Digital VLSI chips, General purpose, ASIC, PLA, FPGA), Design principles (Digital VLSI – Concept of Regularity, Granularity etc), Design Domains (Behavioral, Structural, Physical), Y-Chart, Digital VLSI Design Steps.	6
2	**MOS structure**: E-MOS & D-MOS, Charge inversion in E-MOS, Threshold voltage, Flatband voltage, Potential balance & Charge balance, Inversion, MOS capacitances. **Three Terminal MOS Structure:** Body effect. **Four Terminal MOS Transistor**: Drain current, I-V characteristics. Current-voltage equations (simple derivation). **Scaling in MOSFET**: Short Channel Effects, General scaling, Constant Voltage & Field scaling.] **CMOS**: CMOS inverter, Simple Combinational Gates - NAND gate and NOR Gate using CMOS.	10

3	**Micro-electronic Processes for VLSI Fabrication**: Silicon Semiconductor Technology- An Overview, Wafer processing, Oxidation, Epitaxial deposition, Ion-implantation & Diffusion, Cleaning, Etching, Photo-lithography – Positive & Negative photo-resist **Basic CMOS Technology** – (Steps in fabricating CMOS), Basic n-well CMOS process, p-well CMOS process, Twin tub process, Silicon on insulator **Layout Design Rule**: Stick diagram with examples, Layout rules.	10
4	**Hardware Description Language** – VHDL or Verilog Combinational & Sequential Logic circuit Design.	10

Text Books:
1. Digital Integrated Circuit, J.M.Rabaey, Chandrasan, Nicolic, Pearson Education.
2. CMOS Digital Integrated Circuit, S.M.Kang & Y.Leblebici, TMH.
3. Modern VLSI Design, Wayne Wolf, Pearson Education.
4. VHDL, Bhaskar, PHI.
5. Advance Digital Design Using Verilog , Michel D. Celliti, PHI

References:
1. Digital Integrated Circuits, Demassa & Ciccone, John Willey & Sons .
2. Modern VLSI Design: system on silicon, Wayne Wolf; Addison Wesley Longman Publisher
3. Basic VLSI Design, Douglas A. Pucknell & Kamran Eshranghian, PHI
4. CMOS Circuit Design, Layout & Simulation, R.J.Baker, H.W.Lee, D.E. Boyee, PHI

Control System
CS705C
Contracts: 3L
Credits- 3
36L
Module – I:
a) INTRODUCTION
Concepts of Control Systems- Open Loop and closed loop control systems and their differences-
Different examples of control systems- Classification of control systems, Feed-Back
Characteristics, Effects of feedback.
Mathematical models – Differential equations, Impulse Response and transfer functions -
Translational and Rotational mechanical systems [4L]
Module – I:
b) TRANSFER FUNCTION REPRESENTATION
Transfer Function of linear systems, Block diagram representation of systems considering
electrical systems as examples –Block diagram algebra – Representation by Signal flow graph -
Reduction using mason's gain formula.
[4L]

Module – II:
a) TIME RESPONSE ANALYSIS
Standard test signals - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications – Steady state response - Steady state errors and error constants.[4L]
b) STABILITY ANALYSIS IN S-DOMAIN
The concept of stability – Routh's stability criterion – limitations of Routh's stability. Root Locus Technique: The root locus concept - construction of root loci-effects of adding poles and zeros to G(s)H(s) on the root loci. [5L]
Module – III:
a) FREQUENCY RESPONSE ANALYSIS
Introduction, Frequency domain specifications-Bode diagrams-Determination of Frequency domain specifications and transfer function from the Bode Diagram-Phase margin and Gain margin-Stability Analysis from Bode Plots. [5L]
b) : STABILITY ANALYSIS IN FREQUENCY DOMAIN
Polar Plots, Nyquist Plots Stability Analysis. [4L]
Module - IV :
a) CLASSICAL CONTROL DESIGN TECHNIQUES
Compensation techniques – Lag, Lead, Lead-Lag Controllers design in frequency Domain, PID Controllers. [5L]
b) STATE SPACE ANALYSIS OF CONTINUOUS SYSTEMS
Concepts of state, state variables and state model, derivation of state models from block diagrams, Diagonalization- Solving the Time invariant state Equations- State Transition Matrix and it's Properties – Concepts of Controllability and Observability [5L]
TEXT BOOKS:
Automatic Control Systems 8th edition– by B. C. Kuo 2003– John Wiley and son's.,
2. Control Systems Engineering – by I. J. Nagrath and M. Gopal, New Age International (P) Limited, Publishers, 2nd edition.
REFERENCE BOOKS:
1. Modern Control Engineering – by Katsuhiko Ogata – Prentice Hall of India Pvt. Ltd., 3rd edition, 1998.
2. Control Systems Engg. by NISE 3rd Edition – John Wiley

Modelling & Simulation
CS705D
Contracts: 3L
Credits- 3
Module-I: Introduction to Modelling and Simulation :
Nature of Simulation. Systems , Models and Simulation, Continuous and Discrete Systems, system modelling, Components of a simulation study, Introduction to Static and Dynamic System simulation , Application areas, Advantages ,Disadvantages and pitfalls of Simulation. **6L**
Module –II : System Dynamics & Probability concepts in Simulation :

Exponential growth and decay models, Generalization of growth models , Discrete and Continuous probability functions, Continuous Uniformly Distributed Random Numbers, Generation of a Random numbers, Generating Discrete distributions, Non-Uniform Continuously Distributed Random Numbers, Rejection Method. **10L**

Module-III : Simulation of Queuing Systems and Discrete System Simulation :
Poisson arrival patterns, Exponential distribution, Service times, Normal Distribution Queuing Disciplines, Simulation of single and two server queue. Application of queuing theory in computer system. Discrete Events ,Generation of arrival patterns ,Simulation programming tasks , Gathering statistics, Measuring occupancy and Utilization , Recording Distributions and Transit times . **14L**

Module-IV : Analysis of Simulation output :
Sensitivity Analysis, Validation of Model Results **6L**

Text Books:
1. Jerry Banks, John Carson, B.L.Nelson and D.M.Nicol " Discrete Event System Simulation", Fifth Edition, Pearson.
9. Narsingh Deo, 1979, System Simulation with Digital Computers, PHI.
10. Geoffrey Gordon, "System Simulation", PHI.
11. Averill M. Law and W.David Kelton, "Simulation Modelling and Analysis", Third Edition, McGraw Hill
12. J. N. Kapoor.. Mathematical Modelling, Wiley eastern Limited.

Reference Books:
1. Sankar Sengupta, "System Simulation and Modeling", Pearson.
2. C.Dennis Pegden, Robert E.Shannon and Randall P.Sadowski, 1995, Introduction to Simulation using SIMAN, 2nd Edn.,
Tata McGraw-Hill.
3. A.M.Law and W.D.Kelton.. Simulation Modelling and Analysis, T.M.H. Edition.

Practical

Group Discussion
HU781
Contracts: 3L
Credits- 2
To be prepared

Software Engineering Lab
CS791
Contracts: 3L
Credits- 2
Assignments to be given from the following
1.Preparation of requirement document for standard application problems in standard format.(e.g Library Management

System, Railway Reservation system, Hospital management System, University Admission system)

2.Project Schedule preparation .

3. Use Case diagram,Class diagram,Sequence diagram and prepare Software Design Document using tools like Rational Rose.(

For standard application problems)

4.Estimation of project size using Function Point(FP) for calculation.

5.Design Test Script/Test Plan(both Black box and White Box approach)

6.Compute Process and Product Metrics (e.g Defect Density,Defect Age,Productivity,Cost etc.)>Also by Cost Estimation

models.

Pattern Recognition Lab

CS793A

Contracts: 3L

Credits- 2

Efficient algorithms for nearest neighbour classification,

Example problem on Bayes classifier,

Decision tree construction.

Implementation of Linear Discriminant Function,

Implementation of Support Vector Machine.

Soft Computing Lab

CS793B

Contracts: 3L

Credits- 2

In this laboratory the students need to implement the soft computing tools in Matlab. Some exposure in C also can be used for neural

network and Genetic Algorithm.

A sample assignment list is given below:

FUZZY LOGIC:

1. Write a Matlab program to implement the different Fuzzy Membership functions.

2. Write a Matlab program to implement Fuzzy set operations and its properties.

3. Write a Matlab code to implement composition of Fuzzy and Crisp Relations.

4. Write Matalab code to implement Fuzzy Information System (develop the system using command line and GUI based

Fuzzy toolbox)

Neural network:

5. Write Matlab code to implement McCulloh-Pitts neural network for generate AND, OR functions.

6. Write Matlab code to implement Perceptron learning for particular set of problem.

7. Write Matlab code for OR function with bipolar inputs and targets using Adaline network.

8. Write Matlab code for XOR function with bipolar inputs and targets using Madaline network.

9. Write C program to implement McCulloh-Pitts model to generate AND, OR functions.

Genetic Algorithm

10. Write a Matlab code for maximizing $F(x)=x2$, , where x ranges from say 0 to 31 using Genetic Algorithm.

11. Use of Genetic Algorithm toolbox in matlab for optimization problem solving.

12. Implantation Simple Genetic Algorithm in C for solving optimization problem.

Artificial Intelligence Lab

CS793C

Contracts: 3L

Credits- 2

Assignments to be framed

Programming Languages such as PROLOG & LISP

Image Processing Lab

CS793D

Contracts: 3L

Credits- 2

1. Display of Grayscale Images.
2. Histogram Equalization.
3. Non-linear Filtering.
4. Edge detection using Operators.
5. 2-D DFT and DCT.
6. Filtering in frequency domain.
7. Display of color images.
8. Conversion between color spaces.
9. DWT of images.
10. Segmentation using watershed transform.

Internet Technology Lab

CS795A

Contracts: 3L

Credits- 2

Applet

1. Create a banner using Applet
2. Display clock using Applet
3. Create different shapes using Applet
4. Fill colors in shapes using Applet
5. Goto a link using Applet
6. Create an event listener in Applet
7. Display image using Applet
8. Open a link in a new window using Applet
9. Play sound using Applet
10. Read a file using Applet
11. Write to a file using Applet

JavaScript

12. Validate the fields of a form using JavaScript.
13. Guess a number based on user input.

14. Program on image rollover using JavaScript.

15. Display clock using JavaScript.

16. Prompt, alert, array, looping in JavaScript.

17. Calculator using JavaScript.

18. Validate e-mail, phone no. using reg-ex in JavaScript.

Perl

19. Write a perl script to implement associative array.

20. Write a perl script to implement the regular expression as follows:

a). If a string contains any vowel, count the total number of vowels.

b). If a string starts with MCA and end with bw, print 1 else 0.

c). If string starts with 0 or any no. a's, then print 1 else 0.

21. Write an html code to call a perl script from cgi-bin.

22. Implement the following with regular expression in Perl:

a). a*bc

b). a* at least 2 b's

c). a*exactly 3 b's

23. A simple File operation using Perl.

Client Server Programming

24. Write a socket program to get the current date and time from the server.

25. Write a socket program where the client will send lowercase letters and the server will return uppercase letter.

26. Write a server and a client program to implement TCP chat server-client.

27. Create a simple calculator application using Java RMI.

HTML

1. Start your web page with an <html> tag

i) Add a heading.

ii) Add a title.

iii) Start the <body> section.

iv) Add the following text using <H1> and </H1> tags:

This Web page was designed by (your name)

v) Add the following text using <H2> and </H2> tags: My HTML assignment

vi) Add a horizontal line

vii) Insert an image to your web page.

Note: You should then refer to your image with just the filename, and NOT the entire pathname to the file.

viii) Add another horizontal line.

ix) Enter a paragraph of text.

Write about things you have learned in html.

Make sure the text in this paragraph is a color other than black, but something one can see.

Add a link that takes you to your favorite webpage.

x) Start a new paragraph. Add a three item ordered list. Make it creative (don't just say item 1, item 2, etc… and keep it

clean)!

xi) Close out your body and html tags.

2. Start your web page with an <html> tag

i) Add a heading.

ii) Add a title.

iii) Start the <body> section.

iv) Start a new paragraph.

Use alignment attribute,

Use bold, italic, underline tags,

Use font tag and associated attributes,

Use heading tags,

Use preserve tag,

Use non breaking spaces (escape character).

3. Start your web page with an <html> tag

i) Add a heading.

ii) Add a title.

iii) Start the <body> section.

iv) Start a new paragraph.

Create Hyperlinks:

(a) Within the HTML document.

(b) To another URL.

(c) To a file that can be rendered in the browser.

4. Start your web page with an <html> tag

i) Add a heading.

ii) Add a title.

iii) Start the <body> section.

Create an unordered list,

Create an ordered list,

Use various bullet styles,

Created nested lists,

Use the font tag in conjunction with lists,

Create definition lists,

Use graphics as bullets.

5. Start your web page with an <html> tag

i) Add a heading.

ii) Add a title.

iii) Start the <body> section.

a) Create a simple table

Create borders and adjust border size.

Adjust table cell spacing.

Change border color.

Change table background color.

b) Align a new table on HTML page.

Perform cell text alignment,

Create multi-column tables,

Display information about your academic qualification into this table.

6. Start your web page with an <html> tag

i) Add a heading.

ii) Add a title.

iii) Start the <body> section.

Create a frameset:

Use frame tags,

Create vertical (column) frames,

Create horizontal (row) frames,

Create complex framesets,

Use the hyperlink tag to target displaying an HTML page to another frame.

7. Start your web page with an <html> tag

i) Add a heading.

ii) Add a title.

iii) Start the <body> section.

Create a simple HTML form.

Use the input tag to create a: text box; text area box; check box; list box; radio button; password field; popup menu; hidden

field. Use submit and reset buttons. Create an admission form using the above information.

8. Create a web page that will include an image. Then create image map to watch different parts of that image closely.

9. Using frames as an interface, create a series of web pages where the theme is to provide resources (internet, intranet,

static HTML pages) pertaining to the subject of HTML. Ideally, your goal is to create a resource that you can use long after

this module when needing information on HTML. As a minimum requirement to this assignment your webpage should:

• Consist of at least 3 frames.

• Contain at least 5 URLs to internet and/or intranet sites that you can reference as part of your job.

• Contain at least 5 references to documents that you have created that you use on a regular basis.

• Contain at least 5 references to documents others have created that you use on a regular basis.

• Be organized in a fashion that is logical and intuitive to you.

• Is done with enough quality that you would not be opposed to it being a link at another site.

10. Create a web page as you wish and the html elements of the page will be styled by CSS.

XML

1. Write a XML program that will create an XML document which contains your mailing address.

2. Write a XML program that will create an XML document which contains description of three book category.

3. Create an XML document that contains the name and price per pound of coffee beans.

i) In your XML document mention all properties of XML declaration.

ii) The root element has name <coffee_bean>

iii) Create nested elements for different types of coffee.

iv) Validate the document and if any parsing error is present, fix them.

4. Create an XML document that contains airline flight information.

i) In your XML document mention all properties of XML declaration.

ii) The root element has name <airlines>

iii) Create three nested <carrier> elements for three separate airlines. Each element should include a name attribute.

iv) Within each <carrier> nest at least two <flight> ,each of which contains departure_city, destination_ city, fl_no, dept_time.

v) Validate the document and if any parsing error is present fix them.

5. Create an XML version of your resume. Include elements such as your name and position desired. Nest each of your

former employers within an <employer> element. Also, nest your educational experience within an <education> element.

Create any other nested elements that you deem appropriate, such as <references> or <spcl_skills> elements.

6. Create a DTD on product catalog.

Microelectronics & VLSI Lab
CS795B
Contracts: 3L
Credits- 2
To be Implemented..

Control System Lab
CS795C
Contracts: 3L
Credits- 2

Sl.No.	Name of the Experiment	Periods
•	Familiarization with MATLAB Control System tool Box, MATLAB-SIMULINK tool box & pSPICE.	3
•	Determination of step response for 1st order & 2nd order system with amity feedback on CRO & calculation of control system specifications for variations of system design.	3
•	Simulation of step response & impulse response for Type-I & Type-II system with unity feedback using MATLAB & pSPICE.	3
•	Determination of root locus, Bode-plot, Nyquist Plot, using MATLAB control system	6

	toolbox for a given 2nd order transfer function & determination of different control system specifications.	
•	Determination of PI, PD, and PID controller action on 1st order simulated process.	3
•	Determination of approximate transfer function experimentally using Bode Plot.	3
•	Evaluation of steady-state error, setting time, percentage peak overshoots, gain margin, phase margin with addition of lead compensator in forward path transfer functions using MATLAB & pSPICE.	3
•	Study of position control system using servomotor.	3
•	Design and hardware implementation of a temperature controller using microprocessor/microcontroller.	6

Modelling & Simulation Lab
CS795D
Contracts: 3L
Credits- 2
In this laboratory the students will develop different simulation models. Students also may use any standard software to develop the
models.(Using MATLAB?SCILAB/Any other simulation package)
A sample assignment list is given below:
1. Simulate CPU scheduling algorithm using queuing system a) FCFS b) SJF c) Priority Algo
2. Simulate congestion control algorithms.
3. Simulate disk scheduling algorithms.
4. Simulate Telephone system model
5. Simulate traffic system in computer networks

Syllabus to be implemented from the Academic Year 2014

COMPUTER SCIENCE ENGINEERING SEMESTER VIII

Sl. No.	Field	Theory	L	T	P	Total	Credit Points
		C. THEORY					
			L	T	P	Total	
1	HU801A HU801B	A. Organisational Behaviour B. Project Management	2	0	0	2	2
2	CS801	A. Advanced Computer Architecture B. Parallel Computing C. Natural Language Processing D. Cryptography & Network Security E. Business Analytics	3	0	0	3	3
3	CS802	A. Technology Management (HSS) B. Cyber Law & Security Policy (HSS) C. Optical Networking (ECE) D. Low Power Circuits & Systems (ECE) E. E-Commerce(IT) F. Robotics(EE & ME)	3	0	0	3	3
		Total of Theory				**8**	**8**

VIII Semester

Theory

Organisational Behaviour
HU801A
Contracts: 2L
Credits- 2

1. Organizational Behaviour: Definition, Importance, Historical Background, Fundamental Concepts of OB, Challenges and Opportunities for OB.   **[2]**
2. Personality and Attitudes: Meaning of personality, Personality Determinants and Traits, Development of Personality, Types of Attitudes, Job Satisfaction.   **[2]**
3. Perception: Definition, Nature and Importance, Factors influencing Perception, Perceptual Selectivity, Link between Perception and Decision Making.   **[2]**
4. Motivation: Definition, Theories of Motivation - Maslow's Hierarchy of Needs Theory, McGregor's Theory X & Y, Herzberg's Motivation-Hygiene Theory, Alderfer's ERG Theory, McClelland's Theory of Needs, Vroom's Expectancy Theory.   **[4]**
5. Group Behaviour: Characteristics of Group, Types of Groups, Stages of Group Development, Group Decision Making.   **[2]**
6. Communication: Communication Process, Direction of Communication, Barriers to effective Communication.   **[2]**

A. PRACTICAL							
4	**CS891**	Design Lab / Industrial problem related practical training (Workshop needed)	0	0	6	6	4
5	**CS892**	Project-2	0	0	12	12	6
6	CS893	Grand Viva					3
		Total of Practical				18	13
		Total of Semester				26	21

7. Leadership: Definition, Importance, Theories of Leadership Styles.   **[2]**
8. Organizational Politics: Definition, Factors contributing to Political Behaviour.   **[2]**

9. Conflict Management: Traditional vis-a-vis Modern View of Conflict, Functional and Dysfunctional Conflict, Conflict Process, Negotiation – Bargaining Strategies, Negotiation Process. **[2]**
10. Organizational Design: Various Organizational Structures and their Effects on Human Behaviour, Concepts of Organizational Climate and Organizational Culture. **[4]**

References:
1. Robbins, S. P. & Judge, T.A.: Organizational Behavior, Pearson Education, 15th Edn.
2. Luthans, Fred: Organizational Behavior, McGraw Hill, 12th Edn.
3. Shukla, Madhukar: Understanding Organizations – Organizational Theory & Practice in India, PHI
4. Fincham, R. & Rhodes, P.: Principles of Organizational Behaviour, OUP, 4th Edn.
5. Hersey, P., Blanchard, K.H., Johnson, D.E.- Management of Organizational Behavior Leading Human Resources, PHI, 10th Edn.

Project Management
HU801B
Contracts: 2L
Credits- 2

1. Project Management Concepts: Concept and Characteristics of a Project, Importance of Project Management. **[1]**
2. Project Planning: Project Evaluation, Financial Sources, Feasibility Studies. **[4]**
3. Project Scheduling: Importance of Project Scheduling, Work Breakdown Structure and Organization Breakdown Structure, Scheduling Techniques – Gantt Chart and LOB, Network Analysis – CPM/PERT. **[6]**
4. Time Cost Trade-off Analysis – Optimum Project Duration. **[2]**
5. Resource Allocation and Leveling. **[2]**
6. Project Life Cycle. **[2]**
7. Project Cost – Capital & Operating Costs, Project Life Cycle Costing, Project Cost Reduction Methods. **[2]**
8. Project Quality Management: Concept of Project Quality, TQM in Projects, Project Audit. **[1]**
9. Software Project Charateristics and Mangement **[2]**
10. IT in Projects: Overview of types of Softwares for Projects, Major Features of Project Management Softwares like MS Project, Criterion for Software Selection. **[2]**

References
1. Gopalkrishnan P. and Rama Mmoorthy: Text Book of Project Management, Macmillan

2. Nicholas John M.: Project Management for Business and Technology – Principles and Practice, Prentice Hall India, 2nd Edn.
3. Levy Ferdinand K., Wiest Jerome D.: A Management Guide to PERT/CPM with GERT/PDM/DCPM and other networks, Prentice Hall India, 2nd Edn.
4. Mantel Jr., Meredith J. R., Shafer S. M., Sutton M. M., Gopalan M. R.: Project Management: Core Text Book, Wiley India, 1st Indian Edn.
5. Maylor H.: Project Management, Pearson, 3rd Edn.
6. Nagarajan K.: Project Management, New Age International Publishers, 5th Edn.
7. Kelkar. S.A, Sotware Project Management: A concise Study, 2nd Ed., PHI

Advanced Computer Architecture
CS801A
Contracts: 3L
Credits- 3

Computer Architecture and Organization-Review, Fundamentals of Computer Design, Technology Trends Cost Performance Analysis (3L)
Parallel Processing Architectures- Taxonomy- SISD, MISD, SIMD,MIMD, PRAM models (3L)

Data and Resource Dependencies, Program Partitioning and Scheduling, Control Flow vs. Data Flow (3L)
Network topologies-Static, Dynamic, Types of Networks (3L)
RISC vs. CISC, Memory Hierarchy, Virtual Memory (4L)
Concepts of Pipelining, Instruction Pipelining, dynamic pipelining, arithmetic pipelines. (4L)
Multiprocessors- Multistage Networks, Cache Coherence, Synchronization, Message- passing (4L)
Vector Processing Principles- Instruction types, Compound, Vector Loops, Chaining (4L)
Array Processors- Structure, Algorithms (3L)
Data Flow Architecture- Graphs. Petri Nets, Static and Dynamic DFA, VLSI Computations (4L)
Parallel Programming Models, Languages, Compilers (4L)

Books:
Computer Architecture and Parallel Processing- Kai Hwang and A. .Brigggs International Edition, McGraw Hill
Advanced Computer Architecture: D. Sima, T. fountain, P. Kacsuk, Pearson
Parallel Computer Architecture: D. Culler, J.P.Singh, A.Gupta, Elsevier

Parallel Computing
CS801B
Contracts: 3L
Credits- 3
37L

Module I

Introduction.-Parallel Processing Environment- Pipelining and Data Parallelism, Scalability, Flynn's Taxonomy,. (3L)
Parallel Processing organization- Mesh, Hyper-tree, Pyramid, Butterfly, Hypercube network (4L)

Module II

Parallel Algorithms –Structure, cost, Analysis ;Elementary Algorithms: Broadcast, Prefix sums, All sums (4L)
Algorithms on Selection problem, Merging-Odd-even merging network, CREW Merging, N-ary searching (6L)
Matrix Transposition ,Matrix Multiplications- 2D Mesh SIMD ,Hypercube SIMD, Shuffle-Exchange SIMD models. Discrete Fourier Transform, Fast Fourier Transform (6L)

Module III

Linear system of equations- Gaussian Elimination, Gauss-Seidel algorithm, Jacobi algorithm (3L)
Sorting – Enumeration sort, Odd-even transposition sort, Bitonic merge
Ellis's Algorithm (3L)

Module IV
Graph Algorithms, Spanning Tree Algorithms, (4L)
Parallel Programming Languages –FORTRAN 90, OCCAM(4L)

Books for reference:
1. Parallel Computing –Theory and Practice -Michael J. Quinn (McGraw Hill Inc.)
2. Design and Analysis of Parallel Algorithms- S.G. Akl (PH)

Natural Language Processing

CS801C
Contracts: 3L
Credits- 3

Module I

Regular Expressions and Automata_ Recap) [**2L**]
Introduction to NLP, Regular Expression, Finite State Automata
Tokenization [**5L**]
Word Tokenization, Normalization, Sentence Segmentation, Named Entity Recognition,
Multi Word Extraction, Spell Checking – Bayesian Approach, Minimum Edit Distance
Morphology [**4L**]
Morphology – Inflectional and Derivational Morphology, Finite State Morphological Parsing,
The Lexicon and
Morphotactics, Morphological Parsing with Finite State Transducers, Orthographic Rules and
Finite State Transducers,
Porter Stemmer

Module II

Language Modeling [**4L**]
Introduction to N-grams, Chain Rule, Smoothing – Add-One Smoothing, Witten-Bell
Discounting; Backoff, Deleted
Interpolation, N-grams for Spelling and Word Prediction, Evaluation of language models.

Hidden Markov Models and POS Tagging [**4L**]
Markov Chain, Hidden Markov Models, Forward Algorithm, Viterbi Algorithm, Part of Speech
Tagging – Rule based and
Machine Learning based approaches, Evaluation

Module III

Text Classification [**4L**]
Text Classification, Naïve Bayes' Text Classification, Evaluation, Sentiment Analysis – Opinion
Mining and Emotion
Analysis, Resources and Techniques
Context Free Grammar [**5L**]

Context Free Grammar and Constituency, Some common CFG phenomena for English, Top-Down and Bottom-up parsing,
Probabilistic Context Free Grammar, Dependency Parsing

Module IV

Computational Lexical Semantics [**4L**]
Introduction to Lexical Semantics – Homonymy, Polysemy, Synonymy, Thesaurus – WordNet, Computational Lexical
Semantics – Thesaurus based and Distributional Word Similarity

Information Retrieval [**5L**]
Boolean Retrieval, Term-document incidence, The Inverted Index, Query Optimization, Phrase Queries, Ranked Retrieval
– Term Frequency – Inverse Document Frequency based ranking, Zone Indexing, Query term proximity, Cosine ranking,
Combining different features for ranking, Search Engine Evaluation, Relevance Feedback

Books:
1. Speech and Language Processing, Jurafsky and Martin, Pearson Education
2. Foundation of Statistical Natural Language Processing, Manning and Schutze, MIT Press

Cryptography & Network Security
CS801D
Contracts: 3L
Credits- 3

Total: - 38 Lectures
Module I: Attacks on Computers & Computer Security (5L)

Introduction, Need for Security, Security approaches, Principles of Security, Types of attack.

Module II: Cryptography: Concepts & Techniques (7L)
Introduction, Plaintext & Cipher text, Substitution Techniques, Transposition Techniques, Encryption & Decryption,
Symmetric & Asymmetric key Cryptography, Key Range & Key Size

Module III: Symmetric Key Algorithm (8L)

Introduction, Algorithm types & Modes, Overview of Symmetric Key Cryptography, DES(Data Encryption Standard) algorithm, IDEA(International Data Encryption Algorithm) algorithm, RC5(Rivest Cipher 5) algorithm.

Module IV: Asymmetric Key Algorithm, Digital Signature and RSA (5L)

Introduction, Overview of Asymmetric key Cryptography, RSA algorithm, Symmetric & Asymmetric key Cryptography together, Digital Signature, Basic concepts of Message Digest and Hash Function (Algorithms on Message Digest and Hash function not required).

Module V: Internet Security Protocols, User Authentication (6L)

Basic Concepts, SSL protocol, Authentication Basics, Password, Authentication Token, Certificate based Authentication, Biometric Authentication.

Module VI : Electronic Mail Security (4L)

Basics of mail security, Pretty Good Privacy, S/MIME.
Module7: Firewall (3L)
Introduction, Types of firewall, Firewall Configurations, DMZ Network

Text :
1. "Cryptography and Network Security", William Stallings, 2nd Edition, Pearson Education Asia
2. "Network Security private communication in a public world", C. Kaufman, R. Perlman and M. Speciner, Pearson
3. Cryptography & Network Security: Atul Kahate, TMH.

Reference :
1. "Network Security Essentials: Applications and Standards" by William Stallings, Pearson
2. "Designing Network Security", Merike Kaeo, 2nd Edition, Pearson Books
3. "Building Internet Firewalls", Elizabeth D. Zwicky, Simon Cooper, D. Brent Chapman, 2nd Edition, Oreilly
4. "Practical Unix & Internet Security", Simson Garfinkel, Gene Spafford, Alan Schwartz, 3rd Edition, Oreilly

Business Analytics
CS801E
Contracts: 3L
Credits- 3

Total: - 38 Lectures
Module I: Foundations of Business Analytics (4L)
Introduction to Business Analytics, Analytics on Spreadsheets.

Module II: Product-Market Fit: Gap Analysis (6L)
Gap Analysis, Carrying Out Gap Analysis, Steps in Gap Analysis, Conducting a Representative Survey for Gap Analysis, Predicting
Consumer Behaviour and Gap Analysis in Smartphone Market.

Module III: Analytical Modeling by Factor and Cluster Analysis (8L)
Factor Analysis Concepts, Application of Factor Analysis
Concepts of Cluster Analysis, Similarity Measures, Application of Cluster Analysis.

Module IV: Analytical Modeling by Logistics Regression and Discriminant Analysis (10L)
Linear Discriminant Analysis Model, Predictive Modeling using Discriminant Analysis, Application of Linear Discriminant Analysis for Credit Scoring of Loan Applicants.
Theoretical Formulation of Logistics Regression, Mathematical Interpretation of Logistics Regression, Indicator for Model Fit, Applying Logistics Regression, Application of Logistics Regression in Predicting Risk in Portfolio Management Testing the Reliability/Consistency of the Different Factors Measured.

Module V: Segmentation of primary target market by Heuristic Modeling (4L)
Introduction to RFM Analysis Enhancing Response Rates with RFM Analysis.

Module VI: Segmentation of target market based on large databases using Decision Tree approach. (6L)
Introduction to Chi-square Automatic Interaction Detection (CHAID)
Predictive Modelling by CHAID.

Text:
1. "Business Analytics: An Application Focus", Purba Halady Rao, Prentice Hall.
2. "Business Analytics" James R. Evans, Pearson.

Reference:
1. "Modeling Techniques in Predictive Analytics", Thomas W. Miller, Pearson
2. "Enterprise Analytics: Optimize Performance, Process, and Decisions Through Big Data", Thomas H. Davenport, Pearson.
3. "Fundamentals of Business Analytics", Seema Acharya, Wiley India.
4. "Business Intelligence: A Managerial Perspective on Analytics", Ramesh Sharda, Dursun Delen, Efraim Turban, David King, Prentice Hall.

Technology Management
CS802A
Contracts: 3L
Credits- 3

:To be Implemented.

Cyber law and Security Policy
CS802B
Contracts: 3L
Credits- 3

Module – IA: *Introduction of Cybercrime*: [4]
What is cybercrime?, Forgery, Hacking, Software Piracy, Computer Network intrusion

Module – IB: *Category of Cybercrime*: [4]
how criminals plan attacks, passive attack, Active attacks, cyberstalking.

Module – II: *Cybercrime Mobile & Wireless devices:* [8]
Security challenges posted by mobile devices, cryptographic security for mobile devices, Attacks on mobile/cellphones, Theft, Virus, Hacking. Bluetooth; Different viruses on laptop.

Module -III: *Tools and Methods used in Cyber crime:* [8]
Proxy servers, panword checking, Random checking, Trojan Horses and Backdoors; DOS & DDOS attacks; SQL injection: buffer over flow.

Module – IVA: *Phishing & Identity Theft*: [4]
Phising methods, ID Theft; Online identity method.

Module – IVB: *Cybercrime & Cybersecurity***:** [4]
Legal aspects, indian laws, IT act, Public key certificate

Text: Cyber security by Nina Gobole & Sunit Belapune; Pub: Wiley India.

Optical Networking
CS802C
Contracts: 3L
Credits- 3

Optical Networks: [36 hours]

Module – I: [10]
Optical communications - Basics of: [2]
       Sources.
       Transmitters.
       Modulators.
       Optical fiber.
       Photodetectors, and
       Receivers.
Switching in networks.[2]
       Circuit switched.
       Packet switched.
       Cell switched.
       Virtual circuit switched.
       Burst switched (fast circuit switched).
Transmission [1]
       3. Asynchronous.
       4. Synchronous.
Layering in packet switched networks. [2]
       8. Motivation.
9. Commonly used abstraction,
       9.2 Physical layer.
       9.3 Data link layer.
       9.4 Network layer.
       9.5 Transport layer.
       9.6 Application layer.

Layering in circuit switched networks. [3]

    12. Physical layer.

    13. Multiplexing standards.

    14. Signalling - CAS, CCS.

    15. SS7 concept.

Module – II: [8]

Data plane, management plane, control plane - concept. [1]

First generation networks. [2]

    l) SDH/SONET.

    m) Computer interconnections - ESCON, Fiber Channel, HIPPI.

    n) FDDI.

    o) ATM.

    p) DQDB.

Components – description. [3]

    6. Mode locked laser (for ps pulses).

    7. Tunable filters.

    8. Multiplexers.

    9. Demultiplexers.

    10. Tunable wavelength convertors.

    11. Optical amplifiers.

        a. Fiber - EDFA.

        b. SOA.

    12. Tunable transmitters.

    13. Tunable receivers.

    14. Dispersion compensating fibers.

Multiplexing techniques. [2]

    12. SDM.

    13. TDMA.

    14. WDMA (OFDMA).

        1. DWDM.

        2. SCM.

    15. CDMA.

Module – III : [9]

Protocols for single channel broadcast networks. (recapitulation) [1]

    12. ALOHA, CSMA/CD.

13. Problems with CSMA/CD.

14. Definition of high speed network.

Classification of multiple access methods. (recapitulation) [1]

11. Random access.

12. Reserved acces.

13. Scheduled access.

Multichannel multiple access protocols. [2]

3. Desirable characsticks of protocol.

1. Scalability.

2. Fairness.

4. TTTR.

5. TTFR.

6. FTTR.

7. FTFR.

8. Problem of wavelength stability.

Multihop WDM network. [2]

xii. Shufflenet.

xiii.MSN.

Wavelength routed networks. [3]

14.Mesh.

15. Ring-Traffic grooming problem.

Module – IV: [9]

IP over Optical framework. [2]

➢ ASON

➢ MPëS.

Burst switched network (bufferless networks) [1]

All-optical circuit switches. [1]

All-optical packet switches. [3]

iii) Broadcast and select.

iv) Wavelength routed.

v) Space switch based.

vi) Discussion on various switch architectures.

vii) Packet buffering techniques.

viii)Travelling type.

ix) Recirculating type.

Protection and restoration. [2]

- Restoration mechanism.
- Restoration timing issues.
- Path protection.
- Span protection.
- P-cycles.

Text:
References:
1. WDM Networks: Biswanath Mukherjee.
2. Optical Networks - A Practical Perspective: Rajiv Ramaswamy & Kumar Sivarajan.

Low Power Circuits & Systems
CS802D
Contracts: 3L
Credits-3

Basics of MOS circuits: MOS Transistor structure and device modeling; MOS Inverters; MOS Combinational Circuits – Different Logic Families

Sources of Power dissipation: Dynamic Power Dissipation: Short Circuit Power; Switching Power; Gliching Power: Static Power Dissipation

Supply Voltage Scaling Approaches: Device feature size scaling; Multi-Vdd Circuits; Architectural level approaches: Parallelism, Pipelining; Voltage scaling using high-level transformations; Dynamic voltage scaling; Power Management.

Switched Capacitance Minimization Approaches: Hardware Software Tradeoff; Bus Encoding; Two's complement Vs Sign Magnitude; Architectural optimization; Clock Gating; Logic styles

Leakage Power minimization Approaches: Variable-threshold-voltage CMOS (VTCMOS) approach; Multi-threshold-voltage CMOS (MTCMOS) approach ; Dual-Vt assignment approach (DTCMOS); Transistor stacking.

Special Topics: Adiabatic Switching Circuits; Battery-aware Synthesis; Variation tolerant design

References:

1. Sung_Mo Kang, Yusuf Leblebici, CMOS Digital Integrated Circuits, Tata McGraw Hill
2. Neil H. E. Weste and K. Eshraghian, Principles of CMOS VLSI Design, 2nd Edition, Addison Wesley (Indian reprint).
3. A. Bellamour, and M. I. Elmasri, *Low Power VLSI CMOS Circuit Design*, Kluwer Academic Press, 1995
4. Anantha P. Chandrakasan and Robert W. Brodersen, Low Power Digital CMOS Design, Kluwer Academic Publishers, 1995
5. Kaushik Roy and Sharat C. Prasad, Low-Power CMOS VLSI Design, Wiley-Interscience, 2000

E Commerce
CS802E
Contracts: 3L
Credits-3

Introduction to E-Commerce [6L]: Definition, Scope of E-Commerce, Hardware requirements, E-Commerce and Trade Cycle, Electronic Markets, Electronic Data Interchange and Internet Commerce.

Business to Business E-Commerce [7L]: Electronic Markets, Electronic Data Interchange (EDI): Technology, Standards (UN/EDIFACT), Communications, Implementations, Agreements, Security, EDI and Business, Inter-Organizational E-commerce.

Legal issues [5L]: Risks: Paper Document vs. Electronic document, Authentication of Electronic document, Laws, Legal issues for Internet Commerce: Trademarks and Domain names, Copyright, Jurisdiction issues, Service provider liability, Enforceable online contract.

Security Issues [6L]: Security Solutions: Symmetric and Asymmetric Cryptosystems, RSA, DES, and Digital Signature, Protocols for secure messaging, Secure Electronic Transaction (SET) Protocol, Electronic cash over internet, Internet Security.

Business to Consumer E-Commerce [8L]: Consumer trade transaction, Internet, Page on the Web, Elements of E-Commerce with VB, ASP, SQL.

E-business [7L]: Internet bookshops, Software supplies and support, Electronic Newspapers, Internet Banking, Virtual Auctions, Online Share Dealing, Gambling on the net, E-Diversity, Case studies through internet.

Books:

1. E-Commerce-Strategy, Technologies & Applications by David Whitley, TMH
2. E-Commerce- The cutting edge of business by Kamlesh K. Bajaj, TMH
3. E-Commerce through ASP by W Clarke- BPB

4. Beginning E-Commerce with VB, ASP, SQL Server 7.0 & MTS by Mathew Reynolds, Wrox Publishers

5. Global Electronic Commerce- Theory and Case Studies by J. Christopher Westland and Theodore H. K Clark, University Press

Robotics
CS802F
Contracts: 3L
Credits- 3

No.	Topics	Number of Lectures
	Module 0: Preface, Information for Students and Teachers, Acknowledgement	1
1.	**Module 1: Introduction**	
	Introduction -- brief history, types, classification and usage, Science and Technology of robots, Some useful websites, textbooks and research journals.	
2.	**Module 2: Elements of robots – links, joints, actuators, and sensors**	5
	Position and orientation of a rigid body, Homogeneous transformations, Representation of joints, link representation using D-H parameters, Examples of D-H parameters and link transforms, different kinds of actuators – stepper, DC servo and brushless motors, model of a DC servo motor, Types of transmissions, Purpose of sensors, internal and external sensors, common sensors – encoders, tachometers, strain gauge based force-torque sensors, proximity and distance measuring sensors, and vision.	
3.	**Module 3: Kinematics of serial robots**	4
	Introduction, Direct and inverse kinematics problems, Examples of kinematics of common serial manipulators, workspace of a serial robot, Inverse kinematics of constrained and redundant robots, Tractrix based approach for fixed and free robots and multi-body systems, simulations and experiments, Solution procedures using theory of elimination, Inverse kinematics solution for the general 6R serial manipulator.	
4.	**Module 4: Kinematics of parallel robots**	5
	Degrees-of-freedom of parallel mechanisms and manipulators, Active and passive joints, Constraint and loop-closure equations, Direct	

	kinematics problem, Mobility of parallel manipulators, Closed-from and numerical solution, Inverse kinematics of parallel manipulators and mechanisms, Direct kinematics of Gough-Stewart platform.	
5.	**Module 5: Velocity and static analysis of robot manipulators**	5
	Linear and angular velocity of links, Velocity propagation, Manipulator Jacobians for serial and parallel manipulators, Velocity ellipse and ellipsoids, Singularity analysis for serial and parallel manipulators, Loss and gain of degree of freedom, Statics of serial and parallel manipulators, Statics and force transformation matrix of a Gough-Stewart platform, Singularity analysis and statics.	
6.	**Module 6: Dynamics of serial and parallel manipulators**	4
	Mass and inertia of links, Lagrangian formulation for equations of motion for serial and parallel manipulators, Generation of symbolic equations of motion using a computer, Simulation (direct and inverse) of dynamic equations of motion, Examples of a planar 2R and four-bar mechanism, Recursive dynamics, Commercially available multi-body simulation software (ADAMS) and Computer algebra software Maple.	
7.	**Module 7: Motion planning and control**	6
	Joint and Cartesian space trajectory planning and generation, Classical control concepts using the example of control of a single link, Independent joint PID control, Control of a multi-link manipulator, Non-linear model based control schemes, Simulation and experimental case studies on serial and parallel manipulators, Control of constrained manipulators, Cartesian control, Force control and hybrid position/force control, Advanced topics in non-linear control of manipulators.	
8.	**Module 8: Modeling and control of flexible robots**	4
	Models of flexible links and joints, Kinematic modeling of multi-link flexible robots, Dynamics and control of flexible link manipulators, Numerical simulations results, Experiments with a planar two-link flexible manipulator.	
9.	**Module 9: Modeling and analysis of wheeled mobile robots**	3
	Introduction and some well known wheeled mobile robots (WMR), two and three-wheeled WMR on flat surfaces, Slip and its modeling, WMR on uneven terrain, Design of slip-free motion on uneven terrain,	

	Kinematics, dynamics and static stability of a three-wheeled WMR's on uneven terrain, Simulations using Matlab and ADAMS.	
10.	**Module 10: Selected advanced topics in robotics**	3
	Introduction to chaos, Non-linear dynamics and chaos in robot equations, Simulations of planar 2 DOF manipulators, Analytical criterion for unforced motion. Gough-Stewart platform and its singularities, use of near singularity for fine motion for sensing, design of Gough-Stewart platform based sensors. Over-constrained mechanisms and deployable structures, Algorithm to obtain redundant links and joints, Kinematics and statics of deployable structures with pantographs or scissor-like elements (SLE's).	

Reference Books:

Practical

Design Lab
CS891
Contracts: 6
Credits- 4

The Spoken tutorials are designed by IIT-Bombay and promoted by MHRD, GoI, to make the students industry ready. These tutorials can be organised in Colleges and promoted among students. The tutorials followed by practice will enable the students to handle problems. After 2-3 weeks of practice there is a scope for evaluation and certification.

Please visit the website for details. http://www.spoken-tutorial.org

Any three topics from the following may be can be chosen:

1. C and C++ ; Basic and Intermediate Levels

2. **Advanced C++**

3. Java and Netbeans

4. Java Business Application

5. PHP & MySQL

6. Python

7. Scilab

8. Linux and Ubuntu