Proposed Subject Scheme for B.E. (Computer Engineering)

Semester	1	2	3	4	5	6 (Electives)
III	Digital Electronics Digital Electronics Lab	Electronic Devices & Circuits Electronics Lab	Data Structures and Algorithms Data Structure Lab (C)	Discrete Mathematical Structure Humanities and Social Sciences	Mathematics III	• Management Information Systems • Line Communication • E-Commerce
IV	Principles of Programming Languages Communication Lab	Microprocessor & Interfaces Microprocessor Lab	Object Oriented Programming OOPS Lab (C++)	System Software Engineering System Software Design Lab	Statistics and Probability theory	• Analog & Digital Communication • Intellectual Property Rights • Open Source Technology
V	Software Engineering Software Engineering Lab	Computer Architecture Computer Architecture Lab	Database Management Systems Database Management Lab	Computer Graphics Computer Graphics lab	Telecommunication Fundamentals	• Logic & Functional Programming • Information Theory & Coding • Advanced Data Structures
VI	Operating Systems Shell programming Lab	Computer Networks Network Lab	Design & Analysis of Algorithms Web Programming Lab	Embedded Systems Microcontroller Lab	TOC	• Digital Signal Processing • Advanced software engineering • Microwave & Satellite Communication
VII	Compiler construction Compiler Design Lab	Data Mining & Ware Housing Data Mining & Ware Housing Lab	Logic Synthesis Logic Synthesis Lab	Artificial Intelligence Project Stage I	Multimedia System	• Service Oriented Architecture • Optical communication • Real Time Systems
VIII	Information System and Securities Information System and Securities Lab	CAD For VLSI Design VLSI Design Lab	Advanced Computer Architectures X-windows lab	Project Stage II	Seminar	• Distributed Systems • Image Processing • NLP

3rd Semester

Sub. Code	Name of Subject	Teaching Periods			Duration of Exams (Hours)	Maximum Marks Allocation				
		L	T	P		Internal	End Term	Sessional	Practical	Total
3CS1	Digital Electronics	3	-	-	3	20	80	-	-	100
3CS2	Electronic Devices & Circuits	3	1	-	3	20	80	-	-	100
3CS3	Data Structure and Algorithms	3	-	-	3	20	80	-	-	100
3CS4	Discrete Mathematical Structures	3	-	-	3	20	80	-	-	100
3CS5	Mathematics III	3	1	-	3	20	80	-	-	100
3CS6.1 3CS6.2 3CS6.3	Management Information Systems Line Communication E-Commerce	3	-	-	3	20	80	-	-	100
Total		**18**	**2**	**-**	**-**	**120**	**480**	**-**	**-**	**600**
3CS7	Digital Electronics Lab	-	-	2	3	-	-	60	40	100
3CS8	Electronics Lab	-	-	2+2	3	-	-	60	40	100
3CS9	Data Structure Lab	-	-	2+2	3	-	-	60	40	100
3CS10	Humanities and Social Science	-	-	2		-	-	-	-	50
Discipline & Extra Curricular Activities		-	-	-	-	-	-	-	-	50
Total		**-**	**-**	**12**	**-**	**-**	**-**	**180**	**120**	**400**
Grand Total		**18**	**2**	**12**	**-**	**120**	**480**	**180**	**120**	**1000**

4th Semester

Sub. Code	Name of Subject	Teaching Periods			Duration of Exams (Hours)	Maximum Marks Allocation				
		L	T	P		Internal	End Term	Sessional	Practical	Total
4CS1	Principles of Programming Languages	3	-	-	3	20	80	-	-	100
4CS2	Microprocessor and Interfaces	3	-	-	3	20	80	-	-	100
4CS3	Object Oriented Programming	3	1	-	3	20	80	-	-	100
4CS4	System Software	3	-	-	3	20	80	-	-	100
4CS5	Statistics and Probability Theory	3	1	-	3	20	80	-	-	100
4CS6.1 4CS6.2 4CS6.3	Analog and Digital Communication Intellectual Property Rights Open Source Technology	3	-	-	3	20	80	-	-	100
Total		**18**		**-**	**-**	**120**	**480**	**-**	**-**	**600**
4CS7	Communication Lab	-	-	2	3	-	-	45	30	75
4CS8	Microprocessor Lab	-	-	2	3	-	-	45	30	75
4CS9	Object Oriented Programming Lab	-	-	2+2	3	-	-	60	40	100
4CS10	System Software Lab	-	-	2+2	3	-	-	60	40	100
Discipline & Extra Curricular Activities		-	-	-	-	-	-	-	-	50
Total		**-**	**-**	**12**	**-**	**120**	**-**	**210**	**140**	**400**
Grand Total		**18**		**12**	**-**	**120**	**480**	**210**	**140**	**1000**

5th Semester

Sub. Code	Name of Subject	Teaching Periods			Duration of Exams (Hours)	Maximum Marks Allocation				
		L	T	P		Internal	End Term	Sessional	Practical	Total
5CS1	Software Engineering	3	1	-	3	20	80	-	-	100
5CS2	Computer Architecture	3	-	-	3	20	80	-	-	100
5CS3	Database Management Systems	3	-	-	3	20	80	-	-	100
5CS4	Computer Graphics	3	-	-	3	20	80	-	-	100
5CS5	Telecommunication Fundamentals	3	1	-	3	20	80	-	-	100
5CS6.1 5CS6.2 5CS6.3	Logic & Functional Programming Information Theory and Coding Advanced Data Structure	3	-	-	3	20	80	-	-	100
Total		**18**	**2**	**-**	**-**	**120**	**480**	**-**	**-**	**600**
5CS7	Software Engineering Lab	-	-	2+2	3	-	-	60	40	100
5CS8	Computer Architecture Lab	-	-	2+2	3	-	-	60	40	100
5CS9	Database Management Lab	-	-	2	3	-	-	45	30	75
5CS10	Computer Graphics Lab	-	-	2	3	-	-	45	30	75
Discipline & Extra Curricular Activities		-	-	-	-	-	-	-	-	50
Total		**-**	**-**	**12**	**-**	**-**	**-**	**210**	**140**	**400**
Grand Total		**18**	**2**	**12**	**-**	**120**	**480**	**210**	**140**	**1000**

6th Semester

Sub. Code	Name of Subject	Teaching Periods			Duration of Exams (Hours)	Maximum Marks Allocation				
		L	T	P		Internal	End Term	Sessional	Practical	Total
6CS1	Operating Systems	3	1	-	3	20	80	-	-	100
6CS2	Computer Networks	3	-	-	3	20	80	-	-	100
6CS3	Design & Analysis of Algorithms	3	-	-	3	20	80	-	-	100
6CS4	Embedded Systems	3	1	-	3	20	80	-	-	100
6CS5	Theory Of Computation	3	-	-	3	20	80	-	-	100
6CS6.1 6CS6.2 6CS6.3	Digital Signal Processing Advanced Software Engineering Microwave and Satellite Communication	3	-	-	3	20	80	-	-	100
Total		**18**	**2**	**-**	**-**	**120**	**480**	**-**	**-**	**600**
6CS7	Shell Programming Lab	-	-	2	3	-	-	45	30	75
6CS8	Network lab	-	-	2	3	-	-	60	40	100
6CS9	Web Programming lab	-	-	2+2	3	-	-	45	30	75
6CS10	Microcontroller lab	-	-	2+2	3	-	-	60	40	100
Discipline & Extra Curricular Activities		-	-	-	-	-	-	-	-	50
Total		**-**	**-**	**12**	**-**	**-**	**-**	**210**	**140**	**400**
Grand Total		**18**	**2**	**12**	**-**	**120**	**480**	**210**	**140**	**1000**

7th Semester

Sub. Code	Name of Subject	Teaching Periods			Duration of Exams (Hours)	Maximum Marks Allocation				
		L	T	P		Internal	End Term	Sessional	Practical	Total
7CS1	Compiler Construction	3	-	-	3	20	80	-	-	100
7CS2	Data Mining And Ware Housing	3	1	-	3	20	80	-	-	100
7CS3	Logic Synthesis	3	-	-	3	20	80	-	-	100
7CS4	Artificial Intelligence	3	-	-	3	20	80	-	-	100
7CS5	Multimedia Systems	3	-	-	3	20	80	-	-	100
7CS6.1 7CS6.2 7CS6.3	Service Oriented Architectures Optical Communication Real Time Systems	3	-	-	3	20	80	-	-	100
Total		**18**		**-**	**-**	**120**	**480**	**-**	**-**	**600**
7CS7	Compiler Design Lab	-	-	2+2	3	-	-	45	30	75
7CS8	Data Mining And Ware Housing Lab	-	-	2+2	3	-	-	45	30	75
7CS9	Logic Synthesis Lab	-	-	2	3	-	-	30	20	50
7CS10	Project Stage I	-	-	2/2	-	-	-	30	20	50
7CS11	Practical Training Seminar	-	-	2	-	-	-	40+20	40	100
Discipline & Extra Curricular Activities		-	-	-	-	-	-	-	-	50
Total		**-**	**-**	**13**	**-**	**-**	**-**	**210**	**140**	**400**
Grand Total		**18**	**1**	**13**	**-**	**120**	**480**	**210**	**140**	**1000**

8th Semester

Sub. Code	Name of Subject	Teaching Periods			Duration of Exams (Hours)	Maximum Marks Allocation				
		L	T	P		Internal	End Term	Sessional	Practical	Total
8CS1	Information System and Securities	3	-	-	3	20	80	-	-	100
8CS2	CAD FOR VLSI Design	3	1	-	3	20	80	-	-	100
8CS3	Advanced computer Architectures	3	1	-	3	20	80	-	-	100
8CS4.1 8CS4.2 8CS4.3	Distributed Systems Image Processing Natural Language Processing	3	-	-	3	20	80	-	-	100
Total		**12**	**2**	**-**	**-**	**120**	**480**	**-**	**-**	**400**
8CS5	Information System and Securities Lab	-	-	2+2	3	-	-	60	40	100
8CS6	VLSI Design Lab	-	-	2+2	3	-	-	45	30	75
8CS7	X-Windows Programming Lab	-	-	2+2	3	-	-	45	30	75
8CS8	Project Stage II	-	-	2	-	-	-	120	80	200
8CS9	Seminar Presentation	-	-	2	-	-	-	-	-	100
Discipline & Extra Curricular Activities		-	-	-	-	-	-	-	-	50
Total		**-**	**-**	**16**	**-**	**-**	**-**	**270**	**180**	**600**
Grand Total		**12**	**2**	**16**	**-**	**120**	**480**	**270**	**180**	**1000**

Theory Papers

Name of Subject : DIGITAL ELECTRONICS (3 CS 1)	
Unit	**Contents**
I	Number systems, Coding Schemes: BCD, Excess-3, Grey, r's and (r-l)'s complement. Boolean Algebra, Fundamental theorems, Simplifications of Boolean expressions. Logic gates and their truth table. Gate implementation and Truth table of Boolean functions.
II	Standard forms of Boolean functions. Minterm and Maxterm designation of functions. Simplification of functions on Karnaugh maps, Incompletely specified functions. Cubical representation of Boolean functions and determination of prime implicants. Selection of an optimal set of prime implicants. Multiple output circuits and map minimization of multiple output circuits. Tabular determination of multiple output prime implicants.
III	Combinational circuits – Adder, subtractor, encoder, decoder, multiplexer. Design of Combinational circuit using Multiplexers.
IV	Flip Flops: RS, J-K, D, T. Sequential circuits. Clock, pulse and level mode sequential circuits. Analysis and design of sequential circuits. Synthesis of state diagrams, Finite memory circuits, equivalence relations equivalent states and circuits, determination of classes of indistinguishable states and simplification by implicants tables. Mealy and Moore machines, state assignment and memory element input equations, Partitioning and state assignment.
V	Switching Devices. Positive and Negative logic of OR, AND, NOR, NAND, XOR and XNOR gates. Logic Family: RTL, DTL, DCTL, TTL, RCTL, ECL, HTL, MOS and CMOS logic circuit. Speed and delay in logic circuits, integrated circuit logic and noise immunity.

Name of Subject : ELECTRONIC DEVICES & CIRCUITS (3 CS 2)	
Unit	**Contents**
I	Diode circuits: Diode as a circuit. Element, load line concept, clipping & clamping circuits, voltages multipliers.
II	Devices: construction, characteristics and working principles of the following devices. Diodes, BJT, JFET, MOSFET, UJT, photo diodes, LEDs, photo transistors. Solar cells. Thermistor, LDR.
III	Transistors: transistor characteristics, current components, current gains. Alpha and vita. Operating point. High bride model, h- parameter equivalent circuits. Ce, Cb and Cc configuration. Dc and ac analysis of Ce, Cc and Cb amplifiers. Evers- moll model. Biasing and stabilization techniques. Thermal run away, thermal stability. Equivalent circuits and blessing of JFETs and MOSFETs. Low frequency Cs and Cd JFET amplifiers. FET as a voltage variable resistor.
IV	Small signal amplifiers at low frequency: analysis of BJT and FET, dc and rc coupled amplifiers. Frequency response, midband gain, gains at low and high frequency. Analysis of dc and differential amplifiers, Millers' theorem. Cascading transistor amplifiers, Darlington and cascaded circuits. Emitter and source followers.
V	Oscillators: concept of feedback classification, criterion for oscillation. Tuned collector, Hartley, Colpitts , rc- phase shift , Wein bridge and crystal oscillators, astable, monostable and bistable multivibrators . Schmitt trigger.

Name of Subject : DATA STRUCTURE AND ALGORITHMS (3 CS 3)	
Unit	**Contents**
I	Data Structure: Definition, Implementation, Operation, Application, Algorithm writing and convention. Analysis of algorithm, Complexity Measures and Notations. Arrays: Representation of arrays (multidimensional), Address calculation using column and row major ordering. Linked Lists : Implementation, Doubly linked list, Circular linked list, unrolled linked list, skip-lists, Splices, Sentinel nodes, Application (Sparse Matrix, Associative Array, Functional Programming)
II	Stacks : Definition, Implementation, Application (Tower of Hanoi, Function Call and return, Parentheses Matching, Back-tracking, Expression Evaluation) Queues : Definition, deque, enque, priority queue, bounded queue, Implementation, Application
III	Tree: Definition of elements, Binary trees: Types (Full, Complete, Almost complete), Binary Search Tree, Traversal (Pre, In, Post & Level order), Pruning, Grafting. Application: Arithmetic Expressions Evaluation Variations: Indexed Binary Tree, Threaded Binary Tree, AVL tree, Multi-way trees, B tree, B+ tree, Forest, Trie and Dictionary
IV	Graphs: Elementary definition, Representation (Adjacency Matrix, Adjacency Lists) Traversal (BFS, DFS) Application: Spanning Tree (Prim and Kruskal Algorithm), Dijkstra's algorithm, and Shortest path algorithms.
V	Sorting: Bubble, Selection, Insertion, Quick, Radix, Merge, Bucket and Heap sorts. Searching: Hashing, Symbol Table, Binary Search, Simple String Searching.

Name of Subject: DISCRETE MATHEMATICAL STRUCTURES (3 CS 4)	
Unit	**Contents**
I	Formal Logic: Statement, Symbolic Representation and Tautologies, Quantifiers, Predicator and validity, Normal form. Propositional Logic, Predicate Logic, Logic Programming and Proof of correctness.
II	Proof, Relation and Analysis of Algorithm Techniques for theorem proving: Direct Proof, Proof by Contra position, Proof by exhausting cares and proof by contradiction, principle of mathematical induction, principle of complete induction. Recursive definitions, solution methods for linear, first-order recurrence relations with constant coefficients.
III	Graph Theory: Graphs - Directed and Undirected, Eulerian chains and cycles Hamiltonian chains and cycles, Trees, chromatic number, connectivity and other graphical parameters Applications. Polya's Theory of enumeration and its applications.
IV	Sets and Functions: Sets, relations, functions, operations, equivalence relations, relation of partial order, partitions, binary relations. Transforms: Discrete Fourier and Inverse Fourier Transforms in one and two dimensions, discrete Cosine transform.
V	Monoids and Groups: Groups, Semigroups and Monoids cyclic semi graphs and sub monoids, Subgroups and cosets. Congruence relations on semi groups. Morphism, Normal sub groups. Structure off cyclic groups, permutation groups and dihedral groups elementary applications in coding theory.

Name of Subject : MATHEMATICS III (3 CS 5)	
Unit	**Contents**
I	Introduction: Engineering application of optimization, Statement and classification of optimization problem, single variable and multivariable optimization with and without constraints.
II	Linear Programming: Formulation of Linear Programming problem, Graphical Approach, General Linear Programming problem, Simple Method. Duality in Linear Programming and Transportation Problems.
III	Project Scheduling: Project Scheduling by PERT and CPM Network Analysis. Sequencing Theory: General Sequencing problem n-jobs through 2 machines & 3 machines and 2-jobs through m machine.
IV	Transform Calculus – Laplace Transform with its simple properties, applications to the solution of ordinary and partial differential equation having constant coefficients with special reference to the wave and diffusion equation. Fourier transforms and solution of particular differential equation with constant coefficient.
V	Numerical Methods – Solution of Algebraic and transcendental equations, interpolation- finite differences, inverse interpolation, numerical differentiation and integration, numerical solution of differential equations and partial differential equations, solution of difference equation.

Electives

Name of Subject : MANAGEMENT INFORMATION SYSTEM (3 CS 6.1)	
Unit	**Contents**
I	Introduction: MIS concept, Definition, role & Impact of MIS, Process of management, organization structure & behavior.
II	Basic of Management Information System: Decision Making, Information concepts, System concepts & control Types of system handling system complexity System development model.
III	Development of Management Information System: Requirement and implementation of MIS, Choice of information Technology for Management Information System.
IV	Application of Management Information system: Application in manufacturing sector using for personal management, Financial management, Production Management, Material Management, Marketing Management Application in Service Sector.
V	Enterprise Resource Planning (ERP): EMS, ERP, Benefits implementation, EMS & MIS. Case Studies: Application of SAP technologies in manufacturing sector.

Name of Subject : LINE COMMUNICATION (3 CS 6.2)	
Unit	**Contents**
I	Transmission Lines: Types of transmission lines. General transmission line equation, line constant. Equivalent circuits, infinite line. Reflection on a line. SWR of line with different type of terminations. Distortion less and dissipation less lines, coaxial cables, transmission lines at audio and radio frequencies, Losses in transmission line, Transmission equalizers. Characteristics of quarter wave, half wave and other lengths. Smith chart and its application. Transmission line applications. Stub matching. Measurement of parameters of transmission line, measurement of attenuation, insertion loss, reflection coefficient and standing wave ratio.
II	Attenuators & Filters: Elements of telephone transmission networks, symmetrical and Asymmetrical two port networks. Different Attenuators, pi-section, T-section filter, m-derived filter sections, Lattices filter section.
III	Carrier Telephony: Multi-channel systems; Frequency division and time division multiplexing, power time carrier communication.
IV	Telephone Transmission: Telephone Instrument; Rotary dial and Touch tone dial types, two wire/four wire transmission: Echo & singing, Echo suppressors and cancellers. Cross talk.
V	Basic Of Automatic Telephony: Trunking concepts. Grade of service, Traffic definition, Introduction to switching networks, classification of switching systems. Electronic Exchange, EPABX and SPC Exchange, principle of STD, ISD. Recent Trends in Telecommunication: Voice frequency telegraphy, Facsimile and telex services.

Name of Subject : E-COMMERCE (3 CS 6.3)	
Unit	**Contents**
I	Business Strategy in an Electronic Age: Value Chain-supply chains, Proter's value chain, model and Inter-Organizational value chains. Competitive Advantage-Competitive strategy, Proter's Model, First Mover advantage and competitive advantage using e-commerce Business strategy Introduction to Business Strategy, Strategic Implications of IT technology e-commerce Implementation and evaluation.
II	Business to Business Electronic Commerce: Inter-organizational Transactions, The credit Transaction Trade cycle. A variety of transactions, Electronic markets-markets and electronic markets, usage of electronic markets, Advantages and disadvantages of electronic markets.
III	Electronic Data Interchange (EDI): Definition and benefits of EDI. EDI technology, standards, communications, implementation, agreements and securities. EDI trading patterns and transactions.
IV	Building an E-Commerce Site: Introduction to object behavior, components, active scripting. Object models, Infrastructure objects, service object and data objects, choosing the objects. Building a scalable application, Addition the configure method, connecting to the database, Accessing and versioning the database. Building the catalog object with example. Creating shopping basket-Holding state, creating the tables for a shopping basket, modifying the object model and making the basket accessible.
V	J2EE Architecture Overview: Enterprise components, Information technology in the enterprises, introduction to enterprise objects and enterprise component model. The J2EE model features, J2EE components-container architecture. Enterprises Java and J2EE architecture.

Laboratories

3CS7. DIGITAL ELECTRONICS LAB

1. Experimental study of characteristics of CMOS integrated circuits.
2. Interfacing of CMOS to TTL and CMOS.
3. Study of various combinatorial circuits based on: AND/NAND Logic blocks and OR/NOR Logic blocks.
4. Study of following combinational circuits: Multiplexer; Demultiplexer and Encoder. Verify truth tables of various logic functions.
5. To study various waveforms at different points of transistor bistable multivibrator and its frequency variation with different parameters.
6. To study transistor astable multivibrator.
7. To design a frequency driver using IC-555/timer.
8. To study Schmitt trigger circuit.
9. To study OP-AMP as Current to voltage and voltage to current converter comparator.
10. BCD to binary conversion on digital/IC trainer.
11. Study various Flip flops and construct Parallel-in-Serial-out register. Testing of digital IC by automatic digital IC trainer.

3CS8. ELECTRONICS LAB

1. Study the following devices:
   (a) Analog & digital multimeters
   (b) Function/Signal generators
   (c) Regulated D.C. power supplies (constant, voltage and constant current operations).
2. Study of analog CRO measurement of time period, amplitude, frequency and phase angle using Lissajous figures.
3. Application of diode as clipper and clamper.
4. Plot V-I characteristic of zener diode & study zener diode as voltage, reverse Saturation current and static & dynamic resistances.
5. Plot V-I characteristic of zener diode & study zener diode as voltage regulator. Observe the effect of load changes and determine load limits of the voltage regulator.
6. Plot frequency response curve for audio amplifier and to determine gain bandwidth product.
7. Plot drain current-drain voltage and drain current-gate bias characteristics of field effect transistor and measurement of I & VP.
8. Plot gain: frequency characteristic of two stages RC coupled amplifier and calculate its bandwidth and compare it with theoretical value.
9. Plot gain: frequency characteristic of two stages RC coupled amplifier and calculate its bandwidth and compare it with theoretical value.
10. Plot input and output characteristics of BJT in CB, CC and CE configurations. Find their h-parameters.
11. Study half wave rectifier and effect of filter network on D.C. voltage output and ripple factor.
12. Study bridge rectifier and measure the effect of filter network on D.C. voltage output and ripple factor.

3CS9. DATA STRUCTURE LAB

1. Program on array searching, sorting (Bubble sort, Quick sort, Marge sort etc.)
2. Program to insert element at desire position, replacing element, deletion in array.
3. Various matrices operations.
4. Various strings programs.
5. Implementation of stack and queue using array
6. Implementation of stack and queue using link lists
7. Implementation of circular queue using link lists.
8. Polynomial addition, multiplication.
9. Two-way link lists programs.
10. Infix to postfix/prefix conversion.
11. BST implementation (addition, deletion, searching).
12. Graph traversal (BFS, DFS).

3CS10. HUMANITIES AND SOCIAL SCIENCES

1. **Form of Government:** Democracy, Dictatorship
2. **India:** Brief history of Indian Constitution, History of Indian National Movement, After Independence, Socio-economic growth.
3. **Society:** Social groups-concept and types socialization: concept and types, theory social control :concept and types means. Social problem: concept and types.
4. **The Fundamentals of Economics: The** logic of economics fundamentals definitions of economics, basic terminology.
5. **Micro Economics:** Consumer's behavior, utility, demand, supply, elasticity of demand and supply. Theory of production, production function, factors of production.
6. **Macro Economics: National** income, business cycles, aggregate term, inflation, economic growth, international Trade, exchange rates.
7. **Indian Economy:** Basic features, infrastructure, occupation, natural and human resources, unemployment (Industrial Sector, India and Globalization).

4th Semester

Theory Papers

Name of Subject : PRINCIPLES OF PROGRAMMING LANGUAGE (4 CS 1)	
Unit	**Contents**
I	Programming Language: Definition, History, Features. Issue in Language Design: Structure and Operation of computer, Language Paradigms. Efficiency, Regularity. Issues in Language Translation: Syntax, Semantics, Stages analysis and synthesis, Parse Tree, CFG and BNF grammar.
II	Specification and Implementation of Elementary and Structured Data Types. Type equivalence, checking and conversion. Array, List, Structure, Union.
III	Sequence control with Expressions, Conditional Statements, Loops, Exception handling. Subprogram definition and activation, simple and recursive subprogram, subprogram environment. Parameter passing mechanism.
IV	Abstract Data type, information hiding, encapsulation, type definition. Static and Stack-Based Storage management. Fixed and Variable size heap storage management. Garbage Collection
V	Parallel Programming: Introduction, parallel processing and programming language, Threads, semaphore, monitor, message passing.

Name of Subject : MICROPROCESSOR AND INTERFACES (4 CS 2)	
Unit	**Contents**
I	Introduction to Micro Computer Systems: Microprocessors, microcontroller and microcomputer devices, Machine and assembly language, Bus concept. Architecture & Pinout of 8085A.
II	Assembly Language and Programming in 8085: Instruction set, Program structures (sequential, conditional, iterative), Macros and subroutines, Stack, Counter and timing delay, interrupt structure and its programming.
III	Peripherals and their interfacing with 8085-I: Memory Interfacing, Interfacing I/O ports, Data transfer schemes (Synchronous, asynchronous, interrupt driven), Architecture & interfacing of PPI 8255, Data Converters and Timer 8254.
IV	Peripherals and their interfacing with 8085-II: Architecture & interfacing of- DMA controller 8257, interrupt Controller 8259A, USART 8251, Level Converters MC 1488 and MC 1489, Current loop, RS 232 C and RS 422 A.
V	Comparative study of 8085 A, 8086 and 8088 (Pinout, internal architecture, timing diagrams), Instruction format and addressing modes – Data and Branch related. Features of Pentium processor, MMX and Dual core processor.

Name of Subject : OBJECT ORIENTED PROGRAMMING (4 CS 3)	
Unit	**Contents**
I	Introduction to programming paradigm. Aspect-oriented programming, Dynamic programming, Functional programming, Logic programming, Object-oriented programming, Parallel computing, Event Driven Programming.
II	Overview of C++ (A): Abstraction, Polymorphism, Inheritance, Classes, Objects, Methods. Constructor, destructor
III	Overview of C++ (B) :Overloading (function and operator), references, friend function, overriding, virtual function, virtual classes, templates, Namespace, Nested and inner classes, Exception handling, Run time type casting, STL (List, Map, Algorithm)
IV	Overview of Java(A) : Java Byte code and virtual machine, data types, operators, arrays, Objects, constructors, returning and passing objects as parameter, Single and Multilevel inheritance, Extended Classes, Access Control, Usage of super, overloading and overriding methods, Abstract classes, Using final with inheritance.
V	Overview of Java (B): Package and interfaces, String Handling, String constructors, special string operations, character extraction searching and comparing strings, string Buffer class. Applet Fundamentals, Using paint method and drawing polygons.

Name of Subject : SYSTEM SOFTWARE (4 CS 4)	
Unit	**Contents**
I	Overview: Comparison of machine language, assembly language and high level languages, External and internal representation of instructions and data. Data allocation structures, search structures and addressing modes. Activities and system software for program generation, translation and execution. Editors for source code and object code/executable code files.
II	Assemblers: Assembly language specification. Machine dependent and independent features of assembler. Classification of assemblers. Pass structure of assemblers (problem and associated for IBM-PC.
III	Loader and Linkers: Functions and classification. Machine dependent and independent features of loaders, Design of bootstrap, absolute and relocatable loaders, Design of linker. Case study of MS-DOS linker.
IV	Macro processors: Macro definition, call and expansion. Macro processor algorithm and data structure. Machine independent features (parameters, unique labels, conditional expansion, nesting and recursion).Pass structure and design of microprocessor and macro assembler, Case study of MASM macro processor.
V	High level language processor: HLL specification: Grammars and parse trees, expression and precedence. Lexical analysis: Classification of tokens, scanning methods, character recognition, lexical ambiguity. Syntactic analysis: Operator precedence parsing, recursive descent parsing. Symbol Table Management: Data structure for symbol table, basing functions for symbols, overflow technique, block structure in symbol table.

Name of Subject : STATISTICS AND PROBABILITY THEORY (4 CS 5)	
Unit	**Contents**
I	Introduction: Sample space, Events, Algebra of events, Bayes' Rule, Bernoulli Trials. Probability Distribution and Probability Densities: Bernoulli, Binomial, Poisson, Normal, rectangular and exponential distributions and their PDFs. Moments and MGFs for above distributions.
II	Discrete Random Variables: Random Variables and their event space, probability mass function. Distribution Functions. Probability Generating Function. Expectations: Moments, Computation of mean Time to failure. Bernoulli & Poisson Processes.
III	Queuing Theory: Pure birth, Pure Death and Birth-Death Processes, mathematical Models for M/M/I, M/M/N, M/M/S and M/M/S/N/ queues.
IV	Discrete Parameter Markov Chains: M/G/I Queuing Model, Discrete Parameter Birth-Death Process.
V	Network of queues: Open Queuing Networks. Correlation & Regression: Linear regression, Method of least squares, Normal regression and correlation Analysis.

Name of Subject : ANALOG AND DIGITAL COMMUNICATION (4 CS 6.1)	
Unit	**Contents**
I	Modulation of Signals: Principles of Analog modulation technique like AM, FM, PM, SSB, Generation & detection. Frequency division multiplexer. Pulse modulation: Pulse transmission over band-limited signals, sampling theory, pulse amplitude modulation.
II	Digital Communication: PCM, DCSM, DM, ADM, comparison of above systems on the basis of performance criteria such as bit transmission, signaling rate, error probability, S/N ratio, bandwidth requirement. ISI & Eye diagram.
III	Digital Modulation technique: Data transmission using techniques such as PSK, FSK, QFSK (QAM), MSK Inter system comparison.
IV	Introduction to communication channel: Transmission line-primary and secondary line constant, telephone lines and cable, public switch telephone network (Electronic exchange). Introduction of fiber optic communication-Principle of light communication in fiber, losses in fiber, dispersion, light source and photo detector, connector and splicer.
V	Introduction to coding technique: Information theory, channel capacity, Shannon's theorem, source coding, error control coding, error detection and correction, block code, cycle code, line code channel throughput and efficiency.

Name of Subject : INTELLECTUAL PROPERTY RIGHTS (4 CS 6.2)	
Unit	**Contents**
I	Basic Concepts of Intellectual Property: Introduction to intellectual property rights, Intellectual property laws and the Internet, Trade Related Aspects of Intellectual Property Rights
II	Patents: Introduction to patent law and conditions for patentability, Procedure for obtaining patents, Rights of a patentee, Patent infringements, Biotechnology patents and patents on computer programs, Patents from an international perspective
III	Trademark and Geographical Indications: Statutory authorities and registration procedure, Rights conferred by registration, Licensing, assignment and transfer of trademark rights, Trademark infringement, Geographical Indication of Goods & Appellations of Origin
IV	Copyright: Registration procedure and copyright authorities, Assignment and transfer of copyright, Copyright infringement and exceptions to infringement, Software copyright
V	Designs: Introduction to the law on Industrial Designs, Registration and piracy, International perspective, Introduction to the law on semiconductor layout design, Registration, commercial exploitation and infringement

Name of Subject : OPEN SOURCE TECHNOLOGY (4 CS 6.3)	
Unit	**Contents**
I	OST overview: Evolution & development of OST and contemporary technologies, Factors leading to its growth. Open Source Initiative (OSI), Free Software Foundation and the GNU Project, principle and methodologies. Contexts of OST (India & international). Applications of open source (open source teaching and open source media) Risk Factors. Myths regarding open source.
II	Philosophy of Software Freedom, Free Software, OSS, Closed software, Public Domain Software, Shared software, Shared source. Detail of few OSS like Open Audio, Video, 2d & 3d graphics software, system tools, office tools, Networking & internet, Security, Educational tools and Games.
III	Open Source Development Model, Starting and Maintaining an Open Source Project, Open Source Hardware, Open Source Design, Ongoing OS Projects (i.e. examples of few good upcoming software projects.) Case Study: - Linux, Wikipedia.
IV	Licenses and Patents: What Is A License, How to create your own Licenses? Important FOSS Licenses (Apache, BSD, GPL, LGPL), copyrights and copylefts, Patents
V	Social and Financial impacts of open source technology, Economics of FOSS: Zero Marginal Cost, Income-generation opportunities, Problems with traditional commercial software, Internationalization, Open Source as a Business Strategy.

Laboratories

4CS7. COMMUNICATION LAB

2. Harmonic analysis of a square wave of modulated waveform
3. Observe the amplitude modulated waveform and measures modulation index. Demodulation of the AM signal
4. To modulate a high frequency carrier with sinusoidal signal to obtain FM signal. Demodulation of the FM signal
5. To observe the following in a transmission line demonstrator kit :
    iv. The propagation of pulse in non-reflecting Transmission line.
    v. The effect of losses in Transmission line.
    vi. The resonance characteristics of al half wavelength long x-mission line.
6. To study and observe the operation of a super heterodyne receiver
7. To modulate a pulse carrier with sinusoidal signal to obtain PWM signal and demodulate it.
8. To modulate a pulse carrier with sinusoidal signal to obtain PPM signal and demodulate it.
9. To observe pulse amplitude modulated waveform and its demodulation.
10. To observe the operation of a PCM encoder and decoder .To considers reason for using digital signal x-missions of analog signals.
11. Produce ASK signals, with and without carrier suppression, Examine the different processes required for demodulation in the two cases.
12. To observe the FSK wave forms and demodulate the FSK signals based on the properties of (a) tuned circuits (b) on PI.L.

4CS8. MICROPROCESSORS LAB

1. Study of hardware, functions, memory, and operations of 8085 kit.
2. Program to perform integer addition (two and three numbers 8 bit)
3. Program to perform multiplication (two 8 bit numbers).
4. Program to perform division (two 8 bit numbers).
5. Transfer of a block data in memory to another place in memory in forward and reverse order.
6. Swapping of two block data in memory.
7. Addition of 10 numbers using array.
8. Searching a number in an array.
9. Sorting of array (ascending, descending order).
10. Print Fibonacci sequence. (15 elements)
11. To insert a number at correct place in a sorted array.
12. Interfacing seven segment display using 8255.

4CS9. OBJECT ORIENTED PROGRAMMING LAB

C++ Programs

1. Programs based on inheritance property.
2. Programs of operator overloading (complex number arithmetic, polar coordinates).
3. Programs using friend functions.
4. Programs on various matrix operations.
5. Stack operations using OOPs concepts.
6. To implement Tower of Hanoi problem.

JAVA Programs:-

7. To implement spell checker using dictionary.
8. To implement color selector from a given set of colors.
9. To implement shape selector from a given set of shapes.
10. To implement a calculator with its functionality.
11. To show movement of a car.

4CS10. SYSTEM SOFTWARE LAB

In this lab we will practice how source code is processed by compiler/ assembler/ pre-processor.

All programs have to be written in C++

1. Write a class for file handling, having functions to open/ read/ write/ close/ reset.

(2-5) Develop a program which take input a file of C language

a. Print Lines of Codes and print signature of all function (including main)
b. Print number of variables in every function (with type)
c. Generate a new file without the comments. (/* */ and //)
d. Process all #define (i.e. #define MAX 100, than replace every occurrence of MAX with 100). (Macro value 100 can be an expression also.)

6. Write a program to create a symbol table.

7. Write a program which can parse a given C file and store all variables and functions in symbol table.

(8-10). Write a program to convert given C program into RTL code.

Assumption

a. input C file will have only main function,

b. only two type of statements, either variable declaration statements
(int sub1=23;) OR mathematical expression (sub1=sub2-sub3;).

c. system have 16 registers (R1 to R16)

d. RTL opcode available are: ADD, LOAD, MOVE, SUB, MULTIPLY, DIVIDE

e. No control-flow (i.e. if-else, loop, jump etc.) expression is there in input code e.g.

```
int main()
    {
        int sub1=72, sub2=85, sub3=63;
        float per;
        per=(sub1+sub2+sub3)/(100+100+100);
    }
```

5th semester

Name of Subject : SOFTWARE ENGINEERING (5 CS 1)	
Unit	**Contents**
I	System Analysis: Characteristics, Problems in system Development, System Level project Planning, System Development Life cycle (SDLC), computer system engineering system analysis, modeling the architecture, system specification.
II	Software Project Management: Objectives, Resources and their estimation, LOC and FP estimation, effort estimation, COCOMO estimation model, risk analysis, software project scheduling. Software Development : Life Cycle (SWDLC), SWDLC models software engineering approaches
III	Requirement Analysis: Requirement analysis tasks, Analysis principles. Software prototyping and specification data dictionary finite state machine (FSM) models. Structured Analysis: Data and control flow diagrams, control and process specification behavioral modeling, extension for data intensive applications.
IV	Software Design: Design fundamentals, Effective modular design: Data architectural and procedural design, design documentation.
V	Object Oriented Analysis: Object oriented Analysis Modeling, Data modeling. Object Oriented Design: OOD concepts and methods class and object definitions, refining operations. Class and object relationships, object modularization. Introduction to Unified Modeling Language

Name of Subject : COMPUTER ARCHITECTURE (5 CS 2)	
Unit	**Contents**
I	REGISTER TRANSFER LANGUAGE: Data movement around registers. Data movement from/to memory, arithmetic and logic micro operations. Concept of bus and timing in register transfer.
II	CPU ORGANISATION: Addressing Modes, Instruction Format. CPU organization with large registers, stacks and handling of interrupts & subroutines Instruction pipelining
III	ARITHMETIC ALGORITHM: Array multiplier, Booth's algorithm. Addition subtraction for signed unsigned numbers and 2's complement numbers.
IV	MICROPROGRAMMED CONTROL UNIT : Basic organization of micro-programmed controller, Horizontal & Vertical formats, Address sequencer
V	MEMORY ORGANISATION: Concept of RAM/ROM, basic cell of RAM, Associative memory, Cache memory organization, Vertical memory organization. I/O ORGANISATION: Introduction to Peripherals & their interfacing. Strobe based and handshake-based communication, DMA based data transfer, I/O processor.

Name of Subject : DATABASE MANAGEMENT SYSTEMS (5 CS 3)	
Unit	**Contents**
I	INTRODUCTION TO DATABASE SYSTEMS: Overview and History of DBMS. File System vs DBMS .Advantage of DBMS Describing and Storing Data in a DBMS. Queries in DBMS. Transaction management and Structure of a DBMS.
II	ENTITY RELATIONSHIP MODEL: Overview of Data Design Entities, Attributes and Entity Sets, Relationship and Relationship Sets. Features of the ER Model-Key Constraints, Participation Constraints, Weak Entities, Class Hierarchies, Aggregation, Conceptual Data Base, Design with ER Model-Entity vs Attribute, Entity vs Relationship Binary vs Ternary Relationship and Aggregation vs ternary Relationship Conceptual Design for a Large Enterprise.
III	RELATIONSHIP ALGEBRA AND CALCULUS**:** Relationship Algebra Selection and Projection, Set Operations, Renaming, Joints, Division, Relation Calculus, Expressive Power of Algebra and Calculus.
IV	SQL QUERIES PROGRAMMING AND TRIGGERS: The Forms of a Basic SQL Query, Union, Intersection and Except, Nested Queries ,Correlated Nested Queries, Set-Comparison Operations, Aggregate Operators, Null Values and Embedded SQL, Dynamic SQL, ODBC and JDBC, Triggers and Active Databases.
V	SCHEMA REFINEMENT AND NORMAL FORMS: Introductions to Schema Refinement, Functional Dependencies, Boyce-Codd Normal Forms, Third Normal Form, Normalization-Decomposition into BCNF Decomposition into 3-NF.

Name of Subject : COMPUTER GRAPHICS (5 CS 4)	
Unit	**Contents**
I	Introduction to Raster scan displays, Storage tube displays, refreshing, flicking, interlacing, color monitors, display processors resolution, working principle of dot matrix, inkjet laser printers, working principles of keyboard, mouse scanner, digitizing camera, track ball , tablets and joysticks, graphical input techniques, positioning techniques, rubber band techniques, dragging etc.
II	Scan conversion techniques, image representation, line drawing, simple DDA, Bresenham's Algorithm, Circle drawing, general method, symmetric DDA, Bresenham's Algorithm, curves, parametric function, Beizier Method, B-sp-line Method.
III	2D & 3D Co-ordinate system, Translation, Rotation, Scaling, Reflection Inverse transformation, Composite transformation, world coordinate system, screen coordinate system, parallel and perspective projection, Representation of 3D object on 2D screen.
IV	Point Clipping. Line Clipping Algorithms, Polygon Clipping algorithms, Introduction to Hidden Surface elimination, Basic illumination model, diffuse reflection, specular reflection, phong shading, Gourand shading ray tracing, color models like RGB, YIQ, CMY, HSV etc.
V	Multimedia components, Multimedia Hardware, SCSI, IDE, MCI, Multimedia data and file formats, RTF, TIFF, MIDI, JPEG, DIB, MPEG, Multimedia Tools, Presentation tools, Authoring tools, presentation.

Name of Subject : TELECOMMUNICATION FUNDAMENTALS (5 CS 5)	
Unit	**Contents**
I	Electromagnetic Spectrum, Frequency Spectrum-Bandwidth-Allocation, Time domain and Frequency domain analysis, Transmission media, , Twisted pair, UTP cables, Coaxial and optical fiber cables, wireless, microwave and satellite transmission, Transmission impairments. Serial and parallel transmission, Simplex, half duplex or full duplex transmission mode. Network, LAN, MAN, WAN, Internet, Intranet, Extranet, Network Topology, Protocols, Layered Architecture, OSI and TCP/P protocol Architecture.
II	Physical Layer : Convention and terminology (bit rate, channel capacity, bandwidth, Signal strength, SNR) Physical transmission media interface(Mechanical, Electrical and Radio interface specification) Modulation (ASK, FSK and PSK, PCM, PAM, Delta Modulations), Line coding (NRZ-L, NRZ–I , Bipolar AMI, Manchester and differential Manchester), Multiplexing (FDM, Synchronous and Statistical TDM) Brief Introduction to Ethernet, SONET/SDH.
III	Data Link Layer: Channel allocation problem, pure and slotted ALOHA Protocols, Persisted And Non-Persisted CSMA, Collision Free Protocols, Digital Cellular Radio and CDMA. Logical Link Sub Layer, MAC Sub layer. Brief Introduction: Frame Relay, PPP.
IV	Switching Networks: Circuit switching Networks, Space and Time division switching, Routing circuit switched networks, control signaling packet switching principles, fixed, flooding and adaptive routing strategies, Brief Introduction: Broadband and Narrowband ISDN, ADSL.
V	Network Devices: Gateway, Router, Bridge, Switch, Hub, Repeater, Multilayer Switch, Protocol Converter, Router, Proxy, Firewall, Multiplexer, Network Card, Modem. Network Technology: DSL, GSM, Bluetooth, Infrared. Brief Introduction to Servers : File Server, Print Server, Mail Server, Proxy Server, Remote Access Server (RAS), Application Server, Web Server, Backup Server

Electives

Name of Subject : LOGICAL AND FUNCTIONAL PROGRAMMING (5 CS 6.1)	
Unit	**Contents**
I	PROPOSITIONS: Fully parenthesized propositions, Evaluation of constant propositions, Evaluation of proposition in a state. Precedence rules for operators, Tautologies, Propositions a sets of states and Transforming English to prepositional form.
II	REASONING USING EQUIVALENCE TRANSFORMATIONS: The laws of equivalence, rules of substitution and transitivity, formal system of axioms and Inference rules. NATURAL DEDUCTION SYSTEM: Introduction to deductive proofs, Inference rules, proofs and sub-proofs, adding flexibility to the natural deduction system and developing natural deduction system proofs.
III	PREDICATES: Extending the range of a state, Quantification, Free and Bound Identifiers, Textual substitution, Quantification over other ranges and some theorems about textual substitution and states.
IV	LOGIC PROGRAMMING: Introduction to prepositional and predicate calculus, First-order predicate calculus, Format logical systems, PROLOG programming-Facts, Rules and queries, Implementations, Applications, Strengths and Weaknesses.
V	FUNCTIONAL PROGRAMMING: Introduction to lambda calculus-Syntax and semantics, Computability and correctness. Features of Functional Languages-Composition of functions, Functions as first-class Objects, no side effects and clean semantics, LISP Programming-Data types and structures, Scheme dialect, primitive functions, functions for constructing functions and functional forms. Applications of functional languages and comparison of functional and imperative languages.

Name of Subject : INFORMATION THEORY & CODING (5 CS 6.2)	
Unit	**Contents**
I	Elements Of Information Theory: Measure of information, average information, entropy, information rate. Communication channel, discrete and continuous channel
II	Shannon-Hartley theorem and its implications. Channel capacity, Gaussian channel and bandwidth-S/N tradeoff.
III	Introduction of Coding: types of efforts, types of codes, error control coding, methods of controlling errors
IV	Linear Block and Binary Cyclic Codes: matrix decryption of linear block codes, error detection and error correction capabilities of linear block codes. Hamming codes, structure of cyclic codes, encoding using an (n-k) bit shift register syndrome calculation, its error detection & correction, special classes of cyclic codes bch.
V	Burst and Convolution Codes: burst and random error correcting codes, encoders for convolution codes. Decoders for convolution codes

Name of Subject : ADVANCED DATA STRUCTURES (5 CS 6.3)	
Unit	**Contents**
I	ADVANCED TREES: Definition**s** Operations on Weight Balanced Trees (Huffman Trees), 2-3 Trees and Red-Black Trees. Augmenting Red-Black Trees to Dynamic Order Statistics and Interval Tree Applications. Operations on Disjoint sets and its union-find problem Implementing Sets. Dictionaries, Priority Queues and Concatenable Queues using 2-3 Trees.
II	MERGEABLE HEAPS: Mergeable Heap Operations, Binomial Trees Implementing Binomial Heaps and its Operations, 2-3-4. Trees and 2-3-4 Heaps. Amortization analysis and Potential Function of Fibonacci Heap Implementing Fibonacci Heap. SORTING NETWORK**:** Comparison network, zero-one principle, bitonic sorting and merging network sorter.
III	GRAPH THEORY DEFINITIONS: Definitions of Isomorphic Components. Circuits, Fundamental Circuits, Cut-sets. Cut-Vertices Planer and Dual graphs, Spanning Trees, Kuratovski's two Graphs.
IV	GRAPH THEORY ALGORITHMS**:** Algorithms for Connectedness, Finding all Spanning Trees in a Weighted Graph and Planarity Testing, Breadth First and Depth First Search, Topological Sort, Strongly Connected Components and Articulation Point. Single Min-Cut Max-Flow theorem of Network Flows. Ford-Fulkerson Max Flow Algorithms
V	NUMBER THEORITIC ALGORITHM: Number theoretic notation, Division theorem, GCD recursion, Modular arithmetic, Solving Linear equation, Chinese remainder theorem, power of an element, RSA public key Crypto system, primality Testing and Integer Factorization.

5 CS 7. SOFTWARE ENGINEERING LAB

In this lab first 8 experiments are to practice software engineering techniques. Use any open source CASE tool. Many of them are available at www.sourceforge.net. You can choose any other CASE tool, as per choice.

Language : C++ / JAVA
Design Approach : Object Oriented

These designing can be done on any automation system e.g. library management system, billing system, payroll system, bus reservation system, gas agency management system, book-shop management system, students management system.

1. Do a feasibility study
2. Document all the requirements as specified by customer in Software Requirement Specification
3. Design sequence diagrams for project
4. Design Collaboration diagram
5. Design Data Flow Diagram for the project
6. Design Entity Relation Diagram for the project
7. Design Class diagram
8. Design at least 10 test cases for each module.
9. -10: Code and test the project, which you have designed in last 8 labs.

5 CS 8. COMPUTER ARCHITECTURE LAB

This lab will be based on assembly programming on of RISC processor simulator SPIM. SPIM simulator is available at site http://pages.cs.wisc.edu/~larus/spim.html.

SPIM exercises

1. Read an integer from the keyboard and print it out if (n => n_min AND n <= n_max).
2. Read an integer from the keyboard and print out the following as per switch-case statement

```
Switch (n)
{  n <= 10    print "not a lot"
n == 12    print "a dozen"
n == 13    print "a baker's dozen"
n == 20    print "a score"
n >= 100  print "lots and lots"
n != 42    print "integer"
otherwise print "you have the answer!"
}
```

3. Read a string from the keyboard and count the number of letters. Use the equivalent of following for loop to count number of chars.

for (s1=0; str[s1] != '\n'; ++s1)

4. Print out a line of characters using simple procedure call.
5. Print out a triangle of characters using recursive procedure call.
6. Print factorial of a number using recursion.
7. Print reverse string after reading from keyboard.
8. Print a string after swapping case of each letter.
9. Print an integer in binary and hex.
10. Implement bubble sort algorithm.
11. Print Pascal Triangle of base size 12.
12. Evaluate and print Ackerman function.

5 CS 9. DATABASE MANAGEMENT LAB

Student can use MySql (preferred open source DBMS) or any other Commercial DBMS tool (MS-Access / ORACLE) at backend and C++ (preferred) VB/JAVA at front end.

1. (a) Write a C++ program to store students records (roll no, name, father name) of a class using file handling. (Using C++ and File handling).
   (b) Re-write program 1, using any DBMS and any compatible language.(C++/MySQL) (VB and MS-Access)
2. Database creation/ deletion, table creation/ deletion.
   (a) Write a program to take a string as input from user. Create a database of same name. Now ask user to input two more string, create two tables of these names in above database.
   (b) Write a program, which ask user to enter database name and table name to delete. If database exist and table exist then delete that table.
3. Write a program, which ask user to enter a valid SQL query and display the result of that query.
4. Write a program in C++ to parse the user entered query and check the validity of query. (Only SELECT query with WHERE clause)

5 - 6. Create a database db1, having two tables t1 (id, name, age) and t2 (id, subject, marks).
   (a) Write a query to display name and age of given id (id should be asked as input).
   (b) Write a query to display average age of all students.
   (c) Write a query to display mark-sheet of any student (whose id is given as input).
   (d) Display list of all students sorted by the total marks in all subjects.

7 - 8. Design a Loan Approval and Repayment System to handle Customer's Application for Loan and handle loan repayments by depositing installments and reducing balances.

9 -10. Design a Video Library Management System for managing issue and return of Video tapes/CD and manage customer's queries.

5 CS 10. COMPUTER GRAPHICS LAB

1. Implementation of line generation using slope's method, DDA and Bresenham's algorithms.
2. Implementation of circle generation using Mid-point method and Bresenham's algorithm.
3. Implementation of ellipse generation using Mid-point method.
4. Implementation of polygon filling using Flood-fill, Boundary-fill and Scan-line algorithms.
5. Implementation of 2D transformation: Translation, Scaling, Rotation, Mirror Reflection and Shearing (write a menu driven program).
6. Implementation of Line Clipping using Cohen-Sutherland algorithm and Bisection Method.
7. Implementation of Polygon Clipping using Sutherland-Hodgman algorithm.
8. Implementation of 3D geometric transformations: Translation, Scalind and rotation.
9. Implementation of Curve generation using Interpolation methods.
10. Implementation of Curve generation using B-spline and Bezier curves.
11. Implementation of any one of Back face removal algorithms such as Depth-Buffer algorithm, Painter's algorithm, Warnock's algorithm, Scan-line algorithm)

6th semester

Theory Papers

Name of Subject : OPERATING SYSTEMS (6 CS 1)	
Unit	**Contents**
I	Introduction to Operating Systems, Operating system services, multiprogramming, time-sharing system, storage structures, system calls, multiprocessor system. Basic concepts of CPU scheduling, Scheduling criteria, Scheduling algorithms, algorithm evaluation, multiple processor scheduling, real time scheduling I/0 devices organization, I/0 devices organization, I/0 devices organization, I/0 buffering.
II	Process concept, process scheduling, operations on processes, threads, inter-process communication, precedence graphs, critical section problem, semaphores, classical problems of synchronization. Deadlock problem, deadlock characterization, deadlock prevention, deadlock avoidance, deadlock detection, recovery from deadlock, Methods for deadlock handling.
III	Concepts of memory management, logical and physical address space, swapping, contiguous and non-contiguous allocation, paging, segmentation, and paging combined with segmentation.
IV	Concepts of virtual memory, demand paging, page replacement algorithms, allocation of frames, thrashing, demand segmentation. Security threads protection intruders-Viruses-trusted system.
V	Disk scheduling, file concepts, file access methods, allocation methods, directory systems, file protection, introduction to distributed systems and parallel processing case study.

Name of Subject: COMPUTER NETWORKS (6 CS 2)	
Unit	**Contents**
I	Network, Network Protocols, Edge, Access Networks and Physical Media, Protocol Layers and their services models, Internet Backbones, NAP's and ISPs.
II	Application Layer: Protocol and Service Provided by application layer, transport protocols. The world wide web. HTTP, Message formats, User Server Interaction and Web caches. FTP commands and replies. Electronic Mail, SMTP, Mail Message Formats and MIME and Mail Access Protocols DNS The internet's directory service DNS records and Message.
III	Transport Layer: Transport Layer Service and Principles, Multiplexing and Demultiplexing applications, connectionless Transport. UDP Segment structure and UDP Checksum. Principles of Reliable Data Transfer-Go back to N and Selective Repeat. Connection Oriented Transport TCP Connection and Segment Structure, Sequence Numbers and acknowledgement numbers, Telnet, Round trip time and timeout. TCP connection management.
IV	Network Layer and Routing: Network service model, Routing principles. Link State routing Algorithm, A distant Vector routing & OSPF algorithm. Router Components; Input Prot, Switching fabric and output port. IPV6 Packet format. Point To Point Protocol (PPP), transition States, PPP Layers-Physical Layer and Data Link Layer, Link Control Protocols. LCP Packets and options. Authentication PAP and CHAP, Network Control Protocol (NCP).
V	Sonet/SDH:Synchronous Transport Signals. Physical configuration-SONET Devices, Sections, Lines and Paths. SONET Layers-Photonic Layer, section layer, line layer, path layer and device layer relationship. Sonet Frame format. Section overhead, Line overhead and path overhead. Virtual Tributaries and types of VTs.

Name of Subject: DESIGN & ANALYSIS OF ALGORITHMS (6 CS 3)	
Unit	**Contents**
I	BACKGROUND: Review of Algorithm Complexity and Order Notations and Sorting Methods. DIVIDE AND CONQUER METHOD: Binary Search, Merge Sort, Quick sort and strassen's matrix multiplication algorithms. GREEDY METHOD: Knapsack Problem, Job Sequencing, Optimal Merge Patterns and Minimal Spanning Trees.
II	DYNAMIC PROGRAMMING: Matrix Chain Multiplication. Longest Common Subsequence and 0/1 Knapsack Problem. BRANCH AND BOUND: Traveling Salesman Problem and Lower Bound Theory. Backtracking Algorithms and queens problem.
III	PATTERN MATCHING ALGORITHMS: Naïve and Rabin Karp string matching algorithms, KMP Matcher and Boyer Moore Algorithms. ASSIGNMENT PROBLEMS: Formulation of Assignment and Quadratic Assignment Problem.
IV	RANDOMIZED ALGORITHMS. Las Vegas algorithms, Monte Carlo algorithms, randomized algorithm for Min-Cut, randomized algorithm for 2-SAT. Problem definition of Multicommodity flow, Flow shop scheduling and Network capacity assignment problems.
V	PROBLEM CLASSES NP, NP-HARD AND NP-COMPLETE: Definitions of P, NP-Hard and NP-Complete Problems. Decision Problems. Cook's Theorem. Proving NP-Complete Problems - Satisfiability problem and Vertex Cover Problem. Approximation Algorithms for Vertex Cover and Set Cover Problem.

Name of Subject : EMBEDDED SYSTEMS (6 CS 4)	
Unit	**Contents**
I	Overview of Embedded System: Embedded System, Categories and Requirements of Embedded Systems, Challenges and Issues in Embedded Software Development, Applications of Embedded Systems in Consumer Electronics, Control System, Biomedical Systems, Handheld computers, Communication devices.
II	Embedded Hardware & Software Development Environment: Hardware Architecture, Micro- Controller Architecture, Communication Interface Standards, Embedded System Development Process, Embedded Operating systems, Types of Embedded Operating systems.
III	Design quality and Microcontroller: Quality matrix, software and hardware, Estimation , 8 Bit microcontrollers Architecture, on chip peripherals, instruction set/programming of Intel MCS51 family (8 bit) Inter facing of 8051 with LCD, ADC, sensors, stepper motor, key board, DAC, memory .
IV	Real Time & Database Applications: Real- Time Embedded Software Development, Sending a Message over a Serial Link, Simulation of a Process Control System, Controlling an Appliance from the RTLinux System, Embedded Database Applications using examples like Salary Survey, Energy Meter Readings.
V	Programming Languages for Embedded Systems: Tools for building embedded systems - with case studies. Microchip PIC16 family PIC16F873 processor features architecture memory organization register file map I/O ports PORTA - PORTB PORTC Data EEPROM and flash program memory Asynchronous serial port SPI mode I2C mode.

Name of Subject : THEORY OF COMPUTATION (6 CS 5)	
Unit	**Content**
I	Finite Automata & Regular Expression: Basic Concepts of finite state system, Deterministic and non-deterministic finite automation and designing regular expressions, relationship between regular expression & Finite automata minimization of finite automation mealy & Moore Machines.
II	Regular Sets of Regular Grammars**:** Basic Definition of Formal Language and Grammars. Regular Sets and Regular Grammars, closure proportion of regular sets, Pumping lemma for regular sets, decision Algorithms for regular sets, Myhell_Nerod Theory & Organization of Finite Automata.
III	Context Free Languages& Pushdown Automata: Context Free Grammars – Derivations and Languages – Relationship between derivation and derivation trees – ambiguity – simplification of CEG – Greiback Normal form – Chomsky normal forms – Problems related to CNF and GNF Pushdown Automata: Definitions – Moves – Instantaneous descriptions – Deterministic pushdown automata – Pushdown automata and CFL - pumping lemma for CFL - Applications of pumping Lemma.
IV	Turing Machines: Turing machines – Computable Languages and functions – Turing Machine constructions – Storage in finite control – multiple tracks – checking of symbols – subroutines – two way infinite tape. Undecidability: Properties of recursive and Recursively enumerable languages – Universal Turing Machines as an undecidable problem – Universal Languages – Rice's Theorems.
V	Linear bounded Automata Context Sensitive Language: Chomsky Hierarchy of Languages and automata, Basic Definition& descriptions of Theory & Organization of Linear bounded Automata Properties of context-sensitive languages.

Electives

Name of Subject : DIGITAL SIGNAL PROCESSING (6 CS 6.1)	
Unit	**Contents**
I	Flow Graph and Matrix Representation of Digital Filters: Signal flow graph representation of digital network, matrix representation, basic network structures for IIR and FIR systems, Telligen's theorem for digital filters and its applications.
II	Digital filter Design Techniques: Design of IIR and FIR digital filters, computer aided design of IIR and FIR filters, comparison of IIR and FIR digital filters.
III	Computation of the Discrete Fourier Transform: Goertzel algorithm, FT algorithms, decimation in time and frequency, FFFT algorithm for N a composite number, Chirp Z transforms (CZT).
IV	Discrete Random Signals: Discrete time random process ,averages spectrum representations of infinite energy signals, response of linear system to random signals
V	Power Spectrum Estimation: Basic principles of spectrum estimation, estimates of the auto covariance, power spectrum, cross covariance and cross spectrum.

Name of Subject : ADVANCED SOFTWARE ENGINEERING (6 CS 6.2)	
Unit	**Contents**
I	SOFTWARE CONFIGURATION MANAGEMENT: SCM Process, Objects in Software configuration, Version control, Change control, Configuration audit, Status reporting, SCM standards .SOFTWARE QUALITY ASSURANCE: Quality Concepts, Quality Movement, SQA Activities and Formal Approaches to SQA.
II	SOFTWARE TESTING AND DEBUGGING: Software Testing Fundamentals .Text Case Design ,White -Box Testing, Basis Path testing, Control Structure Testing, Black Box Testing and Testing for Specialized Environments, Architectures and Applications. Program Error, Debugging Process (Information Gathering, Fault Isolation, Fault Confirmation, Documentation, Fixing fault, Testing) Debugging Example.
III	MANAGING TEAM: Understanding behavior and selecting right person for the job, Motivation, working in groups, decision making, leadership and organizational structures. INTERNATIONAL STANDARDS: Importance and defining software quality, ISO 9126, BS 6079 planning steps, ISO 12207 approach to software lifecycle data.
IV	WEB ENGINEERING**:** Attributes of Web-Based Applications. Process, Modeling activity, Analysis modeling for WebApps, Design- functional, information & interaction, testing WebApps- content, navigation, configuration, and performance testing.
V	PROJECT MANAGEMENT FOR SPECIAL CLASSES OF SOFTWARE PROJECTS: Using CASE tools, CBSE, Re-engineering, forward engineering, client/server software engineering, outsourcing, Software project management standards. Change and Content Management of Web Engineering.

Name of Subject : MICROWAVE AND SATELLITE COMMUNICATION (6 CS 6.3)	
Unit	**Contents**
I	Microwave Transmission System: General representation of E M field in terms of TEM, TE and TM components, Uniform guide structures, rectangular wave guides, Circular Wave guides, Solution in terms of various modes, Properties of propagating and evanescent modes, Dominant modes, Normalized model voltages and currents, Power flow and energy storage in modes frequency range of operation for single mode working, effect of higher order modes, Strip line and micro strip lines-general properties, Comparison of coaxial, Micro strip and rectangular wave guides in terms of band width, power handling capacity, economical consideration etc.
II	Origin and brief history of satellite communication; Elements of a satellite communication link; Current status of satellite communication. Orbital Mechanism and Launching of Satellite*:* Equation of orbit, Describing the orbit, Location the satellite in the orbit, Locating the satellite with respect to earth, Orbital elements, Look angle determination, Elevation and Azimuth calculation, Geostationary and other orbits, Orbital perturbations, Orbit determination, Mechanics of launching a synchronous satellite, Selecting a launch vehicle.
III	Space Craft: Satellite subsystems, Altitude and Orbit Control (AOCS), Telemetry, Tracking and Command (TT&C). Communication subsystems, Transponders, Spacecraft antennas, Frequency re-use antennas.
IV	Satellite Channel and Link Design: Basic transmission theory, Noise temperature, Calculation of system noise temperature, Noise figure, G/T ratio of earth stations, Design of down links and uplinks using C/N ratio, FM improvement factor for multi-channel signals, Link Design for FDM/FM, TV signals and Digital Signals.
V	Earth Station Technology: Earth station design, Basic antenna theory, antenna noise temperature; Tracking; Design of small earth station antennas, Low noise amplifiers, High power amplifiers, FDM and TDM systems.

Laboratories

6 CS 7. SHELL PROGRAMMING LAB

1. Practice commands: cp, mv, rm, ln, ls, who, echo, cat, mkdir, rmdir. Wildcards (?, *) , I/O redirection (<, >, >>), pipelines (|)
2. Practice commands: xargs, alias, set-unset, setenv-unsetenv, export, source, ps, job, kill.
3. Practice commands: head, tail, cut, paste, sed, grep, sort, uniq, find , locate, chmod.
4. Writing a simple shell script to echo who is logged in.
5. Write a shell script to display only executable files in a given directory.
6. Write a shell script to sort a list of file either in alphabetic order or largest file first according to user response.
7. Write a shell script to count the lines. Words and characters in its input (Note : Don't use wc).
8. Write a shell script to print end of a glossary file in reverse order using array. (Hint: use awk tail).
9. Modify cal command to accept more than one month (e.g. $cal Oct, Nov,)(Hint : use alias too)
10. Write a shell script to check whether Ram logged in, continue checking every 60 seconds until success.

6 CS 8. NETWORK LAB

1. The lab is to be conducted in Perl programming language, Perl works on all platforms (including windows)
2. Write few basic programs of Perl.
   a. A Hello World Program
   b. Write a program to add to 10 numbers.
   c. Write a program of reading input from the keyboard and displaying them on monitor.
   d. Write a program to take two strings as input and compare them
3. To understand advance constructs of Perl
   e. Write a program to create a list of your course (all theory courses in current semester) using array and print them.
   f. Write a program to accept ten number, store it into a hash table (Perl have itself) and when asked by user tell him that number exists or not. (do not store duplicate numbers)
   g. Write a program to compute the number of lines in a file.
4. Find the IP address of a host or turn an IP address into a name.
5. Connect to an FTP server and get or put files. Automate the one-time transfer of many files to download the file everyday, which have changed since yesterday. (use Net:FTP)
6. Write a program to send mail. The programs should monitor system resources like disk space and notify admin by mail when disk space becomes dangerously low. (use Net:mail)
7. Fetch mail from a POP3 server (use Net:pop3)
8. Find out who owns a domain (use Net:whois , Whois is a service provided by domain name registration authorities to identify owners of domain names)
9. Test whether a machine is alive. machine can be specified using IP address or domain name of machine.
10. You have a URL that fetch its content from a Perl script, convert it to ASCII text (by stripping html tags) and display it.
11. Writing a TCP Client, Writing a TCP Server and Communicate some data over TCP

6 CS 9. WEB PROGRAMING LAB

1. Develop a static html page using style sheet to show your own profile.
   Add a page to show 5 photos and
   Add a page to show your academics in a table
   Add a page containing 5 links to your favorite website
   Add navigational links to all above pages (add menu).
2. Update your homepage, by creating few html file (e.g. header, footer, left-sidebar, right), in these file you will put all html code to be shown on every page.
3. Use Cascading Style Sheets to format your all pages in a common format.
4. Basic Php programs:
   Write a simple "hello word" program using php.
   Write a program to accept two strings (name and age) from user. Print welcome statement e.g. " Hi Ram, your age is 24."
   Write a program to create a calculator, which can support add, subtraction and multiply and division operation.
   Write a program to take input parameters for a table (no. of rows and no. of columns), and create the desired table.
   Create a "Contact Me" page -
   Ask user to enter his name, email ID,
   Use Java-Script to verify entered email address.
   Store submitted value in a MySql database.
   Display latest 5 submitted records in contact me page.
   Display above record with navigation support. e.g. (next, previous, first, last).

6 CS 10. MICROCONTROLLER LAB

1. Write a program to add two 2-byte numbers with a 3-byte sum.
2. Write a program to add an array of 8 numbers using loop.
3. Write a program to convert temperature from Fahrenheit to Centigrade.
4. Implement a sequencer traffic light controller.

5-6. Implement real time interrupt.

7-8. Interface microcontroller with stepper motor and move motor by given steps.

9-10. Interface, test and control LED display with Microcontroller.

11-12. Implement a watchdog timer and test the same to check infinite loop.

Theory Papers

Name of Subject : COMPILER CONSTRUCTION (7 CS 1)	
Unit	**Contents**
I	Compiler, Translator, Interpreter definition, Phase of compiler introduction to one pass & Multipass compilers, Bootstrapping, Review of Finite automata lexical analyzer, Input, buffering, Recognition of tokens, Idea about LEX: A lexical analyzer generator, Error handling.
II	Review of CFG Ambiguity of grammars, Introduction to parsing. Bottom up parsing Top down parsing techniques, Shift reduce parsing, Operator precedence parsing, Recursive descent parsing predictive parsers. LL grammars & passers error handling of LL parser. LR parsers, Construction of SLR, Conical LR & LALR parsing tables, parsing with ambiguous grammar. Introduction of automatic parser generator: YACC error handling in LR parsers.
III	Syntax directed definitions; Construction of syntax trees, L-attributed definitions, Top down translation. Specification of a type checker, Intermediate code forms using postfix notation and three address code, Representing TAC using triples and quadruples, Translation of assignment statement. Boolean expression and control structures.
IV	Storage organization, Storage allocation, Strategies, Activation records, Accessing local and non local names in a block structured language, Parameters passing, Symbol table organization, Data structures used in symbol tables.
V	Definition of basic block control flow graphs, DAG representation of basic block, Advantages of DAG, Sources of optimization, Loop optimization, Idea about global data flow analysis, Loop invariant computation, Peephole optimization, Issues in design of code generator, A simple code generator, Code generation from DAG.

Name of Subject : DATA MININIG AND WAREHOUSING (7 CS 2)	
Unit	**Contents**
I	Overview, Motivation(for Data Mining),Data Mining-Definition & Functionalities, Data Processing, Form of Data Preprocessing, Data Cleaning: Missing Values, Noisy Data, (Binning, Clustering, Regression, Computer and Human inspection), Inconsistent Data, Data Integration and Transformation. Data Reduction:-Data Cube Aggregation, Dimensionality reduction, Data Compression, Numerosity Reduction, Clustering, Discretization and Concept hierarchy generation.
II	Concept Description:- Definition, Data Generalization, Analytical Characterization, Analysis of attribute relevance, Mining Class comparisons, Statistical measures in large Databases. Measuring Central Tendency, Measuring Dispersion of Data, Graph Displays of Basic Statistical class Description, Mining Association Rules in Large Databases, Association rule mining, mining Single-Dimensional Boolean Association rules from Transactional Databases– Apriori Algorithm, Mining Multilevel Association rules from Transaction Databases and Mining Multi-Dimensional Association rules from Relational Databases.
III	What is Classification & Prediction, Issues regarding Classification and prediction, Decision tree, Bayesian Classification, Classification by Back propagation, Multilayer feed-forward Neural Network, Back propagation Algorithm, Classification methods K-nearest neighbor classifiers, Genetic Algorithm. Cluster Analysis: Data types in cluster analysis, Categories of clustering methods, Partitioning methods. Hierarchical Clustering- CURE and Chameleon. Density Based Methods-DBSCAN, OPTICS. Grid Based Methods- STING, CLIQUE. Model Based Method –Statistical Approach, Neural Network approach, Outlier Analysis
IV	Data Warehousing: Overview, Definition, Delivery Process, Difference between Database System and Data Warehouse, Multi Dimensional Data Model, Data Cubes, Stars, Snow Flakes, Fact Constellations, Concept hierarchy, Process Architecture, 3 Tier Architecture, Data Marting.
V	Aggregation, Historical information, Query Facility, OLAP function and Tools. OLAP Servers, ROLAP, MOLAP, HOLAP, Data Mining interface, Security, Backup and Recovery, Tuning Data Warehouse, Testing Data Warehouse.

Name of Subject : LOGIC SYNTHESIS (7 CS 3)	
Unit	**Contents**
I	Introduction to VLSI, circuits Asics and Moore's Law. Microelectronic Design, Styles, four phases in creating Microelectronics chips computer Aided Synthesis and Optimization. Algorithms Review of Graph Definitions and Notations Decision and Optimization Problems, Shortest and Longest Path Problems, Vertex Cover, Graph, Coloring, Clique covering and partitioning Algorithms Boolean Algebra and Representation of Boolean Functions, binary Decision diagrams. Satisfiability and cover problems.
II	Hardware Modeling: Introduction to Hardware Modeling Language, State Diagrams. Data flow and Sequencing Graphs. Compilation and Behavioral Optimization Techniques. Circuits Specifications for Architectural Synthesis Resources and constraints. Fundamental Architectural Synthesis Problems Temporal Domain Scheduling Spatial Domain Binding Hierarchical Models and Synchronization Problem. Area and performance estimation-Resource Dominated circuits and General Circuits.
III	Scheduling Algorithms: Model for Scheduling Problems, Scheduling without Resource, Constraints-Unconstrained Scheduling ASAP Scheduling Algorithms Latency. Constrained Scheduling. ALAP scheduling. Under Timing Constraints and Relative Scheduling with Resource Constraints Integer Linear Programming Model, Multiprocessor Scheduling, Heuristic Scheduling Algorithms (List Scheduling). Force Directed Scheduling.
IV	Two Level Combination Logic Optimization: Logic Optimization Principles-Definitions, Exact Logic Minimization, Heuristic, Logic Minimization, and Testability Properties Operations on Two level logic Cover-positional Cube Notation, Functions with Multivolume inputs and list oriented manipulation. Algorithms for logic minimization.
V	Sequential logic optimization: Introduction, Sequential circuit optimization using state based models- state minimization, state encoding. Sequential circuit optimization using network models. Implicit finite state machine traversal methods. Testability consideration for synchronous circuits.

Name of Subject : ARTIFICIAL INTELLIGENCE (7 CS 4)	
Unit	**Contents**
I	Meaning and definition of artificial intelligence, Various types of production systems, Characteristics of production systems, Study and comparison of breadth first search and depth first search. Techniques, other Search Techniques like hill Climbing, Best first Search. A* algorithm, AO* algorithms etc, and various types of control strategies.
II	Knowledge Representation, Problems in representing knowledge, knowledge representation using propositional and predicate logic, comparison of propositional and predicate logic, Resolution, refutation, deduction, theorem proving, inferencing, monotonic and non-monotonic reasoning.
III	Probabilistic reasoning, Baye's theorem, semantic networks scripts schemas, frames, conceptual dependency and fuzzy logic, forward and backward reasoning.
IV	Game playing techniques like minimax procedure, alpha-beta cut-offs etc, planning, Study of the block world problem in robotics, Introduction to understanding and natural languages processing.
V	Introduction to learning, Various techniques used in learning, introduction to neural networks, applications of neural networks, common sense, reasoning, some example of expert systems.

Name of Subject : MULTIMEDIA SYSTEMS (7 CS 5)	
Unit	**Contents**
I	Introduction to Multimedia, Multimedia Information, Multimedia Objects, Multimedia in business and work. Convergence of Computer, Communication and Entertainment products and Stages of Multimedia Projects, Multimedia hardware, Memory & storage devices, Communication devices, Multimedia software's, presentation tools, tools for object generations, video, sound, image capturing, authoring tools, card and page based authoring tools.
II	Multimedia Building Blocks Text, Sound MIDI, Digital Audio, audio file formats, MIDI under windows environment Audio & Video Capture.
III	Data Compression Huffman Coding, Shannon Fano Algorithm, Huffman Algorithms, Adaptive Coding, Arithmetic Coding Higher Order Modeling. Finite Context Modeling, Dictionary based Compression, Sliding Window Compression, LZ77, LZW compression, Compression, Compression ratio loss less & lossy compression.
IV	Speech Compression & Synthesis Digital Audio concepts, Sampling Variables, Loss less compression of sound, loss compression & silence compression.
V	Images: Multiple monitors, bitmaps, Vector drawing, lossy graphic compression, image file formatic animations Images standards, JPEG Compression, Zig Zag Coding, Multimedia Database. Content based retrieval for text and images, Video: Video representation, Colors, Video Compression, MPEG standards, MHEG Standard Video Streaming on net, Video Conferencing, Multimedia Broadcast Services, Indexing and retrieval of Video Database, recent development in Multimedia

Electives

Name of Subject : SERVICE ORIENTED ARCHITECHURE (7 CS 6.1)	
Unit	**Contents**
I	SOA Fundamentals: Defining SOA, Business Value of SOA, Evolution of SOA, SOA characteristics, concept of a service in SOA, misperceptions about SOA, Basic SOA architecture, infrastructure services, Enterprise Service Bus (ESB), SOA Enterprise Software models, IBM On Demand operating environment.
II	Web services Technologies: XML technologies – XML, DTD, XSD, XSLT, XQuery, XPath Web services technologies - Web services and SOA, WSDL, SOAP, UDDI WS Standards (WS-*) - Web services and Service-oriented enterprise (SOE), WS-Coordination and WS-Transaction, Business Process Execution Language for Web Services (BPEL4WS), WS-Security and the Web services security specifications, WS-Reliable Messaging, WS-Policy, WS-Attachments.
III	SOA Planning and Analysis: Stages of the SOA lifecycle, SOA Delivery Strategies, service-oriented analysis, Capture and assess business and IT issues and drivers, determining non-functional requirements (e.g., technical constraints, business constraints, runtime qualities, non-runtime qualities), business centric SOA and its benefits, Service modeling, Basic modeling building blocks, service models for legacy application integration and enterprise integration, Enterprise solution assets(ESA) .
IV	SOA Design and implementation: service-oriented design process, design activities, determine services and tasks based on business process model, choosing appropriate standards, articulate architecture, mapping business processes to technology, designing service integration environment (e.g., ESB, registry), Tools available for appropriate designing, implementing SOA, security implementation, implementation of integration patterns, services enablement, quality assurance.
V	Managing SOA Environment: Distributing service management and monitoring concepts, operational management challenges, Service-level agreement considerations, SOA governance (SLA, roles and responsibilities, policies, critical success factors, and metrics), QoS compliance in SOA governance, role of ESB in SOA governance, impact of changes to services in the SOA lifecycle.

Name of Subject : OPTICAL COMMUNICATION (7 CS 6.2)	
Unit	**Contents**
I	Introduction to optical communication principles of light transmission optical fiber modes and configurations, Mode theory for circular wave-guides, Single-mode fibers, Multimode fibers, Numerical aperture, Mode field diameter, V-number, fiber materials, Fiber fabrication techniques.
II	Optical sources, LED'S, LASER diodes, Model reflection noise, Power launching and coupling, population inversion, fiber splicing, optical connectors, Photo-detectors, PIN, Avalanche detector, Response time, Avalanche multiplication noise.
III	Signal degradation in optical fibers, Attenuation losses, Signal distortion in optical wave guides, Material dispersion, Wave guide dispersion, Chromatic dispersion, Inter-modal distortion, Pulse broadening in Graded index fibers, Mode coupling, Advance fiber designs: dispersion shifted, Dispersion flattened, Dispersion compensating fibers, Design optimization of single mode fibers.
IV	Coherent optical fiber communication, Modulation techniques for Homodyne and Heterodyne systems, Optical filter link design. Rise time budget and link power budget, Long haul systems bit error rate, line coding, NRZ, RZ, Block Codes eye pattern.
V	Advance system and techniques, wavelength division multiplexing, optical amplifiers semiconductor amplifier, EDFA, Comparison between semiconductor and optical amplifier, Gain band width, Photonic switching, Optical Networks. Optical fiber bus, Ring topology, Star architectures, FDDI, SON-ET.

Name of Subject : REAL TIME SYSTEMS (7 CS 6.3)	
Unit	**Contents**
I	Introduction: Definition, Typical Real Time Applications: Digital Control, High Level Controls, Signal Processing etc., Release Times, Deadlines, and Timing Constraints, Hard Real Time Systems and Soft Real Time Systems, Reference Models for Real Time Systems: Processors and Resources, Temporal Parameters of Real Time Workload, Periodic Task Model, Precedence Constraints and Data Dependency.
II	Real Time Scheduling: Common Approaches to Real Time Scheduling: Clock Driven Approach, Weighted Round Robin Approach, Priority Driven Approach, Dynamic Versus Static Systems, Optimality of Effective-Deadline-First (EDF) and Least-Slack-Time-First (LST) Algorithms, Offline Versus Online Scheduling, Scheduling Aperiodic and Sporadic jobs in Priority Driven and Clock Driven Systems.
III	Resources Access Control: Effect of Resource Contention and Resource Access Control (RAC), Non-preemptive Critical Sections, Basic Priority-Inheritance and Priority-Ceiling Protocols, Stack Based Priority-Ceiling Protocol, Use of Priority-Ceiling Protocol in Dynamic Priority Systems, Preemption Ceiling Protocol, Access Control in Multiple-Unit Resources, Controlling Concurrent Accesses to Data Objects.
IV	Multiprocessor System Environment: Multiprocessor and Distributed System Model, Multiprocessor Priority-Ceiling Protocol, Schedulability of Fixed-Priority End-to-End Periodic Tasks, Scheduling Algorithms for End-to-End Periodic Tasks, End-to-End Tasks in Heterogeneous Systems, Predictability and Validation of Dynamic Multiprocessor Systems, Scheduling of Tasks with Temporal Distance Constraints.
V	Real Time Communication: Model of Real Time Communication, Priority-Based Service and Weighted Round-Robin Service Disciplines for Switched Networks, Medium Access Control Protocols for Broadcast Networks, Internet and Resource Reservation Protocols, Real Time Protocols, Communication in Multicomputer System, An Overview of Real Time Operating Systems.

Laboratories

7 CS 7. COMPILER DESIGN LAB

1. Develop a lexical analyzer to recognize a few patterns in PASCAL and C.
a. (ex: identifiers, constants, comments, operators etc.)
2. Write a program to parse using Brute force technique of Top down parsing.
3. Develop on LL (1) parser (Construct parse table also).
4. Develop an operator precedence parser (Construct parse table also)
5. Develop a recursive descent parser.
6. Write a program for generating for various intermediate code forms
a. i) Three address code ii) Polish notation
7. Write a program to simulate Heap storage allocation strategy
8. Generate Lexical analyzer using LEX
9. Generate YACC specification for a few syntactic categories.
10. Given any intermediate code form implement code optimization techniques

7 CS 8. DATA MINING AND WAREHOUSING LAB

The objective of the lab exercises is to use data mining techniques to use standard databases available to understand DM processes using any DM tool)

2. Gain insight for running pre- defined decision trees and explore results using MS OLAP Analytics.

6. Using IBM OLAP Miner – Understand the use of data mining for evaluating the content of multidimensional cubes.

7. Using Teradata Warehouse Miner – Create mining models that are executed in SQL.

(Portal work : The objective of this lab exercises is to integrate pre-built reports into a portal application)

8. Publish and analyze a business intelligence portal.

Metadata & ETL Lab: The objective of this lab exercises is to implement metadata import agents to pull metadata from leading business intelligence tools and populate a metadata repository. To understand ETL processes

9. Import metadata from specific business intelligence tools and populate a meta data repository.

8. Publish metadata stored in the repository.

9. Load data from heterogeneous sources including text files into a pre-defined warehouse schema.

Case study

3. Design a data mart from scratch to store the credit history of customers of a bank. Use this credit profiling to process future loan applications.

4. Design and build a Data Warehouse using bottom up approach titled 'Citizen Information System'.

7 CS 9 . LOGIC SYNTHESIS LAB

1. Write a program which reads simple digital circuit (of size up to 10 gates) in blif / Boolean equation and display schematic in graphics format.
2. Write a program to convert Blif format into Boolean equation.
3. Write a program that estimate area of circuit (specified as Blif or Boolean equation) using library binding technique of simple circuit (up to 10 gates).
4. Write a program to implement state machine up to 5 states.
5. Write a program to count 4-input lookup table in a simple circuit (up to 10 gates specified as Blif or Boolean equation).
6. Write a program to obtain sequencing graph for a given set of arithmetic expression (up to 10 nodes)
7. Write VHDL Codes for all gates with all Modeling.
8. Write VHDL Codes & Test bench for half adder and full adder.

Theory

Name of Subject : INFORMATION SYSTEM AND SECURITIES (8 CS 1)	
Unit	**Contents**
I	Introduction to security attacks, services and mechanism, introduction to cryptography. Conventional Encryption: Conventional encryption model, classical encryption techniques- substitution ciphers and transposition ciphers, cryptanalysis, stereography, stream and block ciphers. Modern Block Ciphers: Block ciphers principals, Shannon's theory of confusion and diffusion, fiestal structure, data encryption standard(DES), strength of DES, differential and linear crypt analysis of DES, block cipher modes of operations, triple DES, IDEA encryption and decryption, strength of IDEA, confidentiality using conventional encryption, traffic confidentiality, key distribution, random number generation.
II	Introduction to graph, ring and field, prime and relative prime numbers, modular arithmetic, Fermat's and Euler's theorem, primality testing, Euclid's Algorithm, Chinese Remainder theorem, discrete logarithms. Principals of public key crypto systems, RSA algorithm, security of RSA, key management, Diffle-Hellman key exchange algorithm, introductory idea of Elliptic curve cryptography, Elganel encryption.
III	Message Authentication and Hash Function: Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions and MACS, MD5 message digest algorithm, Secure hash algorithm(SHA). Digital Signatures: Digital Signatures, authentication protocols, digital signature standards (DSS), proof of digital signature algorithm.
IV	Authentication Applications: Kerberos and X.509, directory authentication service, electronic mail security-pretty good privacy (PGP), S/MIME.
V	IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management. Web Security: Secure socket layer and transport layer security, secure electronic transaction (SET). System Security: Intruders, Viruses and related threads, firewall design principals, trusted systems.

Name of Subject : CAD FOR VLSI DESIGN (8 CS 2)	
Unit	**Contents**
I	Modern digital systems, complexity and diversity of digital systems, productivity gap and need for CAD tools. Introduction to steps and CAD flow for designing with ASIC and FPGA.
II	Introduction to VHDL, background, VHDL requirement, Elements of VHDL, top down design, convention and syntax, basic concepts in VHDL i.e. characterizing H/W languages, objects, classes, and signal assignments.
III	Structural specification of H/W- Parts library, Wiring, modeling, binding alternatives, top down wiring. Design organization and parameterization. Type declaration, VHDL operators.
IV	VHDL subprogram parameters, overloading, predefined attributes, user defined attributes, packaging basic utilities. VHDL as a modeling language- bi-directional component modeling, multi mode component modeling,
V	Examples of VHDL synthesis subsets- combinational logic synthesis, sequential circuit synthesis, state machine synthesis. VHDL language grammar. Introduction to synthetic circuits and circuit repositories.

Name of Subject : ADVANCED COMPUTER ARCHITECTURES (8 CS 3)	
Unit	**Contents**
I	INTRODUCTION**:** Parallel Computing, Parallel Computer Model, Program and Network Properties, Parallel Architectural Classification Schemes, Flynn's & Feng's Classification, Performance Metrics and Measures, Speedup Performance Laws: Multiprocessor System and Interconnection Networks; IEEE POSIX Threads: Creating and Exiting Threads, Simultaneous Execution of Threads, Thread Synchronization using Semaphore and Mutex, Canceling the Threads.
II	PIPELINING AND MEMORY HIERARCHY: Basic and Intermediate Concepts, Instruction Set Principle; ILP: Basics, Exploiting ILP, Limits on ILP; Linear and Nonlinear Pipeline Processors; Super Scalar and Super Pipeline Design; Memory Hierarchy Design: Advanced Optimization of Cache Performance, Memory Technology and Optimization, Cache Coherence and Synchronization Mechanisms.
III	THREAD AND PROCESS LEVEL PARALLEL ARCHITECTURE: Introduction to MIMD Architecture, Multithreaded Architectures, Distributed Memory MIMD Architectures, Shared Memory MIMD Architecture, Clustering, Instruction Level Data Parallel Architecture, SIMD Architecture, Fine Grained and Coarse Grained SIMD Architecture, Associative and Neural Architecture, Data Parallel Pipelined and Systolic Architectures, Vector Architectures.
IV	Parallel Algorithms: PRAM Algorithms: Parallel Reduction, Prefix Sums, Preorder Tree Traversal, Merging two Sorted lists; Matrix Multiplication: Row Column Oriented Algorithms, Block Oriented Algorithms; Parallel Quicksort, Hyper Quick sort; Solving Linear Systems: Gaussian Elimination, Jacobi Algorithm; Parallel Algorithm Design Strategies.
V	Developing Parallel Computing Applications: OpenMP Implementation in 'C': Execution Model, Memory Model; Directives: Conditional Compilation, Internal Control Variables, Parallel Construct, Work Sharing Constructs, Combined Parallel Work-Sharing Constructs, Master and Synchronization Constructs; Run-Time Library Routines: Execution Environment Routines, Lock Routines, Timing Routines; Simple Examples in 'C'. Basics of MPI.

Name of Subject : DISTRIBUTED SYSTEMS (8 CS 4.1)	
Unit	**Contents**
I	CHARACTERIZATION OF DISTRIBUTED SYSTEMS: Introduction, Examples of distributed Systems, Resource sharing and the Web Challenges. System Models: Architectural models, Fundamental Models Theoretical Foundation for Distributed System: Limitation of Distributed system, absence of global clock, shared memory, Logical clocks, Lamport's & vectors logical clocks, Causal ordering of messages, global state, termination. Distributed Mutual Exclusion: Classification of distributed mutual exclusion, requirement of mutual exclusion theorem, Token based and non token based algorithms, performance metric for distributed mutual exclusion algorithms.
II	DISTRIBUTED DEADLOCK DETECTION: system model, resource Vs communication deadlocks, deadlock prevention, avoidance, detection & resolution, centralized dead lock detection, distributed dead lock detection, path pushing algorithms, edge chasing algorithms. Agreement Protocols: Introduction, System models, classification of Agreement Problem, Byzantine agreement problem, Consensus problem, Interactive consistency Problem, Solution to Byzantine Agreement problem, Application of Agreement problem, Atomic Commit in Distributed Database system.
III	DISTRIBUTED OBJECTS AND REMOTE INVOCATION: Communication between distributed objects, Remote procedure call, Events and notifications, Java RMI case study. SECURITY: Overview of security techniques, Cryptographic algorithms, Digital signatures Cryptography pragmatics, Case studies: Needham Schroeder, Kerberos, SSL & Millicent. DISTRIBUTED FILE SYSTEMS: File service architecture, Sun Network File System, The Andrew File System, Recent advances.
IV	TRANSACTIONS AND CONCURRENCY CONTROL: Transactions, Nested transactions, Locks, Optimistic Concurrency control, Timestamp ordering, Comparison of methods for concurrency control. DISTRIBUTED TRANSACTIONS: Flat and nested distributed transactions, Atomic Commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery. Replication: System model and group communication, Fault - tolerant services, highly available services, Transactions with replicated data.
V	DISTRIBUTED ALGORITHMS: Introduction to communication protocols, Balanced sliding window protocol, Routing algorithms, Destination based routing, APP problem, Deadlock free Packet switching, Introduction to Wave & traversal algorithms, Election algorithm. CORBA CASE STUDY: CORBA RMI, CORBA services.

Name of Subject : IMAGE PROCESSING (8 CS 4.2)	
Unit	**Contents**
I	Introduction and Fundamentals: Motivation and Perspective, Applications, Components of Image Processing System, Element of Visual Perception, A Simple Image Model, Sampling and Quantization. Image Enhancement in Spatial Domain: Introduction; Basic Gray Level Functions – Piecewise-Linear Transformation Functions: Contrast Stretching; Histogram Specification; Histogram Equalization; Local Enhancement; Enhancement using Arithmetic/Logic Operations – Image Subtraction, Image Averaging; Basics of Spatial Filtering; Smoothing - Mean filter, Ordered Statistic Filter; Sharpening – The Laplacian.
II	Image Enhancement in Frequency Domain: Fourier Transform and the Frequency Domain, Basis of Filtering in Frequency Domain, Filters – Low-pass, High-pass; Correspondence Between Filtering in Spatial and Frequency Domain; Smoothing Frequency Domain Filters – Gaussian Low pass Filters; Sharpening Frequency Domain Filters – Gaussian High pass Filters; Homomorphic Filtering. Image Restoration: A Model of Restoration Process, Noise Models, Restoration in the presence of Noise only Spatial Filtering – Mean Filters: Arithmetic Mean filter, Geometric Mean Filter, Order Statistic Filters – Median Filter, Max and Min filters; Periodic Noise Reduction by Frequency Domain Filtering – Band pass Filters; Minimum Mean-square Error Restoration.
III	Color Image Processing: Color Fundamentals, Color Models, Converting Colors to different models, Color Transformation, Smoothing and Sharpening, Color Segmentation. Morphological Image Processing: Introduction, Logic Operations involving Binary Images, Dilation and Erosion, Opening and Closing, Morphological Algorithms – Boundary Extraction, Region Filling, Extraction of Connected Components, Convex Hull, Thinning, Thickening.
IV	Registration: Introduction, Geometric Transformation – Plane to Plane transformation, Mapping, Stereo Imaging – Algorithms to Establish Correspondence, Algorithms to Recover Depth. Segmentation: Introduction, Region Extraction, Pixel-Based Approach, Multi-level Thresholding, Local Thresholding, Region-based Approach, Edge and Line Detection: Edge Detection, Edge Operators, Pattern Fitting Approach, Edge Linking and Edge Following, Edge Elements Extraction by Thresholding, Edge Detector Performance, Line Detection, Corner Detection.
V	Feature Extraction: Representation, Topological Attributes, Geometric Attributes. Description: Boundary-based Description, Region-based Description, Relationship. Object Recognition: Deterministic Methods, Clustering, Statistical Classification, Syntactic Recognition, Tree Search, Graph Matching.

Name of Subject : NATURAL LANGUAGE PROCESSING (8 CS 4.3)	
Unit	**Contents**
I	Introduction to Natural Language Understanding: The study of Language, Applications of NLP, Evaluating Language Understanding Systems, Different levels of Language Analysis, Representations and Understanding, Organization of Natural language Understanding Systems, Linguistic Background: An outline of English syntax.
II	Introduction to semantics and knowledge representation, Some applications like machine translation, database interface.
III	Grammars and Parsing: Grammars and sentence Structure, Top-Down and Bottom-Up Parsers, Transition Network Grammars, Top-Down Chart Parsing. Feature Systems and Augmented Grammars: Basic Feature system for English, Morphological Analysis and the Lexicon, Parsing with Features, Augmented Transition Networks.
IV	Grammars for Natural Language: Auxiliary Verbs and Verb Phrases, Movement Phenomenon in Language, Handling questions in Context-Free Grammars. Human preferences in Parsing, Encoding uncertainty, Deterministic Parser.
V	Ambiguity Resolution: Statistical Methods, Probabilistic Language Processing, Estimating Probabilities, Part-of-Speech tagging, Obtaining Lexical Probabilities, Probabilistic Context-Free Grammars, Best First Parsing. Semantics and Logical Form, Word senses and Ambiguity, Encoding Ambiguity in Logical Form

Laboratories

8CS5. INFORMATION SYSTEM AND SECURITIES LAB

List of Projects are as follows (Implement any one)

1. Shopping cart project using ADO.NET: This sample project has all basic features required for a shopping cart web site including Login, Registration, Add to Cart, Checkout etc. A good ASP.NET learning project using C#, ASP.NET, SQL Server.

2. Personal Assistant: This is a small project for managing personal details. Current version of this project support Address Book feature - Add, Edit and Manage contacts and addresses using VB.NET.

3. Address Book: This is a small project for managing contact details. This is a C# version of the 'Personal Assistant' project.

4. School Management System: This is a project for managing education institutes using C#.

5. Library Management System: This is an academic project for students using Java.

6. spider Alerts & Web services: This project communicates with web services and downloads Alerts from the web server using Java & XML.

7. Patient Information System: This software can be used to keep track of the patients' information and treatment details in a hospital or clinic. Some of the advanced features include patient consulting, lab information, billing etc using JSP, Servlet & JDBC.

8. Web based Address Book: This application can be used to keep track of your contacts/addresses. N Tier architecture is used to separate data layer, business layer and UI layers.

8CS 6 VLSI DESIGN LAB

Simple Design exercises:

01 Half adder, Full adder, Subtractor Flip Flops, 4bit comparator.
02 Parity generator
03 Bit up/down counter with load able count
04 Decoder and encoder
05 8 bit shift register
06 8:1 multiplexer
07 Test bench for a full adder
08 Barrel shifter
09 N by m binary multiplier
10 RISC CPU (3bit opcode, 5bit address)

TOOLS :

Xilinx Tools/ Synopsis Tools/ Cadence Tools/ Model SIM/ Leonardo Spectrum Tools/VIS/SIS Tools to be used.

8CS7. X-WINDOWS LAB

1. To understand x-windows, x-lib, x-toolkit and x network protocol and learn it's commend line argument.

Programs in C/C++ language.

2. Write a program to establish connection with x server and get the sender and protocol information.
3. Using X library of the server, write a program to create a new window of a given size, title, border, foreground and background colors.

4-5 To implement keyboard event handling/marking using x library.
6-7 To implement mouse event handling/marking using x library and interface with windows managers and drawing applications.
8. To implement a multiple windows application.
9-10 To implement various drag and drop based GUI components in Visual Basic.
11-12 To implement various drag and drop based GUI components in Motif and Lesstif.