Bansilal Ramnath Agarwal Charitable Trust's

Vishwakarma Institute of Technology

(*An Autonomous Institute affiliated to University of Pune*)

Structure & Syllabus of

B.Tech (Information Technology)

Pattern 'F11'

Effective from Academic Year 2014-15

Prepared by: - Board of Studies in Computer Engineering

Approved by: - Academic Board, Vishwakarma Institute of Technology, Pune

Signed by,

Chairman – BOS **Chairman – Academic Board**

Content

Sr. No.			Title	Page No.
1		**Program Educational Objectives of B.Tech (Information Technology)**		8
2		**Course Structure - Module III**		16
3		**Course Syllabi for Courses - Module III**		17
	3.1	CS20103	Discrete Structures (Theory Course)	19
	3.2	CS20111	Data Structures (Theory Course)	22
	3.3	CS20108	Computer Organization (Theory Course)	25
	3.4	CS21109	Applied Electronics (Theory Course)	27
	3.5	CS20113	Digital Electronics and Logic Design (Theory Course)	29
	3.6	CS20103	Discrete Structures (Tutorial)	31
	3.7	CS20113	Digital Electronics and Logic Design (Tutorial)	33
	3.8	CS20311	Data structures (Laboratory Course)	34
	3.9	CS20313	Digital Electronics (Laboratory Course)	36
	3.10	CS27401	Mini Project	--
	3.11	CS24301 CS24303	VB.NET OR C#.NET (Skill Development Course)	38 40
	3.12		Elective –Soft Skills	--
	3.13	CS20401	Comprehensive Viva Voce	-
	3.14		Institute Elective	-
				-
4		**Course Structure - Module IV**		42
5		**Course Syllabi for Courses - Module IV**		43
	5.1	CS21104	Mathematical Transformations and Applications (Theory Course)	45
	5.2	CS20110	Computer Graphics (Theory Course)	47

	5.3	CS20105	Principles of Programming Languages (Theory Course)	49
	5.4	CS21112	Data Communication (Theory Course)	52
	5.5	CS20114	Microprocessor and Interfacing (Theory Course)	54
	5.6	CS20114	Microprocessor and Interfacing (Tutorial)	56
	5.7	CS21104	Mathematical Transforms and Applications (Tutorial)	58
	5.8	CS20314	Microprocessor and Interfacing (Laboratory Course)	60
	5.9	CS20305	Principles of Programming Languages (Laboratory Course)	63
	5.10	CS20310	Computer Graphics (Laboratory Course)	65
	5.11	CS27402	Mini Project	-
	5.12	CS24302	ASP.NET OR	67
		CS24304	Python (Skill Development Course)	69
	5.13		Elective – Health & Hobby	-
	5.14	CS20402	Comprehensive Viva Voce	-
				-
6		**Course Structure - Module V**		71
7		**Course Syllabi for Courses - Module V**		72
	7.1	CS30101	Operating Systems (Theory Course)	74
	7.2	CS30103	Computer Networks (Theory Course)	77
	7.3	CS30105	Theory of Computation (Theory Course)	80
	7.4	CS30109	Web Technologies (Theory Course)	83
	7.5	CS30115	Advanced Data Structues (Theory Course)	85
	7.6	CS30101	Operating Systems (Tutorial)	87
	7.7	CS30103	Computer Networks (Tutorial)	89
	7.8	CS30303	Operating Systems (Laboratory Course)	91
	7.9	CS30311	Computer Networks (Laboratory Course)	93
	7.10	CS30309	Web Technologies (Laboratory Course)	95

	7.11	CS37401	Mini Project	-
	7.12		Professional Development Course (Institute Level)	-
	7.13	CS30401	Comprehensive Viva Voce	-
	7.14	CS37301	Seminar	-
	7.15	CS37302	Project Stage - I	-
8		**Course Structure - Module VI**		97
9		**Course Syllabi for Courses - Module VI**		98
	9.1	CS30102	Software Engineering (Theory Course)	100
	9.2	CS30106	Database Management Systems (Theory Course)	103
	9.3	CS30108	Design and Analysis of Algorithm (Theory Course)	106
	9.4	CS30114	Systems Programming (Theory Course)	108
	9.5	CS31114	Data Acquisition Systems (Theory Course)	110
	9.6	CS30102	Software Engineering (Tutorial)	112
	9.7	CS30114	Systems Programming (Tutorial)	114
	9.8	CS30302	Software Engineering (Laboratory Course)	116
	9.9	CS30306	Database Management Systems (Laboratory Course)	119
	9.10	CS31314	Data Acquisition Systems (Laboratory Course)	121
	9.11	CS37401	Mini Project	-
	9.12		Professional Development Course (Institute Level)	-
	9.13	CS30402	Comprehensive Viva Voce	-
	9.14	CS37301	Seminar	-
10		**Course Structure - Module VII**		122
11		**Course Syllabi for Courses - Module VII**		123
	11.1	CS40101	Human Computer Interaction (Theory Course)	124

	11.2	CS40113	Business Analytics (Theory Course)	126
	11.3		*Elective Group I (Theory Course)	
		CS42105	• Mobile Computing	128
		CS42127	• Cloud Computing	130
		CS42103	• Parallel Computing on GPU	132
		CS42102	• Image Processing	134
		CS42101	• Advanced Computer Graphics	136
		CS42131	• Enterprise Systems	138
	11.4		*Elective Group II (Theory Course)	
		CS42125	• Randomized and Approximation Algorithm	141
		CS42112	• Distributed Systems	144
		CS42119	• Information Retrieval	147
		CS42113	• Digital Signal Processing	149
	11.5	CS40101	Human Computer Interaction (Tutorial Course)	151
	11.6		*Elective Group II (Tutorial Course)	
		CS42125	• Randomized and Approximation Algorithm	153
		CS42112	• Distributed Systems	155
		CS42119	• Information Retrieval	157
		CS42113	• Digital Signal Processing	159
	11.7	CS40313	Business Analytics (Laboratory Course)	161
	11.8		*Elective Group I (Laboratory Course)	
		CS42305	• Mobile Computing	163
		CS42327	• Cloud Computing	165
		CS42303	• Parallel Computing on GPU	167
		CS42302	• Image Processing	168
		CS42301	• Advanced Computer Graphics	169
		CS42331	• Enterprise Systems	171
	11.9	CS47303	Project Stage - II	173
12		**Course Structure - Module VIII**		176
13		**Course Syllabi for Courses - Module VIII**		178
	13.1	CS40112	Software Testing and Quality Assurance (Theory Course)	178
	13.2	CS40114	Information Systems Security (Theory Course)	181

	13.3		$Elective Group III (Theory Course)	
		CS42120	• Data Mining	184
		CS42128	• Machine Learning	186
		CS42104	• Neural Networks	189
		CS42124	• Algorithmic Number and Algebra	191
	13.4		$$Elective Group IV (Theory Course)	
		CS42118	• Geographical Information Systems	194
		CS42129	• Management Information Systems	196
		CS42121	• Advanced Computer Architecture	199
		CS42116	• Convergence Technologies	202
		CS42130	• Embedded Systems	205
	13.5		$Elective Group III (Tutorial)	
		CS42120	• Data Mining	207
		CS42128	• Machine Learning	208
		CS42104	• Neural Networks	210
		CS42124	• Algorithmic Number and Algebra	212
	13.6		$$Elective Group IV (Tutorial)	
		CS42118	• Geographical Information Systems	214
		CS42129	• Management Information Systems	215
		CS42121	• Advanced Computer Architecture	217
		CS42116	• Convergence Technologies	218
		CS42130	• Embedded Systems	220
	13.7	CS40312	Software Testing and Quality Assurance (Laboratory Course)	222
	13.8	CS40314	Information Systems Security (Laboratory Course)	224
	13.9	CS47308	Project Stage - III	226
14		**Course Syllabi for PD Courses in TY B.Tech (Infromation Technology)**		229
	14.1	CS33303	Advanced Java	230
	14.2	CS33312	PIC Microcontroller	232
	14.3	CS33313	Mobile Application Development	233
	14.4	CS33306	Ethical Hacking and Network Defense	235
	14.5	CS33310	Spring Framework	237

	14.6	CS33314	Struts Framework	239
	14.7	CS33311	Problem Solving and Programming	241

Program Educational Objectives (PEO)
B.Tech (Information Technology)

1. Program and Course Outcomes

Programme objectives:

PEO No.	Description of the Objective
I	**Preparation:** To prepare the students with a commitment towards intellectual, creative and professional growth by application of innovative practices widely accepted by industry or global educational platform.
II	**Core competence:** To provide students with foundation in application of mathematical & engineering fundamentals to computing solutions that can result in product or process.
III	**Breadth:** To enable student to exercise problem solving capacity with effective use of analysis, design, development that address idea realization.
IV	**Professionalism:** To inculcate students with professional and ethical values communication and collaboration skill and involvement in team work as a member having multidisciplinary knowledge useful to the society.
V	**Learning Environment:**To provide students an academic environment that developed leadership qualities, excellent in subject area of computer engineering and lifelong learning in every sphere of their life.

Course Objectives: Course objectives are specified in the course syllabus.

2. Program and Course Outcomes

Programme Outcomes:

a. **Broad foundations:** Graduates will understand and apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.
b. **Disciplinary Foundation:** Graduates will recognize of the need for, and an ability to engage in, continuing professional development and demonstrate an ability to use current techniques, skills, and tools necessary for computing practices.
c. **Specialization:** Graduates will have understanding of and ability to apply the concepts and skills related to writing technical documents such as specifications, design and users manuals in appropriate formats.
d. **Design:** Graduates will be able to analyze, design, implement, and test a solution to real world problems including appreciating the value of efficient design created to meet clearly developed requirements.
e. **Innovations:** Graduates will demonstrate ability to formulate and answer empirical questions through participation in projects especially addressing design and deployment, of computing infrastructure with technology integration and user-centered design
f. **Communication skills:** Graduates will demonstrate ability to communicate effectively through verbal and written form.
g. **Interpersonal skills:** Graduates should be able to interact professionally with others in the workplace and engage themselves, effectively in team work for group projects.
h. **Engineering and society:** Graduates will understand professional ethical and social responsibility which will prepare then to address local and global impact of engineering solutions.
i. **Engineering Applications:** Graduates will understand and apply engineering artifacts of engineering solutions in meaningful and useful way to society and global environment.
j. **Lifelong Learning:** Graduate will acquire skills necessary to engage in life long learning and understanding of need to continuity improve the skills in refining and updating the knowledge base.

Course Outcomes: Course outcomes are specified in the course syllabus.

FF No. : 654

CS10102:: COMPUTER PROGRAMMING

Credits: 03 **Teaching Scheme: -** Theory 3 Hrs/Week

Prerequisites: Nil

Objectives:

- To understand use of efficient programming and documentation.
- To understand C programming language.
- To learn problem solving skills using C
- Understand of how several fundamental algorithms work, particularly those concerned with string operations, sorting and searching.
- Mapping with PEOs: I, II, IV, V : (a, d, e, g, k, p)

Unit I **(8+2 Hrs)**

A. Introduction to Programming:,. Problem solving using computers and logic design. Algorithms, Algorithm design. Flowcharts, pseudo code. Designing algorithms for problems like arithmetic and geometric progression, roots of quadratic equation, mensuration, min-max, mean, median, mode, prime numbers. Sorting, searching. Implementing algorithms using programming languages – levels of languages. Assemblers, Compilers, Linker, Loader, Interpreter.

Introduction to C: "Hello World" in C – editor, compiler, execution environment. C as a middle level language. Basic structure of C program, standard library and header files, Syntax and Semantics. Variable, constant (literal and named), Data types, variable declaration. Assignment. Operators: Arithmetic, logical, relational, Expressions, Precedence & Associativity. Input and output statements, escape sequences.

B. Bits and bytes – importance of digital representation in computers. Number System and algorithms for inter conversions.C programming on Linux and Windows.

Unit II **(8+2 Hrs)**

A. Flow of Control: Selection Statement: if, nested if –else, Conditional Expression, Switch statements. Iteration Statements: for loop, while loop, do -while loop, nested loop. Jump Statements: go to, break & continue. Common programming errors.

Arrays: Concept, declaration and initialization of arrays, accessing individual elements of array. Concept of 2-D array (Matrix), row major and column major representation of array, address calculation for accessing the individual element.

B. Static variables and constants in C language.

Unit III **(8+2 Hrs)**

A.

Functions: Need of functions, function declaration, definition and call. Inbuilt functions and user defined functions. Passing arguments to a function, returning values from a function. Scope of variable, local and global variable. Access specifiers.Passing arrays to functions.

Strings: Strings as arrays, character array versus strings, reading strings, writing strings, user defined functions for string operations – copy, concatenate, length, reverse, converting case, appending, comparing two string, extracting a substring. Array of strings.

B. , Const keyword, Standard string library functions in string.h

Unit IV **(8+2 Hrs)**

A. Recursive Functions: Need of Recursion, direct recursion, indirect recursion, impact of recursion on local& global variables, examples of recursive programs – factorial, progressions, towers of Hanoi. Recursive vs Iterative solutions. Disadvantages of recursion.

Pointers: Concept of pointers, relevance of data type in pointer variable, pointer arithmetic. Pointer to pointer. Pointers and functions (passing pointers to functions, returning pointers from functions). Pointers and arrays. Pointers and strings. Pointer constants. Array of pointers, pointer to array. Various alternatives of accessing arrays (1-D and 2-D) using pointers.

B. Preprocessor directives. Preprocessor: Macro Substitution, difference between macro and function.

Unit V **(8+2 Hrs)**

Structures: Notion, declaration and initialization, structure variables, accessing and assigning values of the fields, "size of" operator, functions and structures, arrays of structures, nested structures, pointers and structures, passing structure to a function and returning structure from function.

Dynamic memory allocation, type casting, Self referential structures, linked list as a dynamic alternative to arrays.

File Handling in C: file types, file opening modes, file handling I/O – fprintf, fscanf, fwrite, fread, fseek. File pointers. Implementing basic file operations in C.

B. Typedef keyword. Union, Nesting of Structure and Union. Enumerated data types.

Text Books

1. "Programming with C- Schaum's outline Series", B. Gottfried, Second edition, Tata McGraw Hill Publication, ISBN 0-07-463491-7,
2. "Let us C", Y. Kanetkar, Second Edition, BPB Publication. ISBN: 8176566217.

Reference Books

1. "Programming language – ANSI C", Brain W Kernighan and Dennis Ritchie, Second edition ISBN 0-13-110370-9,

Additional Reading

1. "A first book of C- Fundamental of C Programming", Gary Bronson and Stephen Menconi, ISBN: 0314073361,

FF No. : 654

CS10302:: COMPUTER PROGRAMMING LAB

Credits: 01 **Teaching Scheme: -** Laboratory 2 Hrs/Week

Prerequisites: Nil

Objectives:

- To understand use of efficient programming and documentation.
- To understand C programming language.
- To get hands on experience with C language
- To learn problem solving skills using C
- Understand of how several fundamental algorithms work, particularly those concerned with string operations, sorting and searching.
- Mapping with PEOs: I, II, IV, V : (a, d, e, g, k, p)

List of Practical

1. Study of most important DOS/UNIX commands.

2. Write a program in C to find largest element / average of given N elements / sum / reverse of a given integer.

3. Write a program in C to implement a simple mathematical calculator

4. Write a program in C to read an integer and display each of the digits of an integer in English.

5. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

6. Write a program in C to perform Addition / Subtraction / Multiplication of two Matrices. Also determine whether the matrix is symmetric / skewed.

7. Write a program in C to carry out following operations on strings using string library Functions:
a. Length of a sting.
b. Copy a string.
c. Concatenation of strings.

8. Write a program in C to carry out following operations on strings without using string library functions
a. Compare two strings.
b. Reverse given string.
c. To check if the given string is a palindrome or not.

9. Write a program in C to carry out following operations on strings using pointers.
a. Length of a sting.
b. Concatenation of strings.
c. Copy of string
d. Compare two strings.

10. Write a C program that works with complex numbers using a structure. Perform the following operations:
a. Reading a complex number.
b. Addition of two complex numbers.
c. Writing a complex number.
d. Multiplication of two complex numbers.

11. Write a C program to create a database of students by using array of structure and perform following operations on it.
a. Accept/modify record of student
b. Search a particular record
c. Display all records

12. Write a program in C that use both recursive and non-recursive functions to find the Factorial / GCD (greatest common divisor) of two given integers / Fibonacci series.

13. Write a program in C to sort n integers using bubble / merge sort.

14. Write a program in C to search a number in a given list using linear / binary search.

Text Books

1. "Programming with C- Schaum's outline Series", B. Gottfried, Second edition, Tata McGraw Hill Publication, ISBN 0-07-463491-7,
2. "Let us C", Y. Kanetkar, Second Edition, BPB Publication. ISBN: 8176566217.

Reference Books

1. "Programming language – ANSI C", Brain W Kernighan and Dennis Ritchie, Second edition ISBN 0-13-110370-9,
2. " Object Oriented Programming with C+ +", E. Balaguruswamy, Tata McGraw Hill Publication, ISBN 0-07-462038-x.

Additional Reading

1. "A first book of C- Fundamental of C Programming", Gary Bronson and Stephen Menconi, ISBN: 0314073361,
2. "C++ Program Design: An introduction to Programming and Object-Oriented Design", Cohoon and Davidson, 3rd Edition, Tata McGraw Hill. 2003, ISBN-13: 978-0-07-122649-3.

MODULE III

Structure, S.Y.B.Tech (Module III)

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Subject No.	Subject Code	Subject Name	Teaching Scheme (Hrs/week)			Credits
			Lect.	Tutorial	Practical	
S_1	CS20103	Discrete Structures	3	0	0	3
S_2	CS20111	Data Structures	3	0	0	3
S_3	CS20108	Computer Organization	3	0	0	3
S_4	CS21109	Applied Electronics	2	0	0	2
S_5	*CS20113 #CS20114	Digital Electronics and Logic Design Microprocessor and Interfacing	3	0	0	3
T_1	#CS20103	Discrete Structures	0	1	0	1
T_2	*CS20113 #CS20114	Digital Electronics and Logic Design Microprocessor and Interfacing	0	1	0	1
P_1	CS20311	Data Structures	0	0	4	2
P_2	#CS20314 *CS20313	Microprocessor and Interfacing Digital Electronics	0	0	2	1
MP_3	CS27401	Mini Project	0	0	4	2
SD_3	CS24301 CS24303	VB.NET OR C#.NET	0	0	2	1
GP_3	GP_3	Elective –Soft Skills	0	0	2	1
LAB_3	*LAB_3	Technical Writing	0	0	2	1
LAB_3	#LAB_3	General Seminar-2				

CVV_1	CS20401	Comprehensive Viva Voce	Based on Courses S2, S5			2
		Total	14	2	16	26

* Students will register only in Semester III irrespective of Module #Students will register only in Semester IV irrespective of Module

FF No. : 654

CS20103:: DISCRETE STRUCTURES

Credits: 03 **Teaching Scheme: -** Theory 3 Hrs/Week

Prerequisites: Elementary knowledge of 1) Numbers 2) Probability

Objectives:

- There are two principal objectives of this course. First is to study basics of some discrete and algebraic structures. Second, is to study various combinatorial techniques for solving counting problems involving discrete structures.
- Building up essential mathematical background and tools useful for various areas in computer science, typically, design and analysis of algorithms, data structures, cryptography, coding theory, graph theory etc.
- Mapping with PEOs I, II.

Unit 1: Basic Counting (8 hrs)

Part A:
Elementary set theory, principle of mathematical induction, relations, functions, basic counting principles, permutations, combinations, generalized permutations and combinations (with/without repetitions), enumerating combinatorial objects (algorithms to enumerate permutations, combinations, selection with/without repetition), Binomial coefficients and identities.
Part B:
Generalized permutations and combinations (distinguishable/indistinguishable objects)

Unit 2: Advanced Counting Techniques (8 hrs)
Part A:
Double counting and combinatorial proof techniques, Pigeon-Hole Principle (Dirichlet's principle): Some examples from hand-shaking, Erdos-Szekeres theorem, approximation of real numbers by rationals (Dirichlet's Lemma), some special cases of Ramsey theorem, Inclusion Exclusion Principle : Counting with Venn Diagrams, Inclusion Exclusion Formula (some examples from counting Derangements, number of primes upto n, number of onto functions, Euler's phi function), Recurrence relations and generating functions: generating functions and coefficients, use of binomial and multinomial theorem, partitions, exponential generating functions.

Recurrence relations, (some examples from: Fibonacci numbers, Catlan numbers, Derangements, Tower of Hanoi). solution of linear recurrence relations.
Part B: Turan's generalization of Mantel's theorem, Mobius inversion formula and some applications.

Unit 3: Information Theory (8 hrs)
Part A.
Information theory – Self Information, FLC & VLC, Huffman Coding, Entropy and Uncertainty information content, Rate of a language, redundancy. Number theory – Division Algorithm, Euclid's Algorithm, Fundamental Theorem of Arithmetic, Congruence's, Fermat's little theorem, Chinese remainder theorem.
Part B: Introduction to data Compression Application, speech Compression, Telemetry Compression.

Unit 4: Graph Theory (8 hrs)
Part A:
Graphs, different representations, properties of incidence and adjacency matrices, directed/undirected graphs, connected components, degree of a vertex, paths, cycles in graph, Euler and Hamiltonian tours/graphs, Trees, bipartite graphs (graph with only odd cycles, 2-colorable graphs), *perfect matching's* in graph, Tutte's theorem, Konig's theorem, Planar graphs, Theorem on bound on number of edges, Graph colorings
Part B: Hall's marriage theorem, some elementary results from Ramsey theory.
Unit 5 :Queuing Theory (8 hrs)

Part A:
Introduction to Queuing System, Queue characteristics, Birth-Death process, Queuing Models- Poisson Arrival Model, Little's Theorem, M/M/1: ∞ queues, M/M/s:∞, M/M/1/K queues.
Part B:M/G/1 Systems, M/G/1 Queues with Vacations**,** Reservations and Polling, M/M/m/m, and other Markov Systems**.**

Text Books:

1. Discrete Mathematics and its applications by Kenneth Rosen (William C Brown Publisher)
2. Applied Combinatorics by Alan Tucker (Wiley Publishing company)
3. Combinatorics: Topics, techniques, algorithms by Peter J. Cameron (Cambridge University Press)
4. Graph Theory by Reinhard Diestel (Springer Verlag Publishing Company)
5. Introduction to Graph Theory by Douglas B. West (Prentice-Hall publishers)

6. Probability, Statistics and Queuing theory", Allen, A.O., Academic Press.
7. 'Elementary Number Theory', David Burton
8. Probability and Statistics for Engineers, G. S. S. Bhishma Rao, SciTech Publications (India) Pvt. Ltd.

Reference Books:

1. A Course in **Combinatorics** by J. H. ***Van Lint***, R. M. Wilson (Cambridge University Press)
2. Algebra by Michael Artin (Pearson Prentice Hall)
3. Probability and Statistics, William Mendenhall, Robert J. Beaver, Barbara M. Beaver, Cengage Learning India Pvt. Ltd.
4. Probability and Statistics for Scientist and Engineers, Rao V. Dukkipati, New Age International Publishers

CS20111:: Data Structures FF No. : 654

Credits: 03 **Teaching Scheme: -** Theory 3 Hrs/Week
Prerequisites: Nil
Objectives:

1. To study the representation, implementation and application of basic data structures.
2. To introduce algorithmic strategies and time complexity analysis of problems.
3. To study the representation, implementation & applications of data structures.
4. To compare alternative implementations of data structures.
5. To compare the benefits of static and dynamic data structures.
6. To choose the appropriate data structure for modeling a given problem

Unit 1: Fundamentals of Data Structures, Sorting & Searching(8 Hrs)

A: Introduction, Types: Primitive, Non primitive, Linear, Nonlinear, Static, Dynamic Data structures, Internal Sorting Techniques: Selection, Bubble,Insertion, Radix, Shell, Merge, Quick sort, Time & Space Complexity Analysis Searching: Linear, Binary, Fibonacci,Hashing techniques: Hash table, Hash functions, Collision and OverflowHandling Evaluation of Overflow techniques, Heaps:Max Heap, Min Heap, Heap Sort

B: External Sorting, Sparse Matrix: Addition and Fast transpose

Unit 2: Elementary Data Structures (8 Hrs)

A: Stack: Fundamentals of stack, representation using array, Applications of stack: Recursion, Validity of parentheses, Expression conversions and evaluations etc., Queue: Fundamentals of queue, representation using array, Types of queue, Applications of Queue: Job Scheduling, Josephus problem etc.

B: Priority Queue

Unit 3: Linked Lists (8 Hrs)

A: Singly Linked Lists, Doubly linked Lists, Circular liked lists, Generalized linked lists, Applications: Stack & Queue using linked list, Polynomial Manipulation using linked list & Generalized linked list.

B: Dynamic memory allocation for matrices and operations on matrices, Sparse matrix representation

Unit 4: Trees (8 Hrs)

A: Basic terminology, representation using array and linked list, Tree Traversals: Recursive and Non recursive, Operations on binary tree: Finding Height, Leaf nodes, counting no of nodes etc., Construction of binary tree from traversals, Binary Search trees(BST): Insertion, deletion of a node from BST, Optimal Binary Search tree (OBST), Threaded Binary tree (TBT): Creation and traversals on TBT, Height Balanced Tree (AVL): Rotations on AVL tree, M-way search trees: Btrees, B^+ tree

B: Red-Black Trees, Game trees, Expression tree

Unit 5 : Graph (8 Hrs)

A: Terminology and representation, Traversals, Connected components and Spanning trees: Prim's and Kruskal's Algorithm, Shortest Paths and Transitive Closures: Single Source all destinations (Dijkstra's Algorithm), All pair Shortest Path Algorithm, Activity Network, Topological Sort and Critical Path

B: Multistage Graphs

Outcomes:

Upon completion of the course, the students will be able to:

1. Understand of the fundamental data structures used in computer science
2. Analyze the space and time efficiency of most algorithms
3. Design new algorithms or modify existing ones for new applications and reason about the efficiency of the result
4. Use principles for good program design, especially the uses of data abstraction and modular program composition;
5. Use major techniques for implementing the fundamental data types (linked lists, binary search trees, hashing, heaps, etc.)
6. Understand how the choice of data structures and algorithm design methods impacts the performance of programs.
7. Implement specific data structures such as binary trees, heaps, binary search trees, and graphs.

Text Books:

1. "Fundamentals of Data Structures in C", E. Horwitz, S. Sahani, Anderson-Freed, Universities Press, Second Edition, 2008, ISBN 978-81-7371-605-8.
2. "Data structures using C and C++", Y. Langsam, M.J. Augenstein, A.M. Tenenbaum, Pearson Education, Second Edition, 2002, ISBN 81-7808-729-4.

Reference Books :

1. "An Introduction to data Structures with applications", J. Tremblay, P. soresan, TMH Publication, 2nd Edition, 1984. ISBN-0-07-462471-7.

2. "Fundamentals of Computer Algorithms", E. Horwitz , S. Sahani, S. Rajasekaran, Galgotia book source, New Delhi, 2005, ISBN 81-7515-257-5.

CS20108:: COMPUTER ORGANIZATION **FF No. : 654**

Credits: 03 **Teaching Scheme: -** Theory 3 Hrs/Week
Prerequisites: Nil

Objectives:

· To understand the structure, function and characteristics of computer systems
· To understand the design principle of the various functional units of digital Computers.
· To understand concepts of Parallel Processing.
· Mapping with PEOs: I, II, (b).

Unit 1 : Structure of a Computer System (8 Hrs)

Part A: Organization & Architecture, Structure & Function, Brief History of computers, Von Neumann Architecture, Bus Structure, Elements of Bus Design, Integer Representation: Fixed point & Signed numbers. Integer Arithmetic: 2's Complement arithmetic, multiplication, Booth's Algorithm, Division Restoring Algorithm, Non Restoring algorithm, Floating point representation: IEEE Standards for Floating point representations (Single Precision Format).

Part B: PCI Bus. IEEE standards for Floating point representations (Double Precision Format).

Unit 2 : Processor Organization (CPU) (8 Hrs)

Part A: CPU Architecture, Register Organization, Instruction types, Types of operands, Instruction formats, addressing modes and address translation. Instruction cycles, Instruction Pipelining, Pipelining Hazards, Performance Considerations – Effect of Instruction Hazards, Number of pipeline stages. RISC Processors: RISC- Features, CISC Features, Comparison of RISC & CISC Superscalar Processors. Register Organization in 8086/88, 80386Dx microprocessors.

Part B: Introduction to i7 processor.

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Unit 3: Control Unit (8 Hrs)

Part A: Fundamental Concepts: Single Bus CPU organization, Register transfers,Performing an arithmetic/ logic operations, fetching a word from memory, storing a word in memory, Execution of a complete instruction. Micro-operations, Hardwired Control, Example- Multiplier CU. Micro-programmed Control: Microinstructions, Microinstruction-sequencing: Sequencing techniques, Micro-program sequencing.

Part B: Multiple-bus organization. Applications of micro programming.

Unit 4: Memory Organization (8 Hrs)

Part A: Need, Hierarchical memory system, Characteristics, Size, Access time, Read Cycle time and address space. Main Memory Organization: ROM, RAM, EPROM, EPROM, DRAM (example of 64kb memory using 8kb chips), SDRAM, DDR3, Cache memory Organization: Address mapping, Replacement Algorithms, Cache Coherence, MESI protocol. Virtual Memory: Segmentation, Paging, interleaved memories.

Part B: Secondary Storage: Magnetic Disk, Optical memory, CDROM, RAID

Unit 5: Advanced Computer Organizations (8 Hrs)

Part A: The Intel IA-64 Architecture: General Organization, Prediction, Speculation Software pipelining, Instruction set architecture. Introduction to parallel processing: Trends towards parallel processing, architectural classification schemes (Flynn's classification) Introduction to NVIDIA GPU architecture.

Part B: Itanium Organization

Outcomes:

1. Students will learn the design of Processor
2. Students will learn the design of Control unit.
3. Students will learn memory management

Text Books

1. "Computer Organization and Architecture: Designing for Performance", William Stallings, Pearson Prentice Hall Publication, ISBN 81-7758-9 93-8,7th Edition.
2. "Computer Organization", C. Hamacher, V. Zvonko, S. Zaky, Tata McGraw Hill Publication, ISBN 007-120411-3,5th Edition.

Reference Books

1. "Computer Architecture and Parallel Processing", Hwang and Briggs, Tata McGraw Hill Publication ISBN 13: 9780070315563.
2. "Structured Computer Organization", A. Tanenbaum, Prentice Hall Publication, ISBN 81 – 203 – 1553 – 7, 4th Edition.

FF No. : 654

CS21109 :: APPLIED ELECTRONICS

Credits: 02 **Teaching Scheme: -** Theory 2 Hrs/Week

Prerequisites: Nil

Objectives:

- To study the basic components like diode, BJT, Op-Amps and their applications.
- To Study the basic working of active components and their implementation in electronic circuits.

Unit I **(5+1 Hrs)**
Diodes

A. Overview of semiconductor theory: Intrinsic, Extrinsic, doping. Formation of P-N Junction, working Principle, characteristics, Zener Diode working Principle, characteristics, Application as a voltage regulator. Rectifier: - Half wave rectifier, analyze these rectifiers w. r. t. ripple factor, efficiency, clipper and clamper circuits.
B. Full wave rectifier, Bridge rectifier and analyze these rectifiers w. r. t ripple factor, efficiency.

Unit II **(5+1 Hrs)**
Bipolar Junction Transistor

A. Introduction to BJT, BJT configuration, Characteristics of CE, Overview of Biasing, Fixed Bias, Collector to Base Bias, Self Bias, Stability factor for self bias, Applications of transistors:-Transistor as a switch and amplifier
B. Thermal Runaway, Bias Compensation.

Unit III **(5+1 Hrs)**
Operational Amplifiers

A. Block Diagram of an OP-Amp, Direct Coupled Differential Amplifier Circuit, Level Shifter and the Output Stage. Op-Amp Parameters: - offset voltage; input bias current CMRR, slew rate, PSRR, gain bandwidth product, Definitions, Significance.

B. Typical parameter values of Op-Amp (IC-μA741)

Unit IV **(5+1 Hrs)**

OpAmp Applications

A. Adder, Precision Rectifier, Zero Crossing Detector, Schmitt Trigger, Waveform Generator (triangular), Integrator, Instrumentation Amplifier, Current to Voltage Circuits.

B. Subtractor, Differentiator, and Voltage to Current Circuits.

Unit V **(5+1 Hrs)**

Power Devices and Power Supplies

A. Power Devices: - Characteristics and Principle of Operation of SCR, Applications: Half-wave and Full-wave Controlled rectifiers, Fan Regulator, UJT as relaxation oscillator. Power supplies: - Introduction to SMPS, types of SMPS: Buck, Boost, Buck-Boost SMPS, online UPS, off line UPS, Line interactive UPS

B. SCR Applications: Half-wave wave Controlled rectifiers, Introduction to DIAC and TRIAC.

Text Books

1. "Integrated Electronics Analog and Digital Circuits and Systems", J. Millman, C. Halkias, McGraw Hill, 1988, ISBN 0 – 07 – Y85493 –9, 2nd Edition.
2. "Op-Amp and Linear Integrated Circuits", R. Gaikwad, Prentice Hall of India, 2002, ISBN 81 – 203 – 2058 – 1, 4th Edition.

Reference Books

1. "Electronic Devices", Floyd, Pearson Education, 2001, ISBN 81– 7808–355-8, 5th Edition.
2. "Electronic Devices and Circuit Theory", R. Boylstad, L. Nashelsky, Pearson Education, ISBN 81 – 7808 – 590 – 9, 2002, 8th Edition.

Additional Reading

1. "Microwave Devices and Circuits", Liao, Prentice Hall of India, ISBN 81 – 203 – 0699 – 6, 3rd Edition.
2. "Integrated Circuits and Semiconductor Devices", G. Deboo, C. Burrous, Theory and Applications", McGraw Hill, 1987, ISBN 0 – 07 – 016246 – 8, 2nd Edition.

FF No. : 654

CS20113:: DIGITAL ELECTRONICS AND LOGIC DESIGN

Credits: 03 **Teaching Scheme: -** Theory 3 Hrs/Week

Prerequisites: Nil

Objectives:

- To learn basics of digital electronics and its practical application.
- Mapping with PEOs: I, II, (b).

Unit I: Number system and Codes (8+1 Hrs)

A. Introduction, Binary number System, Sign-Magnitude representation, One's and Two's complement representation, Binary arithmetic, 2's complement arithmetic, Octal number System, Hexadecimal number System, BCD code, Excess-3 code, Gray code. Code conversion, Boolean algebra: Basic theorems and properties, K-Map: Representation of truth-table, SOP form, POS form, Simplification of logical functions, Minimization of SOP forms using K- Map.

B. Minimization of POS forms using K- Map, Quine-McCluskey Method, Half adder and subtractor, full adder and subtractor.

Unit II: Combinational & Sequential logic circuits (9+1 Hrs)

A. Design examples- multiplexers: code converter, demultiplexers, encoder: Priority encoders, decoders: 74138, BCD adder and subtractor, parity generator and checker, Digital comparator: 7485.

Introduction of flip-flop (F.F), 1 bit memory cell, clocked S-R F.F., J-K F.F. race around condition, M/S J-K F.F, flip-flop truth table, excitation table, flip-flop conversion, flip-flop characteristics. T and D F.F, Design of 4 – bit UP-Down ripple counter using J-K flip-flop, Design of Synchronous 3 bit up/down counter, mod-n counters (IC -7490, 7493).

Unit III : **Design of sequential circuits (8+1 Hrs)**

A. Moore/Mealy M/c's: representation techniques, state diagrams, state tables, state reduction, state assignment, implementation using flip-flops. Applications like sequence generator and detector. Shift register (modes of operation), 4 bit bi-directional universal shift register, application of shift registers (Ring counter, Sequence generator, Johnson's counter.)ASM charts, notations, design of simple controller, multiplexer controller method, RTL notations and implementation.

B. Examples on ASM, RTL.

Unit IV: Logic Families **(8+1 Hrs)**

A. Characteristics of Digital ICs: Speed, Power dissipation, fan-out, current and voltage parameters, noise margin, operating temperature etc., TTL: Operation of TTL NAND gate, Standard TTL, TTL Characteristics, Active pull-up, Wired-AND, totem pole, open collector, Unconnected Inputs. CMOS Logic: CMOS Inverter, CMOS NAND and NOR, CMOS characteristics. Wired-logic, Unconnected Inputs, Open-Drain Outputs, Comparison of TTL and CMOS, interfacing TTL to CMOS

B. Interfacing CMOS to TTL, Tri-state logic: tri-state buffers, inverters, Study of Data sheets of 7400 Series ICs: (Basic and Universal logic gates)

Unit V: Programmable Logic Devices **(8+1 Hrs)**

A. Programmable Logic array: Input, Output Buffers, AND, OR, Invert/Non-Invert Matrix, Programming the PLA, Applications of PLAs to implement combinational and sequential logic circuits Introduction to :FPGA, CPLD.

Introduction to VHDL: Modeling Digital systems, modeling languages, modeling concepts.

B. Comparison of FPGA and CPLD, VHDL Programs.

Text Books

1. "Modern Digital Electronics", R.P. Jain, Tata McGraw-Hill, 2003, ISBN 0 - 07 - 049492 – 4, 3rd Edition.
2. "A VHDL Primer", J. Bhaskar, Englewood Cliffs, Prentice Hall, 1994, ISBN-13: 978- 0131814479, 2nd Edition.

Reference Books

1. "Digital Design", M. Mano, Pearson Education, 2002, ISBN - 81 - 7808 - 555 – 0, 3rd Edition.
2. "Digital Principles and Applications", A. Malvino, D. Leach, Tata McGraw Hill, 2003, ISBN 0 - 07 - 047258 – 05, 5th Edition.

FF No. : 654

CS20103 :: DISCRETE STRUCTURES

Credits: 01 **Teaching Scheme: -** Tutorial 1 Hr/Week

Prerequisites: Elementary knowledge of numbers and syllabus covered unit-wise in theory lectures.

Objectives:
Upon completion of this module students will be able to:

- Recognize mathematical discrete structures in real life problems.
- Translate problems into mathematical language and analyze problems using methods from all the units.
- Mapping with PEOs: I, (a).

List of Contents

In this module students will work on problems to practice and apply methods introduced in the lectures. Discussions of problems in small groups is always encouraged and facilitated and students are asked to submit weekly home work assignments and provide them immediate feedback and support materials.

Tutorial No. 1:	Elementary set theory, principle of mathematical induction
Tutorial No. 2:	Relations, functions, basic counting principles
Tutorial No. 3:	Permutations, combinations, generalized permutations and combinations (with/without repetitions), Binomial coefficients and identities.
Tutorial No. 4:	Pigeon-Hole Principle (Dirichlet's principle): hand-shaking, Erdos-Szekeres theorem, approximation of real numbers by rationals (Dirichlet's Lemma)
Tutorial No. 5	Generating functions, recurrence relations, solution of linear recurrence relations.
Tutorial No. 6:	FLC & VLC, Problems on Self Information, Huffman Coding, Entropy

Tutorial No. 7:	Number theory -Modula arithmetic, Fermat's little theorem, Chinese remainder theorem
Tutorial No. 8:	Graphs, properties of incidence and adjacency matrices, directed/undirected graphs
Tutorial No. 9:	Connected components, degree of a vertex, paths, cycles in graph, Euler and Hamiltonian tours/graphs
Tutorial No. 10:	Trees, bipartite graphs (graph with only odd cycles, 2-colorable graphs), perfect matching's in graph
Tutorial No. 11:	Planar graphs, Theorem on bound on number of edges, Graph colorings
Tutorial No. 12:	M/M/1: ∞ queues, M/M/s:∞, M/M/1/K problems

Text Books:

1. Discrete Mathematics and its applications by Kenneth Rosen (William C Brown Publisher)
2. Applied Combinatorics by Alan Tucker (Wiley Publishing company)
3. Combinatorics: Topics, techniques, algorithms by Peter J. Cameron (Cambridge University Press)
4. Graph Theory by Reinhard Diestel (Springer Verlag Publishing Company)
5. Introduction to Graph Theory by Douglas B. West (Prentice-Hall publishers)
6. Probability, Statistics and Queuing theory", Allen, A.O., Academic Press.
7. 'Elementary Number Theory', David Burton
8. Probability and Statistics for Engineers, G. S. S. Bhishma Rao, SciTech Publications (India) Pvt. Ltd.

Reference Books:

1. A Course in **Combinatorics** by J. H. ***Van Lint***, R. M. Wilson (Cambridge University Press)
2. Algebra by Michael Artin (Pearson Prentice Hall)
3. Probability and Statistics, William Mendenhall, Robert J. Beaver, Barbara M. Beaver, Cengage Learning India Pvt. Ltd.
4. Probability and Statistics for Scientist and Engineers, Rao V. Dukkipati, New Age International Publishers.

CS20113::DIGITAL ELECTRONICS AND LOGIC DESIGN FF No. : 654

Credits:-01 **Teaching Scheme: -** Tutorial 1 Hr/Week
Prerequisites: Nil

Objectives:
To build different types of combinational and sequential circuits.

1. Introduction to Electronics Workbench/Multisim, IC 74XX and IC 54XX.
2. Design BCD to Seven Segment Display using common cathode and common anode display.
3. Numerical based on Quine-McCluskey Method.
4. Encoder, Decoder and Priority Encoder Applications (Barrel Shifter, Realization of ROM).
5. Design MOD N counter using IC-74190, 74193.
6. Design Sequence detector using Moore and Mealy Model to detect given sequence.
7. Numerical based on RTL.
8. Numerical based on ASM.
9. Study various Characteristics of Digital ICs.
10. Design combinational circuit using ROM, PLA and PAL.
11. Write VHDL Programs for combinational and Sequential circuits.

Text Books

1. "Modern Digital Electronics", R.P. Jain, Tata McGraw-Hill, 2003, ISBN 0 - 07 - 049492 – 4, 3rd Edition.
2. "A VHDL Primer", J. Bhaskar, Englewood Cliffs, Prentice Hall, 1994, ISBN-13: 978- 0131814479, 2nd Edition.

Reference Books

1. "Digital Design", M. Mano, Pearson Education, 2002, ISBN - 81 - 7808 - 555 – 0, 3rd Edition.
2. "Digital Principles and Applications", A. Malvino, D. Leach, Tata McGraw Hill, 2003, ISBN 0 - 07 - 047258 – 05, 5th Edition.

Additional Reading

1. J. Bignell, R. Donovan, "Digital Electronics", DELMAR Thomson Learning, 4th Edition, 2001, ISBN 981 - 240 - 352 – 3.

CS20311:: DATA STRUCTURES FF No. : 654

Credits: 02 **Teaching Scheme: - Laboratory 4 Hrs/Week**
Prerequisites: Computer Programming

Objectives:

- To introduce, fundamental data structures and problem solving paradigms
- To introduce time complexity analysis of problems.
- To study the representation, implementation & applications of data structures.
- To compare alternative implementations of data structures.
- To choose the appropriate data structure for modeling a given problem.
- Mapping with PEOs: I, (a).

List of Lab Experiments

1. Implementation Quick and Merge Sort.
2. Implementation of Heap Sort
3. Simulation of Hash table using any Collision Resolution and Overflow Handling Technique.
4. Simulation of Recursion using STACK.
5. Implementation of Expression conversion and Evaluation.
6. Simulation of Job Scheduling Using Queue
7. Polynomial Manipulation using Queue
8. Implementation of various operations on singly linked list.
9. Implement Generalized linked list and various operations on it.
10. Implement various operations on Doubly Linked list.
11. Implement various operations on Binary Search tree.
12. Implement Threaded Binary tree and its traversals.
13. Implement Btree, B^+tree and operation on it.
14. Implement AVL tree and rotations on it.
15. Implement BFS, DFS on Graph.
16. Implement Prim's and Kruskal's Algorithm.
17. Implement Dijkstra's algorithm
18. Implement all pair shortest path problem.

Text Books:

1. "Fundamentals of Data Structures in C", E. Horwitz, S. Sahani, Anderson-Freed, Universities Press, Second Edition, 2008, ISBN 978-81-7371-605-8.
2. "Data structures using C and C++", Y. Langsam, M.J. Augenstein, A.M. Tenenbaum, Pearson Education, Second Edition, 2002, ISBN 81-7808-729-4.

Reference Books :

1. "An Introduction to data Structures with applications", J. Tremblay, P. soresan,

TMH Publication, 2nd Edition, 1984. ISBN-0-07-462471-7.
2. "Fundamentals of Computer Algorithms", E. Horwitz , S. Sahani, S. Rajasekaran, Galgotia book source, New Delhi, 2005, ISBN 81-7515-257-5.

FF No. : 654

CS20313:: DIGITAL ELECTRONICS

Credits: 01 **Teaching Scheme: -** Laboratory 2 Hrs/Week

Prerequisites: Nil

Objective:

- To build and verify simple combinational and sequential circuits.
- Mapping with PEOs: I, II, (b).

List of Practical

I Combinational Logic Design

1. Verification of Logical Gates and Boolean Algebra.
2. Code converters, e.g. Excess-3 to BCD and vice versa using logical gates.
3. Multiplexer - e.g. 16:1 Mux using 4:1 Mux (IC 74153).
4. Decoder – e.g. 2 bit comparator (IC 74138).
5. BCD adder –using IC 7483

II Sequential Circuit Design (Any six)

1. Conversion of flip-flops. e.g. JK to D, T.
2. Ripple (asynchronous) mod –N counter using J-K F-F.
3. Ripple (asynchronous) mod –N counter using IC 7490.
4. Synchronous 2 bit Up /down counter using JK flip-flop.
5. Sequence generator using JK flip-flop
6. Pseudo random number generator using 74194.(universal shift register)
7. Sequence detector (Moore ckt) using JK flip-flop

8. Sequence detector (Mealy ckt) using JK flip-flop

III ASM (Any one)

1. Simple ASM using multiplexer controller method using Simulator.
2. Design of simple combinational circuit: half adder and subs tractor using VHDL language.

Text Books

1. "Modern Digital Electronics", R.P. Jain, Tata McGraw-Hill, 2003, ISBN 0 - 07 - 049492 – 4, 3rd Edition.
2. "A VHDL Primer", J. Bhaskar, Englewood Cliffs, Prentice Hall, 1994, ISBN-13: 978- 0131814479, 2nd Edition.

Reference Books

1. "Digital Design", M. Mano, Pearson Education, 2002, ISBN - 81 - 7808 - 555 – 0, 3rd Edition.
2. "Digital Principles and Applications", A. Malvino, D. Leach, Tata McGraw Hill, 2003, ISBN 0 - 07 - 047258 – 05, 5th Edition.

Additional Reading

1. J. Bignell, R. Donovan, "Digital Electronics", DELMAR Thomson Learning, 4th Edition, 2001, ISBN 981 - 240 - 352 – 3.

FF No. : 654

CS24301: VB.NET

Credits: 01 **Teaching Scheme: -** Lab 2 Hrs/Week

Prerequisites:

1. C programming.

Objectives:

1. To understand the implementation and components of .Net framework
2. To learn the fundamental concepts of Object Oriented Programming using VB.
3. To learn to windows application development using VB.Net.
4. To learn to database application development using VB.Net.
5. Mapping with PEOs: II, III, (c).

List of Practical

1. Study of .Net framework and its important components.
2. Implementing Arrays, Strings and System collections in VB.Net.
3. Implementing Classes, objects, constructors in VB.Net.
4. Design a simple VB.Net application for calculator.
5. Debugging and Error Handling in VB.Net.
6. Design a simple VB.Net application for notepad/word pad using menu editor.
7. Handling multiple forms in VB.Net.
8. Design Database application in VB.Net.
9. Report Generation and Grid view representation in VB.Net.
10. Publishing and Deployment of windows application in VB.Net/Developing DLLs

Text Books

1. "Beginning VB.NET 2003", Thearon Willis, Jonathan Crossland, Richard Blair, Wrox Publication, ISBN: 978-0-7645-5658-6, April 2004.
2. "Programming VB.Net 2005", Julia Case Bradley,Anita Millspaugh, Mc Graw Hill Publication, ISBN: 9780073304274, August 2010.

Reference Books

1. "Ajax: The Complete Reference", Thomas Powell, Mc Graw Hill Publication, Edition 1, ISBN: 9780070248496, 20-MAR-08.
2. "Beginning VB.NET Databases", Thearon Willis, Wrox publication, ISBN: 978-0-7645-6800-8, October 2004.

FF No. : 654

CS24303: C#.NET

Credits: 01 **Teaching Scheme: -** Lab 2 Hrs/Week
Prerequisites: C programming

Objectives:

1. To understand the implementation and components of .Net framework
2. To learn the fundamental concepts of Object Oriented Programming using C#.
3. To learn to windows application development using C#.
4. To learn to database application development using C#.
5. Mapping with PEOs: II, III, (c).

List of Practical

1. Study of .Net framework and its important components.

2. Implementing Arrays, Strings and System collections in C#.

3. Implementing Classes, objects, constructors in C#

4. Design a simple C#.net application for calculator.

5. Design a simple C#.net application for notepad/word pad using menu editor.

6. Handling multiple forms in C#.

7. Design Database application.

8. Report Generation and Grid view representation.

9. File handling and Exception Handling in C#

10. Publishing and Deployment of windows application in C#.net/Developing DLLs

11. Mini project.

Text Books

1. "Programming in C#", E Balagurusamy, Mc Graw Hill Publication, Edition 3, ISBN:9780070702073, 29-JUN-10.

2. "C# 4.0 The Complete Reference", Herbert Schildt, Mc Graw Hill Publication, Edition 1, ISBN: 9780070703681, 07-MAY-10.

Reference Books

1. "C# 3.0: A Beginner's Guide", Herbert Schildt, Mc Graw Hill Publication, Edition

2, ISBN: 9780070248946, 25-SEP-08.

2. "Ajax: The Complete Reference", Thomas Powell, Mc Graw Hill Publication, Edition 1, ISBN: 9780070248496, 20-MAR-08

MODULE IV

Structure, S.Y B.Tech (Module IV)

FF653, Issue No. 04, Rev 0, dt 02/01/2012

Subject No.	Subject Code	Subject Name	Teaching Scheme (Hrs/week)			Credits
			Lect.	Tutorial	Practical	
S_1	CS21104	Mathematical Transforms and Applications	3	0	0	3
S_2	CS20110	Computer Graphics	3	0	0	3
S_3	CS20105	Principles of Programming Languages	3	0	0	3
S_4	CS21112	Data Communication	2	0	0	2
S_5	*CS20113 #CS20114	Digital Electronics and Logic Design Microprocessor and Interfacing	3	0	0	3
T_1	CS21104	Mathematical Transforms and Applications	0	1	0	1
T_2	*CS20113 #CS20114	Digital Electronics and Logic Design Microprocessor and Interfacing	0	1	0	1
P_1	CS20310	Computer Graphics	0	0	2	1
P_2	CS20305	Principles of Programming Languages	0	0	2	1
P_3	#CS20314 *CS20313	Microprocessor and Interfacing Digital Electronics	0	0	2	1
MP_4	CS27402	Mini Project	0	0	4	2
SD_4	CS24302 CS24304	ASP.net OR Python	0	0	2	1
GP_4	GP_4	Elective –Soft Skills	0	0	2	1
LAB_4	*LAB_4	Technical Writing	0	0	2	1

LAB_4	#LAB_4	General Seminar-2				
CVV_2	CS20401	Comprehensive Viva Voce	Based on Courses S2,S3, S5			2
		Total	14	2	16	26

* Students will register only in Semester III irrespective of Module # Students will register only in Semester IV irrespective of Module

FF No. : 654

CS21104:: MATHEMATICAL TRANSFORMS AND APPLICATIONS

Credits: 03 **Teaching Scheme: -** Theory 3 Hrs/Week

Prerequisites: Engineering Mathematics- I and Engineering Mathematics - II

Objectives:

- To understand the linear differential equations and apply it for computer engineering.
- To understand various transformations like Laplace, Fourier, Z-transform.
- To understand concepts of vector differentiation and integration theorems.
- Mapping with PEOs: I, II, (a).

Unit I **(8+1 Hrs)**

Linear Differential equations of higher order

A. Homogeneous Linear Differential Equations of Second Order, Higher Order Homogeneous & Non Homogeneous Linear Differential Equations with Constant Coefficients, Complementary solution, particular integral by general method, undetermined coefficients and Variation of Parameters method, Euler – Cauchy Equation, Legendre equation and its solution, system of differential equations by matrix method.

B. Coupled circuits by matrix method

Unit II **(8+1 Hrs)**

Complex Variables

A. Complex differentiation, Analytical functions, Cauchy-Riemann equations, Complex Integration, Cauchy's Integral Theorem and formula, Residue Theorem and applications to Engineering Problems, Power series, Taylor series, Laurent series, Radius of convergence.

B. Bilinear Transformations and Conformal mapping.

Unit III **(8+1 Hrs)**

Laplace Transform

A. Introduction to Laplace Transform and its properties. Laplace Transform of Unit step function, Delta function and periodic function. Inverse Laplace Transform and its evaluation. Laplace Transform of special functions.

B. Application of Laplace transform to simultaneous differential equations.

Unit IV **(8+1 Hrs)**
Fourier Transform and Z Transform

A. Introduction to signals and their properties, mathematical operations on signals, Complex Fourier series and frequency spectrum, Fourier integrals, Fourier cosine and sine transforms, Fourier transforms, properties of Fourier transform, Introduction to Z Transform, properties of Z-Transform, Inverse Z-Transform, application of Z-transform to difference equations.

B. Introduction to Discrete Fourier transform. Definition, properties and its inverse.

Unit V **(8+1 Hrs)**
Vector Analysis

A. Vector differentiation, gradient, curl, divergence, directional derivative, line integral, independence of path and conservative vector field, Green's theorem, Stoke's theorem, Gauss divergence theorem.
B. Applications of vectors, Maxwell's equations.

Text Books

1. "Advanced Engineering Mathematics", Erwin Kreyszig, John Wiley and sons, inc.
2. Higher Engineering Mathematics', B V Ramana, Tata McGraw-Hill, 2007.
3. "Advanced Engineering Mathematics", R.K. Jain, S.R.K. Iyengar, Narosa Publications.
4. "Vector Analysis", Schaum's Outline Series, Murray R Spiegel, Seymour Lipschutz, Dennis Spellman

Reference Books

1. "Advanced Modern Engineering Mathematics", Glyn James, Pearson publications, 2011, 6th edition.
2. "Signals and Systems", Alan V. Oppenheim, Alan S. Willsky, PHI publications, second edition.
3. "Signals and Linear Systems", Robert A. Gabel, Richard A. Roberts, John Wiley & sons.

CS20110::COMPUTER GRAPHICS **FF No. : 654**

Credits: 03 **Teaching Scheme: -** Theory 3 Hrs/Week

Prerequisites: C programming

Objectives :

- To understand basic concepts of computer graphics.
- To understand algorithms to draw various graphics primitives.
- To understand 2-D and 3-D transformations.
- To understand curve and fractals.
- Mapping with PEOs: I, II, (b).

Unit 1 : Basic Concepts (8 +1 Hrs)

A. Graphics Primitives: Introduction to computer graphics, Display adapters, Display modes, Pixel, Frame Buffer, Display file structure, Display file interpreter, Raster scan & random scan displays, Aspect Ratio.

Mathematical foundations: Lines and line representations, Vectors, Intersection of lines, Normalized Device Coordinates.

Scan conversions: DDA and Bresenham's line drawing algorithms and Bresenham and Midpoint circle drawing algorithms, Arcs and Sectors, Aliasing and Antialiasing, Character Generation techniques.

B. Display devices, Interactive devices, Data generating devices, Thick lines.

Unit 2 : Polygons and 2D Transformation (9+1 Hrs)

A. Polygons: Introduction, Types of polygons, Inside-outside test of polygon, Polygon filling: Flood fill, Boundary fill, Edge fill, Scan line fill algorithm.
2D Transformations: Introduction, Basic transformations such as- Scaling, Rotation, Translation, Homogeneous coordinates for transformations, Other transformations like – Reflection, Shearing Transformations, Transformations about an arbitrary point, Inverse transformations. Numerical problems on transformation

B. Fence fill algorithm, Problems on 2D transformation.

Unit 3 : Segments and Clipping (9+1 Hrs)

A. Segment: Introduction, Segment table, Segment Creation, Closing, Delete and renaming, Image transformation, Display structures used for segment.
Windowing and Clipping: Introduction, viewing transformation, Line clipping: Cohen Sutherland algorithm, Mid-point line clipping algorithm, Polygon clipping: Sutherland Hodgeman algorithm, Weiler Atherton algorithm, Text clipping, Interior and Exterior clipping.

B. Liang-Barsky algorithm, Cyrus Beck algorithm.

Unit 4 : 3D Transformations and Projections (7+1 Hrs)

A. 3D Transformations: Introduction, 3D point representation, Left handed system, Right handed system, Basic 3D transformations- Scaling, Rotation, Translation, Matrix representation, Derivation of Rotation matrices along the main axis, Rotation about an arbitrary axis, Reflection transformation with respect to main axes.
Projection: Projection concept, parallel and perspective projections, Viewing parameters, 3D windowing and clipping.

B. Reflection transformation with respect to planes, Problems based on 3D transformations

Unit 5 : Hidden Surfaces, Curves and Fractals (7+1 Hrs)

A. Introduction, Back-face removal algorithm, Z buffers, Painters algorithm, Warnock algorithm, binary space partition method.
Curve generation, Curve continuity, Interpolation, LeGrange interpolating algorithms, Spline curve representation, B Spline Curves, Bezier Curves, Fractals, Hilbert curve, Triadic Koch Curve, Fractal lines.
Introduction to light, Light Illumination models (Diffuse, Ambient, Specular), Point source illumination, Shading Algorithms (Phong, Gourad), Color, RGB Color Model.

B. Scan line algorithm for Depth Comparison, Fractal surfaces, CMY and HSV color model

Text Books:

1. "Computer Graphics", D. Hearn, M. Baker, 2nd Edition, Pearson Education, 2002, ISBN 81-7808-794-4.

2. "Procedural Elements for Computer Graphics", D. Rogers, 2nd Edition, Tata McGraw-Hill Publication, 2001, ISBN 0-07-047371-4.

Reference Books:

1. "Computer Graphics", S. Harrington, 2nd Edition, McGraw-Hill Publications, ISBN 0 - 07 -100472 -6.
2. "Computer Graphics Principles and Practice", J. Foley, V. Dam, S. Feiner, J. Hughes, 2nd Edition, Pearson Education, 2003, ISBN 81-7808-038-9.

FF No. : 654

CS20105::PRINCIPLES OF PROGRAMMING LANGUAGES

Credits: 03 **Teaching Scheme: -** Theory 3 Hrs/Week

Prerequisites: nil

Objectives:

- To learn the fundamental concepts of programming languages & the various programming paradigms.
- To increase the capacity to express ideas using a programming language.
- To learn to choose an appropriate programming language for a designed task.
- To learn the important features of different types of languages and their relevance
- To learn past the superficial differences in languages and recognize the commonalities in meaning.
- To develop the ability to quickly learn new programming languages.
- Mapping with PEOs: II, III, (d).

Unit I **(8+1 Hrs)**

Introduction to Programming languages

A. What is a programming language? Why to study principles of programming languages – design, implementation and application of programming languages. Language design principles: characteristics of a good programming language. Data and control abstractions in a programming language. Categorization of various programming languages (purpose, level, domain, paradigm). Programming paradigms – Imperative/Procedural, Object Oriented, Functional Programming, Logic Programming.

B. Comparison of different programming paradigms and representative languages of each.

Unit II **(8+2 Hrs)**

Imperative & Procedural Programming

A. Imperative(C): Variables: lvalue and rvalue. Data types: structures, unions, pointers and reference types. Control Structures: loops and conditionals. Memory leak, invalid pointer references. Type system and type checking.

Procedural: Binding. Block, scope, local and global variables. Access specifiers in C. Activation Records, Procedure Calls, Function Calls, Recursion, Parameter passing methods, Static and Stack-Based Storage management. Heap based storage management. Generic programming.

B. Generic Templates in C++, Library Classes in C++.

Unit III **(8+2 Hrs)**
Object – Oriented Programming (Java-I)

A. Encapsulation: Classes and Objects, Methods and Constructors. Information hiding: access modifiers and packages. Static keyword: class variables and instance variables, class methods and instance methods. this and static. Inheritance, Types of inheritance, Constructors in Derived Classes. Overriding & Hiding Fields & Methods. Polymorphism – static and dynamic. Abstract Classes & methods, Final Classes & methods. Interfaces. Exception Handling - exceptions, checked & unchecked exceptions, user-defined exceptions.
Similarities and differences between C++ and Java: destructors, access modifiers, inheritance, polymorphism, garbage collection.

B. Exception handling in C++, multiple inheritance in C++.

Unit IV **(8+1 Hrs)**
Object – Oriented Programming (Java-II)

A. Multithreading – Thread life Cycle, thread Priority, Thread Methods. Inter-thread Communication. Producer-Consumer using Java.

Java I/O – Introduction to Streams, Readers and Writers. File Management / Processing, primitive / Object Data Processing.

Java GUI: Applet vs Application. AWT vs Swing. Layout Manager. Components. Label, Button, Choice, List, Event Handling (mouse, key).

B. Concurrency Issues with multi-threading, deadlock.

Unit V **(8+2 Hrs)**
Case Studies of different languages

A. Web programming (Overview of HTML, CSS, JavaScript, PHP), functional programming (Overview of Haskell), concurrent programming (Overview of Erlang), logic programming (Overview of PROLOG), Overview of Matlab. Visual programming, Multi-paradigm languages.

B. Overview of LISP (CommonLISP and Scheme)

Text Books

1. "Programming Languages Design and Implementation", T. W. Pratt, M.V.Zelkowitz, Publications, ISBN 10: 0130276782, 4th Edition

2. "Java: The Complete Reference", Herbert Schildt, TMG Publication, ISBN 9780070636774 , 7th Edition

Reference Books

1. "Haskell: The Craft of Functional Programming", S. Thompson, Addison Wesley, ISBN 0201342758, 2nd Edition
2. "Object Oriented Programming with C++", E. Balaguruswamy, Tata McGraw-Hill Publishing Company Ltd, ISBN 0 - 07 – 462038 - X,

Additional Reading

1. "Programming Languages: Principles and Paradigms" A. B. Tucker, R. Noonan, McGraw-Hill, ISBN 0-07-048704-9
2. "Programming Languages: Principles and Practice", K. C. Loudon, Thomson Publications, 981-243-130-6 , 2nd Edition
3. "The C++ Programming Language", B. Stroustrup, Addison-Wesley, 81-317-0521-8, 3rd Edition
4. "MATLAB Programming for Engineers", Stephen J. Chamman, Thomson Learning Publication, ISBN 981-254-893-9, 3rd Edition
5. "Programming In Prolog", Clocksin W F, Mellish C S, Narosa Pblishing House, ISBN 8185198552, 3rd Edition
6. "Lex & Yacc", John R. Levine, Tony Mason, Doug Brown, Shroff Publishers, ISBN 81-7366-062-X, 2nd Edition.
7. "HTML, CSS, Java Script, Perl, Python and PHP", Schafer Steven, Dreamtech India Pvt Ltd., ISBN 81-265-0620-2
8. "LISP", Patrick Henry Winston, Berthold, Pearson Educaation, ISBN 81-7808-155-5, 3rd Edition

FF No. : 654

CS21112 :: DATA COMMUNICATION

Credits: 02 **Teaching Scheme: -** Theory 2 Hrs/Week

Prerequisites: Nil

Objectives:

- To understand the basics of signals, and modulation techniques.
- To understand multiplexing techniques.
- To understand the various transmission techniques.
- To understand basic concepts of computer networks.

Unit I **(6+1 Hrs)**

Introduction to Electronic Communication

A. The importance of Communication, Elements of communication system, Types of electronics communication, Electromagnetic spectrum, Bandwidth, Signal Types, Noise: internal, External, Noise calculation, Nyquist theorem Shannon-Hartley theorem.

B. Survey of communication applications. Numerical based on Shannon-Hartley theorem, Bandwidth calculation.

Unit II **(6+1 Hrs)**

Modulation Techniques

A. Principles of Amplitude Modulation, Modulation index and percentage of modulation, AM power distribution, Single sideband communication, AM transmitters and Receivers. Phase modulation.
B. FM vs. AM, FM vs. PM, AM vs. PM, Numerical based on AM, FM.

Unit III **(5+2 Hrs)**

Multiplexing and Communication

A. Introduction, FDM, TDM, WDM, CDMA, Frequency modulation principles, sideband and modulation index. Pulse code modulation, Delta modulation, Adaptive delta modulation, Differential PCM, PAM,

B. Parallel transmission, serial transmission.

Unit IV **(5+1 Hrs)**

Digital Modulations

A. Sampling theorem, Modems, Null modems, ASK, PSK, FSK, QPSK, Line coding schemes. Frequency hopping spread spectrum, Direct sequence spread spectrum. Encoding Schemes: NRZ, NRZI, Unipolar, Bipolar, Manchester, Differential Manchester.
B. Cellular Telephone System, Examples on Encoding, decoding.

Unit V **(6+1 Hrs)**

Transmission and Propagation

A. Transmission modes, Antenna Fundamentals, Radio Frequency Wave propagation, Attenuation and distortion sources with examples. Dipole antenna, sectorized antenna. Error detection and correction: CRC, Hamming code, Checksum, Block coding

B. Transmission media wired and wireless, Microwave antenna.

Text Books

1. "Electronic Communication Systems", by George Kennedy, Bernard Davis, Tata McGraw Hill Publication, ISBN 0-07-463682-0, Edition 4th
2. "Data Communications and Networking" by Behrouz Forouzan, McGraw Hill Publication, ISBN 0-07-063414-9, Edition 4th

Reference Books

1. "Communication Electronics- Principles and Applications", by Frenzel, Tata McGraw Hill Publication, ISBN 0-07-048398-1, Edition 3rd
2. "Principles of Communication Systems", by Herbert Taub and Donald Schilling, McGraw Hill Publication, ISBN 0-07-062955-2, Edition 2nd.

Additional Reading

1. "Computer Networks", by Andrew S. Tenenbaum , Prentice Hall of India, ISBN 81-203-2175-8, 4th Edition.
2. "Data and Computer Communications", by Stallings W, Prentice Hall of India Pvt. Ltd., 2002, ISBN 81-203-2067-0, Sixth Edition.
3. "Digital and Analog Communication Systems", by Shanmugam K, John Wiley & Sons (Asia) Pvt. Ltd. ISBN 9971-51-146-0.

FF No. : 654

CS20114:: MICROPROCESSOR AND INTERFACING

Credits: 03 **Teaching Scheme: -** Theory 3 Hrs/Week
Prerequisites: Digital Electronics and Logic Design.

Objectives:
To explore internal architecture of microprocessor, signal and interface with memory and I/O devices.

Unit I **(8+1 Hrs)**
8086 Microprocessor

A. Introduction to 80x86 microprocessor, Internal Architecture, Generation of physical address, Minimum & Maximum Mode, Ready and Reset pin significance ,study of 8086 supporting chips 8282(Latch), 8284(Clock Generator), 8286(Transreceiver), 8288(Bus Controller). Timing Diagram Read Write Machine Cycles, Real Mode, General Purpose Instructions.
B. Instruction Set

Unit II **(8+1 Hrs)**
Assembly Language Programming & Interrupt Structure

A. Address Translation, Addressing Modes, Introduction to Assembly Language Programming, Examples on Programming. Interrupt Structure , Interrupt service Routine, Interrupt Vector Table, Hardware and Software Interrupts, INTR ,NMI , Interrupt Response, Execution of an ISR, Priority of Interrupts.
B. Examples on Assembly Language Programming

Unit III **(8+1 Hrs)**
Interfacing with 8086 – I

A. 8259 (Programmable Interrupt Controller): Features, Block Diagram, Control & status registers, Interfacing & Programming ,
8255 (Programmable peripheral interface 8255)-block diagram, control word, interfacing ADC (Successive Approximation Method) , DAC (R – 2R ladder Network.)

B. Interfacing of stepper motor, seven segment display, (8255)

Unit IV **(8+1 Hrs)**

Interfacing with 8086 – II

8253/8254 –(Programmable Interval timer/counter) block diagram, control word & interfacing, Mode0, Mode1, Mode3 of timer,

8251(USART): Features, Block Diagram, Control & status registers, Operating modes, Interfacing & Programming.

B. Programming of 8251, Programming of Timer Mode 1, Mode2, Mode 3, Mode4, Mode5

Unit V **(8+1 Hrs)**

DMA Controller and NDP Co processor

Concept of DMA, 8237 DMA Controller: Features, Block Diagram & programming detail.
8087(NDP) - Features, Block Diagram, Control & status registers, typical Instruction set & programming detail.
B. Programming of 8237 and 8087(NDP).

Text Books

1. "Microprocessors and Interfacing", Douglas Hall, Tata McGraw Hill Publications, ISBN 0-07-025742-6, 2nd Edition.
2. "Advanced 80386, programming techniques " , James Turley , Tata McGraw Hill Publications, ISBN – 0-07-881342-5

Reference Books

1. "Advanced MS DOS Programming", Ray Duncan, BPB Publications ISBN 0 – 07 – 048677 – 8, 2nd Edition.
2. "Microprocessor and Peripheral Handbook", INTEL –VOL I

Additional Reading

1. "Assembly Language Programming", Peter Abel, Pearson Education Publications, ISBN 10:013030655, 5th Edition.
2. Intel Pentium Manual.

FF No. : 654

CS20114:: MICROPROCESSOR AND INTERFACING

Credits: 01 **Teaching Scheme: -** Tutorial 1 Hr/Week

Prerequisites: : Nil

Objectives:

- To study interfacing of 8086, assembly language programming, DOS commands.
- Mapping with PEOs: I, II (b).

List of Contents

A TERM-WORK containing the record of the following:

Assignments :

1. Understanding of different Memory Models
2. List various assembler directives,
3. Understand concepts of editor, assembler, linker, loader.
4. 8086 assembly language programming, to understand the basic concepts of various functions(01,02,08,09,0A) of INT 21h
5. List various debugging commands.
6. Interface 8086 microprocessor with 4KB RAM in minimum mode. Apply memory banking. Draw memory address map and explain address decoding logic.
7. Interface 8086 microprocessor with 16KB ROM in maximum mode. Draw memory address map and explain address decoding logic.
8. Design specified time delay (delay time calculation).
9. Near, Far procedures (string example).
10. Use of string instructions
11. Study of Mother Board

Note: Students should perform vi & vii assignments on drawing sheet

Text Books

1. "Microprocessors and Interfacing", Douglas Hall, Tata McGraw Hill Publications, ISBN 0-07-025742-6, 2nd Edition.
2. "Assembly Language Programming", Peter Abel, Pearson Education Publications, ISBN 10:013030655, 5th Edition

Reference Books

1. "Advanced MS DOS Programming", Ray Duncan, BPB Publications ISBN 0 – 07 – 048677 – 8, 2nd Edition.
2. "Microprocessor and Peripheral Handbook", INTEL –VOL I

FF No. : 654

CS21104:: MATHEMATICAL TRANSFORMS AND APPLICATIONS

Credits: 01 **Teaching Scheme: -** Tutorial 1 Hr/Week

Prerequisites:: Syllabus covered unit-wise in theory lectures.

Objectives:
Upon completion of this module students will be able to:

- Recognize mathematical structures in practical problems
- Translate problems into mathematical language and analyze problems using methods from all the units
- Mapping with PEOs: I, II (a).

List of Contents

In this module students will work on problems to practice and apply methods introduced in the theory lectures. Discussions of problems in small groups is always encouraged and facilitated. Students are asked to submit weekly home work assignments and provide them immediate feedback and support materials.

Tutorial No. 1:	Summary on higher order linear differential equations, solution of homogeneous and non homogeneous equations, complementary solution.
Tutorial No. 2:	Summary on particular solution by method of variation by parameters Method of undetermined coefficients and problems solving.
Tutorial No. 3:	Summary on Euler – Cauchy and Legendre Equation, simultaneous equations and problems solving.
Tutorial No. 4:	Summary on Functions of complex variables, Differentiation of functions of complex variables, Analytic functions, Harmonic functions, Harmonic conjugate.
Tutorial No. 5	Summary on Integration of functions of complex variables, integration along a path, Cauchy's theorem, Cauchy's integral formula, Cauchy's residue theorem and problems solving.
Tutorial No. 6:	Power Series, Taylor Series, Laurent Series

Tutorial No. 7: Summary on Laplace transform, Laplace transform of standard functions, Properties of Laplace and problems solving.

Tutorial No. 8: Summary on Properties of Laplace transform, Laplace transform of Unit step function, Dirac Delta function, Periodic functions and problems solving.

Tutorial No. 9: Summary on Inverse Laplace transform, properties of inverse Laplace transform, solution of differential equations by Laplace transform method and problems solving.

Tutorial No. 10: Summary on Fourier series, Complex form of Fourier series, Fourier integral representation, Sine and Cosine representations and problems solving,

Tutorial No. 11: Summary on Fourier transform, Sine transform, Cosine transform and corresponding inverse and problems solving.

Tutorial No. 12: Summary on Summary on Z transform, properties of Z transform, inverse Z transform, methods of solution and problems solving, solution of difference equation by Z transform.

Tutorial No. 13: Summary on Vector Differentiation, problems on gradient, curl, divergence and directional derivative, summary on Vector Integration, Problems on Line Integral, Green's Theorem.

Tutorial No. 14: Problems on Stoke's theorem, Gauss Divergence theorem and applications of vectors.

Text Books

1. "Advanced Engineering Mathematics", Erwin Kreyszig, John Wiley and sons, inc.
2. "Advanced Engineering Mathematics", R.K. Jain, S.R.K. Iyengar, Narosa Publications.
3. "Higher Engineering Mathematics", B. S. Grewal, Khanna Publishers.
4. "Vector Analysis", Schaum's Outline Series, Murray R Spiegel, Seymour Lipschutz, Dennis Spellman

FF No. : 654

CS20314:: MICROPROCESSOR AND INTERFACING

Credits: 01 **Teaching Scheme: -** Laboratory 2 Hrs/Week

Prerequisites: Nil

Objectives:

- To study programming model of 8086 and assembly language programming.
- Mapping with PEOs: I, II (b).

List of Practical

Group A: - (Any 6)

1. Study of 8086 Architecture and Execution of sample programs.

2. Write 8086 Assembly language program to access marks of 5 subjects stored in array and find overall percentage and display grade according to it.

3. Write 8086 ALP to perform block transfer operation. (Don't use string operations) Data bytes in a block stored in one array transfer to another array.Use debugger to show execution of program.

4. Write 8086 ALP to find and count negative number from the array of signed number stored in memory.

5. Write 8086 Assembly language program (ALP) to arrange the numbers stored in the array in ascending as well as descending order. Assume that the first location in the array hold the number of elements in the array and successive memory location will have actual array elements. Write a separate subroutine to arrange the numbers in ascending and descending order. Accept a key from the user.
   a. If user enters 0, Arrange in ascending
   b. If user enters 1, Arrange in descending

6. Write 8086 Alp to convert 2_digit HEX number into equivalent BCD number.

7. Write 8086 ALP to convert 2_digit BCD number into equivalent HEX number.

Group B: - (Any 6)

8. Write 8086 Assembly language program (ALP) for following operations on the string entered by the user.
   a. Concatenation of two strings
   b. Find number of words, characters

9. Write 8086 ALP to convert an analog signal in the range of 0V to 5V to its corresponding digital signal using successive approximation ADC.

10. Write 8086 ALP to interface DAC & generate following waveforms on oscilloscope. Comment on types of DAC's and write detailed specifications of the DAC used
    i) Square wave -- Variable Duty Cycle & frequency.
    ii) Stair case wave
    iii) Triangular wave

11. Write 8086 ALP to rotate a stepper motor for
    a. one clockwise rotation
    b. one anti clockwise rotation

    Write routines to accelerate and de-accelerate the motor
    Modify your program to rotate stepper motor for given angle and given direction.

12. Write 8086 ALP to program 8253 in Mode 0 . Generate a square wave with a pulse of 10 mS.

13. Write 8086 ALP to initialize 8279 & to display characters in right entry mode. Provide also the facility to display "SECOMP"/.
    a. Character in left entry mode
    b. Rolling Display
    c. Flashing Display

14. Perform an experiment to establish communication between two USART's. Initialize USART-A in asynchronous transmitter mode and interface USART-B by initializing it in asynchronous receiver mode.

Note: - Students should perform any 6 assignments from group A and any 6 assignments from group B.

Text Books

1. "Microprocessors and Interfacing", Douglas Hall, Tata McGraw Hill Publications, ISBN 0-07-025742-6, 2nd Edition.
2. "Assembly Language Programming", Peter Abel, Pearson Education Publications, ISBN 10:013030655, 5th Edition

Reference Books

1. "Advanced MS DOS Programming", Ray Duncan, BPB Publications ISBN 0 – 07 – 048677 – 8, 2nd Edition.
2. "Microprocessor and Peripheral Handbook", INTEL –VOL I

FF No. : 654

CS20305::PRINCIPLES OF PROGRAMMING LANGUAGES

Credits: 01 **Teaching Scheme: -** Laboratory 2 Hrs/Week

Prerequisites: C

Objectives:

- To understand basic concepts of Object Oriented Programming.
- To understand inheritance, polymorphisms, templates, file handling.
- To understand the concept of Interfaces, Packages.
- To understand the concept of Exception Handling and Multithreading
- To understand the concept of Applets and AWT
- Mapping with PEOs: II, III, (d).

List of Practical

1. Write a C++ program to implement the concept of objects, classes, constructors, destructors, inheritance.

2. Write a C++ program to implement the concept of static polymorphism (function and operator overloading.)

3. Write a C++ program to implement the concepts of virtual function (dynamic polymorphism) and friend functions

4. Write a C++ program to use the concept of generic programming (generic functions and generic classes)

5. Write a JAVA program to implement the concept of class, constructor, instance variable & class variable.

6. Write a JAVA program to implement the concept of inheritance, interface & package.

7. Write a Java program to implement the concepts of static polymorphism (function overloading) and dynamic polymorphism (using function overriding)

8. Write a JAVA program to use multithreading

9. Write a JAVA program for file handling.

10. Write a Java program with Graphical User Interface as a
a) Stand alone desktop application
b) Applet

11. Develop a web page using HTML, CSS and JavaScript

12. Familiarity with other programming languages
a) Create a family hierarchy using PROLOG
b) Write a .m file for matrix applications using MATLAB

Text Books

1. "Object Oriented Programming with C++", E. Balaguruswamy, Tata McGraw-Edition
2. "Java: The Complete Reference", Herbert Schildt, TMG Publication, ISBN Hill Publishing Company Ltd, New Delhi ISBN 0 - 07 - 462038 – X, 49780070636774 , 7th Edition

Reference Books

1. "The Waite Group's Object oriented Programming in C++",R. Lafore, Galgotia Publications, ISBN 81-7515-269-9, 3rd Edition
2. "Core Java 2 Volume – I " ,Cay S Horstmann, Gary Cornell, Pearson Education, ISBN 9788131719459, 8th Edition

Additional Reading

1. "Core Java Volume .II " Cornell G, Horstmann C S , Sunsoft Press, ISBN 81-7808-018-4

CS20310::COMPUTER GRAPHICS **FF No. : 654**

Credits: 01 **Teaching Scheme: -** Laboratory 2 Hrs/Week

Prerequisites: C

Objectives:

- To understand algorithms to draw various graphics primitives.
- To understand 2-D and 3-D transformations.
- To understand clipping, curve, fractals.
- Mapping with PEOs: I, II, (b).

List of Practical

1. Write a Program to implement DDA and Bresenham Line drawing algorithm.
2. Write a Program to implement Bresenham's Circle drawing algorithm.
3. Write a Program to implement Polygon fill algorithm.
4. Write a Program to implement Scaling, rotation and translation of a 2D object.
5. Write a program to achieve animation by using segmentation.
6. Write a Program to implement Cohen Sutherland line clipping algorithm.
7. Write a Program to implement Polygon clipping algorithm.
8. Write a Program to implement Scaling, reflection about planes and axes of a 3D object.
9. Write a Program to draw a Koch curve, fractal line and surface.

Text Books

1. "Computer Graphics", S. Harrington, 2nd Edition, McGraw-Hill Publications, 1987, ISBN 0-07-100472-6.
2. "Procedural Elements for Computer Graphics", D. Rogers, 2nd Edition, Tata McGraw-Hill Publication, 2001, ISBN 0-07-047371-4.

Reference Books

1. "Computer Graphics Principles and Practice", J. Foley, V. Dam, S. Feiner, J. Hughes, 2nd Edition, Pearson Education, 2003, ISBN 81-7808-038-9.

2. "Computer Graphics – C Version", D. Hearn, M. Baker, 2nd Edition, Pearson Education, 2002, ISBN 81-7808-794-4.

FF No. : 654

CS24302:: ASP.NET

Credits: 01 **Teaching Scheme: -** Laboratory 2 Hrs/Week

Prerequisites: C#.NET or VB.NET

Objectives:

- To learn the fundamental concepts of ASP.NET.
- To learn to Web application development using ASP.NET.
- To learn to on line database application development.
- To learn to apply security to web applications.
- Mapping with PEOs: II, III, (c).

List of Practical

1. Design simple web application using ASP.NET.
2. Design web application with different validations.
3. Design on line database application.
4. Design data report application.
5. Design web application for uploading files on web.
6. Design AJAX application.
7. Design localized web application.
8. Design WPF browser application.
9. Authentication and authorization in asp..
10. Deployment and publishing web sites.
11. Mini project.

Text Books

1. "Beginning ASP.NET 3.5: In C# and VB", Imar Spaanjaars, Wrox publication, ISBN: 978-0-470-18759-3, March 2008.

2. "ASP.NET 3.5: A Beginner's Guide", William Sanders, McGraw Hill Publication, ISBN: 007159194X / 9780071591942, September 2008.

Reference Books

1. "ASP.NET AJAX Programmer's Reference: with ASP.NET 2.0", Shahram Khosravi, Wrox Publication, ISBN: 978-0-470-10998-4, Sept.2007.
2. "Professional ASP.NET 2.0", B. Evjen, S.Hanselman, F.Muhammad, S. S. Sivakumar, D. Rader, Wrox Publication, ISBN: 978-0-7645-7610-2, Nov. 2005.

FF No. : 654

CS24304:: Python

Credits: 01 **Teaching Scheme: -** Laboratory 2 Hrs/Week

Prerequisites: C programming.

Objectives:

- To learn the fundamental concepts of python languages.
- To learn to GUI application development using python languages.
- To learn to use regular expression for text processing in python language.
- Mapping with PEOs: II, III, (c).

List of Practical

1. Design a Simple Python Script for mathematical calculations.
2. Design a Simple Python Script using Lists/Tuples/Dictionary data types.
3. Design a Simple Python Script using conditional constructs.
4. Design a Simple Python Script using loop constructs.
5. Design an advanced Python Script using loop constructs.
6. Design a Simple Python Script using functions.
7. Design a Simple Python Script using modules
8. Design a Simple Python Script for file handling.
9. Design a Simple Python Script with exception handling.
10. Design a Simple GUI application using Python.

Text Books

1. "Exploring Python", Timothy Budd, Mc Graw Hill Publication, ISBN: 9780073523378, August 2010.
2. "Beginning Python", Peter C. Norton, Alex Samuel, Dave Aitel, Eric Foster-Johnson, Leonard Richardson, Jason Diamond, Aleatha Parker, Michael Roberts ISBN: 978-0-7645-9654-4, August 2005.

Reference Books

1. "Python: Create - Modify – Reuse", James O. Knowlton, Wrox Publication,

ISBN: 978-0-470-25932-0, July 2008.
2. "Professional Python Frameworks: Web 2.0 Programming", Dana Moore, Raymond Budd, William Wright, Wrox Publication, ISBN: 978-0-470-13809-0, October 2007.

MODULE V

Structure, T.Y B.Tech (Module V)

FF653, Issue No. 04, Rev 0, dt 02/01/2012

Subject No.	Subject Code	Subject Name	Teaching Scheme (Hrs/week)			Credits
			Lect.	Tutorial	Practical	
S_1	CS30101	Operating Systems	3	0	0	3
S_2	CS30103	Computer Networks	3	0	0	3
S_3	CS30105	Theory of Computation	3	0	0	3
S_4	CS30109	Web Technologies	3	0	0	3
S_5	CS30115	Advanced Data Structures	2	0	0	2
T_1	CS30101	Operating Systems	0	1	0	1
T_2	CS30103	Computer Networks	0	1	0	1
P_1	CS30303	Operating Systems	0	0	2	1
P_2	CS30311	Computer Networks	0	0	2	1
P_3	CS30309	Web Technologies	0	0	2	1
MP_5	CS37401	Mini Project(T.Y. Semester I) Irrespective of Module	0	0	4	2
* PD_1	PD_1	Institute Level Elective	0	0	2	1
CVV_3	CS30401	Comprehensive Viva Voce	Based on Courses S1, S2,			2
SM_1	CS37301	Seminar(T.Y. Semester I) Irrespective of Module	0	0	4	2
PS_1	CS37302	PROJECT STAGE 1 (T.Y. Semester II)	0	0	4	2

		Irrespective of Module				
		Total	14	2	16	26

FF No. : 654

CS30101:: OPERATING SYSTEMS

Credits: 03 **Teaching Scheme: -** Theory 3 Hrs/Week

Prerequisites: Data Structures and Algorithms, Computer Organization.

Objectives:

- Identify the role of operating systems and explain the different structures operating systems.
- Describe OS support for processes/threads, and virtual memory, I/O and file systems.
- Evaluate processes and/or threads synchronization mechanisms and explain deadlock conditions and ways to resolve them.
- Identify the different design and implementation concepts for Unix/Linux
- Use Inter-Process Communication techniques under Unix/Linux.
- Mapping with PEOs: II, III, (d).

Unit I **(8+1 Hrs)**
Introduction to OS

A. Architecture, Goals & Structures of O.S., Hardware Abstraction Layer, Basic functions, Interaction of OS and Hardware Architecture, System Calls & OS Services, Batch, Multiprogramming, Multitasking, Time sharing, Parallel, Distributed & Real-time OS.
Overview of 386 programming model, Introduction to Mobile OS: Architecture& Mobile OS Layered Model of Mobile OS.
Examples of OS: Linux, MS-Windows 2000.
B. Variants of Linux

Unit II **(8+1 Hrs)**
Process Management

A. Process Description & Control: Process Concept, Process States, Process Description, Threads, SMP & Microkernels: Processes and Threads, Symmetric Multiprocessing, Microkernels.
Concurrency: Principles of Concurrency, Mutual Exclusion: S/W approaches, H/W Support, Semaphores, Monitors, Classical Problems of Synchronization: Readers-Writers problem, Producer Consumer problem, Dining Philosopher problem.
OS Services layer in the Mobile OS: Generic Services.
B. Message Passing, Sleeping Barber problem.

Unit III **(8+1 Hrs)**
Scheduling and Deadlock

A. Uniprocessor Scheduling: Types of Scheduling: Preemptive, Non-preemptive, Long-term, Medium-term, Short-term. Scheduling Algorithms: FCFS, SJF, RR, Priority
Multiprocessor Scheduling: Granularity, Design Issues, Process Scheduling
Deadlock: Principles of deadlock, Deadlock Avoidance, Deadlock Detection, Deadlock Recovery, Deadlock Prevention.
OS Services layer in the Mobile OS: Comms Services.
B. Thread Scheduling, Real Time Scheduling.

Unit IV **(8+1 Hrs)**
Memory Management

A. Memory Management requirements, Memory Partitioning: Fixed and Variable Partitioning, Memory Allocation: Allocation Strategies (First Fit, Best Fit, and Worst Fit), Fragmentation, Swapping.
Virtual Memory: Concepts, Segmentation, Paging, Address Translation, Page Replacement Policies (FIFO, LRU, Optimal, Other Strategies), Thrashing.
OS Services layer in the Mobile OS: Multimedia and Graphics Services, Connectivity Services.
B. Demand paging, Working Set Model.

Unit V **(8+1 Hrs)**
I/O Devices, Files & Shell Programming

A. I/O management & Disk scheduling: I/O Devices, Operating System design issues, I/O Buffering, Disk Scheduling (FCFS, SCAN, C-SCAN, SSTF), RAID.
File Management: Concepts, File Sharing, File Organization, File Directories, Record Blocking, Free Space management, Security Issues.
Shell and Command Programming, AWK Programming.
B. Organization of I/O functions, Disk Caches, Secondary Storage Management.

Text Books

1. "Operating Systems", Stalling William, Pearson Education, ISBN: 0-13-031999-6, 4th Edition.
2. "Operating System Concepts", Silberschatz A., Galvin P., Gagne G., John Wiley and Sons, ISBN: 9971-51-388-9, 6th Edition.

Reference Books

1. "Modern Operating Systems", Tanenbaum Andrew S., Prentice Hall India, ISBN: 81-7808-447-3, 2nd Edition.
2. "Unix Concepts and Applications", Das Sumitabha, Tata McGraw Hill, ISBN: 0-07-053475-6, 3rd Edition.

Additional Reading

1. "Operating System Principles", Silberschatz A., Galvin P., Gagne G, John Wiley and Sons, ISBN: 9812-53-176-9, 7th Edition.
2. "Design of the Unix Operating System", Bach Maurice, Pearson Education, ISBN: 81-7808-731-6, 1st Edition.
3. "Unix Shell Programming", Yashavant Kanetkar, BPB Publications, ISBN: 81-7029-753-2, 1st Edition.
4. "Unix And Shell Programming", Forouzan B. A., Gilberg R. F., Australia, Thomson Brooks Cole, ISBN: 981-243-127-6 , 1st Edition.
5. "The Symbian OS Architecture Sourcebook: Design and Evaluation of a Mobile Phone OS", Ben Morris, John Wiley & Sons, ISBN: 978-0-470-01846-0, 2007.

FF No. : 654

CS30103:: COMPUTER NETWORKS

Credits: 03 **Teaching Scheme: -** Theory 3 Hrs/Week

Prerequisites: Data Communication.

Objectives:

- To understand some of the common data link layer protocols.
- To learn various routing algorithms.
- To understand various protocols used at different layers.
- Mapping with PEOs: II, III, (d).

Unit I **(8+1 Hrs)**
Introduction to Computer Networks and Logical Link Control

A. LAN, MAN, WAN, PAN, Internet, Intranet, Internetwork, Protocol Hierarchy, Design Issues for the Layers, OSI Model, TCP/IP Model. Data Link Layer Design Issues: Services Provided to the Network Layer, Framing, Error Control and Flow Control. Error Detection and correction codes: Hamming Code and CRC. Elementary DLL Protocols: Unrestricted Simplex, Stop-and-Wait and Noisy channel. Sliding Window protocols, HDLC.
B. Point-to-Point Protocol (PPP), MPLS, Network Devices : Repeater, Hubs and Bridges

Unit II **(8+1 Hrs)**
Medium Access Control

A. Channel allocation: Static and Dynamic allocation, Multiple Access Protocols: Pure ALOHA, Slotted ALOHA, CSMA, WDMA. Ethernet: Cabling, MAC Sub-layer protocol: DIX and IEEE 802.3 Frame Formats, Collision Detection, Binary Exponential Backoff Algorithm, Switched Ethernet, Fast Ethernet, Wireless 802.11a/b/g/n LANS, MACA, Broadband wireless: 802.16
B. Gigabit Ethernet, VLAN, Layer-II Switch and Bluetooth

Unit III **(9+2 Hrs)**
Network Layer

A. Design Issues, Packet switching, Connectionless and Connection-oriented Services, Virtual Circuit and Datagram Subnets. Autonomous system. Routing Algorithms: Optimality principle, shortest path routing, flooding, Distance Vector routing, link state routing, hierarchical routing. Congestion Control and QOS: General Principles,

Congestion prevention policies, Load shading, Jitter Control, Quality of Service, Internetworking. Network layer Protocols: ARP, RARP, IP protocol, IPV6, ICMP, Unicast Routing Algorithms: RIP, OSPF, BGP.

B. Routing Algorithms: Broadcast and Multicast routing, Routing for mobile hosts. Multicast Routing: IGMP, Mobile IP.

Unit IV **(8+1 Hrs)**
Transport Layer

A. Services and service primitives, Elements of Transport protocol: Addressing, Connection establishment and release, flow control and buffering, Multiplexing, Crash recovery, UDP: Introduction, TCP: Introduction, Model, protocol, header, connection establishment and release, connection management, Transmission policy, congestion control, timer management, RPC, Transport layer in Mobile network.

B. Real Time Streaming Protocol RTSP, RTP, RTCP

Unit V **(7+1 Hrs)**
Application Layer

A. Domain Name System (DNS) and DNS servers, E-mail: MIME, SMTP and POP3. Remote login, File Transfer Protocol (FTP), SNMP, DHCP and BOOTP. CDN, Working of Bit Torrent, Cloud computing: Architectures, working principle.

B. World Wide Web, HTTP1.0, HTTP 1.1, Wireless Web.

Text Books

1. "Computer Networks", by Tanenbaum A. S., Pearson Education , 2008, ISBN-978-81-7758-165-2, 4th Edition,
2. "Data Communications and Networking", by Forouzan B. A, Tata McGraw-Hill Publications, 2006, ISBN-0-07-063414-9, 4th edition.

Reference Books

1. "Computer Networking- a top-down approach featuring the internet", by James F. Kurose, Person Education, ISBN- 0321227352, 2nd Edition.
2. "Communication Networks- Fundamental Concepts and Key Architectures", by Leon-Garcia-Wadjaja, Tata McGraw-Hill Publications, ISBN-978-0072463521.

Additional Reading

1. "Computer Networks and Internet", by Comer D., Pearson Education, ISBN-81-297-0330-0, 2nd Edition.
2. "Computer Networks- A Systems Approach", by Larry L. Peterson and Bruce S. Davie, Morgan Kaufmann, ISBN-978-81-312-1045-1, 4th Edition.

3. "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud", George Reese, O'Reilly Publication, 2009, ISBN 978-0-596-80163-2. 1st Edition.

FF No. : 654

CS30105:: THEORY OF COMPUTATION

Credits: 03 **Teaching Scheme: -** Theory 3 Hrs/Week

Prerequisites: Data Structures.

Objectives:

- Study abstract computing models (FA, PDA, PM, TM) their languages, grammar, applications, limitations and relevance to modern day computing.
- Learn about the theory of computability and complexity.
- Mapping with PEOs: I, II, (b).

Unit I **(8+1 Hrs)**
Automata Theory

A. Introduction to Finite Automata, Structural Representations, Automata and Complexity, Central Concepts to Automata Theory: Alphabets, Strings, Languages and Problems, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition table, Language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transition, Language of NFA, Equivalence and Minimization of Automata, Conversion of NFA with epsilon to DFA Equivalence of Moore and Mealy Machine. Applications and Limitation of FA.

B. FA with output: Moore and Mealy machine.

Unit II **(8+1 Hrs)**
Regular Expressions (RE) and Languages

A. Regular expression (RE), Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Kleen's Theorem, Regular expression to DFA, DFA to Regular expression, Arden's Theorem, Non Regular Languages, Pumping Lemma for regular Languages, Closure properties of Regular Languages, Applications of RE: Regular expressions in Unix, GREP utilities of Unix, Lexical analysis and finding patterns in text.

B. Decision properties of Regular Languages.

Unit III **(11+1 Hrs)**
Context Free Grammars (CFG) and Push Down Automata(PDA)

A. Context Free Grammars: Definition, Examples, Derivation, Languages of Grammar, Derivation trees, Ambiguity in Grammar, Ambiguous and Unambiguous CFG, Inherent ambiguity, Simplification of CFGs, Normal forms for CFGs: CNF and GNF, Closure properties of CFLs, Decision Properties of CFLs (Emptiness, Finiteness and Membership), Chomsky Hierarchy.
Push Down Automata: Description and definition, Language of PDA, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, CFG to PDA construction (with proof). Equivalence of PDA and CFG (without proof).

B. Regular Grammars, left linear and right linear Regular Grammars, Regular Grammar and Finite Automata, , Pumping lemma for CFLs.

Unit IV **(7+1 Hrs)**

Introduction to Turing Machines

A Turing Machines: Basic model, definition and representation, Instantaneous Description, Language acceptance by TM.
Robustness of Turing Machine model and equivalence with various variants: Two-way/One-way infinite tape TM, multi-tape TM, non-deterministic TM, TM as enumerator.
Recursive and Recursively Enumerable languages and their *closure and decision properties*.

B Comparison between Finite Automata, Push Down Automata, and Turing Machines.

Unit V **(6+1 Hrs)**

Introduction to Computability Theory and Undecidability

Universal Turing Machines, Church-Turing Thesis and intuitive notion of Algorithm.
Introduction to countable and uncountable sets (countability of set of natural numbers, integers, rationals. Uncountability of set of real numbers, points in plane), Encoding for Turing machines and countability of set of all Turing machines. *Existence* of Turing unrecognizable languages.
Undecidability of Halting problem, Post Correspondence Problem. Example of a Turing unrecognizable language.

B. Hilbert's tenth problem, undecidability of tiling problem

Text Books

1. "Introduction to Automata Theory, Languages and Computation", Hopcroft J, Motwani R, Ullman ,Addison-Wesley, ISBN 81-7808-347-7, Second Edition .

Reference Books

1 "Introduction to Theory of Computation", Michael Sipser, Course Technology, ISBN-10: 053494728X, Third Edition.

2 "Introduction to Languages and the Theory of Computation", J. Martin, Tata McGraw-Hill, ISBN 0-07-049939-x, Third edition, 2003.
3 "Introduction to Computer Theory", Cohen D., Wiley Publications, 0-471-51010-6, Second Edition.

Additional Reading

1. "Elements of The theory of Computation", H.R.Lewis, C.H.Papadimitriou, Pearson Education, ISBN 81-7808-487-2, Second Edition.

FF No:654

CS30109 :: WEB TECHNOLOGIES

Credits: 03 **Teaching Scheme: -** 3 Hrs/Week

Prerequisites: Principles of Programming Languages.

Objectives:

- To understand different client and server side web technologies like XML, XSL, DOM, Servlet, AJAX, Web 2.0, Web 3.0 etc.
- To understanding the Servlet model.
- To designing and developing Servlet using session management.
- To understanding the java server pages (JSP) technology model.
- Mapping with PEOs :- IV, (i).

Unit I **(9 Hrs)**

Introduction to Web Technologies

A. World wide web, what we mean by "web technologies", Evolution of web: front content to social to semantic (Web 1.0, 2.0, 3.0, web as a platform) Introduction to Client side technologies: HTML, CSS, JavaScript, AJAX.
HTML : HTML Elements, Attributes, HTML formatting Tags for skeleton, text, links, lists, images, styles, Tables, Frames , Introduction to CSS : Ways of Adding CSS, Selectors, Attribute selectors, JavaScript : Data Types and Variables, Operators and expressions, Arrays, Loops, conditions, JavaScript Objects, Forms & Reg Expressions, Events, JavaScript Browser Functions.

B. Applications of JavaScript, Validations Using JavaScript, Creating Menu using CSS.

Unit II **(8 Hrs)**

JQuery and Data formats and representations – I

A. JQuery : Introduction, Selectors , Events, Effects, Call back and Chaining.
HTML DOM : Predefined Objects : Window ,History, Navigator. Object Hierarchy, Accessing Objects, Event Handlers , Node : Create , Add, Insert, Clone, Remove and Replace. XML DOM
B. Creating Animations and Slider using JQuery, Referring DOM using JavaScript.

Unit III **(8 Hrs)**

Data formats and representations – II

A. XML: Role of XML, Prolog, Elements, Attributes, Namespace XML DTD : Purpose of DTD, Using DTD in XML , Element Type Declaration, Attribute Declaration XSD :

Limitations of DTD, Schema Elements, Element Definition, Schema Schema Validation, Built in Data Types. Parsing XML: The Java API for XML parsing (JAXP), X-Path : XPath FLAVOR , Location Paths and steps, XPath Expressions, XSLT : Overview of XSLT, XSLT Elements, Template rules, Selecting values, Applying templates.
B. X-query.

Unit IV **(8 Hrs)**
Server Side Technologies

A. Introduction to server side Technologies, Introduction to CGI , Servlet: Servlet Application Architecture, Servlet's life cycle : Init(), Service(), Destroy(),HTTPServlet Interface, Request Processing, Response Generation, Accessing database with JDBC, Session Management.
JSP : JSP lifecycle, Directives, Comments, Expressions, Scriptlets, Declaration, Scope of JSP Objects, Standard Actions, Introduction to JavaBeans, Calling JavaBean from JSP Page.
B. Session and Cookies management in Servlet and JSP.

Unit V **(7 Hrs)**
Distribution of data

A. PHP: PHP Fundamentals, PHP Arrays, PHP Functions, PHP Forms, PHP String Handling, PHP Cookies and PHP Sessions. Struts framework: Struts Architecture, Struts Elements, Controller, Action.
B. AJAX: AJAX Benefits, Basic Idea, Asynchronous Communication, AJAX Processing Steps,

Text Books

1. "J2EE: The complete Reference" by James Edward Keogh, Jim Keogh, McGraw-Hill Osborne Media, ISBN: 007222472X, September 2002.
2. "HTML & XHTML: The Complete Reference", Thomas Powell, Tata McGraw Hill Publication, ISBN: 007222942-X, Fourth edition, 2004.
3. "WEB Technologies" bu Uttam K. Roy, OXFORD, ISBN : 978-0-19-806622-4
4. "XML and Related Technologies" by Atul Kahate, PEARSON Eductaion.

Reference Books

1. "Learning XML" by Erik T. Ray, O'Reilly & Associates, Inc., ISBN: 9780596004200, Sept. 2003.
2. "Beginning Java Server Pages" by Vivek Chopra, Jon Eaves, Rupert Jones, Sing Li, John T. Bell, Wrox Publication, ISBN: 978-0-7645-7485-6, February 2005.

FF No. : 654

CS30115:: ADVANCED DATA STRUCTURES

Credits: 02 **Teaching Scheme: -** Theory 2 Hrs/Week

Prerequisites: Data Structures

Objectives:

- To introduce advanced data structures, problem solving paradigms
- To study the representation, implementation & applications of data structures.
- To compare alternative implementations of data structures.
- To choose the appropriate data structure for modeling a given problem.
- Mapping with PEOs: III, (e).

Unit I **(6+1 Hrs)**
Hashing

A. Dynamic Hashing: Motivation for Dynamic Hashing, Dynamic Hashing using Directories, directory less Dynamic Hashing. Bloom Filters: An application-differential files, Bloom Filter Design.
B. Alternate hash functions (mid-square, folding, digit analysis), Double Hashing

Unit II **(7+1 Hrs)**
Priority Queue and Advance Heaps

A. Double Ended Priority queues, Leftist Trees: Height Biased, Weight Biased. Binomial Heaps: Cost Amortization, Definition of Binomial Heaps, Insertion, Melding two Binomial Heaps, deletion of min element. Fibonacci Heaps: Definition, Deletion from an F-heap, Decrease key, Cascading Cut.
B. Comparative study of different priority queue implementations using – binary heaps, leftist trees, binomial heaps, Fibonacci heaps with respect to the following operations – insert, delete, find-min, extract-min, decrease-key, meld

Unit III **(6+1 Hrs)**
Advanced Binary Search Trees

A. Red-Black Trees: Definition, Representation, Searching, Insertion, Deletion. Splay Trees: Bottom-up, top-down.

B. Insertion and Deletion in B Trees and B+ Trees.

Unit IV **(6+1 Hrs)**
Digital Search Structures

A. Digital Search Trees: Definition, Search, Insert and Delete. Binary Tries, Compressed Binary Tries. Multiway Tries: Definition, searching a Trie, sampling strategies, Insertion, Deletion, Height of a Trie. Prefix Search and applications. Suffix Trees.

B. Space required and alternative node structures for a Trie.

Unit V **(7+1 Hrs)**
Data structures for Disjoint Sets and Linear Programming

A. Data structures for Disjoint Sets: Disjoint Set Operations, Linked list representation of disjoint sets, Disjoint set forests. Linear Programming: Overview, Applications, Algorithms, Standard and Slack forms, Formulating problems as linear programs, Simplex Algorithm.
B. Linear Programming duality

Text Books

1. "Fundamentals of Data Structures in C", E. Horwitz , S. Sahani, Anderson-Freed, Universities Press, Second Edition, 2008, ISBN 978-81-7371-605-8.
2. "Introduction to Algorithms", T. Cormen, R.Rivest, C. Stein, C. Leiserson, PHI publication, Second Edition, 2004, ISBN 81-203-2141-3.

Reference Books

1. "Advanced Data structures", Peter Brass, Cambridge Publication, 1st Edition, 2008 ,ISBN – 978-0-521-88037-4.
2. "Data Structures and algorithms with Object Oriented design Patterns in Java", Bruno R. Preiss, wiley Publication, 1st Edition, 2000. ISBN: 978-0-471-34613-5.

FF No. : 654

CS30101:: OPERATING SYSTEMS

Credits: 01 **Teaching Scheme: -** Tutorial 1 Hr/Week

Prerequisites:: Data Structures and Algorithms, Computer Organization.

Objectives:

- Understand Operating System concepts.
- Be familiar with Basic and Advance Unix commands.
- Be able to write Shell and AWK scripts.
- Understand and solve problems involving process control, mutual exclusion, deadlock and synchronization.
- Shell programming in Unix.
- Mapping with PEOs: II, III, (d).

List of Contents

A TERM-WORK containing the record of the following:

1. Execution of Advance Unix commands.
2. Write a shell program to sort an array of numbers using any sort method.
3. Execution of AWK related commands.
4. Solve the Readers-Writers problem using Threads and Mutex.
5. Solve the Producer-Consumer problem using Threads and Mutex.
6. Solve the Producers-Consumers problem using Threads and Semaphores.
7. Design a solution to the Sleeping Barber problem.
8. Draw the Gantt charts and compute the finish time, turnaround time and waiting time for the following algorithms:
    a. First come First serve
    b. Shortest Job First (Non-Preemptive)
9. Calculate the number of page faults for a reference string for the following page replacement algorithms:

a. Optimal
b. FIFO

10. Calculate the total distance traversed by the disk arm to satisfy the pending requests for the following disk scheduling algorithms:
    a. FCFS
    b. C-SCAN

Text Books

1. "Operating Systems", Stalling William, Pearson Education, ISBN: 0-13-031999-6, 4th Edition.
2. "Operating System Concepts", Silberschatz A., Galvin P., Gagne G., John Wiley and Sons, ISBN: 9971-51-388-9, 6th Edition.

Reference Books

1. "Modern Operating Systems", Tanenbaum Andrew S., PHI, ISBN: 81-7808-447-3, 2nd Edition.
2. "Unix Concepts and Applications", Das Sumitabha, TMH, ISBN: 0-07-053475-6, 3rd Edition.

Additional Reading:

1. "Operating System Principles", Silberschatz A., Galvin P., Gagne G, John Wiley And Sons, ISBN: 9812-53-176-9, 7th Edition.
2. "Design of the Unix Operating System", Bach Maurice, Pearson Education, ISBN: 81-7808-731-6, 1st Edition.
3. "Unix Shell Programming", Yashavant Kanetkar, BPB Publications, ISBN: 81-7029-753-2, 1st Edition.
4. "Unix And Shell Programming", Forouzan B. A., Gilberg R. F., Australia, Thomson Brooks Cole, ISBN: 981-243-127-6, 1st Edition.

FF No. : 654

CS30103:: COMPUTER NETWORKS

Credits: 01 **Teaching Scheme: -** Tutorial 1 Hr/Week

Prerequisites: : Nil

Objectives:

- To understand the analysis of network
- Understand the design of network.
- Mapping with PEOs: II, III, (d).

List of Contents

A TERM-WORK containing the record of the following:

A. Assignments :
   i. Study of web Server.
   ii. PC-to-PC communication using RS-232.
   iii. Install two LAN Cards in one of the machine. Install and study router.
   iv. Introduction to NS-2/NS-3/OMNET
   v. Study of System Socket Calls.

B. Mathematical Analysis
   i. Problems on propagation delay
   ii. Problems on transmission delay
   iii. Problems on latency using queuing theory.
   iv. Problems on performance of network.

Text Books

1. "Computer Networks", by Tanenbaum A. S., Pearson Education , 2008, ISBN-978-81-7758-165-2, 4th Edition,
2. "Data Communications and Networking", by Forouzan B. A, Tata McGraw-Hill Publications, 2006, ISBN-0-07-063414-9, 4th edition.

Reference Books

1. "Computer Networking- a top-down approach featuring the internet", by James F. Kurose, Person Education, ISBN- 0321227352, 2nd Edition.
2. "Communication Networks- Fundamental Concepts and Key Architectures", by Leon-Garcia-Wadjaja, Tata McGraw-Hill Publications, ISBN-978-0072463521.

Additional Reading

1. "Computer Networks and Internet", by Comer D., Pearson Education, ISBN-81-297-0330-0, 2nd Edition.
2. "Computer Networks- A Systems Approach", by Larry L. Peterson and Bruce S. Davie, Morgan Kaufmann, ISBN-978-81-312-1045-1, 4th Edition.

FF No. : 654

CS30303:: OPERATING SYSTEMS

Credits: 01 **Teaching Scheme: -** Laboratory 2 Hrs/Week

Prerequisites: Data Structures and Algorithms, Computer Organization

Objectives:

- Be familiar with implementation of a multiprogramming operating system.
- Be familiar with implementation of paging, scheduling.
- Understand the design of computer network.
- Student must be able analyze the packets and write the socket programming.
- Mapping with PEOs: II, III, (d).

List of Practical
Part A:

1. Implementation of a multiprogramming operating system:
    a. Stage I:
        i. CPU/ Machine Simulation
        ii. Supervisor Call through interrupt
    b. Stage II:
        i. Paging
        ii. Error Handling
        iii. Interrupt Generation and Servicing
        iv. Process Data Structure
    c. Stage III:
        i. Multiprogramming
        ii. Virtual Memory
        iii. Process Scheduling and Synchronization
        iv. Inter-Process Communication
        v. I/O Handling, Spooling and Buffering

Text Books

1. "The Logical Design of Operating Systems", Shaw, Alan C, Prentice Hall, 1974.
2. "Computer Networks", by Tanenbaum A. S., Pearson Education , 2008, ISBN-978-81-7758-165-2, 4th Edition,

Reference Books

1. "Operating System Concepts", by Silberschatz A., Galvin P., Gagne G., John Wiley and Sons, ISBN: 9971-51-388-9, 6th Edition.
2. "Communication Networks- Fundamental Concepts and Key Architectures", by Leon-Garcia-Wadjaja, Tata McGraw-Hill Publications, ISBN-978-0072463521.

Additional Reading

1. "Operating System Principles", Silberschatz A., Galvin P., Gagne G, John Wiley and Sons, ISBN: 9812-53-176-9, 7th Edition.
2. "Design of the Unix Operating System", Bach Maurice, Pearson Education, ISBN: 81-7808-731-6, 1st Edition.
3. "Unix Shell Programming", Yashavant Kanetkar, BPB Publications, ISBN: 81-7029-753-2, 1st Edition.
4. "Unix And Shell Programming", Forouzan B. A., Gilberg R. F., Australia, Thomson Brooks Cole, ISBN: 981-243-127-6, 1st Edition.
5. "Modern Operating Systems", Tanenbaum Andrew S., PHI, ISBN: 81-7808-447-3, 2nd Edition.
6. "Unix Concepts and Applications", Das Sumitabha, TMH, ISBN: 0-07-053475-6, 3rd Edition.
7. "Computer Networks- A Systems Approach", By Larry L. Peterson and Bruce S. Davie, Morgan Kaufmann, 4th Edition, ISBN-978-81-312-1045-1.

FF No. : 654

CS30311:: Computer Networks

Credits: 01 **Teaching Scheme: -**Laboratory 2 Hrs/Week

Prerequisites: Data Communication

Objectives:

- Understand the design of computer network and its various protocols of OSI and TCP/IP layer.
- Student must be able analyze the packets
- Understanding network communication using socket programming.
- Mapping with PEOs: II, III, (d).

List of Practical

1. Set up a small network of 2 to 4 computers using Hub/Switch. It includes installation of LAN Cards, Preparation of Cables, Assigning unique IP addresses and sharing C drive on each machine.

2. To transfer the file using PC To PC Communication using RS232D.

3. Installation and configuration web server using Apache Tomcat for Linux / Catlina for Windows XP/ IIS for Windows 7. Access the web pages from another computer.

4. Studying Linux and Windows network commands. [ping, pathping, ipconfig/ifconfig, arp, netstat, nbtstat, nslookup, route, traceroute/tracert, nmap, etc]

5. Installation and configuration of FTP server using Apache Tomcat for Linux / Catlina for Windows XP/ IIS for Windows 7. Access the shared folder from another computer.

6. Installing and configuring DHCP server for Linux and Windows.

7. Sharing the Internet Connection for Wired and Wireless Networks using two NIC.

8. Simulate the sliding window protocols Go Back N and Selective Repeat.

9. Write a program using TCP sockets to transfer a file between two computers.

10. Write a chat application using User Datagram sockets between two computers.

11. Write a program to create TCP/IP packet using standard TCP/IP include files and send it to other machine

12. Study of protocol and packet analyzer using wireshark.

Text Books

1. "The Logical Design of Operating Systems", Shaw, Alan C, Prentice Hall, 1974.
2. "Computer Networks", by Tanenbaum A. S., Pearson Education , 2008, ISBN-978-81-7758-165-2, 4th Edition,

Reference Books

1. "Operating System Concepts", by Silberschatz A., Galvin P., Gagne G., John Wiley and Sons, ISBN: 9971-51-388-9, 6th Edition.
2. "Communication Networks- Fundamental Concepts and Key Architectures", by Leon-Garcia-Wadjaja, Tata McGraw-Hill Publications, ISBN-978-0072463521.

Additional Reading

1. "Operating System Principles", Silberschatz A., Galvin P., Gagne G, John Wiley and Sons, ISBN: 9812-53-176-9, 7th Edition.
2. "Design of the Unix Operating System", Bach Maurice, Pearson Education, ISBN: 81-7808-731-6, 1st Edition.
3. "Unix Shell Programming", Yashavant Kanetkar, BPB Publications, ISBN: 81-7029-753-2, 1st Edition.
4. "Unix And Shell Programming", Forouzan B. A., Gilberg R. F., Australia, Thomson Brooks Cole, ISBN: 981-243-127-6, 1st Edition.
5. "Modern Operating Systems", Tanenbaum Andrew S., PHI, ISBN: 81-7808-447-3, 2nd Edition.
6. "Unix Concepts and Applications", Das Sumitabha, TMH, ISBN: 0-07-053475-6, 3rd Edition.
7. "Computer Networks- A Systems Approach", By Larry L. Peterson and Bruce S. Davie, Morgan Kaufmann, 4th Edition, ISBN-978-81-312-1045-1.

FF No:654

CS30309::WEB TECHNOLOGIES

Credits: 01 **Teaching Scheme: -** Lab 2 Hrs/Week

Prerequisites: Principles of Programming Languages

Objectives:

- To understand different web technologies like XML, XSL, DOM, Servlet etc.
- To understanding the Servlet model.
- To designing and developing Servlet using session management.
- To understanding the java server pages (JSP) technology model.
- Mapping with PEOs :- IV, V, (i).

List of Tutorials

1. Design a Simple web page using HTML.
2. Design an Attractive web page using CSS.
3. Design a web page using HTML and implement validations using Java Script and give effects using JQuery.
4. Design an XML page and there DTD and validate it using Java API for XML parsing.
5. Design an XML page and there XSD and validate it using Java API for XML parsing.
6. Design web page using a Java Servlet to read and write data to database using JDBC.
7. Design an interactive web page using JSP.
8. Design an interactive web page using PHP.
9. Design an interactive website using struts framework.

Text Books

1. "J2EE: The complete Reference" by James Edward Keogh, Jim Keogh, McGraw-Hill Osborne Media, ISBN: 007222472X, September 2002.
2. "HTML & XHTML: The Complete Reference", Thomas Powell, Tata McGraw Hill Publication, ISBN: 007222942-X, Fourth edition, 2004.
3. "WEB Technologies" bu Uttam K. Roy, OXFORD, ISBN : 978-0-19-806622-4

4. "XML and Related Technologies" by Atul Kahate, PEARSON Eductaion.

Reference Books

1. "Learning XML" by Erik T. Ray, O'Reilly & Associates, Inc., ISBN: 9780596004200, Sept. 2003.
2. "Beginning Java Server Pages" by Vivek Chopra, Jon Eaves, Rupert Jones, Sing Li, John T. Bell, Wrox Publication, ISBN: 978-0-7645-7485-6, February 2005.

MODULE VI

Structure, T.Y B.Tech (Module VI)

FF653, Issue No. 04, Rev 0, dt 02/01/2012

Subject No.	Subject Code	Subject Name	Teaching Scheme (Hrs/week)			Credits
			Lect.	Tutorial	Practical	
S_1	CS30102	Software Engineering	3	0	0	3
S_2	CS30106	Database Management Systems	3	0	0	3
S_3	CS30108	Design and Analysis of Algorithms	3	0	0	3
S_4	CS31114	Data Acquisition Systems	3	0	0	3
S_5	CS30114	Systems Programming	2	0	0	2
T_1	CS30102	Software Engineering	0	1	0	1
T_2	CS30114	Systems Programming	0	1	0	1
P_1	CS30302	Software Engineering	0	0	2	1
P_2	CS30306	Database Management Systems	0	0	2	1
P_3	CS31314	Data Acquisition Systems	0	0	2	1
MP_6	CS37401	Mini Project (T.Y.Semester I) Irrespective of Module	0	0	2	1
SM_1	CS37301	Seminar(T.Y. Semester I) Irrespective of Module	0	0	4	2
* PD_2	PD	Institute Level Elective	0	0	2	1
CVV_4	CS30402	Comprehensive Viva Voce	Based on Courses S5, S7			2
PS_1	CS37302	PROJECT STAGE 1	0	0	4	2

		(T.Y. Semester II) Irrespective of Module				
		Total	14	2	16	26

FF No. : 654

CS30102: Software Engineering

Credits: 03 **Teaching Scheme: -** Theory 3 Hrs/Week

Prerequisites: Data Structures

Objectives:

1. To learn the complete Software life cycle and understand its major activities such as software requirement analysis, design, testing, and implementation.
2. Understanding and Experience in Writing Requirements and Specifications.
3. To thoroughly understand the practices of analysis and design (OOA and OOD)
4. To understand the relative merits of the different UML diagrams. Transforming analysis into design and relate it to implementation model
5. To apply design patterns.

- Mapping with PEOs: III, (a).

Unit I: Software Process Models and OO Methodologies (8 Hrs)

Part A: Overview of Software Engineering, Software Process Framework, Process Patterns, Personal and Team Process Models, Process Models: Code-and-Fix, Waterfall Model, Incremental Models, Evolutionary Models, Iterative Development, The Unified Process, Agile process, Extreme Programming, Cleanroom Methodology, Component-Based Software Engineering, CMMI, Impact of Processes and Outcomes, Process Selection and applicability, Software Engineering Principles and Practices, The importance of modeling, UML Building blocks: things, relationships and diagrams, Architectural views: use case, design, implementation, process and deployment, Levels of detail: visualization, specification and construction, Object properties: Abstraction, encapsulation, Modularity, Hierarchy

Part B: Overview of OO Methodologies: OOAD, OOSE, OMT, DSDM

Unit II: Requirement Engineering and Model Driven Development (8 Hrs)

Part A: Requirements Engineering Tasks, Requirement Elicitation Techniques, Software Requirements: Functional, Non-Functional, Domain, Requirements Characteristics and Characterization, Requirement qualities, Requirement Specification, Requirement Traceability, System Analysis Model Generation, Requirement Prioritization, Context Models, Behavioral Models, Data Models, Object Models, Structured Methods, Overview of Model Driven Development, Introduction to Model Driven Architecture: MDA Terms and Concepts, Model Mappings, Marking Models, Executable Models, MOF and XMI, Introduction to UML Metamodel

Part B: Programming In Small Versus Programming In Large, Extensibility Mechanisms and its usage, Introduction to OCL , UML 2.0 Diagram set

Unit III: System Behavior Analysis (8 Hrs)

Part A: Static Behavior: Use Cases, Use Case Diagram Components, Use Case Diagram, Actor Generalization, Include and Extend, Template for Use Case Narrative, Using Use Cases, The Domain Perspective, Data Dictionary: Finding the Objects, Responsibilities, Collaborators, and Attributes, CRC Cards, Class Models and Use Case Models, Judging the Domain Model, Capturing system behavior in use cases

Dynamic Behavior: Sequence diagrams, object lifelines and message types, Modeling collections multiobjects, Refining sequence diagrams, Collaboration diagrams, States, events and actions, Nested machines and concurrency, Modifying the object model to facilitate states, Modeling methods with activity diagrams, Activity Diagrams: Decisions and Merges, Synchronization, Iteration, Partitions, Parameters and Pins, Expansion Regions, Swimlanes, concurrency and synchronization

Part B: Study of other Behavioral Diagrams: Communication Diagram, Interaction Overview Diagrams, Timing Diagrams

Unit IV: System Design Engineering (8 Hrs)

Part A: Design Concepts, The Design Model, Introduction to Pattern-Based Software Design, Software Architecture Vs Software Design, Foundations of Software Architecture, Architecture styles, Reference Architectures Architectural Design: Software Architecture, Data Design and Architectural Design, Conceptual Architecture View, Module Architecture View, Execution Architecture View, Code Architecture View, Design of Software Objects, Features and Methods, Cohesion and Coupling between Objects, Coupling and Visibility, Interfaces, Interfaces with Ball and Socket Notation, Templates, Analysis model vs. design model classes, Categorizing classes: entity, boundary and control , Modeling associations and collections, Preserving referential integrity , Achieving reusability, Reuse through delegation, Identifying and using service packages, Improving reuse with design

Part B: User Interface Design: Rules, User Interface Analysis and Steps in Interface Design, Design Evaluation, Software Reuse

Unit V: Design Patterns (8 Hrs)

Part A: Introduction to Design Pattern, Describing Design Patterns, Catalogue of Design Patterns Creational Patterns: Abstract Factory, Builder, Factory Method, Prototype, Singleton, Structural Patterns: Adapter, Bridge, Composite, Decorator, Facade, Flyweight, Proxy, Behavioral Patterns: Chain of Responsibility, Command, Interpreter, Iterator, Mediator, Memento, Observer, State, Strategy, Template Method, Visitor

Part B: Antipatterns, Applications of Design Patterns, Archetype Patterns

Text Books:

1. Ian Sommerville, 'Software Engineering', Addison-Wesley, 7th Edition ,2004.
2. Tom Pender, "UML Bible", John Wiley & sons, ISBN – 0764526049

Reference Books :

1. Roger S Pressman,'Software Engineering: A Practitioner's Approach', McGraw Hill, 6/e,2005,
2. Mellor, Scott, Uhl, Weise, "MDA Distilled", Pearson Education, ISBN 81-297-0529X
3. Jim Arlow, Ila Neustadt, "UML 2 and Unified Process: Practical Object Oriented Analysis and Design.", 2nd Edition, Addison- Wesley, ISBN – 0321321278.
4. Grady Booch, James Rambaugh, Ivar Jacobson, "Unified Modeling Language Users Guide", 2nd Edition, Addison- Wesley, ISBN – 0321267974
5. Erich Gamma, Richard Helm, Ralph Johnson,"Design Patterns: Elements of Reusable Object-Oriented Software" (Addison-Wesley Professional Computing Series) ,John Vlissides, Publisher: Addison-Wesley Professional, 1st edition (January 15, 1995) , ISBN-10: 0201633612 ISBN-13: 978-0201633610

FF No. : 654

CS30106:: DATABASE MANAGEMENT SYSTEMS

Credits: 03 **Teaching Scheme: -** Theory 3 Hrs/Week

Prerequisites: Data structures

Objectives:

- To understand importance of Database Management System (DBMS) over traditional file processing system.
- To understand significance of requirement analysis phases in designing entity relationship data model.
- To apply normalization process to design a relational model in the required normal form.
- To use SQL to create database objects, populate tables, and retrieve data.
- To understand the concept of transaction and the implementation of transaction management process.
- Mapping with PEOs: II, III, (d).

Unit I **(8+2 Hrs)**
Introduction to DBMS and ER Data Model

A. Data Storage: File processing system, Disadvantages; DBMS: Need of DBMS; Data, Database, Database System, Database Management System, Metadata, Data Dictionary; Data Abstraction, Data Independence; System Architecture of DBMS; Data Model, Data Requirements Analysis; ER Model: Entity, Entity Set, Attributes, Primary Key, Relationship Set, Degree and Attributes of Relationship, Role, Mapping Cardinality, Participation Constraint, Weak Entity Set, Extended ER Features.
B. Object Oriented, Object Relational, Hierarchical and Network Data Models, Tools for Designing ER Model, Introduction of Popularly used Relational DBMS Packages.

Unit II **(8+2 Hrs)**
Relational Data Model

A. Relation, Schema, Attributes, Tuples, Domains, Relation Degree (or Arity), Cardinality, Relation Intention and Extension; Super Key, Candidate Key, Primary Key and Foreign Key; Relational Model Constraints; Schema Diagram, ER to Relational Mapping; Formal Relational Query Languages: Relational Algebra, Tuple Relational Calculus.

B. Domain Relational Calculus, Codd's Twelve Rules for Relational DBMS, Life Cycle of a Relational Database, Reverse Engineering: Conversion of Relational model into ER/ EER Model.

Unit III **(8+2 Hrs)**
Normalization

A. Normalization: Anomalies of un-Normalized Relation; Functional Dependency: Trivial, Full, Partial, Transitive, Multivalued Dependency; Dependency Diagram; Inference Rules; FD Closure; Algorithms for 1. Candidate Key, 2. Attribute Set Closure, 3. Minimal Cover; Decomposition Properties; Normal Forms: 1NF, 2NF, 3NF, BCNF, 4NF; Bottom - up Approach for Relational Model Design, Relational Synthesis Algorithm; Normalization Trade off

B. Join and Inclusion Dependency, 5NF, DKNF, Normalization at Conceptual Level.

Unit IV **(8+2 Hrs)**
Structured Query Language (SQL)

A. Introduction; DDL, DML, TCL, DCL; Advantages and Disadvantages of SQL; DDL: Create, Drop, Alter Database Objects (Table, Constraints, View etc.); SELECT Queries: Simple Queries, Set Membership, Set Operations, Aggregate Functions, Group-by, Having Construct, Join Types, Nested Subqueries; PL/SQL: Block, Cursor, Procedure, Function, Trigger; Embedded SQL.
B. DCL-Security and Authorization, Date-Timestamp, String and Numerical Functions, Mapping of Relational Algebra to SQL.

Unit V **(8+2 Hrs)**
Transaction Management

A. Transaction: Concept, ACID properties, States; Schedule: Definition, Types, Conflict and View Serializability, Precedence Graph, un/Recoverable, Cascadeless Schedules; Concurrency Control Protocols: Lock Based, Timestamp Based Protocol; Deadlock Detection and Avoidance Techniques; Recovery System: Log Based Recovery, Checkpoints; Query Processing and Optimization
Current Trends: OLAP, Data Warehousing, Data Mining, Distributed databases, Parallel databases.
B. Tree and Multiversion Protocol for Concurrency Control, ARIES Recovery Technique, Shadow Paging; Information Retrieval System

Outcomes:

1. Understanding of entity relationship data model and relational data model design
2. Students will be able to design normalized relational model
3. Students will have understanding of SQL and PL/SQL constructs

Text Books

1. "Database System Concepts", Silberschatz, Korth, Sudarshan, McGraw Hill International Edition, ISBN- 0-07-228363-7, 4th Edition.
2. "Fundamentals of Database Systems", Elmasri and Navathe, Pearson Education, ISBN 81-297-0228-2, 4th Edition.

Reference Books

1. "Database System Concepts", Silberschatz, Korth, Sudarshan, McGraw Hill International Edition, ISBN- 0-07-228363-7, 5th Edition.
2. "Fundamentals of Database Systems", Elmasri and Navathe, Pearson Education, ISBN 81-297-0228-2, 6th Edition.

Reference Books

1. "Database Systems", Thomas Connolly and Carolyn Begg, Pearson Education, ISBN 81-7808-861-4, 5th Edition.
2. "Database Management Systems", Ramakrishnan and Gehrke, McGraw-Hill International Edition, ISBN 0-07-115110-9, 3rd Edition.

FF No. : 654

CS30108:: DESIGN AND ANALYSIS OF ALGORITHMS

Credits: 03 **Teaching Scheme: -** Theory 3 Hrs/Week

Prerequisites: Data Structures and Files

Objectives:

- Fundamental understanding of the mathematics used to analyze, evaluate, and design algorithms
- Develop the ability to assess the advantages and disadvantages of different types of algorithms.
- Understand methods for designing time and space efficient algorithms.
- Increased ability to design and implement efficient solutions to problems.
- Proving problems NP-Complete and understand its impact in Computer Science
- Mapping with PEOs: III, (e).

Unit I **(9+1 Hrs)**

Overview of Time Complexity analysis, Divide and Conquer

A. Asymptotic notations (Big Oh, small oh, Big Omega, Theta notations) and time complexity, Overview of searching, sorting algorithms (binary search, insertion sort, heap sort, bubble sort), lower bound for comparison based sorting. Using Recurrence relations and Mathematical Induction to get asymptotic bounds on time complexity and to prove correctness of algorithms.
Divide and Conquer: Analyzing Quick Sort, Merge Sort. Strassen's Matrix Multiplication, Finding median, Counting Inversions, Integer Arithmetic, Application of Divide and Conquer to Geometric Problems. Master Theorem and its uses.
B. Finding Maximum and Minimum, Convex Hull problem.

Unit II **(8+1 Hrs)**

Dynamic Programming Strategy

A. General Strategy, Simple dynamic programming based algorithms to compute Fibonacci numbers, binomial coefficients. Matrix Chain multiplication. Optimal binary search tree (OBST) construction, 0/1-Knapsack, Traveling Salesperson Problem, Shortest path in a Graph, Sequence Alignment problem, Scheduling problem..
B. String Editing Problem.

Unit III **(7+1 Hrs)**
Greedy, Backtracking and Branch & Bound

A. Greedy Method : Analysis of Minimum Spanning Tree and Shortest Path algorithms, Huffman coding, Scheduling Algorithms. Optimal Storage Problem.
Backtracking: General Strategy, n-Queen's problem, Graph Coloring, Hamiltonian Cycles, 0/1 Knapsack, Subset sum problem.
B. Postage stamp problem, n*n*n Queens problem.

Unit IV **(6+1 Hrs)**
NP-Theory

A. Overview of Deterministic and Non Deterministic Algorithms, Complexity classes P, NP, coNP, and their interrelation. Notion of reduction and NP-hardness, Implications of Cook's Theorem. NP-hardness of halting problem.NP-Complete problems- Satisfiability problem, vertex cover problem, clique problem, Hamiltonian-circuit problem, subset sum problem. Introduction to Parallel Algorithms.
B. Decision Vs Search versions of problems in class NP. Parallel algorithms for merging and sorting a list of n numbers

Unit V **(10+1 Hrs)**
Introduction to Randomized, Approximation and Online algorithms

A. Randomized algorithms: Introduction to Las-Vegas and Monte-Carlo Algorithms. Abundance of witnesses/solutions and application of randomization, solving SAT for formulas with "many" satisfying assignments, Randomized Quick Sort, Karger's algorithm for Min Cut problem, probabilistic recurrences, Coupon Collector problem.
Approximation algorithms: Introduction to NP-optimization problems, factor-2 approximation algorithm for Vertex Cover, hardness of approximation of Travelling Sales Person Problem(TSP), factor-2 approximation algorithm for metric TSP, approximation algorithm for set-cover, Machine scheduling, Bin packing. Introduction to Online algorithms.
B. Chebyshev's inequality and Lazy select algorithm.

Text Books

1. Jon Kleinberg, Eva Tardos "Algorithm Design", Pearson, 1st edition, 2005. ISBN 978-81-317-0310-6
2. Horowitz, Sahani, "Fundamentals of computer Algorithms", Galgotia. 2nd Edition, 1998.ISBN 81-7515-257-5

Reference Books

1. Bressard, Bratley "Fundamentals of Algorithmics." ,PHI, 2nd Edition,1996, ISBN 81-203-1131-0
2. Thomas H Cormen and Charles E.L Leiserson, "Introduction to Algorithm" ,PHI 2nd edition, 2001. ISBN 81-203-2141-3

FF No. : 654

CS30114:: SYSTEMS PROGRAMMING

Credits: 02 **Teaching Scheme: -** Theory 2 Hrs/Week

Prerequisites:

2. Data Structures
3. Computer Organization
4. C programming

Objectives:

6. To understand the concepts and components of Systems Programming
7. To Learn and understand the fundamentals of Operating systems
8. Mapping with PEOs: II, III, (d).

Unit I **(6+1 Hrs)**

Introduction to System Programming

A. Introduction: Components of System Software, Language Processing Activities, Fundamentals of Language Processing.
Assemblers: Elements of Assembly language programming. Simple assembler scheme, Structure of an assembler, Design of single and two pass assembler.
Macro Processors: Macro Definition and call, Macro expansion, Nested Macro Calls, Advanced Macro Facilities, design of Macro Preprocessor. Booting Procedure for DOS & Windows,
B. RISC machines, Machine dependent and machine independent Assembler features.

Unit II **(5+1 Hrs)**

Compilers, Loaders and Linkers

A. Compilers: Introduction to Compiler phases, Introduction to cross compiler, Features of machine dependent and independent compilers, Overview of types of compilers, Interpreters.
Linkers: Relocation and linking concepts, Static and dynamic linker, subroutine linkages.
Loaders: Introduction to Loader, Loader Schemes: Compile and go, General Loader Scheme, Absolute loaders, relocating loaders, direct linking loaders.
B. Instruction description, Pseudo operations, Instruction Mapping, MSDOS Linker, Sun OS linker.

Unit III **(5+1 Hrs)**

Essential concepts of Systems programming for Linux as Open Source OS.

A. Introduction and essential concepts of LINUX system programming: System Programming, APIs and ABIs, standards, Program segments/sections; The ELF Format, Linking and loading, Linux dynamic libraries (shared objects), Multitasking and paging, Address translation, Memory Protection, Comparison with Windows.

B. Dynamic linking, API compatibility, Dynamically linked libraries, Overall architecture and limitations.

Unit IV **(6+1 Hrs)**

Encoding and Decoding

A. Encoding and decoding schemes for the X-86 processor, Advanced System Programming Concepts: Operating system interfaces, Stack smashing, Dynamic Linking Libraries.

B. Library Description for IA-32/Intel64.

Unit V **(5+1 Hrs)**

Device Drivers

A. Types of Drivers, Driver History, Driver Issues, Kernel Level Device drivers, Virtual device drivers(VxD), Device Driver Stack Buses and Physical Devices, Static Device drivers, Dynamic Device drivers, PnP, Device Namespace, and Named Devices.

B. .Net Framework and Direct X: History, Components, Compatibility, Architecture.

Text Books

1. "Systems Programming & Operating Systems", D M Dhamdhere, Tata McGraw Hill Publications, ISBN - 0074635794
2. "Systems Programming", John J Donovan, ISBN - 0070176035

Reference Books

1. "Linux System Programming", Robert Love, O'Reilly, ISBN 978-0-596-00958-8

FF No. : 654

CS31114::DATA ACQUISITION SYSTEMS

Credits: 03 **Teaching Scheme: -** Theory 3 Hrs/Week

Unit 1 : Systems and Measurements (8 + 1Hrs)

A. Introduction to data acquisition system(DAS), Block Diagram of DAS, Multichannel DAS, Generalized measurement system, Characteristics of measuring devices, accuracy, precision, errors, linearity, hysteresis, threshold, repeatability, reliability calibration., Basic concepts of feedback control system:- open loop and closed loop.

B. Applications of open loop and closed loop systems

Unit 2 : Sensors and Signal Conditioning circuits (8 + 1 Hrs)

A. Introduction to the sensors, Detectable phenomenon, choosing of sensors, Types of sensors: Temperature sensor (LM35), Light sensor(photodiode, optocoupler), Distance and range sensor(IR), Accelerometer sensor, Gyroscope sensor, Touch screen sensor. Signal conditioning circuits: Analog and Digital, Opamp in signal conditioning circuits as amplifier.

B. Case study for RTD, LVDT and Thermocouple sensors

Unit 3 : ARM Microcontroller (8 + 1 Hrs)

- Family Architecture, Block diagram, Features, Data / Programme Memory, Reg set, Reg Bank, Special Function Registers, Data Memory, Programme Memory, Interrupt Structure , Timer Prog ,Serial Port Prog , Misc Features.

B. Memory I/O Design & Interfacing, Timer Calculation

Unit 4 : I/O interfacing & Bus Systems (8 + 1 Hrs)

A. Interfacing Digital I/O LED , LCD , ADC
Introduction to the BUS System, Bus design issues, Synchronous Bus, Asynchronous Bus, Bus Allocation, Bus Priority. Interfacing Buses: I2C, SPI ,CAN And RS 232C

B. USB, Centronics ,

Unit 5 : Programmable Logic Controls (8 +1 Hrs)

A. PLC : Design, PLC Operation: I/O scan mode, execution mode, PLC Software Functions: Timer, accumulated timer, counters. Elements of Ladder Diagrams (limit, pressure, level, thermal, mechanical switch) and examples based on ladder diagrams. Data Loggers.
B. SCADA

Text Books:

1. "Process control instrumentation", C.D. Johnson, Pearson education, ISBN-81-7758-410-3, seventh edition.
2. "Opamp and linear integrated circuits", Ramakant Gaikwad, PHI publication, ISBN-9780132808682, 4th edition.

Reference Books :

1. "Instrumentation Devices and System", Rangan, G .R. Sarma, V.S.V. Mani, Tata McGraw-Hill, ISBN-0-07-463350-3, 2nd Edition.

2. Microcontroller Handbook

FF No. : 654

CS30102:: SOFTWARE ENGINEERING

Credits: 01 **Teaching Scheme: -** Tutorial 1 Hrs/Week

Prerequisites: Data Structures

Objectives:

- To learn the complete Software life cycle and understand its major activities such as software requirement analysis, design, testing, and implementation.
- Understanding and Experience in Writing Requirements and Specifications.
- To thoroughly understand the practices of analysis and design (OOA and OOD)
- To understand the relative merits of the different UML diagrams. Transforming analysis into design and relate it to implementation model
- To apply design patterns.
- Mapping with PEOs: III, (a).

List of Contents

A TERM-WORK containing the record of the following:

1. To study modeling methodologies and identify their applicability to various categories of projects.
2. To understand Requirement Elicitation Techniques and recognize types of requirements while preparing System Requirement Specification.
3. To study MDD / MDA and identify the importance of Model Transformation.
4. To understand and validate all behavioral diagrams in UML 2.0 along with usage and benefits.
5. To understand and validate all structural diagrams in UML 2.0 along with usage and benefits.
6. To understand selection criteria for application of creational, behavioral and structural design pattern based on problem scenario.

Text Books:

1. Ian Sommerville, 'Software Engineering', Addison-Wesley, 7th Edition ,2004.
2. Tom Pender, "UML Bible", John Wiley & sons, ISBN – 0764526049

Reference Books :

1. Roger S Pressman,'Software Engineering: A Practitioner's Approach', McGraw Hill, 6/e,2005,
2. Mellor, Scott, Uhl, Weise, "MDA Distilled", Pearson Education, ISBN 81-297-0529X
3. Jim Arlow, Ila Neustadt, "UML 2 and Unified Process: Practical Object Oriented Analysis and Design.", 2nd Edition, Addison- Wesley, ISBN – 0321321278.
4. Grady Booch, James Rambaugh, Ivar Jacobson, "Unified Modeling Language Users Guide", 2nd Edition, Addison- Wesley, ISBN – 0321267974
5. Erich Gamma, Richard Helm, Ralph Johnson,"Design Patterns: Elements of Reusable Object-Oriented Software" (Addison-Wesley Professional Computing Series) ,John Vlissides, Publisher: Addison-Wesley Professional, 1st edition (January 15, 1995) , ISBN-10: 0201633612 ISBN-13: 978-0201633610

FF No. : 654

CS30114:: SYSTEM PROGRAMMING

Credits: 01 **Teaching Scheme: -** Tutorial 1 Hr/Week

Prerequisites: : Nil

Objectives:

- To understand the concepts and components of Systems Programming
- To Learn and understand the fundamentals of Operating systems
- Mapping with PEOs: II, III, (d).

List of Contents

A TERM-WORK containing the record of the following:

1. Expanding the Simple Macros with Generating different Parameter Tables and MDT.
2. Expanding the Nested Macros with Generating different Parameter Tables and MDT.
3. Design of 1 pass and 2 Pass assemblers with generating different data structure for it.
4. Design of an Editor: Design of a Line or Screen Editor using C Language.
5. Symbol table generation for input *.c file.
6. Design Lex specifications for the tokens – keywords, identifiers, numbers, operators, white spaces.
7. Simulation of linkers.
8. Simulation of loaders.
9. Understanding the design for DLL on Linux shared library.
10. Use of different debugger tools.

Text Books

1. "Systems Programming & Operating Systems", D M Dhamdhere,TMH,ISBN – 0074635794

Reference Books

1. "Linux System Programming", Robert Love, O'Reilly, ISBN 978-0-596-00958-8

FF No. : 654

CS30302:: SOFTWARE ENGINEERING

Credits: 01 **Teaching Scheme: -** Laboratory 2 Hrs/Week

Prerequisites: Data Structures

Objectives:

- To learn the complete Software life cycle and understand its major activities such as software requirement analysis, design, testing, and implementation.
- Understanding and Experience in Writing Requirements and Specifications.
- To thoroughly understand the practices of analysis and design (OOA and OOD)
- To understand the relative merits of the different UML diagrams. Transforming analysis into design and relate it to implementation model
- To apply design patterns.
- Mapping with PEOs: III, (a).

List of Practical

1. To narrate Requirement Definition Document for the target system with following three areas:
   a. Problem Identification
   b. Problem Definition
   c. Problem Statement

   To narrate System Requirements Specification Document for target system with reference to the IEEE 610.12.1990 Std guidelines.

2. To decompose and organize the problem domain area into broad subject areas and identify the boundaries of problem/system. Specify the behavior of the target system and map requirements to Use cases.
   The System Context Diagram depicts the overall System behavioral trace and Requirement Capture diagram depicts the hierarchical Use case Organization. The Use Case diagram should encompass
   a. Actors (External Users)
   b. Transactions (Use Cases)
   c. Event responses related to transactions with external agents.
   d. Detection of System boundaries indicating scope of system.

3. To depict the dynamic behavior of the target system using sequence diagram. The Sequence diagram should be based on the Scenarios generated by the inter-object Communication. The model should depict:
    a. Discrete, distinguishable entities (class).
    b. Events (Individual stimulus from one object to another).
    c. Conditional events and relationship representation.

4. To depict the state transition with the life history of objects of a given class model. The model should depict:
    a. Possible ways the object can respond to events from other objects.
    b. Determine of start, end, and transition states.

5. To depict the dynamic behavior using detailed Activity diagram.

6. To develop logical static structure of target system with Software Class diagram. To prepare Class Collaboration-Responsibility (CRC) cards for the Conceptual classes traced from System analysis phase. The design model should depict
    a. Relationship between classes: inheritance, Assertion, Aggregation, Instantiation
    b. Identification of objects and their purpose.
    c. Roles / responsibilities entities that determine system behavior.

7. To represent physical module that provides occurrence of classes or other logical elements identified during analysis and design of system using Component diagram. The model should depict allocation of classes to modules. To narrate precise Program Design Language constructs separating computation from interface. To represent deployment view of the system through Architecture Diagram.

8. To enhance Software Class diagram to Architecture diagram with appropriate design patterns. To implement the system according to specification with confirmation to design patterns.

Text Books:

1. Ian Sommerville, 'Software Engineering', Addison-Wesley, 7th Edition ,2004.
2. Tom Pender, "UML Bible", John Wiley & sons, ISBN – 0764526049

Reference Books :

1. Roger S Pressman,'Software Engineering: A Practitioner's Approach', McGraw Hill, 6/e,2005,
2. Mellor, Scott, Uhl, Weise, "MDA Distilled", Pearson Education, ISBN 81-297-0529X
3. Jim Arlow, Ila Neustadt, "UML 2 and Unified Process: Practical Object Oriented Analysis and Design.", 2nd Edition, Addison- Wesley, ISBN – 0321321278.

4. Grady Booch, James Rambaugh, Ivar Jacobson, "Unified Modeling Language Users Guide", 2nd Edition, Addison- Wesley, ISBN – 0321267974

Erich Gamma, Richard Helm, Ralph Johnson,"Design Patterns: Elements of Reusable Object-Oriented Software" (Addison-Wesley Professional Computing Series) ,John Vlissides, Publisher: Addison-Wesley Professional, 1st edition (January 15, 1995) , ISBN-10: 0201633612 ISBN-13: 978-0201633610

FF No. : 654

CS30306:: DATABASE MANAGEMENT SYSTEMS

Credits: 01 **Teaching Scheme: -** Laboratory 2 Hrs/Week

Prerequisites: Nil

Objectives:

- Deep understanding of database design.
- Implementation of database systems.
- Conversant with oracle database: SQLPlus, PL/SQL.
- Mapping with PEOs: II, III, (d).

List of Practical

1. Choose a database system you propose to work on throughout the course. Perform requirements analysis in detail for the same.

2. Systematic design of an entity-relationship (ER) data model for the selected database system.

3. Convert above ER model to relational model. List functional dependencies, draw dependency diagrams. Normalize these relations up to 3NF.

4. Consider a different database system. List functional dependencies [Include complex business logic.] Apply Bottom - up Approach for Relational Model Design Using Relational Synthesis Algorithm for the chosen system. Verify decomposition properties.

5. Create tables with appropriate constraints for the relational schema [designed in above assignments] using DDL queries. Create views, indices, and sequence. Alter the schema by adding/removing columns and constraints. Write DML statements to insert, modify and remove data in tables.

6. Execute 'SELECT' queries using various operators. Also make use of order by, group by, aggregate functions, having clause, and set operators. Use SQL single row functions for date, time, string etc.

7. Write queries involving multiple tables using equijoin, non equijoin, self join and outer join. Write queries containing single row, multiple row, corelated subqueries using operators like =, in, any, all, exists etc. Write DML queries containing

subqueries.

8. Write meaningful stored procedures in PL/SQL to populate a table. Make use of cursors and different arguments.

9. Write useful stored functions in PL/SQL to perform complex computation. Write row level and statement level triggers in PL/SQL.

10. Implement a small database application for the above system using suitable front end and back end tool. Also demonstrate use of Embedded SQL. Generate different useful reports.

Text Books

1. "Fundamentals of Database Systems", Elmasri and Navathe, Pearson Education, ISBN 81-297-0228-2, 4th Edition.
2. "SQL, PL/SQL", Bayross Ivan, BPB Publications New Delhi, ISBN 81-7656-964-X, 3rd Edition.

Reference Books

1. "Oracle: Applications Development", Bayross Ivan, BPB Publications, New Delhi, ISBN 81-7656-912-7.
2. "Oracle SQL * Plus", Gennick Jonathan, Shroff Publishers & Distributors P Ltd Mumbai, ISBN 81-7366-606-7.

FF No. : 654

CS31314::DATA ACQUISITION SYSTEMS

Credits: 01 **Teaching Scheme: -** Laboratory 2 Hrs/Week

Prerequisites: Nil

A: Study of Opamp in signal conditioning circuits as amplifier:

1. Inverting Amplifier.
2. Adder and Subtractor.
3. Integrator and Differentiator.

B: Interfacing of Microcontroller for the following:

1. I/O devices with Key, Switch and LED
2. LCD device
3. RS232C with PC
4. ADC device
5. Temperature Sensor
6. Optocoupler
7. LDR
8. Accelerometer
9. Touch Sensor

C: Mini project based on interfacing of microcontroller

Text Books:

1. "Process control instrumentation", C.D. Johnson, Pearson education, ISBN-81-7758-410-3, seventh edition.
2. "Opamp and linear integrated circuits", Ramakant Gaikwad, PHI publication, ISBN-9780132808682, 4th edition.

Reference Books :

1. "Instrumentation Devices and System", Rangan, G .R. Sarma, V.S.V. Mani, Tata McGraw-Hill, ISBN-0-07-463350-3, 2nd Edition.
2. Microcontroller Handbook

MODULE VII

Structure, B.Tech (Module VII)

FF653, Issue No. 04, Rev 0, dt 02/01/2012

Subject No.	Subject Code	Subject Name	Teaching Scheme (Hrs/week)			Credits
			Lect.	Tutorial	Practical	
S_1	CS40101	Human Computer Interaction	3	0	0	3
S_2	CS40113	Business Analytics	3	0	0	3
S_3	 CS42105 CS42127 CS42103 CS42102 CS42101 CS42131	ELECTIVE I Mobile Computing Cloud Computing Parallel Computing on GPU Image Processing Advanced Computer Graphics Enterprise Systems	3	0	0	3
S_4	 CS42125 CS42119 CS42112 CS42113	ELECTIVE II Randomized and Approximation Algorithms Information Retrievel Distributed System Digital Signal Processing	3	0	0	3
T_1	CS41201	Human Computer Interaction	0	1	0	1
T_2		ELECTIVE II	0	1	0	1
P_1	CS40313	Business Analytics	0	0	2	1
P_2		Elective I	0	0	2	1
PS_2	CS47303	PROJECT STAGE 2 (B.Tech Semester I) Irrespective of Module	0	0	8	4
		Total	12	2	12	20

FF No. : 654

CS40101:: HUMAN COMPUTER INTERACTION

Credits: 03 **Teaching Scheme: -** Theory 3 Hrs/Week

Prerequisites: Nil

Objectives:

- To understand the influence of the human factors on the interface design and development of application software.
- To study the methods and techniques for user-centered design and task analysis-based structural design of the interactions.
- To provide the concepts and strategies for making design decisions for user interface.
- Mapping with PEOs: II, III, (c).

Unit I **(7+1 Hrs)**
Introduction

A. Human, Input-Output Channels, Human Memory, Thinking, Emotions, Computer, Input-Output Devices, Definition of HCI, Usability, Interface, Goals of System Engineering, Goals of User Interface Design, Motivations for Human Factors in Design, Paradigms for Interaction.
B. Selection of Product/System with Interface and Study of Its Usability.

Unit II **(9+2 Hrs)**
Principles, Models & Guidelines

A. Principle 1: Recognize the Diversity, Principle 2: Use the Eight Golden Rules of Interface Design, Principle 3: Prevent Errors, Guidelines for Data Display, Guidelines for Data Entry, Conceptual, Semantic, Syntactic and Lexical Model, GOMS and Keystroke-Level Model, Stages of Action Models, Linguistic Models, BNF, Task Action Grammar.
B. Specialized Users and Their Relevance to Selected Product/System.

Unit III **(8+2 Hrs)**
Design Process and Interaction Styles

A. Design, Three Pillars of Design, Process of Design, Ethnographic Observations, Participatory Design, LUCID, Scenarios, Navigation Design, Screen Design and Layout, Specification Methods, Interaction Styles, Direct Manipulation Systems, Menu Selection, Form-Fillin, Natural Language, Command Language, Dialog Design Notations.

B. Web/Interface Design for Selected Product/System.

Unit IV **(8+2 Hrs)**
Evaluation Techniques and Implementation support

A. Usability Testing, Heuristic Evaluation, Expert Reviews, Usability Surveys, Semiotic Analysis, Acceptance Tests, Evaluation During Active Use, Elements of Windowing Systems, Individual Window Design, Multiple Window Design, Coordination by Tightly-Coupled Windows, Image Browsing by Tightly-Coupled Windows.
B. Usability Evaluation of Selected Product/System.

Unit V **(8+1 Hrs)**
Documentation and Groupware

A. Classification of Documents, Printed Manuals, Online Facilities, Error Messages, Groupware, Goals of Co-operations, Asynchronous Interactions, Synchronous Distributed, Face to Face, Applying CSCW to Leaning, Social Networks, Social Networking Sites.
B. Documentation Design for Selected Product/System.

Text Books

1. "Human-Computer Interaction", Alan Dix, Janet Finlay, Gregory D. Abowd, Russell Beale, Pearson Education, ISBN 81- 297-0409-9, 3rd Edition.
2. "Designing the User Interface", Ben Shneiderman, Pearson Education, ISBN 81-7808-262-4, 3rd Edition.

Reference Books

1. "The Elements of User Interface Design", Theo Mandel, John Wiley & Sons, Inc, ISBN 0-471-16267-1.
2. "The Essentials of User Interface Design", Alan Cooper, Wiley-dreamtech India (P) Ltd., ISBN 81-265-0213-4.

Additional Reading

1. "The Design of Everyday Things", Donald Norman, Basic Books, ISBN 100-465-06710-7, 2002 Edition.
2. "The Essential Guide to User Interface Design", Wilbert O. Galitz, Wiley-dreamtech India (P) Ltd., ISBN 81-265-0280-0, 2nd Edition.
3. "Human-Computer Interaction in the New Millennium", John M. Carroll, Pearson Education, ISBN 81-7808-549-6.

FF No. : 654

CS40113:: BUSINESS ANALYTICS

Credits: 03 **Teaching Scheme: -** Theory 3 Hrs/Week

Prerequisites: Database Management Systems.

Objectives: :

- To understand the technology and processes associated with Business Intelligence framework.
- To demonstrate understanding of Data Warehouse implementation methodology and project life cycle.
- To understand how to identify the metrics, indicators and make recommendations to achieve the business goal for a business scenario.
- Mapping with PEOs: IV, V, (h), (i).

Unit I **(7+1 Hrs)**

Introduction to Business Intelligence and Analytics

A. OLTP Vs OLAP, BI Definitions & Concepts, BI Framework, Role of Data Warehousing in BI, BI Infrastructure Components, Data Warehouse Architecture.
B. BI Vs Business Analytics, BI and Data Mining

Unit II **(9+1 Hrs)**

Introduction to Multi-Dimensional Data Modeling

A. Introduction to Data and Dimension Modeling, Multidimensional Data Model, ER Modeling vs. Multi Dimensional Modeling, Concepts of Dimensions, Facts, Cubes, Attribute, Hierarchies, Star and Snowflake Schema, OLAP Query processing, Indexing techniques, Techniques to handle changing dimensions, families of fact tables, fact less fact table.
B. Introduction to Business measures, metrics, KPIs and performance measurement

Unit III **(7+1 Hrs)**

Basics of Data Integration

A. Concepts of data integration, need and advantages, introduction to common data integration approaches, ETL Process, Introduction to data quality, data profiling concepts and applications.
B. Commercial ETL tools. ETL Case Study.

Unit IV **(8+1 Hrs)**

Basics of Enterprise Reporting

A. Enterprise Reporting Characteristics, Report Standardization and Presentation practices, Types of Enterprise Reports, Components of Reporting System, Concepts of Dashboards, Balanced Scorecards, Explaining the technique for performance management by observing dashboards, assessing key performance indicators and using scorecard.
B. Commercial Reporting tools. Reporting Case Study.

Unit V **(9+1 Hrs)**

Emerging Trends in BI

A. Big data for business analytics, BI and mobility, BI and cloud, Visual data discovery and self-service BI
B. Hadoop and Business Analytics, Mobile Apps for BI

Text Books

1. "Fundamentals of Business Analytics", by R. N. Prasad, Seema Acharya,ISBN: 978-81-256-3203-2, Wiley-India
2. "Data Mining: Concepts and Techniques", Jiawei Han and Micheline Kamber, Morgan Kaufman, ISBN 978-81-312-0535-8, 2nd Edition.

Reference Books

1. "Business Intelligence", David Loshin, Morgan Kaufman, ISBN 978-1-55860-916-7, 2003 Edition.
2. "Business Intelligence for the Enterprise", Mike Biere, Pearson Education, ISBN 0-13-141303-1, 2003 Edition.
3. "Business intelligence Roadmap", Larissa Terpeluk Moss, Shaku Atre, Pearson Education, ISBN 0201784203, 2003 Edition.

FF No. : 654

CS42105:: MOBILE COMPUTING

Credits: 03 **Teaching Scheme: -** Theory 3 Hrs/Week

Prerequisites:

- Communication Engineering
- Computer Network

Objectives

- To understand various wireless networks and their working characteristics.
- To understand characteristics of local and wide area network technologies such as Bluetooth, 802.11 and GSM.
- Distributed systems platforms for mobile computing, including proxy based architectures and service discovery and interaction platforms.
- Mapping with PEOs: I, V, (j).

Unit I **(8+1 Hrs)**
Cellular Network

A. Introduction, Generations (1G,2G,3G,4G), Why cellular networks? Basic cellular system, Frequency allocation, System capacity and frequency re-use, Concept of frequency reuse channels, Co-channel interference and its reduction factor. Types of non co-channel interference, Cell splitting.
B. Signal and signal propagation, IEEE 802.11standard, 802.11a,b,g, 802.15, 802.16.

Unit II **(8+1 Hrs)**
GSM Communication

A. System Architecture: GSM Radio subsystem, Interfaces, Network and switching subsystem, Operation subsystem. GSM channels, GSM protocol architecture, Location tracking and call setup, Security, Data services N/W signaling, GSM mobility management, Administration and maintenance.
Handoff- Initialization of handoff, Delaying handoff, Forcing handoff, Power different handoff. Mobile assisted handoff, Intersystem handoff.
B. Survey of GSM network, Hard, Soft Handoff.

Unit III **(9+1 Hrs)**
GSM Bearer Services

A. SMS architecture protocol, Hierarchy, VOIP services for mobile networks.
WAP: model and architecture, Gateway, protocol stack.
Telecommunication system: GPRS, wireless in local loop, DECT, EDGE, UMTS, Paging systems, CDPD.
B. Wireless application environment, Bluetooth.

Unit IV **(8+1 Hrs)**
Mobile Network and Transport layer

A. Mobile Network layer: Mobile IP, Mobile node, IP packet delivery, Agent discovery, Registration, Tunneling and encapsulation, Mobile ad-hoc networks.
Mobile Transport layer: Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/recovery, Transmission/time-out freezing, Selective retransmission, Transaction-oriented TCP.
B. TCP over 2.5/3G wireless networks.

Unit V **(7+1 Hrs)**
Mobile Databases

A. Database hoarding, Data caching, Data cache and web cache maintenance in mobile environments, Client-Server computing and adaptation, Query processing, Data recovery process, Issues relating to quality of service, Digital audio broadcasting: DAB System, DAB objects, Object transfer protocol, DVB: DVB system.
B. Mobile Billing

Text Books

1. "Mobile Communications", Jochen Schiller, 2nd edition, Pearson education, ISBN- 81-297-0350-5
2. "Mobile Communication", G.K.Behera, Lopamudra Das, Scitech publications,ISBN -9788183711791

Reference Books

1. "Wireless and Mobile Network Architectures", Yi-Bing Lin, Imrich Chlamtac, Wiley publication, ISBN-9971-51-366-8
2. "Mobile Computing", Raj Kamal, Oxford University press, ISBN 978-0-19-568677-7

CS42127::CLOUD COMPUTING FF No. : 654

Credits: 03 **Teaching Scheme: -** Theory 3 Hrs/Week

Prerequisites:
- Computer Networks.
- Web Technology.
- Operating Systems.

Course Objectives:
1. To learn the core concepts and principles of cloud computing as well as identify and explore some of the emerging research challenges in clouds.
2. To gain hands-on experience in using cloud computing infrastructure by designing, developing and deploying applications on cloud infrastructures.
3. To work on a large research project in cloud computing.

Course Outcomes:
1. Students will explain the core concepts of the cloud computing paradigm: how and why this paradigm shift came about and the influence of several enabling technologies in cloud computing.
2. Students will examine the process of working on a large research project under the mentorship of a teaching staff member. They will study how applications for clouds are written, deployed and analyzed. In the process, they will develop the needed skills to go through project planning, design, implementation, analysis and reporting.
3. Students will identify some of the emerging cloud research challenges.

Unit 1 : Introduction to Cloud Computing (7 Hrs)
What is Computing, What is Cloud Computing, What Cloud Computing is not Cloud Computing Features, Salient Features of Cloud Computing, History of Cloud, Cloud Storage, Advantages, Who Needs Cloud? Who Should not Opt for Cloud, Companies in Cloud, Infrastructure as a Service, Platform as a Service (PaaS), Software as a Service (SaaS), Enabling and Management Tools, Software as a Service, Types of SaaS, Important Features, Elasticity and its Benefits, Organization Issues, Managing Services Based on Issues, Service Level Agreements and its Monitoring, Technical Interfaces, Virtualization and its Importance, Virtualization Probing, How to Opt for Automation, Managing Processes, Service Management IT Perspective, Before Implementing Cloud.

Unit 2 : Cloud Deployment Models, Technical Analysis and Business Processes (7 Hrs)
Matrix and Measurements, Aspects of Cloud Strategy, Gathering Information Planning, Developing and Monitoring Highly Scaled Data Center and its Benefits Examining Costs and Productivity, Analyzing Hardware used on the cloud, Open Source, Elasticity Economy, Optimization, Traditional vs. Cloud Design Perspective, Practical Risk and Models, Resource Management.

Unit 3 : Business Processes and High Scaled Applications (6 Hrs)
Definition, Past, Present and Future of Business Process on Cloud, Understanding Best Practices and Standards, Cloud Security Alliances

Unit 4 : Cloud Security (7 Hrs)
Understanding the Security Risks, User Identification, Detection and Forensic Program, Creating a Security Plan, Defining Governance & Expectations, Risks, Cloud Risks, Measurement Methods, Working Together, Maintaining and Measuring IT Service Performance, Listing Control and Compliance Data.

Unit 5 : Virtualization & Service Oriented Architecture and the Cloud (7 Hrs)
Virtualization Features, Applicability, Key Points – Implementing Virtualization, Abstracting Hardware Assets, Managing Virtualization, Abstraction Layers, Understanding the Architecture, How SOA works? Cataloging Services, Benefits, Management and Administration, Issues and the Solutions, Detailing the Services

Unit 6 : Planning for the Cloud (6 Hrs)
Options Discovery, Data Center Costing, Cloud and Cultural Issues, Creating Awareness, Risk Judgment, Right Time Right Targets Right Triumph, List of Resources.

Text Books
1. Cloud Computing for Dummies by Judith Hurwitz, R. Bloor, M.Kanfman, F.Halper (Wiley India Edition).
2. Enterprise Cloud Computing by Gautam Shroff,Cambridge.
3. Cloud Security by Ronald Krutz and Russell Dean Vines, Wiley-India.
Reference Books:
1. Google Apps by Scott Granneman,Pearson.
2. Cloud Security & Privacy by Tim Malhar, S.Kumaraswammy, S.Latif (SPD,O'REILLY)
3. Cloud Computing : A Practical Approach, Antohy T Velte, et.al McGraw Hill,
4. Cloud Computing Bible by Barrie Sosinsky, Wiley India.
5. Cloud Computing, Michael Miller, Que Publishing.

FF No. : 654

CS42103:: PARALLEL COMPUTING ON GPU

Credits: 03 **Teaching Scheme: -** Theory 3 Hrs/Week

Prerequisites: Nil

Objectives:

- Students will be able to detect parallelism in a given problem
- Students can design parallel algorithm for a given problem for GPU
- Students will be able to write parallel programs to execute on GPU
- Mapping with PEOs: II, III, (c).

Unit I **(8+1 Hrs)**

Parallel programming basics

A. Parallel programming definition, motivation, Types and levels of parallelism, Different grains of parallelism, data dependence graph, data parallelism, functional parallelism, Flynn's classification of multi-processors, Motivation for heterogeneous programming, Definition of thread and process, programming parallel computers- extend a compiler, extend a sequential programming language, add a parallel programming layer, create a parallel language.
B. multiprocessor and multicomputer systems, interconnection networks

Unit II **(8+1 Hrs)**

Introduction to GPU, architecture and parallel algorithms

A. Introduction to GPU computing, motivation, Modern GPU architecture case study: NVIDIA Fermi Tesla C2050/Kepler K20, GPU memories- global, shared, texture memory and their properties and uses, roles of CPU and GPU in parallel computing,
GPU computing domain areas and success. Parallel algorithm design. Speedup and scalability.
B. parallel algorithm design for data clustering, theory of locality of reference

(8+1 Hrs)

Unit III

Compute Unified Device Architecture (CUDA)

A. CUDA Architecture, CUDA programming model, execution model, thread organization: Concept of grid, block and thread, thread index generation, warp; memory model: Introduction to global, shared, local memories, usage of cache, texture cache, constant memory, memory banks and bank conflicts, memory coalescing,. CUDA structure and API details. CUDA example programs (Vector dot product, Vector-Matrix multiplication and etc).

B. atomic operations in CUDA

Unit IV **(8+1 Hrs)**
Problem solving using GPUs

A. Single vss double precision, solving problems that involves Vectors, Matrices, Binomial coefficients, Bernstein coefficients and etc. Instructor will choose the problems from several domains.
B. Study problems given by instructor

Unit V **(8+1 Hrs)**
Parallel reduction and Tools

A. Reduction operation using prefix sum example. Performance issues in algorithms-deciding parallelization of a part of algorithm and selecting the highest parallelism, Need of profilers, Introduction to CUDA Tools: MemCheck and & Visual Profiler.

B. Memory leaks and associated problems

Text Books

1. CUDA: Programming Massively Parallel Processors: A Hands-On Approach. Authors: David Kirk, Wen-mei Hwu © ELSEVIER Inc.
2. CUDA by Example: An Introduction to General-Purpose GPU Programming by Jason Sanders and Edward Kandrot
3. Parallel Programming in C with MPI and OpenMP by Michael J. Quinn, Tata McGraw-Hill Edition
4. Advanced computer architecture by Kai Hwong, Tata McGraw-Hill Edition, 2001

References:

http://developer.nvidia.com/
www tutorials on introduction to parallel computing
Other references suggested by instructor

FF No. : 654

CS42102:: IMAGE PROCESSING

Credits: 03 **Teaching Scheme: -** Theory 3 Hrs/Week

Prerequisites: Nil

Objectives:

- To explore several different image processing techniques, and learn to improve images with them.
- To get familiarized to image enhancement and compression.
- Mapping with PEOs: II, III, (c).

Unit I **(8+1 Hrs)**
Introduction to image processing

A. Components of image processing system, Scenes and Images, Vector Algebra, Orthogonal Transform, Human Visual System, color vision color model: RGB, HVS, YUV, CMYK, and some basic relationships between pixels, linear and non linear operations.
B. Application of different color models in Image processing.

Unit II **(8+1 Hrs)**
Image Formation and Digitization

A. Geometric Model, Photometric Model, Sampling, Digitization, Elements of Digital Geometry, Image Properties, Representation
B. Overview of application of Image processing.

Unit III **(8+1 Hrs)**
Image Processing

A. Basic gray level transformations, histogram processing, enhancement using logical and arithmetic operations Image Enhancement - Contrast Intensification, Smoothening, Sharpening Image Restoration -- Square Error Restoration Techniques, Singular Value Decomposition.
B. Image Compressing - Basic - Lossy Compression, Loss-Less Compression.

Unit IV **(8+1 Hrs)**
Image transform

A. Introduction to two dimensional orthogonal and unitary transforms, properties of unitary transforms one-two dimensional discrete Fourier Transform (DFT), Wavelet transforms. Cosine, sine transforms.
B. Slant, KL, affine transforms. Applications of transforms in Image processing.

Unit V **(8+1 Hrs)**
Compression fundamental

A. File format (bmp, tiff, pcx, gif, jpeg.) Compression fundamentals, image compression models, error free compression: LZW coding, Bit plane Coding, Lossless Predictive Coding, lossy compression: lossy Predictive Coding, Transform, vector Quantization, image compression standard: Binary Image, Continuous Tone Still Image, Video.
B. Elements of information theory, error free compression: VLC, JPEG compression standards Factral.

Text Books

1. "Digital Image Processing", Rafael Gonzalez & Richard Woods, Pearson publications, ISBN 0132345633, 3rd Edition.
2. "Fundamental of Digital Image Processing", Anil K. Jain, PHI publication, ISBN 13: 9780133361650, 5th Edition.

Reference Books

1. "Digital Image Processing", Pratt, Wiley Publication, ISBN 0-471-37407-5, 3rd Edition.
2. "Digital Image Processing",K.R. Castleman, Prentice Hall: Upper Saddle River, NJ, 3, ISBN 0-13-211467 -4, 3rd Edition.

FF No. : 654

CS42101:: ADVANCED COMPUTER GRAPHICS

Credits: 03 **Teaching Scheme: -** Theory 3 Hrs/Week

Prerequisites: Computer Graphics

Objectives:

- To learn about recent research advances in Computer Graphics, Computational Geometry, Interactive Techniques, and Visualization.
- To gain first-hand experience with the challenges of efficient and accurate modeling, rendering, and simulation, and the necessary data structures and algorithms.
- To explain the principles and techniques underlying 3D computer graphics and 3D API.
- To develop programming skills in 3D computer graphics.
- To introduce advanced techniques for 3D rendering and modeling.
- Implement key components of the rendering pipeline, especially visibility, rasterization, viewing, and shading.
- Mapping with PEOs: V, (j).

Unit I **(8+1 Hrs)**
OpenGL

A. OpenGL over windows, SDK, Extensions, GLUT, GLU, OpenGL primitives, Programming language: Blending, 3D viewing(camera analogy), Lighting model, Culling, Fog, Texture mapping.
B. OpenGL over Linux, pBuffer rendering, Shadowing Techniques.

Unit II **(8+1 Hrs)**
Graphics Hardware

A. Graphics card, Components of graphics card, General-Purpose computation**,** GPU, GPGPU**,** CUDA architecture, CUDA Programming: Type qualifiers, Execution configuration, vector types, functions, APIs.
B. How graphics card works? GeForce 6800 series GPU architecture.

Unit III **(8+1 Hrs)**
Advanced Rendering Techniques

A. Point based rendering, Mesh Simplification, Spatial partitioning, Solid Modeling, Subdivision surfaces: Catmull-Clark subdivision, Subdivision rules, Visibility Computation: culling types, cells and portals, hardware support.
B. Splines , Tessellation, 3D viewing.

Unit IV **(8+1 Hrs)**
Photorealistic and Volume Rendering

A. Global Illumination, Normals and reflections, Ray-Tracing algorithm and mathematical formulation, Photon mapping algorithm, Monte Carlo algorithm, Volume graphics overview, Direct volume rendering, Marching square algorithm.
B. Monte Carlo mathematical formulation, Marching cubes algorithm.

Unit V **(8+1 Hrs)**
Texture Synthesis and Image Processing

A. Texture synthesis**,** Image processing: Digital image representation, Image data structures, Sampling and Quantization, Image enhancement in spatial domain.
B. Image compression, Image synthesis.

Text Books

1. "Procedural Elements for Computer Graphics", Rogers David F.,Tata McGraw Hill, 2001, ISBN 0-07-047371-4.
2. "OpenGL Programming Guide: The Official Guide to Learning OpenGL", Mason Woo, Jackie, Tom Davis, Version 2.1, 6th Edition, Pearson Education, ISBN 978-81-317-2184-1.

Reference Books

1. "Computer Graphics", M Paulin Baker, Donald Hearn, PHI, 2001, ISBN 81-203-09440-8.
2. "Digital Image Processing", Rafael C. Gonzalez , Richard E. Woods, 2nd Edition, Prentice Hall, ISBN: 0-201-18075-8.

Additional Reading

1 "Computer graphics: A Programming approach", Harrington Steven, Tata McGraw Hill, ISBN 0-07-026753-7.
2."Advanced Animation and Rendering Techniques : Theory and Practice", Alan H. Watt and Mark Watt, Addison-Wesley, acm press, ISBN: 0201544121.
3. "CUDA by Example: An Introduction to General-Purpose GPU Programming" , Jason Sanders, Edward Kandrot, Addition-Wesley, ISBN-13: 978-0-13-138768-3

FF No. : 654

CS42131: Enterprise Systems

Credits: 03 **Teaching Scheme: -** Theory 3 Hrs/Week

Prerequisites: Software Engineering, Database Management System

Objectives:

- To model business requirements and business processes using BPMN 2.0 standard
- To discover the set of services with composite services creation and designing services to facilitate integration and understand interrelationships among SOA, Web Services, OOD and an IT infrastructure
- To focus Enterprise SOA and facilitate use of Enterprise Service Bus in an Enterprise SOA
- To explore the concepts and technology for service orchestration and discuss the guidelines to integrate a Business Process Management Solution in an Enterprise SOA.
- To practice the concepts, specifications, and technologies for service composition and explore the role of an enterprise service bus in an Enterprise SOA.
- To understand case studies, lessons learned, and best practices for planning and implementing SOA projects
- Mapping with PEOs: III, (a).

Unit I: Business Process Management (8 Hrs)

Part A: Business Process Modeling Foundation: Conceptual Model and Terminology, Abstraction Concepts, From Business Functions to Business Processes, Activity Models and Activity Instances , Process Models and Process Instances , Process Interactions, Modeling Process Data /Organization / Operation, Business Process Flexibility

Process Orchestrations: Control Flow Patterns, Workflow Nets, Business Process Modeling Notation

Process Choreographies: Motivation and Terminology, Development Phases, Process Choreography Design and Implementation, Service Interaction Patterns

Properties of Business Processes: Data Dependencies, Structural Soundness, Soundness, Relaxed Soundness, Weak Soundness, Lazy Soundness, Soundness Criteria Overview

Part B: Petri Nets, Event-driven Process Chains, Yet Another Workflow Language, Graph-Based Workflow Language

Unit II: SOA Fundamentals (8 Hrs)

Part A: Service-Oriented Computing and SOA , Introduction to Service-Oriented Computing, The Evolution of SOA, Principles of Service-Orientation, Goals and Benefits of Service-Oriented Computing, Service-Orientation, Problems Solved by Service-

Orientation, Challenges Introduced by Service-Orientation, Effects of Service-Orientation on the Enterprise, Origins and Influences of Service-Orientation, Understanding Design Principles, Principle Profiles, Design Pattern References, Principles and Design Granularity
Service Contracts (Standardization and Design): Contracts principles, Types of Service Contract Standardization, Contracts and Service Design, Versioning, Technology / Development Tool Dependencies
Service Coupling (Intra-Service and Consumer Dependencies): Coupling principles, Service Contract Coupling Types, Service Consumer Coupling Types, Service Loose Coupling and Service Design, Enterprise Service Bus, Web Services and Primitive SOA, Web Services and Contemporary SOA, Service Layers
Part B: XML; HTTP; SOAP

Unit III: SOA Design Principles (8 Hrs)
Part A: Service Abstraction (Information Hiding and Meta Abstraction Types): Abstraction principles, Types of Meta Abstraction, Measuring Service Abstraction, Service Abstraction and Service Design, Risks Associated with Service Abstraction
Service Reusability (Commercial and Agnostic Design): Reuse Principle, Service Reuse in SOA, Service Reusability and Service Design
Service Autonomy (Processing Boundaries and Control): Autonomy Principle, Types of Service Autonomy, Measuring Service Autonomy, Service Contract Autonomy (services with normalized contracts) Autonomy and Service Design
Service Statelessness (State Management Deferral and Stateless Design): State Management, Measuring Service Statelessness, Statelessness and Service Design
SOA Delivery Strategies, Service-Oriented Analysis: Introduction, Service Modeling, Service-Oriented Design: Introduction, SOA Composition Guidelines), Service Design,
Part B: Importance of WSDL, SOAP, The use of registries via UDDI

Unit IV: SOA Technology and Implementation (8 Hrs)
Part A: Service Discoverability (Interpretability and Communication): Discoverability, Types of Discovery and Discoverability, Measuring Service Discoverability, Discoverability and Service
Service Composability (Composition Member Design and Complex Compositions): Composition, Composition Concepts and Terminology, Complex Service Composition, Measuring Service Composability and Composition Effectiveness Potential, Composition and Service Design, Service-Orientation and Object-Orientation, Mapping Service-Orientation Principles to Strategic Goals
Part B: SOA Platforms, SOA support in .NET and J2EE platforms

Unit V: Enterprise Architecture (8 Hrs)
Part A: Introduction to Enterprise Architecture, State of the Art and Foundations of Enterprise Architecture, Communication of Enterprise Architecture, Language for Enterprise Modeling, Viewpoints and Visualization, Architecture Analysis, Architecture Alignment, Tool Support, Domain-Driven Architecture, Resource-Oriented Architecture,

Defining EAI, The EAI Process, Data-Level EAI, Application Interface-Level EAI, Method-Level EAI, User Interface-Level EAI
Part B: Enterprise Architecture Frameworks: The Open Group Architecture Framework (TOGAF), Zachman Framework for Enterprise Architecture Extended Enterprise Architecture Framework (E2AF), Department of Defense Architecture Framework (DoDAF), Federal Enterprise Architecture Framework (FEAF), Treasury Enterprise Architecture Framework (TEAF)

Text Books:

1. Mathias Weske, Business Process Management, Concepts, Languages, Architectures, ISBN 978-3-540-73521-2 Springer Berlin Heidelberg New York, 2007
2. Thomas Erl, Service-Oriented Architecture: Concepts, Technology, and Design. ISBN: 0-13-185858-0, Publisher: Prentice Hall PTR, 2005

Reference Books :

1. Thomas Erl, SOA Principles of Service Design, Pearson Education, Inc., ISBN 0-13-234482-3, 2007
2. Eric A. Marks, Michael Bell., Executive's guide to service-oriented architecture, John Wiley & Sons, Inc.ISBN-13: 978-0-471-76894-4, 2006
3. Daniel Minoli, Enterprise Architecture A to Z, Frameworks, Business Process Modeling, SOA, and Infrastructure Technology, Auerbach Publications, Taylor & Francis Group, ISBN 978-0-8493-8517-9, 2008
4. Setrag Khoshafian, Service Oriented Enterprises, Auerbach Publications, Taylor & Francis Group, ISBN 0-8493-5360-2, 2007
5. Mike Rosen, Boris Lublinsky, Kevin T. Smith, Marc J. Balcer, Applied SOA: Service-Oriented Architecture and Design Strategies, Wiley Publishing, Inc., ISBN: 978-0-470-22365-9, 2008
6. Marc Lankhorst et al., Enterprise Architecture at Work, Modelling, Communication and Analysis, Second Edition, ISBN 978-3-642-01309-6, Springer-Verlag Berlin Heidelberg 2009
7. David S. Linthicum, Enterprise Application Integration Addison-Wesley Professional 2003, ISBN-10: 1402052626

FF No. : 654

CS42125:: Randomized and Approximation Algorithm

Credits: 03 **Teaching Scheme: -** Theory 3 Hrs/Week

Prerequisites: Prior introduction to basic probability theory is helpful though it is not presumed. First course on algorithms.

Objectives: :

- Study the role of randomization and approximation techniques in algorithm design.
- The goal of the first part of the course is to study various randomized algorithms for several fundamental algorithmic questions. The goal of second part is to study approximation algorithms for various important NP-hard problems.
- Apart from algorithmic side of the course, mathematical background and tools built up during the course will be helpful for further study in areas such as pseudo-random generators, expander graphs and their role in derandomization, PCP-theorem and hardness of approximation.
- Mapping with PEOs I, II.

Unit I **(8+1 Hrs)**

Basic probability theory and introduction to randomization

A. Introduction to randomized algorithms, Las Vegas and Monte-Carlo algorithms (with examples randomized quick sort, min-cut algorithm, binary planar partitions). Probabilistic recurrences.
Basic probability theory: random variables, expectation, variance, conditional probability, linearity of expectation etc.
Indicator random variables and there role in algorithm analysis.
Basic complexity classes: P, NP, RP, Co-RP, ZPP, BPP and their interrelations, probability amplification in BPP.
B. non uniform class P/Poly and Adleman's theorem- BPP is contained in P/Poly

Unit II **(8+1 Hrs)**

Tail inequalities and applications

A. Moments and deviation, occupancy problem, Markov and Chebyshev inequalities and some applications, randomized selection (lazy select algorithm), variance of sum of independent random variables, stable marriage problem, coupon collector problem, Tail estimates, Chernoff bound and some applications, set balancing, wiring problem.
B. Co-related random variables and their sum, martingales.

Unit III **(8+1 Hrs)**

Random walks and some algebraic techniques

A. Markov chains and random walks, 2-SAT example, random walks on graphs and some applications, graph connectivity.
Algebraic techniques: finger printing (example of matrix multiplication), polynomial identity testing and Schwartz-Zippel lemma (examples: equality of strings, perfect matching problem), Mulmuley-Vazirani-Vazirani isolation lemma and application to matching problem.
B.expanders and rapid mixing random walks.

Unit IV **(8+1 Hrs)**

A. Number theoretic algorithms (Quadratic non-residues, primality testing).
Applications to geometric algorithms (Convex hulls, half space intersection, diameter of point set, LP)
Introduction to approximation algorithms, NP-hard optimization problems, lower bounding OPT, example of set-cover (O(log n) factor approx-algorithm based on greedy strategy, layering)
B. Application of randomized algorithms in advanced data structures (skip lists, random treaps, hashing)

Unit V **(8+1 Hrs)**

Approximation Algorithms

A. Shortest super-string problem, Traveling Salesman Problem (TSP), general TSP hard to approximate, metric TSP, Steiner Trees, Knapsack and FPTAS algorithms.
Linear programming based algorithms, LP relaxation, LP duality. LP rounding strategy and primal-dual schema, set-cover and some other examples using LP based techniques, maximum satisfiability.
B. Hardness of approximation, statement of PCP theorem.

Advanced Topics:

(depending on the avaibility of time some of the following topics may be included)
Role of expander graphs in derandomization, more on hardness of approximation, Approximation algorithms for classical problems on integer lattices.

Text Books

1. Randomized Algorithms by Rajeev Motwani and Prabhakar Raghavan (Cambridge University Press)
2. Approximation Algorithms by Vijay V. Vazirani (Springer)
3. Introduction to Algorithms by Thomas H. Coreman, Charles E. Leiserson, Ronald L.

Rivest, Clifford Stein (MIT Press)Morgan Kaufman, ISBN 978-81-312-0535-8, 2nd Edition.

Reference Books

1. A course in probability theory by Kai Lai Chung (Academic Press)
2. An Introduction to Probability Theory and Its Applications Vol I by William Feller (Wiley)
3. Structural Complexity I by Error! Hyperlink reference not valid.Error! Hyperlink reference not valid.Error! Hyperlink reference not valid., Error! Hyperlink reference not valid., Error! Hyperlink reference not valid. (Springer) (for basic complexity theory)
4. Computational Complexity: Modern approach by Sanjeev Arora and Boaz Barak (Cambridge University Press) book is freely available on authors homepage http://www.cs.princeton.edu/theory/complexity/

FF No. : 654

CS42112:: DISTRIBUTED SYSTEMS

Credits: 03 **Teaching Scheme: -** Theory 3 Hrs/Week

Prerequisites: Operating Systems.

Objectives:
To study the different design issues of Distributed Operating Systems.

- Create an awareness of the major technical challenges in distributed systems design and implementation.
- Expose students to current technology and distributed infrastructure software.
- Expose students to past and current research issues in the field of distributed systems.
- Provide experience in the implementation of typical algorithms used in distributed systems.
- Mapping with PEOs: II, III, (c).

Unit I **(8+1 Hrs)**
Introduction

A. Introduction to Distributed Systems, Examples of Distributed Systems, Hardware and Software Concepts, Design issues.
System models: Introduction, Architectural Model, Fundamental Models.
Introduction to Hadoop/MapReduce.
B. Conceptual design of a Distributed File System based on concepts learned in Unit I. Reading: Hadoop/MapReduce.

Unit II **(8+1 Hrs)**
Communication

A. Interprocess Communication: Message Oriented Communication, Stream Oriented Communication.
RPC: RPC Model, Transparencies in RPC, Implementation, Stub Generation, RPC Messages, Server Management, Call Semantics, Communication Protocols, Distributed Objects: Remote Method Invocation.
B. Case studies of exiting RPC implementation. Design a RPC/RMI mechanism based on the case studies and concepts learned in class.

Unit III **(8+1 Hrs)**

Synchronization

A. Time and Global States: Clock Synchronization, Logical Clocks, Global State, Event Ordering.
Distributed Deadlock Algorithms for Avoidance, Prevention, and Detection: Centralized Approach, Hierarchical Approach, WFG Based Fully Distributed, Deadlock Recovery.
Co-ordination: Election Algorithm: Bully Algorithm, Ring Algorithm, Mutual Exclusion: Centralized Approach, Distributed Approach (Ricart and Agrawala).
Distributed Transaction: Transaction Model, Classification, Implementation, Concurrency Control: 2 Phase Locking, Strict 2 PL.
B. Comparative analysis of time synchronization/mutual exclusion/election algorithms implementations in well-established distributed systems.

Unit IV **(8+1 Hrs)**
Fault Tolerance

A. Introduction to Fault Tolerance, Failure Models, Failure Masking by Redundancy: Triple Modular Redundancy.
Process Resilience: Design Issues, Failure Masking and Replication, Agreement in Faulty Systems: Two Army Problem, Byzantine Generals Problem.
Reliable Client Server Communication, Reliable Group Communication.
Distributed Commit: 2 Phase Commit.
B. Identify the issues that can arise in your DFS prototype in case of various failures. Based on the concepts learned in unit IV design a fault tolerance mechanism for the DFS. Develop test-case scenarios to assess the system's resilience.

Unit V **(8+1 Hrs)**
Distributed File Systems and Distributed Shared Memory

A. Name Services: Name Entities, Name Resolution: Linking, Mounting, Iterative and Recursive Algorithms. Distributed Shared Memory: Introduction, Architecture of DSM Systems, Design and Implementation Issues of DSM: Granularity, Structure of Shared Memory Space, Consistency Models, Replacement Strategies, Thrashing,

B. Data Intensive Computing, Google FS, BigTable.

Text Books

1. "Distributed Systems Principles and Paradigms", Andrew S. Tanenbaum & Maarten Van Steen, Prentice Hall India, ISBN 81-7808-789-8, 1st Edition.
2. "Distributed Operating Systems Concepts and Design", Pradeep K. Sinha, Prentice Hall India, ISBN: 81-203-1380-1, 1st Edition.

Reference Books

1. "Distributed Systems – Concepts and Design", George Coulouris, Jean Dollimore & Tim Kindberg, Addison-Wesley, ISBN: 0-201-61918-0, 3rd Edition.
2. "Distributed Operating Systems", Andrew S. Tanenbaum, Addison Wesley Longman, ISBN: 81-7808-294-2, 1995.

Additional Reading

1. "Advanced Concepts In Operating Systems", Mukesh Singhal, Niranjan G. Shivaratri, McGrawHill, ISBN: 0-07-113693-2, 1994.
2. "Distributed and Parallel Systems: From Cluster to Grid Computing", Peter Kacsuk, Thomas Fahringer, Zsolt Nemeth, Springer, ISBN: 978-0-378-69857-1, 2007.
3. "Distributed Computing: Principles, Algorithms, and Systems", Kshemkalyani, Singhal, Cambridge University Press, ISBN-13: 978-0-521-87634-6, 1st Edition.
4. **"Distributed Computing: Principles and Applications"**, **M. L. Liu**, Addison-Wesley, ISBN-10: 0201796449, 2004.

CS42119:: INFORMATION RETRIEVAL FF No.654

Credits: 03 **Teaching Scheme: -** Theory 3 Hrs/Week

Prerequisites: Data Structures, Database Management Systems

Objectives:

- Problem solving using different Information Retrieval Models
- Problem solving using various Indexing and Searching Techniques
- Problem solving for Text Classification
- To build an Information Retrieval system
- Mapping with PEOs: III, (e).

Unit I **(9 Hrs)**
Information Retrieval Introduction and Models

A. Introduction, Definition, Objectives, Search and Browse Capabilities; A Formal Characterization of IR Models;
Boolean Retrieval, Extended Boolean Models; Vector Space Model, Document Representation, Measure of Relatedness, Term Weighting;
B. Bayesian Model, Data Structures and Techniques for Ranking, Models for Browsing.

Unit II **(8 Hrs)**
Query Processing and Retrieval Evaluation

A. Lexical Analysis, Stemming Algorithms, Thesaurus Construction; Query Languages; Similarity Measures and Ranking; Relevance Feedback, Query Expansion;
Retrieval Performance Evaluation Measures for Ranked and Unranked Results;
B. Porter's Stemming Algorithm, Automatic Local Analysis, Automatic Global Analysis.

Unit III **(8 Hrs)**
Indexing and Searching

A. Automatic Indexing, Inverted Files, Structures Used, Signature Files, Compression, Partitioning, Suffix Trees and Suffix Arrays, Index Construction, Distributed Indexing, Index Compression;
Sequential Searching, Pattern Matching, String Matching Allowing Errors, Regular Expressions and Extended Patterns, Pattern Matching using Indices, Structural Queries.

B. Fast Inversion (FAST-INV) Algorithm, Algorithms on PAT Tree.

Unit IV **(8 Hrs)**
Parallel and Distributed IR and Web Searching

A. Parallel IR, Index Construction, Distributed IR;
Characterizing the Web, Search Engines, Browsing, Metasearchers, Searching using Hyperlinks, Crawling, Link Analysis.
B. PageRank Algorithm, HillTop Algorithm.

Unit V **(7 Hrs)**
Text Classification and Multimedia IR

A. Naive Bayes Text Classification, Vector Space Classification; Document and Term Clustering, Flat and Hierarchical Clustering, Matrix Decomposition, Latent Semantic Indexing;
Multimedia Data Modeling, Query Languages, A Generic Multimedia Indexing (GEMINI) Approach, One Dimensional Time Series, Two Dimensional Color Images, Automatic Feature Extraction; Audio, Graph, Video Retrieval;

B. Hashing Algorithms, Image features and similarity functions.

Text Books

1. "Modern Information Retrieval The Concepts and Technology behind Search", Ricardo Baeza-Yates, Berthier Ribeiro-Neto, 2nd Edition, ACM Press Books

2. "Introduction to Information Retrieval", Christopher D. Manning, Prabhakar Raghavan and Hinrich Schütze, Cambridge University Press, 2008.

Reference Books

1. "Information Storage and Retrieval Systems Theory and Implementation", Gerald Kowalski, Mark Maybury, Springer Pvt. Ltd., 2006
2. "Information Retrieval Data Structures & Algorithms" William Frakes, Ricardo Baeza-Yates, Pearson Education, 2008.
3. "Information Retrieval", C. J. Van Rijsbergen, Information Retrieval Group, University of Glasgow, online at http://www.dcs.gla.ac.uk/Keith/Preface.html.

FF No. : 654

CS42113:: DIGITAL SIGNAL PROCESSING

Credits: 03 **Teaching Scheme: -** Theory 3 Hrs/Week

Prerequisites: Nil

Objectives:

- To understand how to analyze and manipulate digital signals in various domains and design digital filters.
- Mapping with PEOs: II, III, (c).

Unit I **(8+1 Hrs)**

Introduction to signals and systems

A. Classification of Signals: Analog, Discrete-time and Digital, Basic sequences and sequence operations. Discrete-time (D.T) systems, Properties of D. T. Systems and Classification Linear Time Invariant Systems, impulse response, linear convolution and its properties, , DTS described by difference equations, Recursive and Non recursive, Relaxed and Non relaxed systems, Periodic Sampling, Sampling Theorem, Frequency Domain representation of sampling, reconstruction of a band limited Signal, A to D conversion Process: Sampling, quantization and encoding.
B. Properties of LTI systems, parallel and cascade connection, Correlation of DTS.

Unit II **(8+1 Hrs)**

Z and Fourier transforms

A. Z-transform, ROC and its properties, Inverse z transform by inspection, partial fraction and complex inversion, Z transform properties: multiplication by exponential sequence, Linearity, time shifting, frequency shifting, time reversal, convolution theorem initial value theorem, final value theorem, System Functions for LTI Systems: Stability and causality, inverse systems, significance of poles/zeros, Unilateral Z-transform: solution of difference equation with and without initial condition. Representation of Sequences by Fourier Transform, F. T. theorems: convolution theorem, and windowing theorem.
B. Symmetry properties of F. T, F. T. theorems: Linearity, time shifting, frequency shifting, time reversal, differentiation.

Unit III **(8+1 Hrs)**

Frequency analysis of Signals and Systems

A. Frequency Response of LTI Systems: Ideal frequency selective filters, magnitude and phase response, group delay, Frequency Response for Rational System Functions: Frequency Response of a single zero or pole, Frequency response from pole-zero plot using simple geometric construction
Sampling the F.T., Fourier representation of finite-duration sequences, The Discrete Fourier Transform, Properties of DFT:circular shift, duality, symmetry, Circular Convolution, Linear Convolution using DFT, Effective computation of DFT and FFT, DIT FFT, Overlap and save algorithm, Inverse DFT using FFT(DIF)
B. Properties of DFT: Linearity,DIF FFT, Goertzel Algorithm, Inverse DFT using FFT(DIT)

Unit IV **(9+1 Hrs)**
Design of Digital Filters

A. Concept of filtering, Ideal filters and approximations, specifications, IIR filter design from continuous time filters: Characteristics of Butterworth, Cheybyshev approximations, impulse invariant and bilinear transformation techniques, Design examples, FIR filter design using windows: properties of commonly used windows, systems with Linear phase, Generalized Linear phase systems, Four Types of GLPS (TypeI), Design Examples, Design using Kaiser window, Comparison of IIR and FIR Filters .
B. Four Types of GLPS (Type II,III,IV),Examples on Filter Design (IIR & FIR

Unit V **(7+1 Hrs)**
Realization of Filters

A. Block diagrams and Signal flow graph representation of LCCDE, Basic structures for IIR Systems: direct form, cascade form, parallel form, feedback in IIR systems, Basic Structures for FIR Systems: direct form, cascade form, structures for linear phase FIR Systems,
Detail Study of DSP chip architecture as an example of ADSP 21XX series and their desirable features.
B. Instruction set of ADSP 21XX series processor and some examples.

Text Books

1. "Digital signal processing", Proakis J., Manolakis D., Prentice Hall Publications ISBN 9780072957167, 3rd Edition.
2. "Discrete time signal processing", Oppenheim A., Schafer R., Buck J., Prentice Hall *Publications*, ISBN 0-849-31093-8 2nd Edition

Reference Books

1. "Digital Signal Processing: A Computer Based Approach", Mitra S., Tata McGraw- Hill, ISBN 0-07-044705-5
2. "Digital Signal Processing", Vallavraj A., S Salivahanan, Tata McGraw- Hill, ISBN 0-07-463996, 2nd Edition

FF No. : 654

CS40101:: HUMAN COMPUTER INTERACTION

Credits: 01 **Teaching Scheme: -** Tutorial 1 Hr/Week

Prerequisites: : Nil

Objectives:

- To identify and incorporate key social, cognitive and physiological factors that influence user perceptions, understandings and usages of Information Technology.
- To motivate students for interviews and field-work with users for improved practical approach in interface/interaction design.
- Mapping with PEOs: II, III, (c).

List of Contents

A TERM-WORK containing the record of the following:

1. Design user persona for the users of selected product/system.
2. Perform GOMS analysis for selected product/system.
3. Conduct a contextual inquiry for selected product/system.
4. Design an interface prototype for selected product/system.
5. Evaluate an interface using usability testing / evaluation technique.

Text Books

1. "Human-Computer Interaction", Alan Dix, Janet Finlay, Gregory D. Abowd, Russell Beale, Pearson Education, ISBN 81- 297-0409-9, 3rd Edition.
2. "Designing the User Interface", Ben Shneiderman, Pearson Education, ISBN 81-7808-262-4, 3rd Edition.

Reference Books

1. "The Elements of User Interface Design", Theo Mandel, John Wiley & Sons, Inc, ISBN 0-471-16267-1.
2. "The Essentials of User Interface Design", Alan Cooper, Wiley-dreamtech India (P) Ltd., ISBN 81-265-0213-4.

Additional Reading

1. "The Design of Everyday Things", Donald Norman, Basic Books, ISBN 100-465-06710-7, 2002 Edition.
2. "The Essential Guide to User Interface Design", Wilbert O. Galitz, Wiley-dreamtech India (P) Ltd., ISBN 81-265-0280-0, 2nd Edition.
3. "Human-Computer Interaction in the New Millennium", John M. Carroll, Pearson Education, ISBN 81-7808-549-6.

FF No. : 654

CS42125:: Randomized and Approximation Algorithm

Credits: 01 **Teaching Scheme: -** Tutorial 1 Hr/Week

Prerequisites: Prior introduction to basic probability theory is helpful though it is not presumed. First course on algorithms.

Objectives: :

- Study the role of randomization and approximation techniques in algorithm design.
- The goal of the first part of the course is to study various randomized algorithms for several fundamental algorithmic questions. The goal of second part is to study approximation algorithms for various important NP-hard problems.
- Apart from algorithmic side of the course, mathematical background and tools built up during the course will be helpful for further study in areas such as pseudo-random generators, expander graphs and their role in derandomization, PCP-theorem and hardness of approximation.
- Mapping with PEOs I, II.

List of Contents

A TERM-WORK containing the record of the following:

Assignments :

1. Problem solving based on basic probability (random variables, mean, variance)
2. Problem solving based on basic probability (linearity of expectation, some applications, conditional probability)
3. Use of indicator random variables in algorithm analysis
4. Tail Inequalities and applications (Markov, Chebyshev)
5. Tail Inequalities and applications (Chernoff bound, variance of sum of co-related random variables)
6. Random walks, rapid mixing and some applications like sampling points from convex bodies
7. Schwartz-Zippel Lemma and applications

8. Complexity of perfect matching problem
9. Randomization in Number theoretic and geometric algorithms
10. Approximation algorithms, lower bounding OPT
11. Linear programming and LP-duality, LP based approximation algorithms
12. PCP theorem and hardness of approximation

Text Books

1. Randomized Algorithms by Rajeev Motwani and Prabhakar Raghavan (Cambridge University Press)
2. Approximation Algorithms by Vijay V. Vazirani (Springer)
3. Introduction to Algorithms by Thomas H. Coreman, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein (MIT Press)Morgan Kaufman, ISBN 978-81-312-0535-8, 2nd Edition.

Reference Books

1. A course in probability theory by Kai Lai Chung (Academic Press)
2. An Introduction to Probability Theory and Its Applications Vol I by William Feller (Wiley)
3. Structural Complexity I by Error! Hyperlink reference not valid.Error! Hyperlink reference not valid.Error! Hyperlink reference not valid., Error! Hyperlink reference not valid., Error! Hyperlink reference not valid. (Springer) (for basic complexity theory)
4. Computational Complexity: Modern approach by Sanjeev Arora and Boaz Barak (Cambridge University Press) book is freely available on authors homepage http://www.cs.princeton.edu/theory/complexity/

FF No. : 654

CS42112:: DISTRIBUTED SYSTEMS

Credits: 01 **Teaching Scheme: -**Tutorial 1 Hr/Week

Prerequisites: Operating Systems.

Objectives:

- To study the different design issues of Distributed Operating Systems.
- To study various methods of communication in Distributed Operating Systems.
- To analyze Distributed File System.
- Mapping with PEOs: II, III, (c).

List of Contents

A TERM-WORK containing the record of the following:

1. Design and develop a basic prototype distributed system (e.g. a DFS).
2. Design and implement a RPC/ RMI mechanism (Java)
3. Design and implement a clock synchronization algorithm for prototype DS.
4. Implement Ring or Bully election algorithm for prototype DS.
5. Ricart Agrawala's distributed algorithm for mutual exclusion.
6. Problem solving of Wait-die and Wait –wound scheme for deadlock prevention.
7. Simulate Wait for Graph based Centralized or Hierarchical or Distributed algorithm for deadlock detection.
8. Simulate Recursive or Iterative name resolution algorithm.
9. Implementation of 2PC / Byzantine Generals Problem
10. Simulate any one of the Consistency models.

Text Books

1. "Distributed Systems Principles and Paradigms", Andrew S. Tanenbaum & Maarten Van Steen, Prentice Hall India, ISBN 81-7808-789-8, 1st Edition.
2. "Distributed Operating Systems Concepts and Design", Pradeep K. Sinha, Prentice Hall India, ISBN 81-203-1380-1, 1st Edition.

Reference Books

1. "Distributed Systems – Concepts and Design", George Coulouris, Jean Dollimore & Tim Kindberg, Addison-Wesley, ISBN: 0-201-61918-0, 3rd Edition.
2. "Distributed Operating Systems", Andrew S. Tanenbaum, Addison Wesley Longman, ISBN: 81-7808-294-2, 1995.

Additional Reading:

1. "Advanced Concepts in Operating Systems", Mukesh Singhal, Niranjan G. Shivaratri, McGrawHill, ISBN: 0-07-113693-2, 1994.
2. "Distributed and Parallel Systems: From Cluster to Grid Computing", Peter Kacsuk, Thomas Fahringer, Zsolt Nemeth, Springer, ISBN: 978-0-378-69857-1, 2007.
3. "Distributed Computing: Principles, Algorithms, and Systems", Kshemkalyani, Singhal, Cambridge University Press, ISBN-13: 978-0-521-87634-6, 1st Edition.
4. **"Distributed Computing: Principles and Applications"**, **M. L. Liu**, Addison-Wesley, ISBN-10: 0201796449, 2004.

FF No. : 654

CS42119:: INFORMATION RETRIEVAL

Credits: 01 **Teaching Scheme: -** Tutorial 1 Hrs/Week

Prerequisites: Data Structures, Database Management Systems

Objectives:

- To study popularly used Information Retrieval Models
- To learn various Indexing and Searching Techniques
- To understand Parallel and Distributed Information Retrieval Systems
- To understand use of Text Classification and Clustering in Information Retrieval
- Mapping with PEOs: III, (a).

List of Contents

A TERM-WORK containing the record of the following:

Assignments :

1. Problem solving for Boolean model.
2. Problem solving for Vector Space model.
3. Study of Stemming Algorithms and Thesaurus Construction
4. Problem solving for Index creation: Inverted Files, Signature Files, Suffix Trees and Suffix Arrays
5. Problem solving for Sequential Searching and Pattern Matching techniques
6. Problem solving for Latent Semantic Indexing for Text Classification
7. Build an Information Retrieval system using Apache **Lucene**

Text Books

1. "Modern Information Retrieval", by Ricardo Baeza-Yates, Berthier Ribeiro-Neto, Addison Wesley Longman Publishing Co. Inc, ISBN:020139829X, 1999.
2. "Introduction to Information Retrieval", by Christopher D. Manning, Prabhakar Raghavan and Hinrich Schütze, Introduction to Information Retrieval, Cambridge University Press. ISBN: 0521865719, 2008.

Reference Books

1. "Information Retrieval", C. J. Van Rijsbergen, Information Retrieval Group, University of Glasgow, online at http://www.dcs.gla.ac.uk/Keith/Preface.html.
2. "Information Retrieval Data Structures & Algorithms" by Bill Frakes, Ricardo Baeza-Yates, Prentice-Hall, ISBN 0-13-463837-9, 1999.
3. Apache **Lucene** Tutorial

FF No. : 654

CS42113:: DIGITAL SIGNAL PROCESSING

Credits: 01 **Teaching Scheme: -** Tutorial 1 Hr/Week

Prerequisites:: Nil

Objectives:

- To understand how to analyze and manipulate digital signals in various domains
- Mapping with PEOs: II, III, (c).

List of Contents

A TERM-WORK containing the record of the following:

Assignments :

1 Verification of sampling Theorem:

2 Linear Convolution

3 GDE

4 Correlation.

5 Pole Zero Implementation

6 Magnitude and Phase response of a system

7 DFT

8 Circular convolution

9 FFT Algorithms (DIT/DIF)

10 Design IIR filter using analog filter approximations

11 Designing FIR filters using windowing techniques

Students should implement the above assignments in Matlab .

Text Books

1. "Digital signal processing", Proakis J., Manolakis D., Prentice Hall Publications ISBN 9780072957167, 3rd Edition.
2. "Discrete time signal processing", Oppenheim A., Schafer R., Buck J., Prentice Hall *Publications*, ISBN 0-849-31093-8 2nd Edition

Reference Books

1. "Digital Signal Processing: A Computer Based Approach", Mitra S., Tata McGraw- Hill, ISBN 0-07-044705-5
2. "Digital Signal Processing", Vallavraj A., S Salivahanan, Tata McGraw- Hill, ISBN 0-07-463996, 2nd Edition

FF No. : 654

CS40313:: BUSINESS ANALYTICS

Credits: 01 **Teaching Scheme: -** Lab 2 Hr/Week

Prerequisites: : Database Management Systems.

Objectives:

- To understand the technology and processes associated with Business Intelligence framework.
- To demonstrate understanding of Data Warehouse implementation methodology and project life cycle.
- To understand how to identify the metrics, indicators and make recommendations to achieve the business goal for a business scenario.
- Mapping with PEOs: IV, V, (h), (i).

List of practicals

1. Define a real world problem of Business Analytic and generate a requirement document to define what reports are need for the analytic
2. Design a multi-dimensional data model using galaxy schema for multiple business facts for the above mentioned real world problem.
3. Implement the designed schema and create cubes using datawarehousing software.
4. Create three or more distinct data sources (e.g. text files, relational databases and Excel, etc) and apply ETL process using an ETL tool to load data in the created cube.
5. Use Reporting tool to generate reports defined in the requirement specification document by analyzing the designed cube.
6. Make use of a Big Data system to perform similar business analytic.

Text Books

1. "Fundamentals of Business Analytics", by R. N. Prasad, Seema Acharya,ISBN: 978-81-256-3203-2, Wiley-India
2. "Data Mining: Concepts and Techniques", Jiawei Han and Micheline Kamber, Morgan Kaufman, ISBN 978-81-312-0535-8, 2nd Edition.

Reference Books

1. "Business Intelligence", David Loshin, Morgan Kaufman, ISBN 978-1-55860-916-7, 2003 Edition.
2. "Business Intelligence for the Enterprise", Mike Biere, Pearson Education, ISBN 0-13-141303-1, 2003 Edition.
3. "Business intelligence Roadmap", Larissa Terpeluk Moss, Shaku Atre, Pearson Education, ISBN 0201784203, 2003 Edition.

FF No. : 654

CS42305:: MOBILE COMPUTING

Credits: 01 **Teaching Scheme: -** Laboratory 2 Hrs/Week

Prerequisites: Computer Networks

Objectives:

- Understand the basic of mobile communication.
- Understand the gaming applications on mobile.
- Understand the transfer of files in mobile network.
- Mapping with PEOs: I, V, (j).

List of Practical

Assignments should be implemented on android operating systems.

1. Design simple GUI application with activity and intents e.g. calculator.
2. Design an application to handle address book and call log.
3. Design an application to display map with current location.
4. Design an application to send SMS and emails.
5. Design a client server application to communicate with database server.
6. Design an application for voice calling over IP.
7. Design an application for sending files.
8. Design a gaming application.
9. Design GSM network of 5 nodes and implement handoffs.
10. Design a GSM network and access the channel using ALOHA.

Text Books

1. "Beginning Android Application Development", Wei-Meng Lee, Wrox publication, ISBN: 978-1-118-01711-1, March 2011.

2. "Mobile Communications", Jochen Schiller, 2nd edition, Pearson education, ISBN- 81-297-0350-5.

Reference Books

1. "Wireless and Mobile Network Architectures", Yi-Bing Lin, Imrich Chlamtac, Wiley publication, ISBN-9971-51-366-8.
2. "Mobile Computing", Raj Kamal, Oxford University press, ISBN 978-0-19-568677-7

FF No. : 654

CS42327::CLOUD COMPUTING

Credits: 01 **Teaching Scheme: -** Lab 2 Hrs/Week

Prerequisites: Computer Networks, web Technology, Operating Systems.

Course Objectives:

1. To learn the core concepts and principles of cloud computing as well as identify and explore some of the emerging research challenges in clouds.
2. To gain hands-on experience in using cloud computing infrastructure by designing, developing and deploying applications on cloud infrastructures.
3. To work on a large research project in cloud computing.

Course Outcomes:

1. Students will explain the core concepts of the cloud computing paradigm: how and why this paradigm shift came about and the influence of several enabling technologies in cloud computing.
2. Students will examine the process of working on a large research project under the mentorship of a teaching staff member. They will study how applications for clouds are written, deployed and analyzed. In the process, they will develop the needed skills to go through project planning, design, implementation, analysis and reporting.
3. Students will identify some of the emerging cloud research challenges.

List of Practicals

1. Google Drive
2. Google Apps & Box. Com
3. Amazon Web Services
4. Windows Server Installation & Hyper V
5. Creating Machines Through Hyper-V
6. Using Database Services (Salesforce.com)
7. Using Application Services (Salesforce.com)

Text Books

1. Cloud Computing for Dummies by Judith Hurwitz, R.Bloor, M.Kanfman, F.Halper (Wiley India Edition)
2. Enterprise Cloud Computing by Gautam Shroff,Cambridge
3. Cloud Security by Ronald Krutz and Russell Dean Vines, Wiley-India

Reference Books:

1. Google Apps by Scott Granneman,Pearson
2. Cloud Security & Privacy by Tim Malhar, S.Kumaraswammy, S.Latif (SPD,O'REILLY)

3. Cloud Computing : A Practical Approach, Antohy T Velte, et.al McGraw Hill,
4. Cloud Computing Bible by Barrie Sosinsky, Wiley India

FF No. : 654

CS42303:: PARALLEL COMPUTING ON GPU

Credits: 01 **Teaching Scheme: -** Laboratory 2 Hrs/Week

Prerequisites: Nil

Objectives:

- Students will be able to detect parallelism in a given problem
- Students can design parallel algorithm for a given problem for GPU
- Students will be able to write parallel programs to execute on GPU
- Mapping with PEOs: II, III, (c).

List of Practical

1. Parallel GPU implementation of vector-vector operations
2. Parallel GPU implementation of vector-Matrix operations
3. Parallel computation of binomial coefficient matrix
4. Parallel GPU implementation of Matrix-Matrix operations
5. Assignment focusing on optimization of data transfer between CPU and GPU:using page locked host memory and to avoid the data transfer
6. Assignment focusing on memory optimization: use of GPU shared, constant and texture memory.
7. Parallel GPU implementation involving kernel looping.
8. Parallel computation of set of multi-indices on GPU.

Text Books

1. CUDA: Programming Massively Parallel Processors: A Hands-On Approach. Authors: David Kirk, Wen-mei Hwu © ELSEVIER Inc.
2. CUDA by Example: An Introduction to General-Purpose GPU Programming by Jason Sanders and Edward Kandrot
3. Parallel Programming in C with MPI and OpenMP by Michael J. Quinn, Tata McGraw-Hill Edition
4. Advanced computer architecture by Kai Hwong, Tata McGraw-Hill Edition, 2001

References:

http://developer.nvidia.com/
www tutorials on introduction to parallel computing
Other references suggested by instructor

FF No. : 654

CS42302:: IMAGE PROCESSING

Credits: 01 **Teaching Scheme: -** Laboratory 2 Hrs/Week

Prerequisites: Nil

Objective:

- To study various operation of Image processing.
- Mapping with PEOs: II, III, (c).

List of Practical

All the assignments should be done using 'MATLAB '.
Optional support of 'C 'may be used.

1. Study of different file formats e.g. BMP, TIFF and extraction of attributes of BMP.
2. Study of statistical properties- mean, standard deviation, profile, variance and Histogram Plotting.
3. Histogram equalization & modification.
4. Gray level transformations such as contrast stretching, negative, power law transformation etc.
5. Spatial Domain filtering- smoothing & sharpening filters.
6. DCT/IDCT of given image.
7. Edge detection using Sobel, Prewitt and Roberts operators.
8. Morphological operations- erosion, dilation, opening & closing on binary image.
9. Pseudo coloring.
10. Creating noisy image and filtering using MATLAB.

Text Books

1. "Digital Image Processing", Rafael Gonzalez & Richard Woods, Pearson publications, ISBN 0132345633, 3rd Edition.
2. "Fundamental of Digital Image Processing", Anil K. Jain, PHI publication, ISBN 13: 9780133361650, 5th Edition.

Reference Books

1. "Digital Image Processing", William Pratt, Wiley Publication, ISBN 0-471-37407-5, 3rd Edition.
2. "Introduction to Matlab 7 for Engineering", William J.Palm, McGraw Hill Publication, ISBN 0072922427, 2nd Edition.

FF No. : 654

CS42301:: ADVANCED COMPUTER GRAPHICS

Credits: 01 **Teaching Scheme: -** Laboratory 2 Hrs/Week

Prerequisites: Nil

Objectives:

- To gain first-hand experience with the challenges of efficient and accurate modeling, rendering, and simulation, and the necessary data structures and algorithms.
- To introduce a current 3D graphics API.
- To develop programming skills in 3D computer graphics.
- Become acquainted with some advanced topics in computer graphics; these might include texturing, physically-based modeling, procedural modeling, curves and surfaces, global illumination, interaction, and visualization.
- Mapping with PEOs: V, (j).

List of Practical

1. Implement an OpenGL program to draw different 2D shapes.
2. Implement an OpenGL program to draw 2 overlapped shapes and use alpha blending.
3. Implement an OpenGL program to draw 3D cube and apply transformations.
4. Implement an OpenGL program to draw 12 spheres and apply different light effects.
5. Implement an OpenGL program to draw scene and apply fog effect.
6. Implement an OpenGL program to draw 3D cube and apply different textures on different faces.
7. Implement CUDA program for the prefix addition.
8. Implement CUDA program for the multiply two matrices.
9. Draw histogram of 256-color bmp image.

10. Implement a program for edge detection using Gaussian filter.

Text Books

1. "Procedural Elements for Computer Graphics", Rogers David F.,Tata McGraw Hill, 2001, ISBN 0-07-047371-4.
2. "OpenGL Programming Guide: The Official Guide to Learning OpenGL", Mason Woo, Jackie, Tom Davis, Version 2.1, 6th Edition, Pearson Education, ISBN 978-81-317-2184-1.

Reference Books

1. "Computer Graphics", M Paulin Baker, Donald Hearn, PHI, 2001, ISBN 81-203-09440-8.
2. "Digital Image Processing", Rafael C. Gonzalez , Richard E. Woods, 2nd Edition, Prentice Hall, ISBN: 0-201-18075-8.

Additional Reading

1. "Advanced Animation and Rendering Techniques : Theory and Practice", Alan H. Watt and Mark Watt, Addison-Wesley, acm press, ISBN: 0201544121
2. "CUDA by Example: An Introduction to General-Purpose GPU Programming" , Jason Sanders, Edward Kandrot, Addition-Wesley, ISBN-13: 978-0-13-138768-3.

FF No. : 654

CS42331: Enterprise Systems

Credits: 01 **Teaching Scheme: -** Laboratory 2 Hrs/Week

Prerequisites: Software Engineering, Database Management System

Objectives:

- To model business requirements and business processes using BPMN 2.0 standard
- To discover the set of services with composite services creation and designing services to facilitate integration and understand interrelationships among SOA, Web Services, OOD and an IT infrastructure
- To focus Enterprise SOA and facilitate use of Enterprise Service Bus in an Enterprise SOA
- To explore the concepts and technology for service orchestration and discuss the guidelines to integrate a Business Process Management Solution in an Enterprise SOA.
- To practice the concepts, specifications, and technologies for service composition and explore the role of an enterprise service bus in an Enterprise SOA.
- To understand case studies, lessons learned, and best practices for planning and implementing SOA projects
- Mapping with PEOs: III, (a).

List of Practical

1. To narrate concise Requirement Definition Document and System Requirements Specification Document for target system with reference to the IEEE 610.12.1990 Standard guidelines clearly indicating the requirements considerations.
2. To decompose and organize the problem domain area into broad subject areas and identify the boundaries of problem/system along with identification of Business Processes and develop full detail Business Process diagrams.
3. To develop Domain-driven vocabulary of the target system indicating domain lexicon and context-based terminologies.
4. To identify and categorize the target system services with detailed service specifications modeled with component diagram incorporating appropriate architectural style and coupling.
5. To design the service layers and tiers modeled with deployment diagram accommodating abstraction, autonomy, statelessness and reuse.
6. To map the service levels and primitives to appropriate Strategies for data processing using XML / XQuery/ JSON / JAXB.

7. To produce, invoke, compose Web Services using SOAP, WSDL and UDDI.
8. To implement and integrate the components of the target system using .NET / J2EE platforms adhering to Service specifications.
9. To create the balanced scorecard for the target system indicating the standards and principles applied.

Text Books:

1. Mathias Weske, Business Process Management, Concepts, Languages, Architectures, ISBN 978-3-540-73521-2 Springer Berlin Heidelberg New York, 2007
2. Thomas Erl, Service-Oriented Architecture: Concepts, Technology, and Design. ISBN: 0-13-185858-0, Publisher: Prentice Hall PTR, 2005

Reference Books :

1. Thomas Erl, SOA Principles of Service Design, Pearson Education, Inc., ISBN 0-13-234482-3, 2007
2. Eric A. Marks, Michael Bell., Executive's guide to service-oriented architecture, John Wiley & Sons, Inc.ISBN-13: 978-0-471-76894-4, 2006
3. Daniel Minoli, Enterprise Architecture A to Z, Frameworks, Business Process Modeling, SOA, and Infrastructure Technology, Auerbach Publications, Taylor & Francis Group, ISBN 978-0-8493-8517-9, 2008
4. Setrag Khoshafian, Servive Oriented Enterprises, Auerbach Publications, Taylor & Francis Group, ISBN 0-8493-5360-2, 2007
5. Mike Rosen, Boris Lublinsky, Kevin T. Smith, Marc J. Balcer, Applied SOA: Service-Oriented Architecture and Design Strategies, Wiley Publishing, Inc., ISBN: 978-0-470-22365-9, 2008
6. Marc Lankhorst et al., Enterprise Architecture at Work, Modelling, Communication and Analysis, Second Edition, ISBN 978-3-642-01309-6, Springer-Verlag Berlin Heidelberg 2009
7. David S. Linthicum, Enterprise Application Integration Addison-Wesley Professional 2003, ISBN-10: 1402052626

FF No. : 654

CS47303:: PROJECT STAGE 2

Credits: 04 **Teaching Scheme: -** Practical 8 Hrs/Week

Aim

This course addresses the issues associated with the successful management of a software development project. The course emphasizes project life cycle phases requirement engineering, system analysis and system design. A further aim is for students to heighten personal awareness of the importance of developing strategies for themselves and their career. The Project Work can lead to:

a. Transform existing systems into conceptual models.
b. Transform conceptual models into determinable models.
c. Use determinable models to obtain system specifications.
d. Select optimum specifications and create physical models.
e. Apply the results from physical models to create real target systems.

Objectives

1. To provide an understanding of the project planning process and problem scoping
2. To define roles and work with cross functional teams
3. To establish clear project objectives and milestones
4. To create effective and deliverable project plans
5. To perform rigorous analysis and design activities for solution planning
6. To select appropriate technology for implementation and testing
7. Mapping with PEOs: III, IV, (f),(i).

Overview of the Course:

1. The Student Project Group is expected to make a survey of situation for identifying the requirements of selected Technological Problem. The Student Project Group will be monitored by Internal Guides and External Guides (if any).
2. The project requires the students to conceive, design, implement and operate a mechanism (the design problem). The mechanism may be entirely of the student's own design, or it may incorporate off-the-shelf parts. If the mechanism incorporates off-the-shelf parts, the students must perform appropriate analysis to show that the parts are suitable for their intended purpose in the mechanism.
3. The project must be open-ended – meaning that there is not a known correct answer to the design problem. Students are expected to apply their creativity (simply copying or re-creating something that already exists is not acceptable).
4. The project must have an experimental component. Students must conceive, design, implement and operate an appropriate experiment as part of the project.

The experiment might be to collect data about some aspect of the design (i.e., to verify that the design will work as expected). Alternatively, the experiment could be to verify that the final mechanism performs as expected.

5. Upon receiving the approval, the Student Project Group will prepare a preliminary project report consisting Requirement Definition Document, Feasibility Study Document, System Requirement Specification, System Analysis Document, Preliminary System Design Document. All the documents indicated will have a prescribed format.
6. The Project Work will be assessed jointly by a panel of examiners having more than Five Years experience. The Project Groups will deliver the presentation of the Project Work which will be assessed by the panel.
7. The Student Project Group needs to actively participate in the presentation. The panel of examiners will evaluate the candidate's performance based on presentation skills, questions based on the Project Work, understanding of the Project, analysis and design performed for the project.
8. The Student Project Groups are expected to work on the recommendations given by the panel of examiners. In no case any variation in Project Theme will be permitted.

Assessment Scheme

Sr. No.	Content	Marks
1	System Requirement Specification	20
2	Feasibility Study	10
3	System Analysis	30
4	System Design	30
5	Presentation of the Project Work	10

Outcomes:

Upon completion of the course, the students will be to:

1. Identify major issues in complex situations; and know how to prepare alternative solutions and make decisions.
2. Becoming aware of the need to think and act in an entrepreneurial manner by developing the ability to: critically and creatively understand innovations and development, work independently and collaboratively.

Note:

The student needs to identify a technological problem in the area of Computer Engineering or Information Technology of their choice and address the problem by formulating a solution for the identified problem. The project work needs to be

undertaken by a group of maximum FOUR and minimum of THREE students. The Project work will be jointly performed by the project team members.
The Project Group will prepare a synopsis of the project work which will be approved by the concerned faculty member. The project should not be a reengineering or reverse engineering project. In some cases, reverse engineering projects will be permissible based on the research component involved in it. The project work aims at solving a real world technical problem. Hence ample literature survey is required to be done by the students. Application-oriented projects will not be acceptable. Low-level custom User Interface development and its allied mapping with a particular technology will not be accepted.
Following is the list of recommended domains for Project Work:

Computer Networks	Image Processing
Operating Systems	Artificial intelligence
Network Security	Expert Systems
Digital Signal Processing	Object Oriented Systems
Systems Programming	Modeling and Design
Real Time Systems	System Testing
Embedded systems	Storage Management
Cluster Computing	Client-Server Computing
Mobile &Wireless Communications	Cloud Computing
Multimedia Systems	Protocol Engineering

MODULE VIII

Structure, B.Tech (Module VIII)

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Subject No.	Subject Code	Subject Name	Teaching Scheme (Hrs/week)			Credits
			Lect.	Tutorial	Practical	
S_1	CS40112	Software Testing and Quality Assurance	3	0	0	3
S_2	CS40114	Infromation Systems Security	3	0	0	3
S_3	 CS42128 CS42104 CS42124	ELECTIVE III Machine Learning Neural Network Algorithmic Number and Algebra	3	0	0	3
S_4	 CS42118 CS42129 CS42121 CS42116 CS42131	ELECTIVE IV Geographical Information Systems Management Information Systems Advanced Computer Architecture Convergence Technologies Embedded Systems	3	0	0	3
T_1		ELECTIVE III	0	1	0	1
T_2		ELECTIVE IV	0	1	0	1
P_1	CS40312	Software Testing and Quality Assurance	0	0	2	1
P_2	CS40314	Infromation Systems Security	0	0	2	1
PS_3	CS47308	PROJECT STAGE 3 (B.Tech Semester II) Irrespective of Module	0	0	12	6
		Total	12	2	14	22

FF No. : 654

CS40112: Software Testing and Quality Assurance

Credits: 03 **Teaching Scheme: -** Theory 3 Hrs/Week

Prerequisites: Software Engineering, Database Management System

Objectives:

- To understand Software Measurement Theory and Software Test Automation
- To practice Software Testing Techniques and Strategies
- Understand the fundamental concepts, approaches, and methodologies in software quality management and assurance.
- Understand the framework and general approach of several Quality System Standards and Total Quality Management (TQM).
- Mapping with PEOs: III, (e).

Unit I: Software Measurement (8 Hrs)

Part A: Measurement Theory and Why to Measure the Software, Measurement and Models, Measurement Scales, Classification of Software Measures, Measurement Framework, Measuring Internal Product Attributes: Size, Measuring Internal Product Attributes : Structure, Halstead's Software Science, Product Quality Metrics, In-Process Quality Metrics, Software Reliability: Measurement and Prediction, Planning a Measurement Program, Measurement in Practice

Part B: The Rayleigh Model, Exponential Distribution and Reliability Growth Models, SRE process, Reliability Concepts: Hardware and Software, Deploying SRE

Unit II: Principles of Testing (8 Hrs)

Part A: Testing Concepts: Purpose of Software Testing, Testing Principles, Goals of Testing, Testing aspects: Requirements, Test Scenarios, Test cases, Test scripts/procedures, Strategies for Software Testing, Testing Activities, Mistakes, Faults & Failures, Planning Verification and Validation, Software Inspections, Automated Static Analysis, Verification and Formal Methods, Levels of Testing

White-Box Testing: Test Adequacy Criteria, Static Testing, Structural Testing, Code Complexity Testing, Mutation Testing, Data Flow Testing

Black-Box Testing: Test Case Design Criteria, Requirement Based Testing, Positive and Negative Testing, Boundary Value Analysis, Equivalence Partitioning State Based Testing, Domain Testing

Part B: Analysis of Flow Graphs, Complexity Measures and computations

Unit III: Functional Testing (8 Hrs)

Part A: Test Plan, Test Management, Test Execution and Reporting, Test Specialist Skills, Tester's Workbench and Tool Categories, Test Maturity Model and Test Process Assessment**,** Debugging & Root Cause Analysis, Software Items, Component & Units, Test Bed, Traceability and Testability, Attributes of Testable Requirements, Test Matrix, Benefits of Formal Test Documentation, Types of Testing Documentation, Verification Testing, Validation Testing, Integration Testing, System and Acceptance Testing, GUI Testing, , Regression Testing, Selection, Minimization and Prioritization of Test Cases for Regression Testing, Creating Test Cases from Requirements and Use cases
Part B: Software Defects: Origins of Defects, Defect Classes, Defect Repository / Test Design, Developer/Tester Support for Defect Repository, Need for Testing

Unit IV: Higher Order Testing (8 Hrs)
Part A: Object Oriented Testing, Specification Based Testing, Performance Testing, Ad-hoc Testing, Usability and Accessibility Testing, Risk-based Testing, Exploratory Testing, Scenario-based Testing, Random Testing Compatibility Testing, User Documentation Testing, Client –Server System Testing, RAD Testing, Configuration Testing, Testing internal Controls, Multiplatform Environment Testing, Security Testing, Web-based System Testing, Testing VS Test Automation, Tool evaluation and selection, Automation team roles, Architectures, Planning and implementing test automation process
Part B: IEEE Standards Related to Testing, ISO 12207 & IEEE/EIA Std12207on Testing, ISO 9000:2000 on Testing, ISO 9003, IEEE Std 1012, IEEE Std 1028

Unit V: Software Quality Assurance (8 Hrs)
Part A: Quality Concepts, Software Quality Assurance, Planning for SQA, Six Sigma Principles, Malcolm Baldridge Assessment, Edward Deming's Principles, Total Quality Management, Ishikawa's Seven Basic Tools, Using Agile Methods to Improve Software Testing, Building Agility into the Testing Process, Software Maintenance, Purpose of Inspection, Cost of Inspections, Defect Detection and Prevention, Feedback, Feed-forwards and Control, Flow of Inspection Process, Activities of Inspection, Economics of Inspections
Part B: Software Benchmarks and Baselines, Key Factors for Software Assessment and Benchmark Studies, Identifying Software Best and Worst Practices

Text Books:

1. Fenton, Pfleeger, "Software Metrics: A Rigourous and practical Approach", Thomson Brooks/Cole, ISBN 981-240-385-X.
2. Desikan, Ramesh, "Software Testing: principles and Practices", Pearson Education, ISBN 81-7758-121-X.

Reference Books :

1. Burnstein, "Practical Software Testing", Springer International Edition, ISBN 81-8128-089-X

2. William E. Perry, " Effective Methods for Software Testing", John Wiley and Sons, ISBN 9971-51-345-5
3. Yogesh Singh, "Software Testing", Cambridge University Press, ISBN 978-1-107-01296-7
4. Nina Godbole, "Software Quality Assurance: Principles And Practice",Alpha Science International, Ltd (August 1, 2004) ISBN-10: 1842651765 ISBN-13: 978-1842651766
5. Ronald Radice, "Software Inspections", Tata McGraw Hill, ISBN 0-07-048340-X
6. Capers Jones," Software Assessments, Benchmarks, and Best Practices" ,Burlington, Vermont Publisher: Addison-Wesley Professional 2000 ISBN-10: 0201485427 ,ISBN-13: 9780201485424

FF No. : 654

CS40114 ::INFORMATION SYSTEMS SECURITY

Credits: 03 **Teaching Scheme: -** Theory 3 Hrs/Week

Prerequisites: Computer Networks.

Objectives:

- To understand various attacks in the network.
- To learn various cryptographic techniques.
- To understand access control techniques
- To understand data security

Unit I **(8+1 Hrs)**

Introduction

A. Introduction to Security: Vulnerabilities, threats, Risk, attack and attack types, Security services.
Protocol Vulnerabilities: DoS and DDoS, session hijacking, ARP spoofing, Pharming attack.
Software vulnerabilities: SYN-Flooding, SQL- injection, Phishing, buffer overflow, Cross-site scripting attack.

B. DNS poisoning, Sniffing, Sabotage flashing attack Virus and Worm Features, Security Policy, Types of Security Policy, The role of trust, Types of Access Control,

Unit II **(8+2 Hrs)**

Private key cryptography

A. Mathematical background for cryptography: modulo arithmetic, GCD (Euclids algorithm), algebraic structures (Groups, Rings, Fields, Polynomial Field). Data Encryption Standard: Feistel structure, round function, blocks cipher modes of operation. S-DES Attacks on DES.S-AES, AES.
B. Chinese remainder theorem, Elementary Ciphers (Substitution, Transposition and their Properties).

Unit III **(8+2 Hrs)**

Public key cryptography

A. RSA: RSA algorithm, Key generation in RSA, attacks on RSA, Diffie-Hellman key exchange: Algorithm, Key exchange protocol, Attack. Elliptic Curve Cryptography (ECC): Elliptic Curve over real numbers, Elliptic Curve over Zp, Elliptic Curve arithmetic. Diffie-Hellman key exchange using ECC. Message authentication and Hash Function.

B. Diffie-Hellman key exchange on EC Groups, digital signature, EC- based digital signature.

Unit IV **(8+1 Hrs)**

Information Security

A. Overview, Design Principles, What is identity? Files and Objects, Users, Groups and roles, Naming Certificate, Identity on the web, Access control lists, Information Flow basics and backgrounds, Complier based mechanism, Execution based mechanism, Example Information flow controls. Access Control in Operating Systems: Discretionary Access Control, Mandatory Access Control, Role Based Access Control.

B. SOA and Cloud data management.

Unit V **(8+1 Hrs)**

Applying security

A. Network layer security: IPSec for IPV4 and IPV6. Transport layer security: SSL and TLS. Application layer security: Security services, S/MIME, PGP, PEM, Https, Honey pots.

B. Cyber laws, IDS, SNORT.

Text Books

1. "Cryptography and Network Security-Principles and Practices" by William Stallings, Pearson Education, 2006, ISBN 81-7758-774-9, 4th Edition.
2. "Network Security and Cryptography", by Bernard Menezes, Cengage Lerning, 2010, ISBN 81-315-1349-1, 1st Edition.

Reference Books

1. "Computer Security: Art and Science", by Matt Bishop, Pearson Education, 2002, ISBN 0201440997, 1st Edition.
2. "Network security, private communication in a public world", by Charlie Kaufman, Radia Perlman and Mike Speciner, Prentice Hall, 2002, ISBN 9780130460196, 2nd Edition.

Additional Reading

1. "Security architecture, design deployment and operations", by Christopher M. King, Curtis Patton and RSA press, McGraw-Hill, 2001, ISBN 0072133856, 1st Edition.

2. 'INSIDE NETWORK Perimeter Security" by Stephen northcatt, leny zeltser, et al, Pearson Education Asia, ISBN 8178087618, 1st Edition.

FF No. : 654

CS42120 :: DATA MINING

Credits: 03 **Teaching Scheme: -** Theory 3 Hrs/Week

Prerequisites: Database Management Systems.

Objectives:

- Study different functionalities of data mining, various algorithms, and get an overview of significant data mining applications
- Mapping with PEOs: III, (e).

Unit I (9+2 Hrs)

Data Mining and Preprocessing

A. **Introduction:** Need of Data Mining, Knowledge Discovery in Database (KDD), Architecture of Data Mining System; Data Objects and Attribute Types, Statistical Description of Data, Data Visualization

Data Preprocessing: Central Tendency, Data Dispersion, Data Summarization, Cleaning, Integration, Transformation, Reduction, Discretization, Binarization, Variable Transformation

B. Relation of Data Mining with Business Intelligence and Business Analytics, Integration of Data Mining with a Database or Data Warehouse System, Basics of Business Intelligence and DataWarehousing, Issues in Data Mining

Unit II (7+1 Hrs)

Mining Frequent Patterns, Association and Correlations

A. Frequent Itemset Mining: Interesting Item Set Mining: Market Basket Analysis, Generating Association Rules, Apriori Algorithm, A pattern growth approach for mining frequent item set, Mining frequent item-sets using vertical data, Evaluation of Association Patterns, From Association Analysis to Correlation Analysis

B. Sequential Pattern Mining Algorithms, Pattern mining in multi-level, multi-dimensional space

Unit III (9+2 Hrs)

Classification and Prediction

A. **Classification:** Decision Tree Classifier, Rule Based Classification, Bayesian Classification, Neural Network Classification: Back Propagation Algorithm, Lazy Learner: kNN Classifier, Support Vector Machine

Model Overfitting, Classifier Accuracy Measures, Techniques for Evaluating Classifier Accuracy, Ensemble Methods, Multiclass Problem

Prediction: Linear, Non-Linear Regression

B. Case-Based Reasoning, Associative Classification, Other Classification Techniques: Genetic Algorithm, Fuzzy Set Approach, Rough Set, Constraints Based Association Mining.

Unit IV **(8+2 Hrs)**
Clustering and Outlier Detection

Cluster Analysis: Categories of Clustering methods, Different Types of Clusters, Partitioning methods: k-Means, k-Medoids; Hierarchical Clustering Methods: BIRCH, Chameleon; Grid Based Methods: STING; Density based Clustering: DBScan
Cluster Evaluation
Outlier Analysis: Types of outlier, Proximity based approach: distance based , Density based approach

B. Grid Based Methods: CLIQUE, Density based Clustering: OPTICS, Deviation based outlier detection approach: grid based

Unit V **(7+1 Hrs)**
Data Mining on different Databases

A. Multimedia Data Mining, Web Mining, Text Mining, Spatial Data Mining, Mining on Social Networks, Multirelational Data Mining.
B. Graph Mining , Mining Time – Series Data, Data Mining Applications

Unit VI
Part B of Unit I to V

Text Books

1. "Data Mining: Concepts and Techniques", Jiawei Han and Micheline Kamber, Morgan Kaufman, ISBN 978-81-312-0535-8, 2nd Edition.
2. "Introduction to Data Mining", Pang-Ning Tan, Vipin Kumar, Michael Steinbach, Pearson

Reference Books

1. "Data Mining and Analysis: Fundamental Concepts and Algorithms", Mohammed J. Zaki, Wagner Meira Jr., Cambridge University Press
2. "Mastering Data Mining: The art and science of customer relationship management", M Berry and G. Linoff, John Wiley, ISBN 9971-51-369-2, 2001 Edition.
3. "Data Mining : Theory and Practice" , Soman K P, Diwakar Shyam, Ajay V, New Delhi, Prentice Hall Of India, ISBN 81-203-2897-3, 2006 Edition.

FF No. : 654

CS42128:: MACHINE LEARNING

Credits: 03 **Teaching Scheme: -** Theory 3 Hrs/Week

Prerequisites: Artificial Intelligence, Neural Networks.

Objectives:

- To introduce students to several prominent areas of soft computing, including feature extraction, decision trees, neural networks, genetic algorithms, Bayesian learning, clustering, ensemble learning, support vector machines, and reinforcement learning, fuzzy logic and illustrate what types of problems the different methods are suited for.
- To give students hands-on experience with these methods and tools for implementing and using them on real-world problems like Matlab statistical tools, Matlab NN tools, Neurosolutions, WEKA etc.
- To give students experience with performing simulations and doing statistical data analysis of the results.
- To design and implement soft computing algorithms and evaluate with the help of different parameters like accuracy, time complexity, space complexity, performance etc.

Unit I **(7 Hrs)**
Fundamentals

A:Introduction: Soft computing and hard computing, types, applications. Well posed learning problem, Designing a learning system, Perspectives and issues in soft computing, Concept Learning and the General-to-Specific Ordering: Task, search, Find S algorithm, Version space and the candidate elimination algorithm, list then eliminate algorithm, inductive bias, Decision Tree Learning: representation, appropriate problems, Basic design tree learning algorithm, Hypothesis space.
B: Solving Problems based on above algorithms. inductive bias, issues in decision tree learning.

Unit II **(7 Hrs)**
Learning by experience

A:Artificial Neural Networks: representation, perceptron, learning rules, activation functions, Backprapogation algorithm, Support Vector Machines and Kernel based methods, obtaining the optimal hyperplane, SVM formulation with slack variables; nonlinear SVM classifiers, Kernel Functions for nonlinear SVMs; Mercer and positive definite Kernels, Support Vector Regression and ε-insensitive Loss function, examples of SVM learning,Overview of SMO and other algorithms for SVM; ν-SVM and ν-SVR; SVM as a risk minimizer, Positive Definite Kernels; RKHS; Representer Theorem Feature Selection, Model assessment and cross-validation, Feature Selection and Dimensionality Reduction
B: Solving Problems based on above algorithms. ensemble classifiers, Principal Component Analysis,Assessing Learnt classifiers; Cross Validation, evaluation

Unit III **(6 Hrs)**
Hypothesis and Probability

A: Evaluating Hypotheses, Evaluating hypothesis accuracy, Sampling theory, Central limit theorem, hypothesis testing, comparing learning algorithms. Bayesian Learning, Bayes theorem and concept learning, Maximum likelihood hypothesis, minimum description length primciple, Gibbs algorithm.
B: Solving Problems based on above algorithms. k-means algorithm

(7 Hrs)
Unit IV
Computational Learning and use of Instances

A: Computational Learning Theory, probably learning, sample complexity for finite hypothesis spaces, sample complexity for infinite hypothesis spaces, Mistake bound model of learning, weighted majority algorithm, Instance-Based Learning: k-nearest neighbor learning.
B: Solving Problems based on above algorithms. locally weighted regression,

(7 Hrs)
Unit V
Code Optimization and Run Time Environments

A: Introduction to Genetic Algorithms: hypothesis space search, genetic programming, models of evaluation and learning, Learning Sets of Rules: sequential covering algorithms, learning rule sets summary, learning first order rules, resolution Genetic algorithm.
B: Solving Problems based on above algorithms. inverted deduction

(7 Hrs)

Unit VI
Analytical and Inductive Learning

A: Introduction to analytical learning. Combining Inductive and Analytical Learning, Reinforcement Learning. Hybrid systems, fuzzy logic. Classical set, Fuzzy sets, Fuzzy relations, Fuzzification, Membership functions, Defuzzification, Methods of de-fuzzification,Fuzzy rules.
B: Solving Problems based on above algorithms. implementation of all these algorithms

Text Books

1. T. Mitchell, " Machine Learning", McGraw-Hill, 1997.
2. Anup Kumar Srivastava, Soft Computing, Alpha Science International limited. 2009.

Reference Books

1. Ethem Alpaydin, "Introduction to Machine Learning", MIT press, 2004.
2. Jacek M. Zurada, "*Introduction to Artificial neural System"*, JAICO publishing house,2002,.
3. Research papers suggested by the faculty.

FF No. : 654

CS42104:: NEURAL NETWORKS

Credits: 03 **Teaching Scheme: -** Theory 3 Hrs/Week

Prerequisites: Nil

Objectives:

- To focus on the foundations of neural network theory and the application of neural network models in engineering, cognitive science, and artificial intelligence.
- To introduce the neural networks as means for computational learning.
- To present the basic network architectures for classification and regression.
- Mapping with PEOs: III, IV, (f).

Unit I **(8+2 Hrs)**
Introduction

A. Introduction and Role of Neural Network (NN), Applications: Signal Processing, Pattern recognition, Medicine, Speech Production/Recognition, Business etc., Artificial Neural Networks, Bilogical Neural Networks, Components of Neural Network, Network topologies, Linear Separability, Hebb Net, Perceptron, Adaline/Madaline, Paradigms of Learning: Unsupervised, Reinforced, Supervised, Competitive, Offline or Online, Activation Functions
B. Examples on Learning.

Unit II **(8+1 Hrs)**
The Perceptron, Backpropagation and other Neural Networks

A. Standard Backpropagation: Architecture, Algorithm, Applications, variations, Theoretical results, Boltzmann machine, Continuous Hopfield, Gaussian Machine, Cauchy machine neural networks

(8+2 Hrs)

Unit III
Competitive Neural Network

A. Fixed weight Competitive Neural Network, Kohonen Self Organizing Maps, Learning Vector Quantization, Counter propagation: Fully Counter propogation neural network, Forward only Counter propagation Neural network.
B. Applications of Self organizing Maps

Unit IV **(8+1 Hrs)**
Adaptive Resonance Theory(ART)

A. The ART Network Structure, Network Operation, Properties of ART, ART-1, ART2 Network, Architecure, Algorithm, Applications.
B. Case Study: ART2 Application

Unit V **(8+2 Hrs)**
Pattern Association

A. Training Algorithm for Pattern association, Heteroassociative Memory Neural Network, Auto associative Neural Network, Iterative Auto associative Neural Network, Discrete Hopfield Network, Bidirectional associative Memory (BAM),
B. Perceptron Case Study

Text Books

1. "Fundamentals of Neural Networks: Architectures, Algorithms and Applications", Laurene Fausett, Prentice Hall Edition
2. "Principles of Artificial Neural Networks", Daniel Graupe, World Scientific Publishing, ISBN 13-978-981-270-624-9, 2nd Edition.
3. "Artificial Neural Networks", B. Yegnanarayana, PHI Learning Private Limited, ISBN 978-81-203-1253-1, 2010 Edition.

Reference Books

1. "Introduction to Artificial Neural Systems", Jacek M. Zurada, Jaico Publishing House, ISBN81-7224-650-1, 2006 Edition.
2. "Neural Networks a Comprehensive Foundation", Simon Haykin, Pearson Education, ISBN 81-7808-300-, 2nd Edition.

Additional Reading

1. "Neural Networks a Classical Approach", Satish Kumar, Tata McGraw-Hill Publishing Company Limited, ISBN 0-07-048292-6, 2004 Edition.
2. "Neural Networks for Pattern Recognition", Christopher M. Bishop, OXFORD University Press, ISBN 0-19-566799-9.

FF No. : 654

CS42124:: ALGORITHMIC NUMBER AND ALGEBRA

Credits: 03 **Teaching Scheme: -** Theory 3 Hrs/Week

Prerequisites: Basic introduction to linear algebra and abstract algebra (though it is not presumed) is helpful to better appreciate the contents of the course. First course on algorithms.

Objectives:

- Study basic number theory, various algebraic structures (such as groups, rings, fields, vector-spaces …etc) and their applications. These topics will be mainly studied in a computational perspective.
- Study various algorithms for several fundamental algorithmic questions in Number Theory and Algebra.
- Building up mathematical background and tools for further study in areas such as cryptography, computational number theory, computational complexity, coding theory.
- Mapping with PEOs I, II.

Unit I **(8+2 Hrs)**

Basic Number Theory

A. Infinitely many primes in Z(some proofs), greatest common divisor, unique factorization of integers, modular arithmetic, (some results on modular arithmetic: Fermat's little theorem, Wilson's theorem,… etc), linear congruences and Chinese Remaindering Theorem, linear Diophantine equations, some arithmetic multiplicative functions (e.g. Euler's phi function, Mobius function, divisor function…), Dirichlet convolution, Mobius inversion. Quadratic residues, Legendre symbol, Gauss' law of Quadratic reciprocity. Distribution of primes, Prime number theorem.

B. More Diophantine equations (e.g. Pell's equation), more results on distribution of primes(proving lower and upper bound(asymptotic) on pi(x), where pi(x) is number of primes upto x)

Unit II **(8+1 Hrs)**

Basic abstract Algebra

A. Groups, subgroups, Lagrange's theorem, group homomorphism, quotient groups, normal subgroups, cyclic groups, Abelian groups and their decomposition, rings, ideals, some examples of rings (e.g. polynomial ring F[x], ring of integers modulo n), units and zero devisors in the ring, structure of unit group of Z_n, integral domains, fields, vector spaces. Unique factorization in ring k[x] where k is a field, Principal Ideal Domains(PID).
Basics of finite fields: existence of finite fields of size p^n for n>0, p prime, isomorphism of finite fields of same size, structure of multiplicative group, field automorphisms, Frobenius maps.

B. Ring of Gaussian integers Z[i] and Lagrange's four square theorem, analogies between ring of integers and univariate polynomial ring, more properties of finite fields.

Unit III **(8+2 Hrs)**
Number theoretic algorithms

A. Euclid's algorithm for GCD, Extended Euclid's algorithm, fast integer arithmetic, algorithms for modular arithmetic, fast exponentiation, finding modular inverse, finding order of element in a group, finding quadratic non-residues, algorithm for modular square-root, algorithms for discrete-log problem.
Univariate polynomial arithmetic (multiplication, gcd, etc), irreducibility testing for polynomials in F[x] where F is finite field, ring F[x]/(f), modular inverse computation.
B. Chinese Remaindering and computing determinant of integer matrix, Euclid's algorithm and Fibonacci numbers (a detailed analysis of Euclid's algorithm), Some more algorithmic questions over finite fields.

Unit IV **(9+2 Hrs)**
Polynomial Factorization

A. *Univariate polynomial factorization over finite fields:* revisit unique factorization, Randomized polynomial time algorithms:

a. Berlekamp's algorithm: linear algebra preliminaries for Berlekamp's algorithm, Frobenius map, the algorithm, resultants and some implications of Berlekamp's algorithm, parallel algorithm for computing gcd of polynomials.

b. Cantor-Zassenhaus algorithm: distinct degree and equal degree factorization, CRT and Cantor-Zassenhaus algorithm.

Geometry of Numbers and polynomial factorization over rationals: Basics on integer lattices, Minkowski's theorems, algorithmic questions over integer lattices (Closest Vector Problem and Shortest Vector Problem) Gauss' algorithm for SVP in 2 dimensions. Lenstra-Lenstra-Lovasz(LLL) approximation algorithm for SVP. Deterministic polynomial time algorithm for factorization of univariate polynomials over rational(using LLL and Hensel lifting lemma)

B. Reduction of polynomial factorization problem to root finding using Berlekamp's algorithm. Recent deterministic sub-exponential time algorithm for the problem.

Unit V **(7+1 Hrs)**

Primality

A. Pratt's result: PRIMES in NP intersection coNP, randomized polynomial time algorithms:

a. Miller-Rabin primality test: Carmichael numbers, derandomizing Miller-Rabin test using Riemann Hypothesis, computing a factor of a number given phi(n) where phi is Euler's totient function.

b. Solovay-Stassen primality test: Jacobi symbol, quadratic reciprocity, Solovay-Strassen primality test.

Prime number theorem and generating large primes (application to RSA crypto system)

B. Agarwal-Kayal-Saxena(deterministic polynomial time) primality test.

Text Books

1. Modern Computer Algebra by Joachim von zur Gathen, Jürgen Gerhard (Cambridge)
2. A computational introduction to Number Theory and Algebra by Victor Shoup(Cambridge)
3. A classical introduction to modern number theory by Ireland and Rosen (Springer)

Reference Books

1. Topics in Algebra by I. N. Herstein (Wiley Publishing company)
2. Algebra by Michael Artin (Pearson Prentice Hall)

FF No. : 654

CS42118:: GEOGRAPHICAL INFORMATION SYSTEMS

Credits: 03 **Teaching Scheme: -** Theory 3 Hrs/Week

Prerequisites: Nil

Objectives:

- To increase student awareness of GIS technology and provide opportunities to process, analyze and visualize spatial data and information.
- To understand the complexities of data manipulation, analysis, and mapping at different scales of space, time, and complexity.
- To study applications of GIS and Remote Sensing.
- Mapping with PEOs: I, V, (j).

Unit I **(8+1 Hrs)**
GIS and Maps

A. Fundamentals of GIS: Roots of GIS, Overview of Information System, Four Ms, GIS Definition and Terminology, GIS Queries, GIS Architecture, Models of GIS, Framework for GIS, GIS Categories, Levels/Scales of Measurement. Map Language: Map as a Model, Classification of Maps, Spatial Referencing System, Map Projections, Commonly Used Map Projections, Grid Systems, Computer in Map Production, Digital Database in a GIS, Linkage of GIS to Remote Sensing
B. Selection of a GIS Application in Various Domains such as Weather Forecasting, Urban Planning, Agriculture, Defense, Network Applications.

Unit II **(8+2 Hrs)**
Remote Sensing Fundamentals

A. Remote Sensing - Basic Principles: Electromagnetic Remote Sensing, Energy Sources, Energy Interactions with Earth's Surface Materials, Microwave Remote Sensing: Radar Principle, Factors affecting Microwave Measurements, Radar Wavebands, SLAR Systems, Interpreting SAR Images, Geometrical Characteristics. Remote Sensing Platform and Sensors: Satellite System Parameters, Sensor Parameters, Imaging Sensor Systems, Earth Resources Satellites, Meteorological Satellites.
B. Study of Satellites such as IRS, OCEANSAT-1, IKONOS etc.

Unit III **(8+2 Hrs)**
Image Processing

A. Digital Image Processing: Basic Character of Digital Images, Preprocessing, Registration, Enhancement, Spatial Filtering, Transformations, Classification, Image Classification and GIS. Visual Image Interpretation: Types of Pictorial Data Products, Image Interpretation Strategy, Image Interpretation Process, Overview of Image Interpretation Equipments.
B. Study of GIS Hardware and Software required specially for Image Processing.

Unit IV **(8+2 Hrs)**
Spatial Data Modeling and Management

A. Spatial Data Modeling: Stages of GIS Data Modeling, Graphic Representation of Spatial Data, Raster GIS Models, Vector GIS Models, GIS Data Management: Database Management Systems, GIS Data File Management, Database Models, Storage of GIS Data Object based Data Models, Temporal Topology, Organizational Strategy of DBMS in GIS.
B. Design a Spatial Database for a Selected Application.

Unit V **(8+1 Hrs)**
Data Input, Quality and Analysis

A. Data Input and Editing: The Data Stream, Data Input Models, Data Input Methods, GPS for GIS Data Capture, Data Editing. Data Quality Issues: Components of Data Quality, Accuracy, Precision and Resolution, Consistency, Completeness, Sources of Error in GIS, GIS Output, Modeling Errors and Error Evaluation. Data Analysis and Modeling: Format Conversion, Data Medium Conversion, Spatial Measurement Methods, Buffering Techniques, Overlay Analysis, Modeling Surfaces.
B. Identification of Data Inputs Outputs and Study of Required Analytical Approach.

Text Books

1. "Remote Sensing and Geographical Information Systems", M. Anji Reddy B S Publications, Second Edition, 2006.
2. "Introduction to Geographic information systems", Kang-Tsung Chang, Tata-McGraw-Hill Publications, Third edition, 2006. ISBN: 978-0073101712.

Reference Books

1. "Principles of Geographical Information Systems", Peter A Burroughs and McDonnell, Oxford University Press, 1998. ISBN 978-0198233657.
2. "The GIS Book", George B Korte, Onward press (Thomson Learning), 5th Edition, 2001. ISBN 81-7800-112-8.

Additional Reading

1. Bolstad, Paul "GIS Fundamentals**."**, Eider Press. 2nd edition 2005. ISBN 978-0-9717647-2-9.

FF No. : 654

CS42129: MANAGEMENT INFORMATION SYSTEMS

Credits: 03 **Teaching Scheme: -** Theory 3 Hrs/Week

Prerequisites: Nil

Objectives:

- To identify and analyze the role of computer based information systems in the successful management of organizations.
- Elaborate the major types of information systems in organizations and their role in managing the organization.
- To recognize the moral dimensions of information systems problems and apply specific ethical principles to determine an appropriate course of action.
- Mapping with PEOs :- III, IV, (f).

Unit I **(8+2 Hrs)**

Foundations of Information Systems

A. Introduction, Why Information Systems (IS)? IS Framework, System Concepts, Components of IS, Major Roles of IS, Trends in IS, Major Types of IS– Transaction Processing Systems (TPS), MIS, Decision Support Systems (DSS), etc, Organization Basic, Features of Organizations, Models of Organizations, Competitive Strategy Concepts, Strategic Uses of Information Technology, The Value Chain.
B. Selection of a Domain: Banking, Healthcare, Hotel, Telecom, Education, Agriculture, Shopping Mall, Automobile, Food Industry etc.

Unit II **(8+2 Hrs)**

Manufacturing and Service Systems

A. Functional Levels in Manufacturing Systems, Personnel Management, Financial Management, Production Management, Material Management, Marketing Management, MIS for Manufacturing Sector, Service Sector, Distinctive Services, Service Vs. Product, Service Process Cycle and Analysis, Customer Service Design, MIS for Service Sector, Insurance and Airline
B. Identification of Functional Levels, Services and Products in Selected Domain.

Unit III **(8+2 Hrs)**

e-Business

A. Enterprise Resource Planning (ERP), Benefits and Challenges of ERP, Trends in ERP, Supply Chain Management (SCM), The Role of SCM, Benefits and Challenges of SCM, Trends in SCM, Customer Relationship Management (CRM), The Three Phases of CRM, Benefits and Challenges of CRM, Trends in CRM, Electronic Commerce (e-Commerce), Scope of e-Commerce, Essential e-Commerce Processes, Electronic Payment Processes, B2C e-Commerce, B2B e-Commerce.
B. Study of Process to accommodate e-Business Approach in Selected Domain.

Unit IV **(8+2 Hrs)**
Information Systems for Decision Support

A. Business and Decision Support, Decision Making Process, Components of DSS, MIS, Difference between DSS and MIS, Online Analytical Processing, Types of DSS, Using DSS, What-if analysis, Sensitivity analysis, Goal-seeking analysis, Optimization analysis, Data Mining for Decision Support, Executive Information Systems, Knowledge Management Systems, Group Decision Support Systems (GDSS), Components of GDSS, Overview of a GDSS Meeting, Expert Systems.
B. Identify Decision-making Aspects in a Selected Domain with Appropriate Examples.

Unit V **(8+2 Hrs)**
Challenges Ahead

A. Introduction to Security and Ethical Challenges, Ethical Responsibility of Business Professionals, Computer Crime, Hacking, Cyber Theft, Unauthorized Use at Work Software Piracy, Piracy of Intellectual Property, Computer Viruses and Worms, Security Management, Tools, Encryption, Firewalls, e-Mail Monitoring, Biometric Security, Disaster Recovery, Fault Tolerant Systems, etc, Global Management of Information Technology, Cultural, Political and Geo-economic Challenges, Global Business/IT Strategies.
B. Study of Cybercrimes and Preventive Measures w. r. t. Selected Domain.

Text Books

1. "Management Information Systems: Managing Information Technology in the Business Enterprise", James O'Brien, Tata McGraw-Hill Publishing Company Limited, 10th Edition, ISBN 0-07-058739-6.
2. "Management Information Systems", Jawadekar Waman S, Tata McGraw-Hill Publishing Company Limited, ISBN 0-07-044575-3, 2nd Edition.

Reference Books

1. "Management Information Systems: Managing the Digital Firm", Kenneth C. Laudon, and Jane P. Laudon, Prentice-Hall of India, ISBN 81-203--2908-2, 9th Edition.
2. "Management Information Systems", Oz Effy, Singapore, Thomson, ISBN 81-315-0174-4, 5th Edition.

Additional Reading

1. "Management Information Systems", Shajahan S, Priyadharshini R, New Age International, ISBN 81-224-1549-0.
2. "Management Information Systems", Arora Ashok, Bhatia Akshaya, Excel Pub, ISBN 81-7446-188-4.
3. "Information Systems A management Perspective", Alter Steven, Addison Wilsey, ISBN 0-201-35109-9, 3rd Edition.
4. "Information Systems For Modern Management", Murdick R G, Ross J E, Claggett J R, Prentice Hall Of India, ISBN 81-203-0397-0, 3rd Edition.

FF No. : 654

CS42121: ADVANCED COMPUTER ARCHITECTURE

Credits: 03 **Teaching Scheme: -** Theory 3 Hrs/Week

Prerequisites: Computer Organization

Objectives:
To study Parallel Processing concepts and Parallel Processor architecture.
To study Various types of Advance Computer Architecture.

Unit I **(8+1 Hrs)**
Overview of Parallel Processing

A. Overview of Parallel Processing and Pipelining Processing, study and comparison of uni-processors and parallel processors.
Necessity of high performance, Constraints of conventional architecture, Parallelism in uni-processor system, Evolution of parallel processors, future trends, Architectural Classification, Applications of parallel processing, Instruction level Parallelism and Thread Level Parallelism

B. Explicitly Parallel Instruction Computing (EPIC) Architecture, Performance Metrics and Measures, Speedup Performance Laws.

Unit II **(8+1 Hrs)**
Pipelining Processing

A. Principles and implementation of Pipelining, Classification of pipelining processors, Pipeline Architecture, Study and comparison of processors with and without pipelining. General pipelining reservation table, Design aspect of Arithmetic and Instruction pipelining, Pipelining hazards and resolving techniques, Data buffering techniques, Job sequencing and Collision, Advanced pipelining techniques, loop unrolling techniques, out of order execution, software scheduling, trace scheduling.

B. Advances in pipeline architectures. Implementation issues of a program on any pipelined processor their analysis.

Unit III **(8+1 Hrs)**
SIMD Computer Organization and Parallel Algorithms For Array Processors

A. Study and comparison of Vector and array processors,
Vector and Array Processor, Basic vector architecture, Issues in Vector Processing, Vector performance modeling, vectorizers and optimizers, Case study: Cray Arch. Masking and Data network mechanism, Inter PE Communication, Interconnection networks of SIMD, Static Vs Dynamic network, cube hyper cube and Mesh Interconnection network. Matrix Multiplication. Sorting,
SIMD computer organization.
B. Implementation issues of Matrix multiplication and sorting on array processor and their analysis**.**

Unit IV **(8+1 Hrs)**

Multiprocessor

Microprocessor Architectures, study and comparison of Loosely and Tightly coupled multiprocessors.
Loosely and Tightly coupled multiprocessors, Processor characteristics of multiprocessors, Inter Processor communication network, Time shared bus, Crossbar switch, Multiport Memory Model, Memory contention and arbitration techniques, Cache coherency and bus snooping, Massively Parallel Processors (MPP), Cow's and NOW's Cluster and Network of Work Stations), Chip Multiprocessing (CMP).

B. Implementation issues of a program on multiprocessor system

Unit V **(8+1 Hrs)**
Parallel Programming Techniques

Study of Architecture of Multithreaded processors, Latency hiding techniques, Principles of multithreading, Issues and solutions.
Message passing program development, Synchronous and asynchronous message passing, Message passing parallel programming, Shared Memory Programming, Data Parallel Programming.

B. Implementation issues of a multithreaded program.

Text Books

1. Kai Hwang, Faye A. Briggs, "Computer Architecture and Parallel Processing" McGraw-Hill international Edition.
2. Kai Hwang, "Advanced Computer Architecture", Tata McGraw-Hill.

Reference Books

1. Rajaraman, L Sivaram Murthy, "Parallel Computers", PHI.
2. William Stallings, "Computer Organization and Architecture, Designing for performance" Prentice Hall, Sixth edition.
3. Kai Hwang, Scalable Parallel Computing.
4. Harrold Stone, High performance computer Architecture.
5. Richard Y. Kain, Advanced Computer Architecture
6. http://www.intel.com/products/processor (for Intel Itanium Processor).

FF No. : 654

CS42116 :: CONVERGENCE TECHNOLOGY

Credits: 03 **Teaching Scheme: -** Theory 3 Hrs/Week

Prerequisites: Computer Networks.

Objectives:

- To understand need of convergence.
- To learn various networks, and signaling in that network.
- To understand voice and data communication.

Unit I **(7+2 Hrs)**

Introduction to Convergence

A. what is network Convergence, the promise of network convergence, networking issues and convergence, Voice and data network characteristics, benefits of IP centric network, challenges of converged network, introduction to VOIP, applications of converged networks, VOIP implementation challenges.

B. voice and data network growth factor, effects of network convergence on businesses.

Unit II **(9+1 Hrs)**

Protocols and Standards for Convergence

A. Protocols Supporting VOIP: Multicast IP, RTP, RTCP, RSVP, RTSP, SDP, SAP, SIP.
Subscriber Lines: T1/T3, DS0, DS1, DS3, E1/E3.
Signaling Standards: H.323, SIP. Gateways, Gatekeepers.
B. MGCP, Audio and Video Codecs.

Unit III **(9+1 Hrs)**

Switching networks

A. ISDN: conceptual view of ISDN, transmission structure, user-network interface configuration, ISDN Protocol Architecture, ISDN connection, Addressing, Interworking, PRI, BRI, LAPD,
Basic Call control, SS7.
B-ISDN standards, Broadband services, B-ISDN architecture, B-ISDN protocol reference model.

B. ISDN standards, SDH.

Unit IV **(7+1 Hrs)**

Frame Relay and SMDS

A. Frame Relay Circuits, Frame mode protocol architecture, frame mode call control, LAPF, Congestion in frame relay networks, approaches to congestion control, Traffic rate management, Explicit congestion avoidance, implicit congestion control.
SMDS: introduction to SMDS, SMDS interface protocol, SMDS addressing.
B. Comparison of SMDS with other LAN technologies.

Unit V **(8+1 Hrs)**

ATM technology

A. ATM VPI& VCI, Creation of virtual channel, Definitions of Virtual circuit and permanent virtual circuit, ATM reference model, step-by-step PVC example of how ATM network processes cells, AAL, Adaption layer from voice over ATM perspective AAL1,AAL2, AAL3, Connection admission control (CAC). Cell Loss Priority (CLP), ATM and convergence technology.
B. ATM versus Frame relay, ATM versus SONET.

Text Books

1. "ISDN and Broadband ISDN with frame relay and ATM" by William Stallings, Pearson Education, 2003, ISBN 81-7808-422-8, 4th Edition.
2. "Voice over IP Technologies" by Mark A. Miller, P.E., Wiley Publications, 2002, ISBN 81-265-0286-X, 1st Edition.

Reference Books

1. "Computer Communications and Networking Technologies", by Michael A. Gallo, William M. Hancock, Cengage Learning, 2002, ISBN81-315-0364-X, 1st Edition.
2. "ATM network concepts and protocols", by Sumeet Kasera and Pankaj Sethi, Tata McGraw Hill, 2001, ISBN 0-07-463776-2, 1st Edition.

Additional Reading

1. "VOIP", by Ulyess Black, Pearson Education, 2001, ISBN 0130652040, 2nd Edition.
2. "Multimedia communication system techniques standards and networks", by K.R. Rao, Zoran Bojkovic and Dragorad Milovanovic, Pearson Education, 2002, ISBN 0-13031398-X, 1st Edition.

FF No. : 654

CS42130 :: EMBEDDED SYSTEMS

Credits: 03 **Teaching Scheme: -** Theory 3 Hrs/Week

Prerequisites: Understanding of Microprocessors, Peripheral Chips, Conversion, Interfacing Techniques.

Objectives:

- To exhibit knowledge of the architecture of microcontrollers and apply program control structures to microcontrollers.
- To develop the ability to use assembly language to program a microcontroller and demonstrate the capability to program the microcontroller to communicate with external circuitry using parallel ports.
- To demonstrate the capability to program the microcontroller to communicate with external circuitry using serial ports and timer ports.

Unit I Introduction to Embedded Systems (8+1 Hrs)

A. Introduction to Embedded Systems, Review of Microprocessors and Micro-controllers, Multiprocessor systems using General Purpose Processor. CISC and RISC Processor architectures. DSP processor. Design Process in Embedded System, Components of Embedded System & its Classification, Characteristic of embedded system. Introduction to embedded processor, Digital Signal Processor, Application Specific System Processor, Design Process in Embedded System, Design metrics, Steps in design process. Challenges in Embedded System design, Design Examples. Advances in Embedded Systems

B. Memory Selection Criterion

Unit II Bus Design (8+1 Hrs)

A. Introduction to the BUS System, Bus design issues, Synchronous Bus, Asynchronous Bus, Bus Allocation, Bus Priority. Protocol Architecture, topology, different Packets, Communication Cycle, Arbitration, Applications. Interfacing Buses: I2C, SPI ,CAN .

B. Study of RS 232C , Centronics and USB

Unit III Microcontroller Support Units (8+1 Hrs)

A. Details of Components of Embedded Systems-Management of Power Supply, Clocking Unit, Real Time Clock and Timers, Reset Circuitry and Watchdog Timer. Structural Units of Processor, Processor and Memory Selection, Memory Map Of Embedded System, Interfacing Processors , Memories and I/O. Processor , Memory Map Of Embedded System

B. Design Parameters problem solving. PWM ADC Timers

Unit IV I/O Interfacing (8+1 Hrs)

A I/O interfacing and Communication I/O devices, ADC / DAC, Optical Devices such as LED / LCD Display devices, Opto-Isolator, Relay & stepper motor, Timers/Counters. Parallel v/s serial communication. Parallel ports their uses in device interfacing.
B. Design Implementation of OP Amps

Unit V RTOS (8+1 Hrs)

A. Device drivers, Interrupts, Interrupt Service Routines, Scheduling Algo, Inter Process Communication, Process Syn+chronisation. Multiple Tasks, Threads, Processes. Shared Data / Priority Inversion Char: of RTOS, Real Time Scheduling of RTOS
B. Case Study of Embedded Systems in Detail.(H/W + S/W Algo)

Text Books

1 Raj Kamal 'Embedded Systems ', Tata McGraw-Hill . ISBN0-07-049470-3
2. Dr. K. V. K. K. Prasad "Embedded/Real time System : Concepts, Design, & Programming ". Dreamtech Press

Reference Books

1. Dr. K. V. K. K. Prasad, Gupta Dass, Verma "Programming for Embedded system " Wiley -Dreamtech India Pvt. Ltd.
2. Sriram lyer , Pankaj Gupta,"Embedded Real time Systems Programming", Tata Mc-Graw Hill, 2004.

Additional Reading

1. Microcontroller Handbook
2. CAN Specification Version 2.0 Protocol Standard.
3. USB Specification Version 2.0 Protocol Standard.
4. I2C Specification Protocol Standard.
6. Tammy Noergaard, ― Embedded Systems Architecture‖ by Elsevier

FF No. : 654

CS42120 :: DATA MINING

Credits: 01 **Teaching Scheme: -**Tutorial**:** 1 Hr/Week

Prerequisites: Database Management Systems.

Objectives:

- Study different functionalities of data mining, various algorithms, and get an overview of significant data mining applications
- Mapping with PEOs: III, (e).

List of Contents

A TERM-WORK containing the record of the following assignments:

Implementation of following data-mining tasks using a suitable Data Mining Toolkit:

1. Data Preprocessing
2. Association Mining Algorithms
3. Classification Algorithms
4. Linear Regression
5. Clustering Algorithms

Text Books

1. "Data Mining: Concepts and Techniques", Jiawei Han and Micheline Kamber, Morgan Kaufman, ISBN 978-81-312-0535-8, 2nd Edition.
2. "Introduction to Data Mining", Pang-Ning Tan, Vipin Kumar, Michael Steinbach, Pearson

Reference Books

1. "Data Mining and Analysis: Fundamental Concepts and Algorithms", Mohammed J. Zaki, Wagner Meira Jr., Cambridge University Press
2. "Mastering Data Mining: The art and science of customer relationship management", M Berry and G. Linoff, John Wiley, ISBN 9971-51-369-2, 2001 Edition.
3. "Data Mining : Theory and Practice" , Soman K P, Diwakar Shyam, Ajay V, New Delhi, Prentice Hall Of India, ISBN 81-203-2897-3, 2006 Edition.

FF No. : 654

CS42128 :: MACHINE LEARNING

Credits: 01 **Teaching Scheme: -**Tutorial**:** 1 Hr/Week

Objectives:

- To introduce students to several prominent areas of machine learning, including feature extraction, decision trees, neural networks, genetic algorithms, Bayesian learning, clustering, ensemble learning, support vector machines, and reinforcement learning, and illustrate what types of problems the different methods are suited for.
- To give students hands-on experience with these methods and tools for implementing and using them on real-world problems.
- To give students experience with performing simulations and doing statistical data analysis of the results.
- To give students experience with performing simulations and doing Matlab neural network tool for data analysis of the results.

List of Tutorials

1. Implementation of learning algorithms like Find S algorithm, Version space and the candidate elimination algorithm, list then eliminate algorithm for simple real world problems.
2. Implementation of learning algorithms like Backprapogation algorithm, Support Vector Machines for real time problems.
3. Implementation of algorithms like Evaluating hypothesis accuracy, Sampling theory, Central limit theorem, hypothesis testing, for real time problems.
4. Implementation of learning algorithms like Bayesian Learning for real time problems.
5. Implementation of learning algorithms like weighted majority algorithm, Instance-Based Learning: k-nearest neighbor learning, locally weighted regression for real time problems.
6. Implementation of learning algorithms like Genetic Algorithms for real time problems.
7. Implementation of learning algorithms like unsupervised or reinforcement learning for real time problems.
8. Implementation of Fuzy logic for real time problems.

9. Presentations on selected research topics.
10. A mini project for a real problem.

Outcomes:

At the end of the course, the students will be able to:
1. Use the advanced concepts and techniques of soft computing.
2. Develop skills of using recent soft computing software for solving practical problems.
3. Gain experience of doing independent study and research.
4. Able to Publish papers in international conferences and journals.

Text Books

1) T. Mitchell, " Machine Learning", McGraw-Hill, 1997.
2) Randy L. Haupt and Sue Ellen Haupt , Practical Genetic Algorithms.
3) David E. Goldberg, Genetic Algorithms in Search, Optimization, and Machine Learning.

Reference Books

1). Ethem Alpaydin, "Introduction to Machine Learning", MIT press, 2004.
2). Jacek M. Zurada, "Introduction to Artificial neural System", JAICO publishing house,2002,.
3). Research papers suggested by the faculty.

FF No. : 654

CS42104 :: NEURAL NETWORKS

Credits: 01 **Teaching Scheme: -**Tutorial**:** 1 Hr/Week

Objectives:

- To focus on the foundations of neural network theory and the application of neural network models in real world problem solving.
- To make students capable to select an ANN model, design the topology and initialize the network parameters.
- To make students aware about advantages and shortcomings of ANN.
- To make them aware of modern neural network architecture.
- To make the students aware of supervised, unsupervised and reinforcement learning and algorithms used for each learning.

List of Tutorials:

Minimum eight experiments based on the following topics.
1. Supervised Leaning rules for a single neuron
2. Unsupervised Learning rules.
3. Simple Perceptron classifier
4. Feedforward neural network.
5. Backpropagation algorithm
6. MAXNET
7. Hamming Distance Classifier
8. Hopfield network
9. SOM
10. SVM
11. Verification of logic gates using NN algorithms
12. Feature extraction for a given real world problem of importance.
13. Design of Fuzzy sets for a given problem statement.
14. Two short assignments based on research papers suggested by staff.

Outcomes:
Upon completion of the course, the students will:
1. Have an in-depth understanding of artificial neural networks fundamentals.
2. Have a knowledge about various learning paradigms and models of ANN.
3. Be able to classify real problems into neural OR non-neural problem.
4. Have a good knowledge of feature extraction and selection.
5. Know about modern ANN architecture and hybrid neural systems (FNN).

Text Books

1. Jacek M. Zurada, "Introduction to Artificial neural System", JAICO publishing house,2002,.
2. Haykin, S., Neural Networks - A Comprehensive Foundation (2nd Edition). Macmillan, 1999.
3. Prof. Dr. S. T. Patil, Neural Networks and applications, Nirali Prakashan, Pune.

Reference Books

1. Christopher M. Bishop, "Neural Networks for Pattern Recognition", Indian Edition, oxford,1996
2. B. Yegnarayana, Artificial Neural Networks, PHI, 2001.
3. Timothy J. Rosss, "Fuzzy logic with engineering applications", Wiley, 2004.
4. Bart Kosko, "Neural networks and fuzzy systems", prentice hall of India, 1994.
5. John Yen and Reza Langari, "Fuzzy logic, intelligence, control and information",
6. Pearson education.
7. Some basic and modern research papers suggested by staff in charge.

FF No. : 654

CS42124:: ALGORITHMIC NUMBER AND ALGEBRA

Credits: 01 **Teaching Scheme: -** Tutorial 1 Hr/Week

Prerequisites: Basic introduction to linear algebra and abstract algebra (though it is not presumed) is helpful to better appreciate the contents of the course. First course on algorithms.

Objectives:

- Study basic number theory, various algebraic structures (such as groups, rings, fields, vector-spaces …etc) and their applications. These topics will be mainly studied in a computational perspective.
- Study various algorithms for several fundamental algorithmic questions in Number Theory and Algebra.
- Building up mathematical background and tools for further study in areas such as cryptography, computational number theory, computational complexity, coding theory.
- Mapping with PEOs I, II.

List of Contents

A TERM-WORK containing the record of the following:

1. Problem solving based on topic like prime numbers, gcd of integers, some simple number theoretic questions
2. Modular arithmetic, Chinese remaindering applications
3. Multiplicative functions, analytical estimates of some number theoretic functions
4. Problem solving (based on topics Groups, subgroups, homomorphism, cyclic groups etc)
5. Ring, ideals, some examples of commutative rings
6. Vector spaces
7. Integral domains, finite fields

8. More on finite fields, automorphisms, Frobenius maps, some algorithmic questions..
9. Ring of univariate polynomials F[x], quotient ring F[x]/(f)
10. Berlekamp's algorithm and more
11. Integer lattices
12. Carmichael numbers, Lagrange symbol, Jacobi symbols, Primality testing.

Text Books

1. Modern Computer Algebra by Joachim von zur Gathen, Jürgen Gerhard (Cambridge)
2. A computational introduction to Number Theory and Algebra by Victor Shoup(Cambridge)
3. A classical introduction to modern number theory by Ireland and Rosen (Springer)

Reference Books

1. Topics in Algebra by I. N. Herstein (Wiley Publishing company)
2. Algebra by Michael Artin (Pearson Prentice Hall)

FF No. : 654

CS42118::GEOGRAPHICAL INFORMATION SYSTEMS

Credits: 01 **Teaching Scheme: -** Tutorial 1 Hrs/Week
Prerequisites: Nil

Objectives:

- To study applications of GIS & Remote Sensing
- To study Data Modeling and Analysis required by these systems.
- Mapping with PEOs: I, V, (j).

List of Practical

A TERM-WORK containing the record of the following:

1. Prepare a map for the selected geographical area as per topological survey.
2. Design a spatial database for the entities related with a geographical area specified in above map.
3. Study the connectivity of maps with spatial databases.
4. Analyze a case study of any GIS application of your choice.
5. Prepare a presentation on any latest GIS technology / technique / software /hardware.

Text Books

1. "Remote Sensing and Geographical Information Systems", M. Anji Reddy B S Publications, Second Edition, 2006.
2. "Introduction to Geographic information systems", Kang-Tsung Chang, Tata-McGraw-Hill Publications, Third edition, 2006. ISBN: 978-0073101712.

Reference Books

1. "Principles of Geographical Information Systems", Peter A Burroughs and McDonnell, Oxford University Press, 1998. ISBN 978-0198233657.
2. "The GIS Book", George B Korte, Onward press (Thomson Learning), 5th Edition, 2001. ISBN 81-7800-112-8.

FF No. : 654

CS42129: MANAGEMENT INFORMATION SYSTEMS

Credits: 01 **Teaching Scheme: -** Tutorial 1 Hr/Week

Objectives:

- To identify and analyze the role of computer based information systems in the successful management of organizations.
- Elaborate the major types of information systems in organizations and their role in managing the organization.
- To recognize the moral dimensions of information systems problems and apply specific ethical principles to determine an appropriate course of action.
- Mapping with PEOs :- III, IV, (f).

List of Contents

A TERM-WORK containing the record of the following:

1. Consider any organization from any sector. Study its organizational structure and comment about it.
2. By giving examples, differentiate between operational, strategic and tactical level of management process and its effect on design information system.
3. Identify and evaluate the design considerations for the given information system.
4. Study testing and quality assurance strategies.
5. Identify cases of computer crime, hacking, and cyber theft with respect to given information system. Plan about how to avoid and deal with such kind of security threats.

Text Books

1. "Management Information Systems: Managing Information Technology in the Business Enterprise", James O'Brien, Tata McGraw-Hill Publishing Company Limited, 10th Edition, ISBN 0-07-058739-6.
2. "Management Information Systems", Jawadekar Waman S, Tata McGraw-Hill Publishing Company Limited, ISBN 0-07-044575-3, 2nd Edition.

Reference Books

1. "Management Information Systems: Managing the Digital Firm", Kenneth C. Laudon, and Jane P. Laudon, Prentice-Hall of India, ISBN 81-203--2908-2, 9th Edition.

2. "Management Information Systems", Oz Effy, Singapore, Thomson, ISBN 81-315-0174-4, 5th Edition.

Additional Reading

1. "Management Information Systems", Shajahan S, Priyadharshini R, New Age International, ISBN 81-224-1549-0.
2. "Management Information Systems", Arora Ashok, Bhatia Akshaya, Excel Pub, ISBN 81-7446-188-4.
3. "Information Systems A management Perspective", Alter Steven, Addison Wilsey, ISBN 0-201-35109-9, 3rd Edition.
4. "Information Systems For Modern Management", Murdick R G, Ross J E, Claggett J R, Prentice Hall Of India, ISBN 81-203-0397-0, 3rd Edition.

FF No. : 654

CS42121 :: ADVANCED COMPUTER ARCHITECTURE

Credits: 01 **Teaching Scheme: -** Tut 1 Hrs/Week
Prerequisites: Computer Organization

Objectives:

- To study Parallel Processing concepts and Parallel Processor architecture.
- To study various types of Advance Computer Architecture.

List of Contents:

1. Introduction to Explicitly Parallel Instruction Computing (EPIC) Architecture.
2. To study numerical based on Performance Metrics and Measures, Speedup Performance Laws.
3. To study implementation issues of a program on any pipelined processor and their analysis.
4. To study numerical based on Pipelining.
5. To study implementation issues of Matrix multiplication and sorting on array processor and their analysis**.**
6. To study implementation issues of a program on multiprocessor system.
7. To study implementation issues of a multithreaded program.
8. To study Architecture of Multithreaded processors

Text Books

1. Kai Hwang, Faye A. Briggs, "Computer Architecture and Parallel Processing" McGraw-Hill international Edition.
2. Kai Hwang, "Advanced Computer Architecture", Tata McGraw-Hill.

Reference Books

1. Rajaraman, L Sivaram Murthy, "Parallel Computers", PHI.
2. William Stallings, "Computer Organization and Architecture, Designing for performance" Prentice Hall, Sixth edition.
3. Kai Hwang, Scalable Parallel Computing.
4. Harrold Stone, High performance computer Architecture.
5. Richard Y. Kain, Advanced Computer Architecture
6. http://www.intel.com/products/processor (for Intel Itanium Processor).

CS42116 :: CONVERGENCE TECHNOLOGY

Credits: 01 **Teaching Scheme: -**Tutorial: 1 Hr/Week

Prerequisites: : Nil

Objectives:

- To understand the next generation technology.
- Understand the switching techniques.

List of Contents

A TERM-WORK containing the record of the following:

A. Assignments :

1. Study of audio and video data.
2. Signal passing through network for voice data.
3. Study of E/T cables.
4. Study of gatekeepers in convergence technology.
5. Study of ISDN devices.
6. Study of SIP implementation.
7. Study of SS7 implementation.
8. Comparison of ISDN and B-ISDN.
9. Use of frame relay in convergence.
10. Examples on convergence

Text Books

1. "ISDN and Broadband ISDN with frame relay and ATM" by William Stallings, Pearson Education, 2003, ISBN 81-7808-422-8, 4th Edition.
2. "Voice over IP Technologies" by Mark A. Miller, P.E., Wiley Publications, 2002, ISBN 81-265-0286-X, 1st Edition.

Reference Books

1. "Computer Communications and Networking Technologies", by Michael A. Gallo, William M. Hancock, Cengage Learning, 2002, ISBN81-315-0364-X, 1st Edition.
2. "ATM network concepts and protocols", by Sumeet Kasera and Pankaj Sethi, Tata McGraw Hill, 2001, ISBN 0-07-463776-2, 1st Edition.

Additional Reading

1. "VOIP", by Ulyess Black, Pearson Education, 2001, ISBN 0130652040, 2nd Edition.
2. "Multimedia communication system techniques standards and networks", by K.R. Rao, Zoran Bojkovic and Dragorad Milovanovic, Pearson Education, 2002, ISBN 0-13031398-X, 1st Edition.

FF No. : 654

CS42130:: EMBEDDEDED SYSTEMS

Credits: 01 **Teaching Scheme: -**Tutorial 1 Hr/Week

Prerequisites: MI MPMC.

Objectives:

- To study the different design issues of Embedded Systems.
- To study various methods of Designing & Interfacing Hardware in Embedded Systems.

List of Contents

A TERM-WORK containing the record of the following:

1. Interface the LCD to Microcontroller
2. Understanding Different Interrupts and Programming The Interrupts
3. Programming the ADC in Microcontroller
4. Program the USART in Microcomputer.
5. Program the I2C Interface
6. Program the SPI interface.
7. Study different kinds of RESET.
8. Program the Timers for Creating the Square Wave.
9. Switching TRIACS and SCR.
10. Mini Project Design and Implementation

Text Books

1 Raj Kamal 'Embedded Systems ', Tata McGraw-Hill . ISBN0-07-049470-3
2. Dr. K. V. K. K. Prasad "Embedded/Real time System : Concepts, Design, & Programming ". Dreamtech Press

Reference Books

1. Dr. K. V. K. K. Prasad, Gupta Dass, Verma "Programming for Embedded system " Wiley -Dreamtech India Pvt. Ltd.
2. Sriram lyer , Pankaj Gupta,"Embedded Real time Systems Programming", Tata Mc-Graw Hill, 2004.

Additional Reading

1. Microcontroller Handbook
2. CAN Specification Version 2.0 Protocol Standard.
3. USB Specification Version 2.0 Protocol Standard.
4. I2C Specification Protocol Standard.
5. Tammy Noergaard, ― Embedded Systems Architecture‖ by Elsevier

FF No. : 654

CS40312: Software Testing and Quality Assurance

Credits: 01 **Teaching Scheme: -** Laboratory 2 Hrs/Week

Prerequisites: Software Engineering

Objectives:

- To understand Software Measurement Theory and Software Test Automation
- To practice Software Testing Techniques and Strategies
- Understand the fundamental concepts, approaches, and methodologies in software quality management and assurance.
- Understand the framework and general approach of several Quality System Standards and Total Quality Management (TQM).
- Mapping with PEOs: III, (e).

List of Contents

A TERM-WORK containing the record of the following:

1. To Prepare Test Plan for the implemented system under test. The Test plan consists of following issues.
    a. Purpose of the test.
    b. Location and schedule of the test.
    c. Test descriptions.
    d. Pass and Fail Criteria.

2. To identify and narrate Test cases, Test scripts/procedures and Test incident Report identifier for the system under test. Refer Use case analysis document to prepare mentioned/ identified test documents.

3. To perform Unit testing especially indicating the traced Independent data paths, Control paths and Error handling paths. Prepare control flow graphs for the unit under test. Compute the Cyclomatic complexity of the unit.

4. To perform Data Flow testing for the Program Segments by identifying the Definition-Use chain and type of data flow anomaly.

5. To perform Mutation Analysis of the Program Segments along with mutant history, mutation score and type of mutation by using any Code analysis Tool / Mutation Testing Tool (JUNIT, MuJava).

6. To study difference between Automation Testing and Manual Testing use Rational Functional Testing Tool and Rational Quality Manager Tool (Hands on).

7. To perform Black-Box Testing for all the units contained in the architectural segments using Equivalence Partitioning, Boundary Value Analysis and Orthogonal Array testing methods. To study exploratory Testing for the Module under Test and merits/demerits of this technique.

8. To perform Regression Testing / GUI Testing of the System under construction with Unit and Integration profiles by using any Functional Testing Tool.

9. To study Web Based Testing for Web Application incorporating any Open Source Tool. To study Performance Testing, Load Testing, Security Testing, Stress Testing, Demonstrate on link Test expectation.

Text Books:

1. Fenton, Pfleeger, "Software Metrics: A Rigourous and practical Approach", Thomson Brooks/Cole, ISBN 981-240-385-X.
2. Desikan, Ramesh, "Software Testing: principles and Practices", Pearson Education, ISBN 81-7758-121-X.

Reference Books :

1. Burnstein, "Practical Software Testing", Springer International Edition, ISBN 81-8128-089-X
2. William E. Perry, " Effective Methods for Software Testing", John Wiley and Sons, ISBN 9971-51-345-5
3. Yogesh Singh, "Software Testing", Cambridge University Press, ISBN 978-1-107-01296-7
4. Nina Godbole, "Software Quality Assurance: Principles And Practice",Alpha Science International, Ltd (August 1, 2004) ISBN-10: 1842651765 ISBN-13: 978-1842651766
5. Ronald Radice, "Software Inspections", Tata McGraw Hill, ISBN 0-07-048340-X
6. Capers Jones," Software Assessments, Benchmarks, and Best Practices" ,Burlington, Vermont Publisher: Addison-Wesley Professional 2000 ISBN-10: 0201485427 ,ISBN-13: 9780201485424

FF No. : 654

CS40314::INFORMATION SYSTEMS SECURITY

Credits: 01 **Teaching Scheme: -** Laboratory 2 Hrs/Week

Prerequisites: Nil

Objectives:

- Able to analyze the packets.
- To understand the various attacks.
- To able to do encryption and decryption.

List of Practical

1. Demonstrate: SQL injection, Cross-site scripting, buffer overflow.
2. Implement packet sniffer.
3. Implementation of Caesar and Vigenere Cipher
4. Implementation of Playfair Cipher
5. Implementation of Hill Cipher
6. Implementation of S-DES.
7. Implementation of S-AES
8. Implementation of RSA.
9. Implementation of Diffie-Hellman key exchange
10. Implementation of DOS/DDOS attack.
11. Design your own database and make it secured to avoid the various attacks.

Text Books

1. "Network Security and Cryptography", by Bernard Menezes, Cengage Lerning, 2010, ISBN 81-315-1349-1, 1st Edition.
2. "Cryptography and Network Security-Principles and Practices" by William Stallings, Pearson Education, 2006, ISBN 81-7758-774-9, 4th Edition.

Reference Books

1. "Computer Security: Art and Science", by Matt Bishop, Pearson Education, 2002, ISBN 0201440997, 1st Edition.
2. "Network security, private communication in a public world", by Charlie Kaufman, Radia Perlman and mike speciner, Prentice Hall, 2002, ISBN 9780130460196, 2nd Edition.

Additional Reading

1. "Security architecture, design deployment and operations", by Christopher M. King, Curtis Patton and RSA press, McGraw-Hill, 2001, ISBN 0072133856, 1st Edition.
2. 'INSIDE NETWORK Perimeter Security" by Stephen northcatt, leny zeltser, et al, Pearson Education Asia, ISBN 8178087618, 1st Edition.

FF No. : 654

CS47308:: PROJECT STAGE 3

Credits: 06 **Teaching Scheme: -** Practical 12 Hrs/Week

Aim

This course addresses the issues associated with the successful management of a software development project. The course emphasizes project life cycle phases requirement engineering, system analysis and system design. A further aim is for students to heighten personal awareness of the importance of developing strategies for themselves and their career. The Project Work can lead to:

a. Transform existing systems into conceptual models.
b. Transform conceptual models into determinable models.
c. Use determinable models to obtain system specifications.
d. Select optimum specifications and create physical models.
e. Apply the results from physical models to create real target systems.

Objectives

1. To provide an understanding of the project planning process and problem scoping
2. To define roles and work with cross functional teams
3. To establish clear project objectives and milestones
4. To create effective and deliverable project plans
5. To perform rigorous analysis and design activities for solution planning
6. To select appropriate technology for implementation and testing
7. Mapping with PEOs: III, IV, (f).

Overview of the Course:

1. The Student Project Group will prepare a detailed Project Report consisting Semester I Preliminary Project document along with Detailed System Design Document, Implementation and Testing Document with conclusion and future scope of the Project Work. All the documents indicated will have a prescribed format. The Project Report ideally should consist of following documents : (Exceptions may be there based on the nature of the project, especially if some of the following documents are not applicable to a particular project as determined by the project guide, coordinator and head of department).

Sr.	Project Item
1	Project Cover Front Page
2	Project Completion Certificate [Institute]

3	Project Completion Letter [In case of Sponsored Projects]
4	Acknowledgments
5	Table of Contents
6	List of Figures
7	List of Tables
8	Project Synopsis [Problem Background, Existing System Details, Proposed Solution]
9	Feasibility Study Report
10	Project Plan
11	System Requirement Specification
12	System Analysis Document: UML Use Case Diagrams
13	System Analysis Document: UML Sequence Diagrams
14	System Analysis Document: UML State Diagrams
15	System Design Document with Module Specifications
16	System Implementation
17	System Testing and Experimental Findings
18	Conclusion
19	References

2. The Project Work will be assessed jointly by a panel of examiners consisting faculty and industry experts. The Project Groups will deliver the presentation and demonstration of the Project Work which will be assessed by the panel.
3. The Student Project Group needs to actively participate in the presentation. The panel of examiners will evaluate the candidate's performance based on presentation skills, questions based on the Project Work and overall development effort taken by the candidates.

Note:
The student needs to design and develop solution for the identified technological problem in the area of Computer Engineering or Information Technology of their choice. The Project Implementation needs to be completed using best possible use of available technologies as applicable to deal with the complexity of the project. The Project Group will prepare a detailed report of the project work which will be approved by the concerned faculty member. The Project Report need to be submitted both in Hard form and Soft form in CD. The Soft Copy of the Project Report must accompany other project deliverables as well.

Assessment Scheme

Sr. No.	Content	Marks
1	System Requirement Specification	05
2	Feasibility Study	05
3	System Analysis	10
4	System Design	10
5	System Implementation	25
6	System Testing	25
7	Presentation of the Project Work	20

Outcomes:

Upon completion of the course, the students will be to:

1. Identify major issues in complex situations; and know how to prepare alternative solutions and make decisions.
2. Becoming aware of the need to think and act in an entrepreneurial manner by developing the ability to: critically and creatively understand innovations and development, work independently and collaboratively.

PD

FF No. : 654

CS33303:: ADVANCED JAVA

Credits: 01 **Teaching Scheme: -** Laboratory 2 Hrs/Week

Prerequisites: Core Java.

Objectives:

At the end of course Students will be able to :

- Use the advanced features of Java Technology
- Work with collection API and develop fast programs.
- Use the serialization concepts of java technology.
- Develop good multithreaded programs
- Work the latest JDBC technology

List of Practical

1. Design a java application to demonstrate the use Java revision, anonymous inner classes, file handling, GUI, event handling, debugging using IDE.

2. Design a java application to demonstrate use of Multithreading, concurrency, synchronous and asynchronous callbacks, ThreadPools using ExecutorService.

3. Design a java application to demonstrate use of Collections and generics.

4. Design a java database application using multithreading and concurrency control.

5. Design a java application to demonstrate use of Servlets and JSP.

6. Design a client-server application demonstrating the use of Java I/O using sockets with GUI for configurations.

7. Design a java RMI application.

8. Designing a java application to demonstrate use of Web Services - REST and SOAP.

9. Design a java application to demonstrate dynamic invocation using reflection.

Text Books

1. "Advanced Java 2: development for enterprise applications", Clifford J. Berg, Sun ISBN: 0130848751, Microsystems Press, 2000.
2. "Advanced Java networking", Dick Steflik, Prashant Sridharan, ISBN: 0130844667, Prentice Hall PTR, 2000.

Reference Books

1. "Java: The Complete Reference", , Herbert Schildt, Mc Graw Hill Publication, Seventh Edition, ISBN: 007063677X, 2006.
2. "Java generics and collections", Thomas Powell, O'Reilly Media, ISBN: 0596527756, 2006.

FF No. : 654

CS33312:: PIC Microcontroller

Credits: 01 **Teaching Scheme: -** Laboratory 2 Hrs/Week

Prerequisites: Microprocessor, x86 , x86 Interfacing Chips.

Objectives:

- To Be familiar with PIC Microcontroller.
- To Study and Interface Peripheral (IP) .
- To Understand Design of Microcontroller Based Projects.

List of Practical

1. Assignment on Program Compilation and Burning into Microcontroller.
2. Assignment on Input Output.
3. Assignment on Interrupt.
4. Assignment on LED.
5. Assignment on Timer.
6. Assignment on LCD.
7. Assignment on UART.
8. Assignment on Write and Read from EEPROM.
9. Assignment on ADC.
10. Assignment on PWM.
11. Assignment on Stepper Motor.

Text Books

1. Data Sheet www.microchip.com
2. Hitachi Data Sheet on LCD HD 44780

Reference Books

1. Microchip 18F45xx

FF No. : 654

CS33313:: MOBILE APPLICATION DEVELOPMENT

Credits: 01 **Teaching Scheme: -** Laboratory 2 Hrs/Week

Prerequisites: Java.

Objectives:

At the end of course Students will be able to :

- Use Eclipse IDE and Android Development Tools plug-ins.
- Work with Android SDK UI widgets.
- Develop simple android applications.
- Develop internet based application.
- Work with Embedded database SQLite.

List of Practical

1. Download, Install and Configure Eclipse IDE with Android Development Tools (ADT) plug-ins and Android SDK.

2. Building Simple User Interface using UI Widgets such as Buttons, Text Fields and View.

3. Design an android based application using content provider.

4. Develop an android based application to implement the sequential and random file operation.

5. Develop an android based application to create simple embedded database for the student attendance and find defaulters in the class using SQLite.

6. Design an android based application to demonstrate GPS services using Google map.

7. Design an android based application to implement HTTP operations for internet communication.

8. Design an android based application to implement chat application using socket programming.

9. Design an android based application to take a snapshot by using the Camera in

your mobile. Save the snapshot in the image or video format. Use Camera Media API provided Android.

10. Mini Project.

Text Books

1. "Head First Android Development", Jonathan Simon, O'Reilly Media, Inc., 1005 Gravenstein Highway North, Sebastopol, CA 95472,
   ISBN: 978-1-449-39330-4, 2011
2. "Beginning Android™ Application Development", Published by Wiley Publishing, Inc.10475 Crosspoint Boulevard Indianapolis, IN 46256. ISBN: 978-1-118-01711-1, 2011

Reference Books

1. "Professional Android™ Application Development", Published by Wiley Publishing, Inc.10475 Crosspoint Boulevard Indianapolis, IN 46256, ISBN: 978-0-470-34471-2, 2009
2. "Pro Android 4", Published by Apress,Satya Komatineni, Dave MacLean,
   ISBN 978-1-4302-3930-7, 2012

FF No. : 654

CS33306: ETHICAL HACKING AND NETWORK DEFENSE

Credits: 01 **Teaching Scheme: -** Laboratory 2 Hrs/Week

Prerequisites: Fundamentals of IT, Networking, Microsoft OS, LINUX or UNIX operating systems

Objectives:

- Explain what an ethical hacker can and cannot do legally, and explain the credentials and roles of penetration testers.
- Define the types of malicious software found in modern networks.
- Explain the threats and countermeasures for physical security and social engineering.
- Perform foot printing to learn about a company and its network.
- Perform port scans to locate potential entry points to servers and networks.
- Perform enumeration (finding resources, accounts, and passwords) on Microsoft,
- Netware and Unix/Linux targets.
- Perform very simple programming in C, HTML, and Perl, specifically oriented towards the needs of network security professionals.
- Learn how to identify Microsoft Windows vulnerabilities and to harden systems.
- Learn how to identify Linux vulnerabilities and to protect servers.
- Describe how to take control of Web Servers, and how to protect them.
- Locate and hack into wireless networks, and protect them.
- Explain how cryptography and hashing work, and perform attacks against them such as password cracking and man-in-the-middle attacks

Unit I **(8+1 Hrs)**

Understanding Ethical Hacking Terminology, Identifying Different Types of Hacking Technologies, Understanding the Different Phase Involved in Ethical Hacking, Hacktivism, Types of Hacker Classes, Ethical Hackers and Crackers, Goals of Attackers, Security, Functionality And Ease of Use Triangle, Defining the Skills Required to become an Ethical Hacker, Project, How to Conduct Ethical Hacking, Creating a Security Evaluation Plan, Types of Ethical Hacks, Footprinting and Social Engineering, Understand How Traceroute Is Used in Footprinting, Define the Terms Port Scanning, Network Scanning and Vulnerability, Scanning, Project, Understand various Scanning Methodologies,SYN, Stealth, XMAS, NULL, IDLE and FIN Scans, Project

Unit II **(8+1 Hrs)**

TCP Communication Flag Types, Banner Grabbing and OS Fingerprinting Techniques How Proxy servers are used in launching an Attack?, Http tunneling Techniques, IP Spoofing Techniques, Enumeration, Password-cracking Techniques, Cracking Windows

2000 Passwords, Redirecting the SMB Logon to the attackers, SMB Redirection, SMB , Relay MITM Attacks and Countermeasures, NetBIOS DOS Attacks, Project, Password-Cracking Countermeasures, Active/Passive online Attacks, Offline Attacks, Nonelectronic Attacks, Keyloggers and other Spyware Technologies, Project.

Unit III **(8+1 Hrs)**

Trojans and Backdoors, Overt and Covert Channels, Types of Trojans, Reverse-connecting Trojans, Netcat Trojan, Indications of a Trojan Attacks, Project, Wrapping Trojan Construction Kit and Trojan Makers, The countermeasure Techniques in Preventing Trojans, Trojan-Evading techniques, System File Verification, Project
Difference between a Virus and a Worm, Types of Viruses, Antivirus Evasion Techniques,Virus Detection Methods.

Unit IV **(8+1 Hrs)**

Protocols Susceptible to Sniffing, Active and Passive Sniffing, ARP Poisoning, Ethereal Capture and Display Filters, MAC Flooding, DNS Spoofing Techniques, Describe Sniffing Countermeasures, Project, Types of DOS Attacks, How DDos Attacks Work,
How BOTs/BOTNETs work, Smurf Attacks, SYN Flooding, Project, Spoofing vs Hijacking, Types of Session Hijacking, Steps to perform session Hijacking, Prevention of session Hijacking, Project

Unit V **(8+1 Hrs)**

Hacking Web Servers, Web Application Vulnerabilities, Web-Based Password Cracking Techniques, Project, Wireless Hacking, WEP, WPA Authentication Mechanisms and Cracking Techniques, Wireless Sniffers and Locating SSIDS, MAC spoofing, Wireless hacking Techniques, Methods used to secure Wireless Networks, Project, Linux Hacking
Compilation of a Linux Kernel, GCC Compilation Commands, How to install Linux Kernel Modules, Linux Hardening Methods, IDSs, Honeypots and Firewalls,Project.

Unit VI **(8+1 Hrs)**

Physical Security, Overview of Physical Security, Need of Physical Security, Factors Affecting Physical Security, Project, Penetration Testing Methodologies, Security Assessments, Overview of Penetration Testing Methodologies, Penetration Testing Steps
Pen-Test Legal Framework, Automated Penetration Testing Tools, Pen-Test Deliverables.

Text Books

1. Michael T Simpson – "Ethical Hacking and Network Defense".

FF No. : 654

CS33310: SPRINGS FRAMEWORK

Credits: 01 **Teaching Scheme: -** Laboratory 2 Hrs/Week

Prerequisites: Java, JSP, Servlets

Objectives:

- Be familiar with Basic and Advance Java.
- Understand and Use Framework.
- Understand struts

List of Practical

1. Assignment on Spring Environment Setup.
2. Assignment on Spring Hello World Example.
3. Assignment on Spring IOC Container.
4. Assignment on Spring Bean Scopes, Spring Bean Life Cycle.
5. Assignment on Spring Bean Post Processors.
6. Assignment on Spring Dependency Injection, Spring Injecting Inner Beans, Spring Injecting Collection, Spring Beans Auto-Wiring.
7. Assignment on Spring Annotation Based Configuration, Spring Java Based Configuration.
8. Assignment on Event Handling in Spring.
9. Assignment on Spring AOP Assignments.
10. Assignment on Spring JDBC assignments.
11. Assignment on Spring Web-MVC Assignments.

Text Books

1. Spring Recipes – A problem solution approach by Gary Mak, Josh Long and Daniel Rubio.
2. Professional Java Development with the Spring Framework, by Rod Johnson
3. Spring Live by Matt Raible.

Reference Books

1. Pro Spring 3.0 by Clarence Ho, Rob Harrop.
2. Expert Spring MVC and Web Flow by Seth Ladd, Darren Davison, Steven Devijver, Colin Yates

FF No. : 654

CS33311: STRUTS FRAMEWORK

Credits: 01 **Teaching Scheme: -** Laboratory 2 Hrs/Week

Prerequisites: Java, JSP, Servlets

Objectives:

- Be familiar with Basic and Advance Java.
- Understand and Use Framework.
- Understand struts

List of Practical

1. Building a Simple Struts Application
2. Struts validator framework
3. Setup validator framework in Struts
4. Struts validator Framework
5. Using the validator framework in struts
6. Validator framework work in Struts
7. Sing validator framework work in struts
8. Using the validator Framework
9. Fixed Value check using struts validator framework
10. Struts 2 double validator
11. Struts 2 Date validator
12. Client Side Address Validation in Struts
13. Struts 2 RequiredString validator
14. Struts 2 E-mail Validator
15. XML files used in Validator Framework?
16. struts - Framework
17. Struts 2 Validation (Int Validator)
18. Struts 2 Url Validator
19. Validation using validator-rules.xml – Struts

Course Outcomes: At the end of this course students should be able to understand:

i. Struts Architecture
ii. Action Mappings
iii. Forms
iv. The JSP Standard Tag Library
v. Internationalization And Localization

vi. Input Validation
vii. Advanced Configuration

Text Books

1. "Jakarta Strus Live" by Rick Hightower published by SourceBeat.
2. Struts: The Complete Reference by James Holmes.

Reference Books

1. The Struts Framework: Practical Guide for Java Programmers by Sue Spielman.
2. Struts 2 Black Book, 2nd Edition, Kogent Solutions Inc.

FF No. : 654

CS33314:: PROBLEM SOLVING AND PROGRAMMING

Credits: 01 **Teaching Scheme: -** Laboratory 2 Hrs/Week

Prerequisites: Data strutures.

Objectives:

- To introduce advanced data structures, problem solving paradigms
- To study the representation, implementation & applications of data structures.
- To compare alternative implementations of data structures.
- To choose the appropriate data structure for modeling a given problem

List of Practical

1. Data structure review (stack, queue, linked list).
2. Graph searching techniques (DFS, BFS, IDDFS etc.) and applications of graph searching in problems in programming competition..
3. Advanced data structures union-find (including optimized algorithms like path compression), segment trees, interval trees, augmented data structures and their applications.
4. String searching algorithms.
5. Dancing links to speed up backtracking
6. Network flow.

Text Books

1. "Fundamentals of Data Structures in C", E. Horwitz , S. Sahani, Anderson-Freed, Universities Press, Second Edition, 2008, ISBN 978-81-7371-605-8.
2. "Introduction to Algorithms", T. Cormen, R.Rivest, C. Stein, C. Leiserson, PHI publication, Second Edition, 2004, ISBN 81-203-2141-3.
3. Jon Kleinberg, Eva Tardos "Algorithm Design", Pearson, 1st edition, 2005. ISBN 978-81-317-0310-6

Reference Books

1. "Advanced Data structures", Peter Brass, Cambridge Publication, 1st Edition, 2008 , ISBN – 978-0-521-88037-4.
2. "Data Structures and algorithms with Object Oriented design Patterns in Java", Bruno R. Preiss, wiley Publication, 1st Edition, 2000. ISBN: 978-0-471-34613-5.