OUTCOME BASED EDUCATION (OBE)

FOR

BACHELOR OF TECHNOLOGY

IN

COMPUTER SCIENCE AND ENGINEERING

CURRICULUM AND SYLLABUS

NITTUGCSE08

2013 - 2014

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History of Department of CSE

Program	Description
UG in B. Tech. (Computer Science & Engineering)	Started with 30 seats in 1983 Intake increased to 40 in 1990 Intake increased to 66 in 1998 Intake increased to 76 in 2009 Intake increased to 92 in 2010 Accredited by NBA-AICTE in 1997 for 5 years Accredited by NBA-AICTE in 2005 for 3
PG in M. Tech. (Computer Science & Engineering)	Started with 10 seats in 1987 Current Sanctioned Intake 28 Accredited by NBA-AICTE in 2008 for 5 years

Institute Vision and Mission

Institute Vision

- To provide valuable resources for industry and society through excellence in technical education and research

Institute Mission

- To offer state-of-the-art undergraduate, postgraduate and doctoral programmes
- To generate new knowledge by engaging in cutting-edge research
- To undertake collaborative projects with academia and industries
- To develop human intellectual capability to its fullest potential

CSE Department Vision and Mission

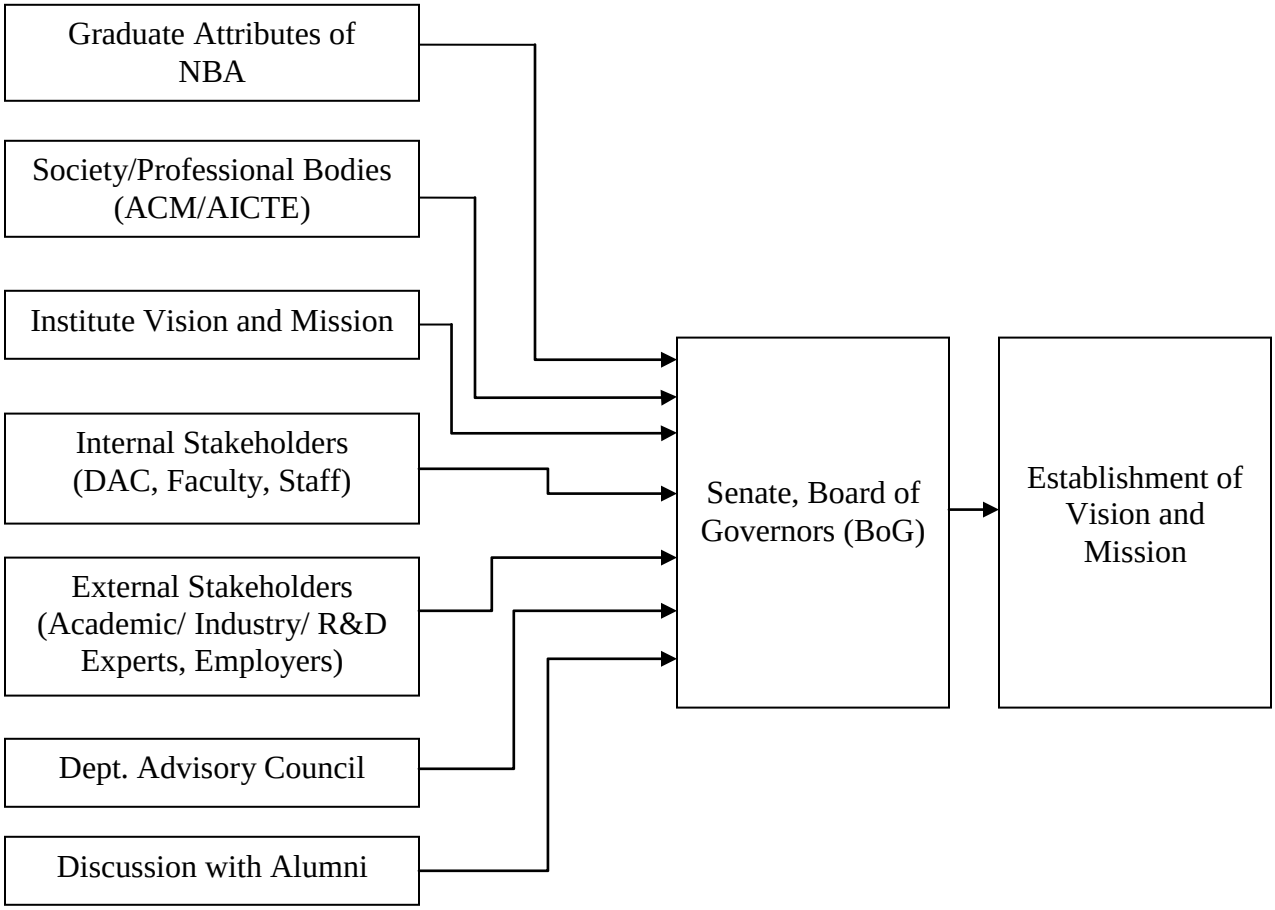
Department vision

- To Produce “Creators of Innovative Technology”

Department Mission

- To impart knowledge in the state of art in Computer Science and Engineering with relevant theoretical basis
- To participate in design and development process in industries and research establishments
- To promote research of international quality.

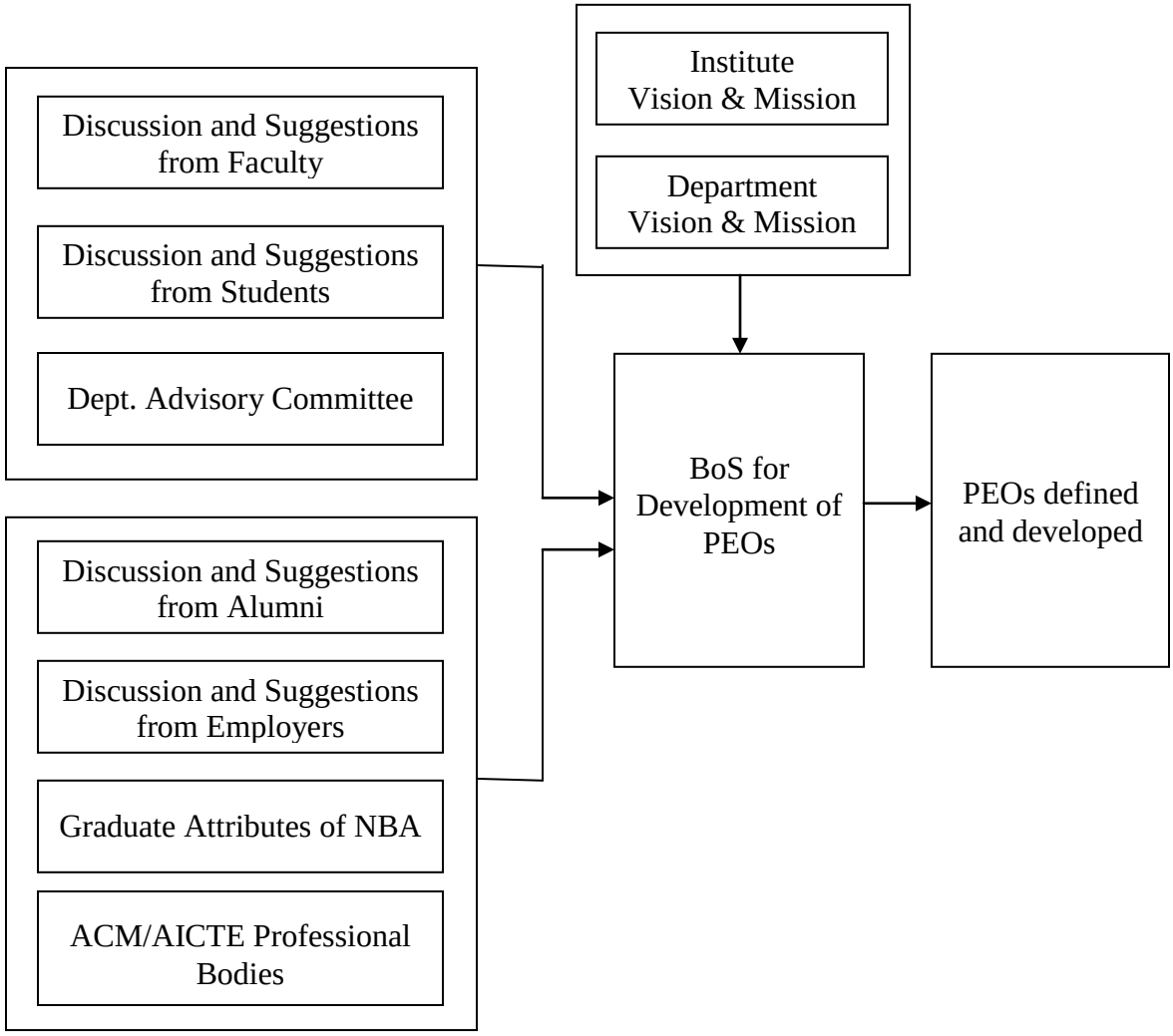
Department Vision and Mission Definition Process



Programme Educational Objectives (PEO)

- Graduates are prepared to be employed in IT industries and be engaged in learning, understanding, and applying new ideas
- Graduates are prepared to take up Masters/Research programmes
- Graduates are prepared to be responsible computing professionals in their own area of interest.

PEO Process Establishment



Mapping of Institute Mission to PEO

Institute Mission	PEO
To offer state-of-the-art undergraduate, postgraduate and doctoral programmes	PEO – 1 and PEO – 2
To generate new knowledge by engaging in cutting-edge research	PEO – 1, PEO – 2, and PEO – 3
To undertake collaborative projects with academia and industries	PEO – 2 and PEO – 3
To develop human intellectual capability to its fullest potential	PEO – 1 and PEO – 3

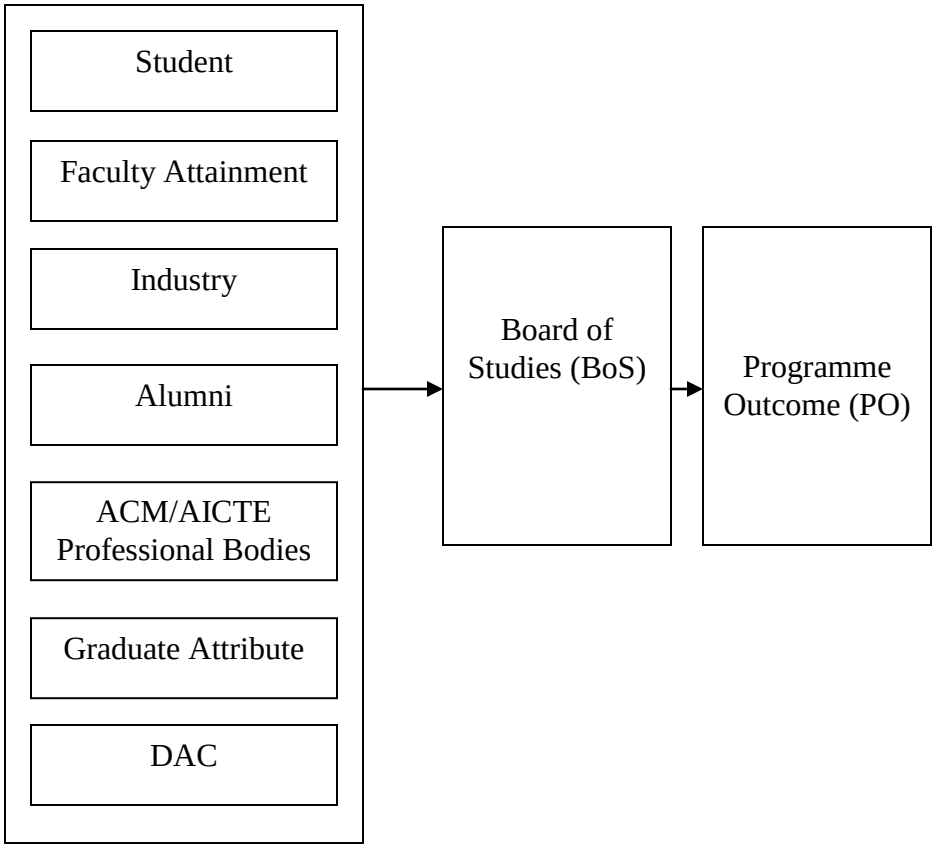
Mapping of Department Mission to PEO

Department Mission	PEO
To impart knowledge in the state of art in Computer Science and Engineering with relevant theoretical basis	PEO – 1, PEO – 2, and PEO – 3
To participate in design and development process in industries and research establishments	PEO – 1 and PEO – 2
To promote research of international quality	PEO – 1 and PEO – 2

Programme Outcome (PO)

1. Ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modelling and design of computer based systems
2. Ability to apply the engineering knowledge in all domains, viz., health care, banking and finance, other professions such as medical, law, etc.
3. Ability to design and conduct experiments as well as to analyze and interpret data
4. Ability to analyze the problem, subdivide into smaller tasks with well defined interface for interaction among components, and complete within the specified time frame and financial constraints
5. Ability to propose original ideas and solutions, culminating into a modern, easy to use tool, by a larger section of the society with longevity
6. Ability to design, implement, and evaluate secure hardware and/or software systems with assured quality and efficiency
7. Ability to communicate effectively the engineering solution to customers/users or peers
8. Ability to understand contemporary issues and to get engaged in lifelong learning by independently and continually expanding knowledge and abilities

PO Process Establishment



Correlation between the POs and the PEOs

	PEO-1	PEO-2	PEO-3
PO-1	√	√	
PO-2	√	√	√
PO-3	√	√	
PO-4	√	√	
PO-5	√	√	√
PO-6	√	√	√
PO-7	√		√
PO-8	√	√	√

Mapping of POs with Course Delivery

PO	Course Delivery								
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
1	√	√	√	√	√	√	√		√
2	√	√	√	√	√	√	√		
3	√	√	√						
4			√	√	√	√			
5	√	√					√	√	
6	√	√	√	√	√	√			√
7				√	√	√	√	√	√
8	√							√	

* Course Delivery:
  1. Class room Lecture
  2. Laboratory class and demo
  3. Group Assignments
  4. Mini Project
  5. Final Project
  6. Term Project
  7. Comprehensive Viva Voce
  8. Seminar
  9. Internship

Mapping of Courses and POs

S: Strong Correlation M: Medium Correlation Blank: No Correlation

Course Code	Course Name	Programme Outcomes							
		1	2	3	4	5	6	7	8
CS 201	Discrete Mathematics	S					M		M
CS 203	Principles of Programming Languages	S	S	S	S		S		M
CS 205	Numerical Computing	S	S	M					
CS 207	Data Structures	S	S	S	S				
CS 209	Digital Computer Fundamentals	S	S	S	S	S	S		M
CS 211	Computer Organization and Architecture	S	S	S	S	S	S		M
CS 213	Programming Languages Lab	S	S	S	S		S		M
CS 215	Data Structures Lab	S	S	S	S				
CS 202	Automata and Formal Languages	S	S	S	S	S			M
CS 204	Digital System Design	S	S	S	S	S	S		M
CS 206	Logical Foundations of Computer Science	S	S	S	S				
CS 208	Introduction to Algorithms	S	S	S	S	M	S		S
EC 214	Basics of Communication Engineering	S	S	S	S	S	S		M
MA 204	Introduction to Probability Theory	S	S	S	S	S			S
CS 214	Digital System Design Lab	S	S	S	S	S	S		M
CS 216	Algorithms Lab	S	S	S	S	M	S		S
CS 301	Systems Programming	S	S	S	S	S	S		M
CS 303	Computer Networks	S	S	S	S	S	S		M
CS 305	Microprocessor Systems	S	S	S		S	S		M
CS 307	Software Engineering	S	S		S		S	S	S
CS 309	Combinatorics and Graph Theory	S	S	S	S				M
MA 304	Principles of Operational Research	S	S	S	S	S			M
CS 313	Microprocessor Systems Lab	S	S	S		S	S		M
CS 315	Systems Programming	S	S	S	S	S	S		M

Course Code	Course Name	Programme Outcomes							
		1	2	3	4	5	6	7	8
	Lab								
CS 302	Information Security	S	S	S	S	S	S		S
CS 304	Operating Systems	S	S	S	S	S	S		S
CS 306	Database Management Systems	S	S	S	S	S	S		S
HM 302	Corporate Communication							S	S
CS 308	Artificial Intelligence and Expert Systems	S	S	S	S	S	S		M
CS 352	Design and analysis of Parallel algorithms	S	S	S	S				M
CS 354	Advanced Microprocessor systems	S	S	S		S	S		M
CS 314	Operating Systems Lab	S	S	S	S	S	S		S
CS 316	Database Laboratory	S	S	S	S	S	S		S
CS 401	Distributed Computing	S	S	S	S	S	S		S
CS 403	Web Technology	S	S	S	S	S	S		M
CS 405	Principles of Compiler Design	S	S	S	S	S	S		S
CS 407	Advanced Computer Architecture	S	S	S		S	S		S
CS 451	Principles of Cryptography	S	S	S	S		S		S
CS 453	Network Principles and Protocols	S	S	S	S	S	S		S
CS 455	Mobile Computing	S	S	S	S	S	S		S
CS 457	Computer Graphics	S	S	S	S				
CS 413	Compiler Design Lab	S	S	S	S	S	S		S
CS 415	Web Technology Lab	S	S	S	S	S	S		M
CS 402	Advanced Database Management Systems	S	S	S	S	S	S		M
HM 402	Industrial Economics							S	S
CS 452	Real Time Systems	S	S	S	S	S	S		M
CS 454	Data Warehousing and Data Mining	S	S	S	S	S	S		M
CS 456	Advanced Topics in Algorithms	S	S	S	S				S
CS 498	Project Work	S	S	S	S	S	S	S	S

Alignment of Graduate Attributes with PO

Sl. No.	Graduate attributes of NBA	Programme Outcomes							
		1	2	3	4	5	6	7	8
1	Graduates will demonstrate knowledge of mathematics, science and engineering.	√	√	√					
2	Graduates will demonstrate an ability to identify, formulate and solve engineering problems.	√	√	√					
3	Graduate will demonstrate an ability to design and conduct experiments, analyze, and interpret data.			√					
4	Graduates will demonstrate an ability to design a system, component or process as per needs and specifications.				√	√	√		
5	Graduates will demonstrate an ability to visualize and work on laboratory and multi-disciplinary tasks.	√	√		√				
6	Graduate will demonstrate skills to use modern engineering tools, softwares and equipment to analyze problems.				√				
7	Graduates will demonstrate knowledge of professional and ethical responsibilities.							√	√
8	Graduate will be able to communicate effectively in both verbal and written form.							√	
9	Graduate will show the understanding of impact of engineering solutions on the society and also will be aware of contemporary issues.				√	√			
10	Graduate will develop confidence for self education and ability for life-long learning.								√
11	Graduate who can participate and succeed in competitive examinations.	√							√
12	Graduate who can understand environmental issues and provide sustainable solutions					√			√

Design of Curriculum

The B. Tech. Curriculum bas been designed conforming to the recommendations of ACM and guidelines of AICTE. It consists of the following components of study:

a) Mathematics
b) Basic Science (Physics, Chemistry)
c) Humanities (English, Management)
d) Computer Science and Engineering

Further, the engineering component has the following classifications:

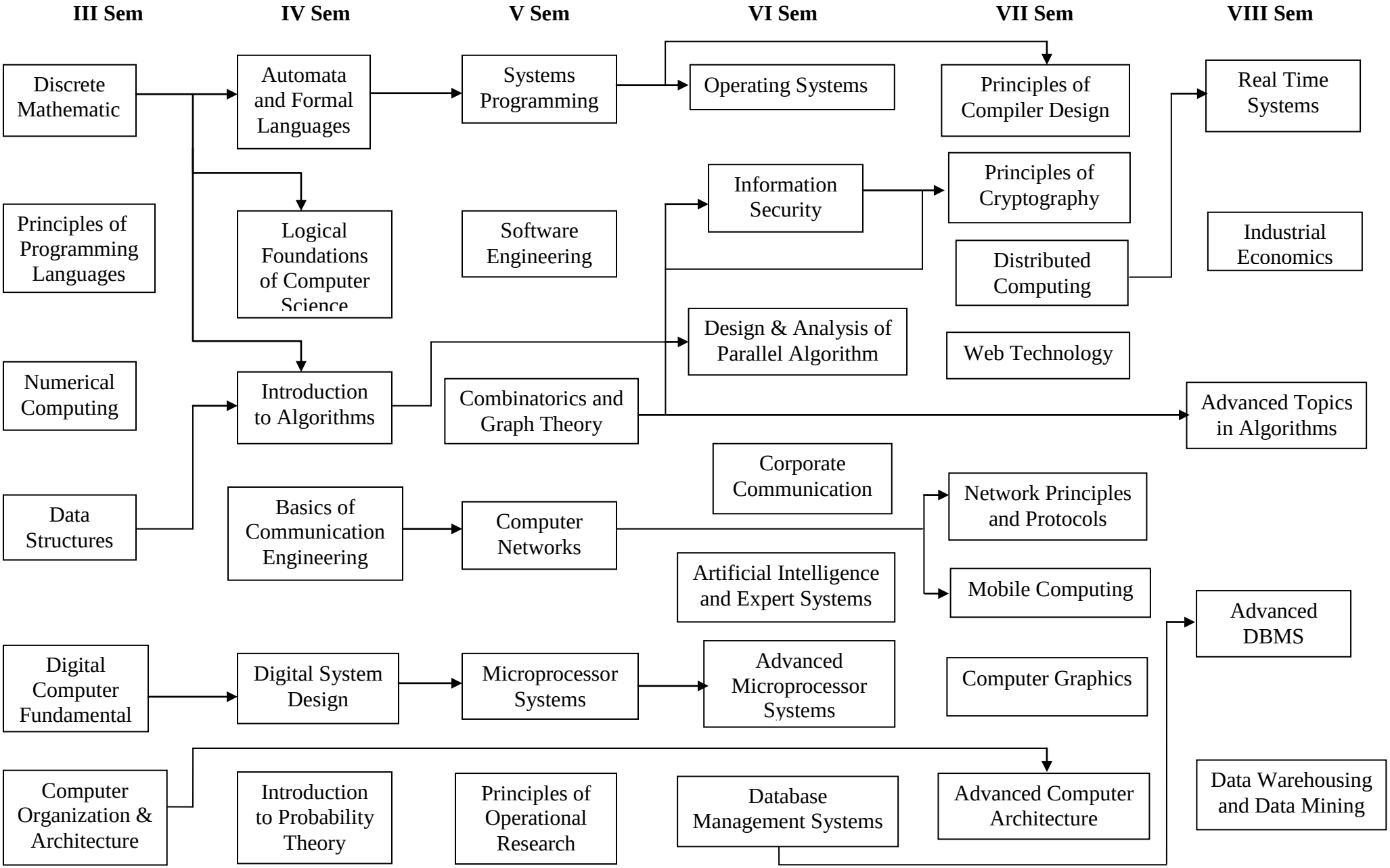
a) Theoretical Computer Science or Mathematical Foundations of Computer Science
b) Hardware
c) System Software
d) Applications

Moreover, the CSE subjects are grouped into Core and Elective subjects. Electives are offered in VI, VII, and VIII semesters. In each semester (III to VIII) two laboratory courses are taught. The student is tested for comprehensive knowledge in VII semester. Project work is undertaken in VIII semester. In theory and laboratory classes mini project/term project is encouraged. Internship in industries and premiere institutions such as IITs and IISc is encouraged and availed in summer/winter vacation. Some students do avail internship offer in abroad also.

Mapping of Curriculum Components with PEO and PO

Course Component	Curriculum Content (% of Credits of programme)	Total Contact Hours	Total Credits	PO	PEO
Theory	17%	24	24	1- 8	1-3
System Software	13%	18	18	1, 3, 4, 6, 8	1-3
Hardware	13%	18	18	3, 4, 6, 8	1-3
Networking	13%	18	18	3, 4, 5, 8	1-3
Application	19%	27	27	3, 4, 6, 8	1-3
Soft Skills	6%	9	9	1-5, 7-8	1-3
Laboratory	15%	26	20	1, 3, 4, 5, 6, 8	1-3
Project	4%	12	6	1-8	1-3

Pre-requisite Course Chart



B. Tech. (CSE) – Curriculum (NITTUGCSE08)

Semester-wise Curriculum (Batch Starting 2008 – 2009)

THIRD SEMESTER

CODE	COURSE TITLE	L	T	P	C
CS201	Discrete Mathematics	3	0	0	3
CS203	Principles of Programming Languages	3	0	0	3
CS205	Numerical Computing	3	0	0	3
CS207	Data Structures	3	0	0	3
CS209	Digital Computer Fundamentals	3	0	0	3
CS211	Computer Organization and Architecture	3	0	0	3
CS213	Programming Languages Laboratory	0	0	3	2
CS215	Data Structures Laboratory	0	0	3	2
TOTAL CREDITS					**22**

FOURTH SEMESTER

CODE	COURSE TITLE	L	T	P	C
CS202	Automata and Formal Languages	3	0	0	3
CS204	Digital System Design	3	0	0	3
CS206	Logical Foundations of Computer Science	3	0	0	3
CS208	Introduction to Algorithms	3	0	0	3
EC214	Basics of Communication Engineering	3	0	0	3
MA204	Introduction to Probability Theory	3	0	0	3
CS214	Digital System Design Laboratory	0	0	3	2
CS216	Algorithms Laboratory	0	0	3	2
TOTAL CREDITS					**22**

FIFTH SEMESTER

CODE	COURSE TITLE	L	T	P	C
CS301	Systems Programming	3	0	0	3
CS303	Computer Networks	3	0	0	3
CS305	Microprocessor Systems	3	0	0	3
CS307	Software Engineering	3	0	0	3
CS309	Combinatorics and Graph Theory	3	0	0	3
MA304	Principles of Operational Research	3	0	0	3
CS313	Microprocessor Systems Laboratory	0	0	3	2
CS315	Systems Programming Laboratory	0	0	3	2
TOTAL CREDITS					**22**

SIXTH SEMESTER

CODE	COURSE TITLE	L	T	P	C
CS302	Information security	3	0	0	3
CS304	Operating Systems	3	0	0	3
CS306	Database Management Systems	3	0	0	3
HM302	Corporate Communication	3	0	0	3
CS308	Artificial Intelligence and Expert Systems	3	0	0	3
	Elective - I	3	0	0	3
CS314	Operating Systems Laboratory	0	0	3	2
CS316	Database Laboratory	0	0	3	2
TOTAL CREDITS					**22**

SEVENTH SEMESTER

CODE	COURSE TITLE	L	T	P	C
CS401	Distributed Computing	3	0	0	3
CS403	Web Technology	3	0	0	3
CS405	Principles of Compiler Design	3	0	0	3
CS407	Advanced Computer Architecture	3	0	0	3
	Elective - II	3	0	0	3
	Elective - III	3	0	0	3
CS413	Compiler Design Laboratory	0	0	3	2
CS415	Web Technology Laboratory	0	0	3	2
CS449	Comprehensive Viva-Voce				3
TOTAL CREDITS					**25**

EIGTH SEMESTER

CODE	COURSE TITLE	L	T	P	C
CS402	Advanced Database Management Systems	3	0	0	3
HM402	Industrial Economics	3	0	0	3
	Elective - IV	3	0	0	3
	Elective - V	3	0	0	3
CS498	Project Work				6
TOTAL CREDITS					**18**

Total Credits in the B. Tech. Course = 22 + 22 + 22 + 22 + 25 + 18 = 131

Total Minimum Credits required = 176 (131 + 45)

List of Electives for Sixth Semester: (One)

1. CS352 Design and Analysis of Parallel Algorithms
2. CS354 Advanced Microprocessor Systems

List of Electives for Seventh Semester: (Two)

1. CS451 Principles of Cryptography
2. CS453 Network Principles & Protocols
3. CS455 Mobile Computing
4. CS457 Computer Graphics and Image Processing
5. Any Elective from Other Department

List of Electives for Eighth Semester: (Two)

1. CS452 Real Time Systems
2. CS454 Data Warehousing And Data Mining
3. CS456 Advanced Topics in Algorithms
4. Any Elective from Other Department

Reserved List of Electives

(To be exchanged with offered list of electives based on requirements in future)

1. CS355 Fault Tolerant Computing Systems
2. CS357 Networked Multimedia Systems
3. CS359 High Speed Networks
4. CS363 Object Oriented System Design
5. CS358 Distributed Data Base Systems

THIRD SEMESTER

CS201: Discrete Mathematics

Credit: 3

Objectives

- To get familiar and understand the fundamental notions in discrete mathematics
- To understand and demonstrate the basic concept of an algorithm and its application in combinatorial mathematics
- To identify the basic properties of graphs and trees and model simple applications

Outcomes

- Ability to apply knowledge of discrete structures in areas such as cryptography, database, etc.
- Ability to apply induction and other proof techniques towards problem solving

Unit – I

Set Theory - Set operations, properties - power set - methods of proof - relations, graph and matrix of a relation - partial and total orders, well ordering - equivalence relations, classes and properties - functions, 1-1, onto and bijective

Unit – II

Induction and Combinatorics - Peano's axioms - Mathematical induction (simple and strong) - pigeon-hole principle - principle of inclusion and exclusion

Unit – III

Algebraic Structures - Semi-groups, monoids, groups, subgroups and their properties - cyclic groups - cosets - permutation groups - Lagrange's theorem - Cayley's theorem - normal subgroups - homomorphism of groups - quotient groups - rings and fields

Unit – IV

Recurrence Relations and Generating Functions - Homogeneous and inhomogeneous recurrences- solving recurrences - Repertoire method - Perturbation method - Convolutions - simple manipulations and tricks.

Unit – V

Graph Theory - - Representation of a graph - Trees - Cycles - Paths and connectedness - Graph Isomorphism - Operations on graphs - Vertex and edge cuts

Text Book

- K. D. Joshi, "Discrete Mathematics", Wiley Eastern Ltd.

Reference Books

1. Arthur Gill, "Applied Algebra for Computer Science", Prentice Hall
2. R. Balakrishnan and K.Ranganathan, "A Text Book of Graph Theory", Springer
3. D. S. Chandrasekharaih, “Discrete Mathematical Structures”, Prism Books, 2005

CS203: Principles of Programming Languages

Credit: 3

Objectives

- To provide an introduction to formalisms for specifying syntax and semantics of programming languages
- To provide an exposure to core concepts and principles in contemporary programming languages
- To analyze and optimize the complexity of the programming languages.
- To explore the concept of concurrent and parallel programming

Outcomes

- Ability to program in different language paradigms and evaluate their relative benefits
- Knowledge of, and ability to use, language features in current programming languages
- Develop algorithms for problem solving

Unit – I

Introduction to Language Paradigms - Criteria for good language design - Data types - Abstraction - Imperative languages - Pascal, C - design issues

Unit – II

Object-Oriented Programming - Data encapsulation - Classes in C++ - Over loading - Derived classes - Information hiding - Inheritance and polymorphism - Generic functions

Unit – III

Functional Programming - Introduction to LISP - Lists - Storage allocation for lists - Some useful functions - Error handling

Unit – IV

Logic Programming - Computing with relations - Introduction to Prolog - Data structures in Prolog - Programming techniques - Control in Prolog - Cuts.

Unit – V

Parallel Programming - Synchronizations - Concurrency - Deadlocks - Mutual exclusion - Concurrent programming - Communicating sequential processes: input-output commands

Text Book

- R. SETHI, "Programming Languages: Concepts and Constructs", II Ed., Pearson Education, 1996

Reference Book

- Robert W. Sebesta, "Concepts of Programming languages", IV Ed., Pearson Education 1999

CS205: Numerical Computing

Credit: 3

Objectives

- To learn about existence and uniqueness criteria for numerical methods
- To solve systems of linear equations by direct methods
- To use iterative methods to solve systems of non-linear equations

Outcomes

- Ability to comprehend numerical methods
- Skill set in implementing numerical algorithms to solve mathematical problems

Unit – I

Non-Linear Systems - Various types of errors - Bisection method - Regula falsi method - Newton-Raphson method - Graffe's method - Bairstow's method - Newton's method for solving $f(x,y) = 0$ and $g(x,y) = 0$.

Unit – II

Linear Systems - Gaussian elimination - Iterative methods - Sufficient conditions for convergence - LU decomposition method - Power method to find the dominant Eigen value and Eigen vector.

Unit – III

Interpolation and Curve Fitting - Newton's forward and backward interpolation - Method of least squares to fit equations of the form $y = ab^2$ and $y = ax^2 + bx + c$.

Unit – IV

Numerical Differentiation and Integration - Simpson's one-third rule - Simpson's three-eighth rule - Double integration using trapezoidal and Simpson's one-third rule.

Unit – V

Numerical Solution of Differential Equations - Euler's method - Taylor's method - Runge-Kutta method of fourth order - Numerical solution of Laplace equation - One-dimensional heat flow equation and wave equation by finite difference methods.

Text Book

- P. Kandasamy and K. Thilagavathy, “Numerical Methods”, S. Chand Publication, 2007.

Reference Books

- C. F. Gerald and P. O. Wheatley, "Applied Numerical Analysis", McGraw Hill, 1981
- Cheneg and Kincaid, "Introduction To Numerical Computing", Tata McGraw-Hill, 1998

CS207: Data Structures

Credit: 3

Objectives

- To understand the various techniques of sorting and searching
- To design and implement arrays, stacks, queues, and linked lists
- To understand the complex data structures such as trees and graphs

Outcomes

- Ability to develop programs to implement linear data structures such as stacks, queues, linked lists, etc.
- Application of trees and graphs in real world scenarios
- Technical knowhow on the implementation of sorting and searching algorithms

Unit – I

Development of Algorithms - Notations and analysis - Storage structures for arrays - Sparse matrices - Stacks and Queues: Representations and applications.

Unit – II

Linked Lists - Linked stacks and queues - Operations on polynomials - Doubly linked lists - Circularly linked lists - Dynamic storage management - Garbage collection and compaction.

Unit – III

Binary Trees - Binary search trees - Tree traversal - Expression manipulation - Symbol table construction - Height balanced trees - Red-black trees.

Unit – IV

Graphs - Representation of graphs - BFS, DFS - Topological sort - Shortest path problems. String representation and manipulations - Pattern matching.

Unit – V

Sorting Techniques - Selection, Bubble, Insertion, Merge, Heap, Quick, and Radix sort - Address calculation - Linear search - Binary search - Hash table methods.

Text Books

1. J. P. Tremblay and P. G. Sorenson, "An Introduction to Data Structures with applications", Second Edition, Tata McGraw Hill, 1981
2. M. Tenenbaum and Augestien, “Data Structures using C”, Third Edition, Pearson Education 2007.

Reference Book

1. Sartaj Sahni, “Data Structures, Algorithms and Applications in C++”, Universities Press (I) Pvt. Ltd.

CS209: Digital Computer Fundamentals

Credit: 3

Objectives

- To impart the essential knowledge on the fundamentals and applications of digital circuits and digital computing principles
- To provide an overview on the design principles of digital computing systems
- To provide technical knowledge about various digital hardware components

Outcomes

- Ability to design and develop basic logic circuits
- Expertise to design and implement various digital systems

Unit – I

Binary codes - Weighted and non-weighted - Binary arithmetic conversion algorithms - Error detecting and error correcting codes - Canonical and standard boolean expressions - Truth tables.

Unit – II

K-map reduction - Don't care conditions - Adders / Subtractors - Carry look-ahead adder - Code conversion algorithms - Design of code converters - Equivalence functions.

Unit – III

Binary/Decimal Parallel Adder/Subtractor for signed numbers - Magnitude comparator - Decoders / Encoders - Multiplexers / Demultiplexers - Boolean function implementation using multiplexers.

Unit – IV

Sequential logic - Basic latch - Flip-flops (SR, D, JK, T and Master-Slave) - Triggering of flip-flops - Counters - Design procedure - Ripple counters - BCD and Binary - Synchronous counters.

Unit – V

Registers - Shift registers - Registers with parallel load - Memory unit - Examples of RAM, ROM, PROM, EPROM - Reduction of state and flow tables - Race-free state assignment - Hazards.

Text Book

- Morris Mano, "Digital Design", Prentice Hall of India, 2001

Reference Book

- W. H. Gothmann, "Digital Electronics - An Introduction to Theory and Practice", Prentice Hall of India, 2000

CS211: Computer Organization and Architecture

Credit: 3

Objectives

- To understand how computers are constructed out of a set of functional units and how the functional units operate, interact, and communicate
- To understand the factors and trade-offs that affect computer performance
- To understand the concrete representation of data at the machine level and how computations are performed at the machine level

Outcomes

- Ability to design basic ALU and CU
- Ability to design different I/O modules for enhancing performance

Unit – I

Basic structure of computers - Operational concepts - Bus structures - Arithmetic operations - Memory operations - Addressing modes - Basic I/O operations - Performance.

Unit – II

Arithmetic - Addition & subtraction of signed numbers - Multiplication - Integer division - Floating point operations.

Unit – III

Processing unit - Control unit - Pipelining - Multiple bus organization - Hardwired control - Micro programmed control - Hazards - Data path - Embedded systems.

Unit – IV

Memory system - Basic concepts - Semiconductor RAM memory - Cache memory - Performance considerations - Virtual memory - Secondary storage.

Unit – V

I/O Organization - Accessing I/O devices - Interrupts - DMA - Buses - Interface circuits - Serial communication links.

Text Book

- C. Hamacher, Z. Vranesic, and S. Zaky, "Computer Organization", McGraw Hill, Fifth Edition, 2002

Reference Book

- W. Stallings, "Computer Organization and Architecture", Pearson education, First Edition, 2002

CS213: Programming Languages Laboratory

Credit: 2

Objectives

- To know and understand the principal programming abstractions
- To be able to express computational solutions in the main programming idioms
- To be able to program in imperative, concurrent, functional and object-oriented programming languages.

Outcomes

- Ability to write programs in specific languages such as C, C++/Java, Scheme, and PROLOG
- Ability to test and debug the programs for critical errors
- Ability to analyze and optimize programs

Experiments

1. UNIX shell programming
2. Programming tools and windows
3. Network File Systems
4. Network Information Systems
5. Message Passing Interface
6. Functional programming techniques through LISP
7. Object-oriented programming techniques through C++/Java
8. Logic programming through techniques PROLOG

CS215: Data Structures Laboratory

Credit: 2

Objectives

- To analyze the time and space complexities and efficiency of various algorithms.
- To understand the practical application of linear and nonlinear data structures.
- To introduce and practice advanced algorithms, programming techniques necessary for developing sophisticated computer application programs.

Outcomes

- Ability to apply and implement the learned algorithm for problem solving
- Ability to identify the appropriate data structure to develop real time applications

Experiments

- Problems in C/C++/ Java using data structures involving arrays, stacks, queues, strings, linked lists, trees, graphs.
- Operations on stacks, queues and linked lists
- Conversion of infix expressions to postfix and evaluation of postfix expressions
- Implementation of priority queue
- Implementation of Binary Tree and Binary Search Tree
- Implementation of Sorting Techniques

FOURTH SEMESTER

CS202: Automata and Formal Languages

Credit: 2

Objectives

- Ability to construct and interpret
- finite state diagrams and DFSA
- Proficiency with mathematical tools and formal method
- Technical knowhow on applying the techniques to computing

Outcomes

- Proficiency with mathematical tools and formal method
- Technical knowhow on applying the techniques to computing

Unit – I

Finite Automata - Deterministic, non-deterministic and equivalence - Equivalence of regular expressions and FA - Moore and Mealy machines.

Unit – II

Regular Languages - Pumping lemma of regular sets - Myhill Nerode theorem - Minimization of finite automata - Chomsky hierarchy of languages.

Unit – III

Text-Free Language - Context-free grammar - Derivation trees - Ambiguity simplification - Normal forms - UVWXY theorem - Applications.

Unit – IV

Pushdown Automata - Definitions - Context free languages - Construction of PDA for simple CFLs - Linear bounded automata.

Unit – V

Turing Machines - Universal Turing Machines - Types of Turing Machines - Techniques - Halting problem - Stack automata - Definitions.

Text Book

- J. E. Hopcroft and J. D. Ullman, "Introduction to Automata Theory, Languages and Computation", Pearson Education, 2001

Reference Book

- Peter Linz, "An Introduction to Formal Language and Automata", Narosa Pub. House, Reprint 2000

CS204: Digital System Design

Credit: 3

Objectives

- To understand the architecture of basic building blocks, logic gates, adders, multipliers, shifters and other digital devices
- To understand the logic of minimization techniques including Karnaugh Maps
- To understand the structure of field programmable logic circuits FPGAs
- To analyze design of combinational logic, sequential circuits, PLA, PAL

Outcomes

- Ability to design basic digital circuits and systems
- Ability to use high-level hardware description languages such as Verilog for the design of combinational and sequential circuits

Unit – I

Introduction to VLSI design - Basic gate design - Digital VLSI design - Design of general boolean circuits using CMOS gates.

Unit – II

Verilog Concepts – Basic concepts – Modules & ports & Functions – useful modeling techniques – Timing and delays – user defined primitives.

Unit – III

Modeling Techniques – Gate level modeling – Dataflow modeling – Physical modeling – Structural / Data flow modeling – Switch level modeling.

Unit – IV

Advanced Verilog Concepts – Synthesis concepts – Inferring latches and flip-flops – Modeling techniques for efficient circuit design.

Unit – V

Design of high-speed arithmetic circuits - Parallelism - Pipelined Wallace tree tipliers - Systolic algorithms - Systolic matrix multiplication.

Text Book

- Samir Palnitkar, "Verilog HDL Synthesis", BS Publications, First Edition, 2001

Reference Book

- Bhaskar, "Verilog HDL Synthesis", BS Publications, First Edition, 2001

CS206: Logical Foundations of Computer Science

Credit: 3

Objectives

- To study about the notions, mechanisms, and properties of weakest preconditions
- To learn how to create a strong guarded commands and its related theorems
- To learn the basics of propositional logic and its conversions
- To analyze the principles and proofs of predicate calculus.

Outcomes

- Ability to define and convert the prepositional formula
- Knowledge of predicate calculus and its application in programming
- Ability to prove program correctness using the logics.

Unit – I

Review of Prepositional Calculus - Validity - Satisfiability related concepts - CNF and DNF forms - Conversion of arbitrary prepositional formula to CNF or DNF.

Unit – II

Compactness idea - Resolution principle and proof of the theorem - Review of predicate calculus - Interpretation of formulae in predicate calculus.

Unit – III

Prenex normal form and examples - Application of logic in programming - Proof rules for structured statements (assignment, while, repeat-until, for statements).

Unit – IV

Pre-conditions / Post-conditions - Weakest precondition - Notion of machine - Mechanism and Wp as a predicate transformer - Properties of Wp.

Unit – V

Guarded Commands - General form of if command - Wp of if - Related theorem - General form of do command - Wp of do - Need for strong guards.

Text Books

- D. Gries, "The Science of Programming", Narosa, 1981
- S. Alagic, M. A. Arbib, "The Design of Well-Structured and Correct Programs", SpringerVerlagn, 1978

Reference Book

- E. W. Djikstra, "A Discipline of Programming", Prentice Hall, Englewood Cliffs, 1976

CS208: Introduction to Algorithms

Credit: 3

Objectives

- To understand the importance of algorithm and its complexity
- To analyze the complexity of an algorithm in terms of time and space complexities
- To design and implement various programming paradigms and its complexity

Outcomes

- Ability to analyze the time and space complexity, given an algorithm
- Apply the techniques of algorithm in solving real world problems
- Systematic development of an algorithm for solving a problem

Unit – I

Algorithms - Examples - Tournament method - Evaluating polynomial functions - pre-processing of coefficients - solving recurrence equations.

Unit – II

Divide and Conquer method - Strassen's matrix multiplication - Greedy method - Knapsack problem - Job sequencing with deadlines - Minimum spanning trees.

Unit – III

Dynamic Programming - Multistage graphs - All pair's shortest paths - Optimal binary search trees - Travelling salesman problem - Fast Fourier transform.

Unit – IV

Randomized Algorithms and Amortized Analysis - Las Vegas and Monte Carlo types - Randomized quick sort and its analysis - Min-Cut algorithm.

Unit – V

NP-Hard and NP-complete problems - Basic concepts - Reducibility - Cook's theorem (without proof) - Turing machines - NP-Hard graph problems.

Text Book

- T. H. Cormen, C. E. Leiserson, R. L. Rivest, "Introduction to Algorithms", The MIT press, Cambridge, Massachusetts and McGraw Hill, 1990

Reference Book:

- A. V. Aho, J. E. Hopcroft and J. D. Ullman, "The Design and Analysis of Computer Algorithms", Addison Wesley, 1974

EC214: Basics of Communication Engineering

Credit: 3

Objectives

- To have a detailed study of various analog and digital modulation and demodulation techniques
- To have a thorough knowledge of various multiplexing schemes and Data communication protocols
- To know about the standards and mechanisms of television systems

Outcomes

- Knowledge of working of basic communication systems
- Ability to evaluate alternative models of communication system design

Unit – I

Principles of Amplitude Modulation, single and double side band - suppressed carrier system and frequency modulation - varactor diode and reactance modulator - AM detectors - FM discriminators - AM and FM transmitters and receivers.

Unit – II

Sampling theorem - pulse modulation techniques - PAM, PWM and PPM concepts - PCM encoder and decoder - multliplexing - time division multiplexing and frequency division multiplexing.

Unit – III

Data transmission using analog carriers - MODEMS employing FSK, QPSK, QAM and MSK - asynchronous and synchronous transmission - error control techniques - data communication protocols - link oriented protocols - asynchronous protocols.

Unit – IV

Microwave links, Optical communication principles - Satellite communication systems - Pagers - Cellular phones - EPABX.

Unit – V

Requirements and standards - need for scanning - interlaced scanning - VSB modulation - types of camera tubes and picture tubes - B/W and color systems - PAL - CCTV -Cable TV

Text Book

1. Simon Haykin - Communication systems.
2. R. R. Gulathi - Modern Television Engineering & Practice.
3. John G. Proakis and M. Salehi - Communication Systems Engineering.

Reference Books

1. Kennedy - Electronic Communication systems.
2. Taub and Schilling – Principles of Communication Systems, Tata McGraw Hill, 2nd Edition.
3. William Stallings – Data & Computer Communications, PHI, 7th Edition.
4. Wayne Tomasi – Electronic Communications Systems (Fundamentals through advanced), Pearson Education, 5th Edition.

MA204: Introduction to Probability Theory

Credit: 3

Objectives

- To introduce the fundamental concepts and theorems of probability theory
- To apply elements of stochastic processes for problems in real life
- To understand elementary queuing concepts and apply elsewhere in computer science.

Outcomes

- Conceptualize the necessity of randomness concept in practical situation
- Approximate the real problems using stochastic process and deduce results
- Deduce useful results and interpret them based on the analysis of queuing theory

Unit – I

Axioms of probability theory - Probability spaces - Joint and conditional probabilities- Bayes' Theorem- Independent events.

Unit – II

Random Variable and random vectors - Distributions and densities. Independent random variables – Functions of one and two random variables.

Unit – III

Moments and characteristic functions - Inequalities of Chebyshev and Schwartz. Convergence concepts.

Unit – IV

Random processes - Stationarity and ergodicity - Strict sense and wide sense stationary processes - Covariance functions and their properties - Spectral representation - Wiener-Khinchine theorem.

Unit – V

Gaussian processes - Processes with independent increments - Poisson processes - Lowpass and Bandpass noise representations.

Text Books

- Davenport, Probability and Random Processes for Scientist and Engineers, McGraw-Hill
- Papoulis, A., Probability, Random variables and Stochastic Processes, McGraw Hill.

CS214: Digital System Design Laboratory

Credit: 2

Objectives

- To develop programs in Hardware Description Language
- To design and implement synchronous sequential, asynchronous sequential circuits
- To be familiar with basic combinational and sequential components used in the typical data path designs

Outcomes

- Ability to design combinational and sequential circuits using logic gates and flip-flops
- Ability to develop Verilog modules for building digital system components

Experiments

- Design of a 32-bit carry look-ahead adder with logarithmic depth using Verilog
- Design of a Wallace tree multiplier using Verilog
- Design of a 4-bit DSP processor using Verilog
- Burning the 4-bit DSP processor on a FPGA

CS216: Algorithms Laboratory

Credit: 2

Objectives

- To learn how to analyze the complexity of algorithms
- To compare and evaluate algorithms in terms of time and space complexity
- To program brute force, divide and conquer, decrease and conquer, transform and conquer, greedy, and dynamic techniques

Outcomes

- Ability to solve and analyze general algorithms based on space and time complexity
- Ability to implement and empirically compare fundamental algorithms and data structures to real-world problems
- Knowledge about different algorithmic paradigms and optimization

Experiments

- Estimating worst-case/average-case complexity of algorithms via programs
- Determining machine constants
- Programs involving some advanced data structures
- Implementing example problems
- Illustrating the different paradigms of algorithm design
- Solving miscellaneous problems e.g. problems in string manipulation, graph theory, optimization

FIFTH SEMESTER

CS301: Systems Programming

Credit: 3

Objectives

- To introduce the major programming paradigms, data structures and principles involved in systems programming
- To acquire comprehensive knowledge about various system components and its functionalities as well as the interactions with hardware resources
- To provide basic insight about writing system programs for each system components
- To gain knowledge about developing interfaces for various system components and its issues

Outcomes

- Deep knowledge of basic systems programming paradigms
- Knowhow on the design principles of various system components

Unit – I

Fundamentals of language processors - Language specification - Data structure for language processing - Scanning - Parsing.

Unit – II

Assemblers - Elements of assembly language programming - Single pass and two pass assembler - Assembler for IBM PC.

Unit – III

Macro Processors - Macro definition and call - Macro expansion - Conditional and nested macro calls - Design of a macro processor.

Unit – IV

Loaders - Relocation and linking concepts - Relocating programs - Design of a linker - Linking for overlays - A linker for MSDOS.

Unit – V

Linkers - Software tools - Text editor - Debug monitors - Interpreters - Program generators - User interfaces - Recent trends and developments.

Text Book

- D. M. Dhamdhere, "System Programming and Operating Systems", Tata McGraw Hill, 3rd Edition, 2002

Reference Books

- J. J. Donovan, "Systems Programming", McGraw Hill, 1984
- Leland L. Beck, "An Introduction to Systems Programming", Addison-Wesley, 4th Edition, 2001

CS303: Computer Networks

Credit: 3

Objectives

- To provide insight about networks, topologies, and the key concepts
- To gain comprehensive knowledge about the layered communication architectures (OSI and TCP/IP) and its functionalities
- To understand the principles, key protocols, design issues, and significance of each layers in ISO and TCP/IP
- To know the basic concepts of network security and its various security issues related with each layer

Outcomes

- Knowledge of basic network theory and layered communication architectures
- Ability to solve problems in networking

Unit – I

Introductory Concepts - Network hardware - Network software - Physical layer - Guided transmission media - Cable television.

Unit – II

Data Link Layer - Design issues - Channel allocation problem - Multiple access protocols - Ethernet - Wireless LAN - 802.11 architecture.

Unit – III

Network Layer - Design issues - Routing algorithms - Congestion control algorithms - Quality of Service - Internetworking.

Unit – IV

Transport Layer - Transport service - Elements of transport protocols - User Datagram Protocol - Transmission Control Protocol.

Unit – V

Application Layer - DNS - Electronic mail - World Wide Web - Multimedia - Network security.

Text Books

1. A. S. Tanenbaum, "Computer Networks", Pearson Education, Fourth Edition, 2003
2. W. Stallings, "Data and Computer Communication", Pearson Education, Fifth Edition, 2001

Reference Book:

- Behrouz A. Foruzan, “Data Communication and Networking”, Tata McGraw Hill, 2004

CS305: Microprocessor Systems

Credit: 3

Objectives

- To acquire knowledge about the hardware architectures and the functional blocks of each microprocessors (8085, 8086, and 8088)
- To know the functionality of common peripheral controllers and its interfaces with various peripheral devices
- To gain the practical development of applications using microprocessors (8085 and 8086)

Outcomes

- Knowledge of architecture of basic microprocessors
- Ability to build a microprocessor based system for practical applications

Unit – I

8085 Microprocessor - Architecture - Bus organization - Registers - ALU - Instruction set of 8085 - Instruction format - Addressing modes - Timing diagrams.

Unit – II

Serial I/O - Interrupts - Data transfer techniques - Parallel data transfer using 8155 - DMA transfer using 8257 DMA controller.

Unit – III

Microprocessor System Design - System design using interrupt controller - Floppy Disk Controller - CRT controller.

Unit – IV

Microprocessor Interfacing Techniques - Interfacing memory and I/O devices - Interfacing A/D converters and D/A converters - Recent trends and developments.

Unit – V

8086/8088 - Internal architecture - Instruction set - Segmented memory concepts - Memory interfacing [ROM/DRAM] - Bus concepts.

Text Book

- R. S. Gaonkar, "Microprocessor Architecture, Programming and Applications with the 8085/8080A", Wiley Eastern Ltd, Second Edition, 1986

Reference Book

- D. V. Hall, "Microprocessors and Digital Systems", McGraw Hill International students, Second Edition, 1986

CS307: Software Engineering

Credit: 3

Objectives

- To understand the importance of software engineering lifecycle models in the development of software
- To understand the various design principles in modelling a software
- To develop a software which adheres to the standard benchmarks
- To undergo the technical know in the process of software testing

Outcomes

- Ability to develop software projects using software practices
- Knowledge of software cost estimation and software quality metrics

Unit – I

Software Process – Introduction – S/W Engineering Paradigm – life cycle models (waterfall, incremental, spiral, WINWIN spiral, evolutionary, prototyping) – system engineering – computer based system – life cycle process – development process

Unit – II

Software Requirements – Functional & non-functional – user-system requirement engineering process – feasibility studies – elicitation – validation & management – software prototyping – S/W documentation – Analysis and modelling

Unit – III

Design Concepts and Principles – modular design – design heuristic – S/W architecture – data design – architectural design – transform & transaction mapping –Introduction to SCM process – Software Configuration Items.

Unit – IV

Software Testing – Taxonomy of S/W testing – levels - black box testing – testing boundary conditions – structural testing — regression testing– S/W testing strategies – unit testing – integration testing – validation testing – system testing and debugging.

Unit – V

Software Project Management - S/W cost estimation – Function point models – COCOMO model – Delphi method – S/W challenges – S/W maintenance.

Text Book

- R. S. Pressman, "Software Engineering - A practitioners approach", III Edition, McGraw Hill International editions, 1992.

Reference Books

- Ian Sommerville, “Software Engineering”, Pearson Education Asia, VI Edition, 2000.
- Pankaj Jalote, “An Integrated Approach to software Engineering”, Springer Verlag, 1997.
- James F. Peters and Witold Pedryez, “Software Engineering – An Engineering Approach”, John Wiley and Sons, New Delhi.

CS309: Combinatorics and Graph Theory

Credit: 3

Objectives

- To obtain basic knowledge about graphs, their properties and applications as models of networks
- To formulate problems in terms of graphs, solve problems, and apply algorithms
- To be familiar with a wide variety of graph theoretic ideas, notation, algorithms, and useful proof techniques

Outcomes

- Develop problem solving skills in the field of graph theory
- Application of pigeonhole principle and rules for counting, permutations, and combinations problems

Unit – I

Permutations and Combinations - Distribution of distinct / non-distinct objects - Generating functions for combinations - Portion of integers - Ferrers graph.

Unit – II

Recurrence Relations - Linear recurrence relations with constant coefficients - Solution by the technique of generating functions - Permutations with restrictions on relative positions.

Unit – III

Basic Definitions - Trees and fundamental circuits - Cut-sets and Cut-vertices - Connectivity and Separability - Network flows - 1 and 2 isomorphism.

Unit – IV

Planar and Dual Graphs - Kuratowski's graphs - Representations of a planar graph - Vector space associated with a graph - Subspaces - Orthogonal vectors and spaces.

Unit – V

Matrix Representation of Graphs - Circuit matrix - Cutset matrix - Path matrix - Adjacency matrix - Coloring problems - Algorithms for fundamental circuits, cut-vertices and separability.

Text Books

- E. S. Page and L. B. Wilson, "An introduction to computational combinatorics", Cambridge University Press, 1979
- D. E. Knuth, O. Patashuk, and R. L. Graham, "Concrete Mathematics", 1994.

Reference Book

- Douglas. B. West, "Introduction to Graph Theory", Second edition. Prentice Hall,2001

MA304: Principles of Operational Research

Credit: 3

Objectives

- To classify and formulate real-life problem for modelling, solving and applying for decision making.
- To study the formulation and various methods of solutions for linear programming, transportation, assignment , CPM and PERT problems
- To solve problems using dynamic programming method

Outcomes

- Analyse problems in engineering, management, or business environment, focusing on important details
- Formulate real problems in terms of input-output parameters relationships and identify the solution methods

Unit - I

Introduction to operational research-Linear programming problems (LPP)-Graphical method-Simplex method-Big M Method-Dual simplex method-Primal Dual problems.

Unit – II

Dual theory and Sensitivity analysis-Transportation and assignment problems-Applications(Emphasis should be more on problems than theory)

Unit – III

CPM and PERT –Network diagram-Events and activities-Project Planning-Reducing critical events and activities-Critical path calculations-example-Sequencing problems.

Unit – IV

Replacement problems-Capital equipment-Discounting costs-Group replacement. Inventory models-various costs- Deterministic inventory models-Economic lot size-Stochastic inventory models-Single period inventory models with shortage cost.

Unit – V

Dynamic programming-Formulation-Invest problem-General allocation problem-Stage coach problem-Production Scheduling.

Text Books

- H. A. Taha, operational research-An introduction, Macmillan, 1976
- F. S. Hiller and G. J. Liebermann, Introduction to operational research (7^{th} edition)
- B. E. Gillet, Introduction to operational research-A computer oriented algorithmic approach, McGraw Hill, 1989
- H. M. Wagner, Principles of operational research with applications to managerial decisions, PH, Inc, 1975

CS313: Microprocessor Systems Laboratory

Credit: 2

Objectives

- To understand and learn the assembly language programming of various microprocessor architectures
- To obtain the practical training of interfacing the peripheral devices with the processor.
- To control the components of a microprocessor based system through the use of interrupts.
- To have a practical knowledge on assembling PC hardware, installation and troubleshooting the Microprocessor and Microcontrollers.

Outcomes

- Design assembly level programs for different microprocessor families
- Design of programs for interfacing devices with the microprocessor

Experiments

- Solving problems using 8085
- Interfacing various devices with the microprocessor: A/D converter, D/A converter, seven segment display, stepper motor, external keyboard, interrupt controller and 8251 for serial data transfer
- Interfacing using microcontroller trainer kits
- PC hardware assembly
- Installation and trouble shooting

CS315: Systems Programming Laboratory

Credit: 2

Objectives

- To develop system software for a broad range of engineering and scientific applications.
- To provide a deep understanding of the basic issues of interacting programs directly with the operating systems
- To design and implement software tools like text editor, interpreter, program generator, etc.

Outcomes

- Ability to design and develop single pass and two-pass assemblers
- Ability to develop loader, linker, and debugger

Experiments

- Symbol table (Tree-storage) construction
- Implementation of single pass and two-pass assembler, macro pre-processor, module binder (with limited instruction set)
- Implementation of software tools like text editor, interpreter, program generator, etc.

SIXTH SEMESTER

CS302: Information Security

Credit: 3

Objectives

- To understand the threat models and the basic types of authentication mechanisms
- To analyze cryptographic techniques, protocols, formats, and standards
- To analyze different log files and understand Cyber laws to recover and secure the data

Outcomes

- Ability to apply cryptographic algorithms to prevent data access by unauthorized users
- Ability to implement security algorithms as per the need of organization

Unit – I

Introduction to security and services, vulnerabilities and countermeasures, malicious code, goals of security- prevention, detection, and recovery.

Unit – II

Cryptography-Types of encryption, confidentiality using symmetric encryption, PKI, RSA, Key management, Diffie- Hellman, ECC, CA, etc., authentication protocols.

Unit – III

Securing the systems-Network security protocols: SSL, IPSEC, Kerberoes, X.509 Authentication service, Electronic mail security S/MME, Application security- SSL, PGP, SET.

Unit – IV

Network perimeter security-Secured router configuration, firewall, design principles, trusted systems, VPN, IDS, IPS penetration testing, NAT.

Unit – V

Computer forensics and Cyber laws- data recovery, security policies and procedures, security lifestyle management, security audit, managed security services

Text Books

1. Rick Lehtinen, G. T. Gangemi, S. R., Computer Security Basics, Second Edition, O'Reilly Pubs, June 2006.
2. Bruce Schneier, Applied Cryptography, Second Edition, John Wiley & Sons, 1996
3. Charlie Kaufman, Radia Perlman, and Mike Speciner, Network Security: Private Communication in a Public World, 2nd Edition, Prentice Hall, 2002.
4. William Stallings, Cryptography and Network Security, Fourth Edition, Prentice Hall, 2005
5. Stephen Northcutt, Karen Kent, and Lenny Zeltser, Inside Network Perimeter Security, Sams Publications, 200
6. Marije, Computer Forensics and Cyber Crime: An Introduction, Prentice Hall, 2004.

CS304: Operating Systems

Credit: 3

Objectives

- To know the basics such as process and CPU scheduling algorithms
- To understand the critical regions and dead lock problem
- To understand virtual memory concept, thrashing problem and page replacement algorithms
- To understand the file tables, access algorithms, and spoofing

Outcomes

- Ability to implement CPU scheduling algorithms and resolve problems related to critical regions
- Ability to implement memory management techniques
- Knowhow on the design principles on various Operating Systems

Unit – I

Basic OS Concepts - User's view of the OS - Architectural support - Thread and process scheduling - Pre-emptive and non-preemptive - FCFS, SJF, Round Robin, Multilevel Queue.

Unit – II

Synchronization - Peterson's solution - Bakery algorithm - Hardware-based solutions - Semaphores - Critical regions - Problems of synchronization - Deadlock prevention and recovery - Banker's algorithms.

Unit – III

Memory Management - Segmentation, Paging and Virtual memory - Case study of x86 32-bit memory management unit - FCFS, FRU - Belady's anomaly - Stack-based algorithms - Thrashing - Working set.

Unit – IV

Design of the Unix File System - Buffer caches - File system organization - Inodes - Super blocks - File access algorithms - File tables - Inode tables - Network file systems.

Unit – V

I/O Organization - Block and character device drivers - Unix system file protection mechanism - Access and capability lists - Authentication - Spoofing - Case study of a virus on UNIX.

Text Book

- A. Silberchatz and P. B. Galvin, "Operating System Concepts", Addison Wesley, VI Edition, 2005.

Reference Book

- W. Stallings, "Operating Systems", Prentice Hall, V Edition, 2005.

CS306: Database Management Systems

Credit: 3

Objectives

- To understand the different database models and language queries to access databases
- To understand the normalization forms in building an effective database tables
- To protect the data and the database from unauthorized access and manipulation

Outcomes

- Ability to define, manipulate, and control a relational database management system
- Ability to design SQL based Client-Server applications
- Ability to build a database management system that satisfies relational theory

Unit – I

Databases - Need - Concepts - Architecture - Data independence - Data modeling: Entity-relationship model - Weak entity sets - Mapping ER model to Relational model.

Unit – II

Concepts - Integrity constraints - Relational algebra - Relational calculus - Tuple relational calculus - Domain relational calculus - Overview of QBE.

Unit – III

SQL Queries - Nested queries - Aggregate operators - Null values - Embedded SQL - Database security - Views - Queries on views.

Unit – IV

Schema Refinement - Functional dependencies - Normalization - Decomposition - Armstrong's axioms - 3NF, BCNF, 4NF - Multi-valued dependencies.

Unit – V

Object-oriented data model - Object identity and pointers - Object definition and manipulation language - Object-oriented databases - Object relational databases - Recent trends.

Text Book

- A. Silberchatz, F. Korth, and S. Sudarshan, "Database System Concepts", Fourth Edition, McGraw Hill, 2002.

Reference Book

- R. Elmasri and S. B. Navathe, "Fundamentals of Database Systems", Third Edition, Pearson Education, 2000

HM302: Corporate Communication

Credit: 3

Objectives

- To introduce the students to the corporate world and its culture
- To prepare for participation in seminars, group discussions, and interviews
- To prepare students to present the ideas effectively
- To enable the students write research papers and technical proposals

Outcomes

- Increased confidence in dealing with different culture of people from across the globe
- Systematically put forward the ideas in an effective manner to the global world

CS308: Artificial Intelligence and Expert Systems

Credit: 3

Objectives

- To know about basic concepts of NLP and Machine Learning
- To obtain a thorough knowledge of various knowledge representation schemes
- To have an overview of various AI applications
- To study about various heuristic and game search algorithms
- To know about various Expert System tools and applications

Outcomes

- Knowledge of AI principles, Heuristics, Expert Systems, NLP, and Machine Learning techniques
- Skills in developing programs using LISP and PROLOG

Unit – I

Search Strategies - Hill climbing - Backtracking - Graph search - Properties of A* algorithm - Monotone restriction - Specialized production systems - AO* algorithm.

Unit – II

Searching game trees - Minimax procedure - Alpha-beta pruning - Introduction to predicate calculus.

Unit – III

Knowledge Representation - Reasoning - STRIPS - Structured representation of knowledge - Dealing with uncertainty.

Unit – IV

Introduction to Expert Systems - Inference - Forward chaining - Backward chaining - Languages and tools - Explanation facilities - Knowledge acquisition.

Unit – V

Natural Language Processing - Introduction - Understanding - Perception - Machine learning.

Text Book

- G. Luger, W. A. Stubblefield, "Artificial Intelligence", Third Edition, Addison-Wesley Longman, 1998.

Reference Book

- N. J. Nilsson, "Principles of Artificial Intelligence", Narosa Publishing House, 1980

CS314: Operating Systems Laboratory

Credit: 2

Objectives

- To understand and write program in Unix environment
- To design and implement the scheduling algorithms
- To design and implement advanced file system operations

Outcomes

- Ability to write system level programs
- Ability to develop shell scripts

Experiments

- Designing a command shell in Java
- Synchronization of processes
- Study of scheduling algorithms
- Implementation of a file system
- Advanced file system implementation

CS316: Database Laboratory

Credit: 2

Objectives

- To understand basic concepts and terminology related to DB and storage management
- To program simple database applications in Oracle/VB/DB2
- To write application software with host language interface

Outcomes

- Ability to write queries for design and manipulation of database tables using MySQL
- Apply normalization procedures in the database tables
- Design and develop applications using PHP-MySQL

Experiments

- Exercises to be based on Sybase / Oracle / Postgres / VB / Power Builder / DB2 / MS-Access.
- Applications involving vendor development systems, stores management system, finance management etc.
- Creation and querying of database tables
- Design of tables by normalization and dependency analysis
- Writing application software with host language interface

SEVENTH SEMESTER

CS401: Distributed Computing

Credit: 3

Objectives

- To critically appraise advanced technologies for developing distributed systems
- To practically examine the development of Microkernel, Distributed algorithms, Time stamping in distributed systems
- To critically investigate the problems and pitfalls of distributed systems
- To understand the assumptions and limitations of the underlying distributed systems

Outcomes

- Ability to analyze, design, build, and deploy distributed computer systems
- Ability to solve problems in the design of Distributed Operating Systems

Unit – I

Distributed Systems - Goal - Advantages over centralized systems - Organization of multiprocessor systems - Hardware/software concepts - Review of layered protocols.

Unit – II

Client/Server Model - Microkernel - RMI - Distributed algorithms - Time stamping - Circulating tokens - Diffusing computations.

Unit – III

Mutual Exclusion Algorithm - Election algorithm - Detecting loss of tokens and regeneration - Distributed deadlock detection algorithms - Distributed termination algorithms.

Unit – IV

File Replication - Semantics of file sharing - Remote access methods - Fault tolerant issues - Introduction to distributed operating systems.

Unit – V

Introduction to Distributed Operating Systems - Motivations - Management systems - Levels of distribution transparency - Architecture - Introduction to concurrency control.

Text Books

1. George Coulouris and Jean Dollimore, and Tim Kindberg, "Distributed System Concepts and Design", 4th Edition, Addison Wesley, 2005
2. A. S. Tanenbaum, "Distributed Operating Systems", Prentice Hall, 1995.

Reference Book

- S. Ceri and G.Pelagatti, "Distributed Databases - Principles and Systems", McGraw Hill, 1985

CS403: Web Technology

Credit: 3

Objectives

- To have an overview of Internet Protocols and Client/Server models.
- To understand the basics of Web Designing using HTML, DHTML, and CSS.
- To study about Socket Communication and RMI.
- To learn the basics about Client side scripts and Server side scripts

Outcomes

- Knowledge on Internet technologies and Web Designing tools
- Ability to build real world applications using Socket programming, Client side, and Server side Scripting languages

Unit – I

Internet Principles – basic web concepts – Client/ server model – Retrieving data from Internet – Internet Protocols and applications

Unit – II

HTML forms – HTML tags emulation – Links and addressing- HTML and Images

Unit – III

Streaming – Networking Principles – Sockets for Clients – Sockets for Servers – Protocol Handlers – Content Handlers – Multicast sockets – Remote method Invocation.

Unit – IV

Scripts - Java Script, VB Script, DHTML, XML, CGI, Servlets.

Unit – V

Server Scripts - Java Sever Pages (JSP), Active Server pages (ASP), Simple applications – On-line databases – Monitoring user events – Plug-ins – Database connectivity.

Text Books:

1. Eillotte Rusty Harold, "Java Network Programming", O'Reilly Publications, 1997.
2. Harvey M. Deitel and Paul J. Deitel, "Internet & World Wide Web How to Program", 4th edition, 2008.
3. N. P. Gopalan and J. Akilandeswari, "Web Technology – A Developer's Perspective", PHIO Pvt Ltd., New Delhi-, 2007.

Reference Books:

1. Jason Hunter and William Crawford, "Java Servlets Programming", O'Reilly Publications, 1998.
2. Jeff Frantzen and Sobotka, "Java Script" Tata McGraw Hill, 1999.
3. Eric Ladd and Jim O'donnell, "Using HTML 4, XML and Java", Prentice Hall of India – QUE, 1999.

CS405: Principles of Compiler Design

Credit: 3

Objectives

- To understand the various stages involved in the design of a compiler
- To have a grasp on the syntactic and semantic structure in the compiler design

Outcomes

- Design, develop, and implement a compiler for any language
- Develop phases of compiler using Lex and Yacc tools

Unit – I

Introduction - Structure of a compiler - Different phases of a compiler - Finite automata and lexical analysis.

Unit – II

Syntactic specification - Context-free grammars - Derivation and parse trees - Basic parsing techniques.

Unit – III

LR Parsers - SLR, Canonical LR and LALR - Syntax-directed translation schemes - Various forms of intermediate code.

Unit – IV

Translation of array references: procedure calls, declarations and case statements - Symbol tables - Run-time storage administration - Error detection and recovery.

Unit – V

Code Optimization - Loop optimization - DAG representation of basic blocks - Code generation from DAG's - Compiler compilers: YACC - Attributed parser generators.

Text Book

- A. V. Aho, R. Sethi, and J. D. Ullman, "Compilers, Principles, Techniques and Tools", Pearson Education, 13th Indian Reprint, 2003

Reference Book

- J. P. Tremblay and P. G. Sorrenson, "The Theory and Practice of Compiler Writing", McGraw Hill, 1985

CS407: Advanced Computer Architecture

Credit: 3

Objectives

- To understand the fundamental knowledge in architecture design, pipelined processor design, and their impacts on performance
- To understand the fundamental knowledge in memory hierarchy
- To assess the communication and the computing possibilities of parallel system architecture

Outcomes

- Ability to evaluate performance of different computer structures
- Ability to design memory sub systems for a specified performance

Unit – I

Parallel computer models - Flynn's classification - Parallel and vector computers - System, implicit and explicit parallelism - Multi-vector and SIMD computers - PRAM and VLSI models.

Unit – II

Program and network properties - Data and control dependence - Hardware and software parallelism - Partitioning and scheduling - Interconnection architectures.

Unit – III

Performance laws - Metrics and measures - Amdahl's law for fixed workload - Bounded speed-up model - Scalability analysis and approaches.

Unit – IV

Symbolic Processors - CISC and RISC architectures - Super scalar processors and their features - Memory hierarchy.

Unit – V

Linear Pipeline Processors - Basic considerations - Basics of non-linear pipeline processors - Design of pipelined architecture - Recent trends and developments.

Text Book

- K. Hwang, "Advanced Computer Architecture, Parallelism, Scalability, Programmability", McGraw Hill, New York, 1993

Reference Book

- D. A. Patterson and J. L. Hennessy, "Computer Architecture: A Quantitative Approach", Harcourt Asia, Morgan Kaufmann, 1999

CS413: Compiler Design Laboratory

Credit: 2

Objectives

- To provide a deep insight into the various programmatic stages in building a compiler

Outcome

- Design and develop various modules of a compiler
- Develop modules of compiler using Lex and Yacc tools

Experiments

- Design of lexical analyzers and parsers like recursive-descent parser for a block structured language with typical constructs
- Exercises using LEX and YACC
- Quadruples/Triples generation using LEX and YACC for a subset of a block structured language, e.g. PASCAL

CS415: Web Technology Laboratory

Credit: 2

Objectives

- To develop skills in Web Designing using HTML, DHTML, and CSS.
- To implement application protocols such as HTTP request, FTP, SMTP, POP3 in Java Socket Programming
- To develop programming skills in using client side and server side scripting languages

Outcomes

- Programming skills on internet based applications
- Design and development of sophisticated web sites and web applications

Experiments

- Designing a static web page using HTML.
- Designing a dynamic web page using DHTML using different style sheets
- Working with AWT and different Layouts in Java
- Programs using Java Applets
- Programs for creating simple chat application using Datagram sockets and Datagram packets
- Java Socket programming to implement HTTP request, FTP, SMTP, POP3
- Programs using Java servlets to create three-tier applications

EIGHTH SEMESTER

CS402: Advanced Database Management Systems

Credit: 2

Objectives

- To understand the basic concepts and terminology related to DBMS and Relational Database Design
- To the design and implement Distributed Databases.
- To understand advanced DBMS techniques to construct tables and write effective queries, forms, and reports

Outcomes

- Ability to write complex queries including full outer joins, self-join, sub queries, and set theoretic queries
- Knowhow of the file organization, Query Optimization, Transaction management, and database administration techniques

Unit – I

Concepts - EER-to-Relational mapping - Integrity constraints in data modeling - Review of normalization theory - Review of file structures and access methods.

Unit – II

Basic Algorithms - Use of heuristics - Optimization algorithm - Heuristic optimization of query graphs - Using cost estimations in query optimization.

Unit – III

More Concepts - Concurrent execution - Implementation of atomicity, durability - Isolation - Recoverability - Serializability of schedules - Testing for conflict - Serializability - View serializability.

Unit – IV

Lock-based protocols - Timestamp-based protocols - Validation-based protocols - Multiversion schemes - Deadlock handling.

Unit – V

Log-based recovery - Buffer management - Recovery with concurrent transactions - Recovery techniques - Shadow paging. Database System Architectures - Parallel databases - Advanced transaction processing - Emerging database applications - Recent trends and developments.

Text Book

- A. Silberschatz, H. F. Korth, and S. Sudarshan, "Database System Concepts", Fourth Edition, McGraw Hill, 2000

Reference Book

- R. Elmasri and S. B. Navathe, "Fundamentals of Database Systems", Third Edition, Pearson Education, 2000

HM402: Industrial Economics

Credit: 3

Objectives

- To provide the analytical skills required for understanding problems in industrial economics, including applications of game theory
- To analyze various aspects of strategic interaction between firms and the determinants of industrial structure
- To apply economic models of firm behaviour to analyse questions in business strategy, competition policy, and regulation

Outcomes

- Ability to understand the determinants of the size and structure of firms and the implications of the separation of ownership and control
- Ability to recognize and explain the basic determinants of market structure and the key issues in competition policy and regulation

Unit – I

Industrial Economics - Elasticity of demand and supply - Consumption laws - Types of competitions - Keynesian employment theory - Production, planning and control.

Unit – II

Money Banking & Financial Management - Functions of commercial and central banking - The problem of foreign exchange - Sources of industrial finance - Management accounting.

Unit – III

General Management - Principles of management - Scientific management - Advanced techniques in management: MBE, MBO, MBC, MBP, MIS - Quantitative techniques in management.

Unit – IV

Marketing Management - Definition of marketing - Market research - Need for marketing - Sales forecasting - Product life cycle - Market segmentation.

Unit – V

Personnel Management & Industrial Psychology - Selection and recruitment - Training and development - Job evaluation and merit rating - Worker participation - Quality - Work life.

Text Books

- Gupta, G. S., "Managerial Economics", Tata McGraw Hill, 1993 Edition.
- Rasad, L. N., "Principles of Management Theory and Practice", Sultan & Chand, 1992 Edition.

Reference Books

- Davar, S. R., "Personal Management & Industrial Relations", Vikas Publishing (P) Ltd., 1993 Edition.

List of Electives

CS352: Design and Analysis of Parallel Algorithms

Credit: 3

Objectives

- To learn about parallel computing models, design and analyze parallel algorithms for PRAM machines and Interconnection networks.

Outcomes

- Ability to design and analyze parallel algorithms

Unit – I

Introduction to Parallel Computers - SIMD - EREW, CREW - SM-SIMD algorithms - Shared memory SIMD - Tree and mesh interconnection computers.

Unit – II

Sorting - Sorting on a linear array - Sorting on a mesh - Sorting on EREW SIMD computer - MIMD enumeration sort - MIMD quick sort - Sorting on other networks.

Unit – III

Matrix operations - Mesh transpose - Shuffle transpose - EREW transpose - Mesh multiplication - Cube multiplication - Matrix by vector multiplication - Tree multiplication.

Unit – IV

Numerical problems - Linear equations - SIMD algorithm - Roots of nonlinear equations - MIMD algorithm - Partial differential equations - Computing Eigen values.

Unit – V

Graph problems - Computing the connectivity matrix - Finding connected components - Traversal - Minimal alpha-beta tree - Storage requirements.

Text Book

- S. G. Akl, "The Design and Analysis of Parallel Algorithms", Prentice Hall of India, 1989.

Reference Book

- S. Lakshmivarahan and S. K. Dhall, "Analysis and Design of Parallel Algorithms - Arithmetic and Matrix Problems", McGraw Hill, 1990

CS354: Advanced Microprocessor Systems

Credit: 3

Objectives

- To describe the function of the microprocessor and detail its basic operation
- To understand the concepts of advanced architecture in the microprocessors
- To describe the function and purpose of each program-visible registers in microprocessor
- To describe the memory access in real mode and protected mode

Outcomes

- Knowledge of advanced microprocessor families
- Ability to develop modules for interfacing various I/O devices

Unit – I

80286 Architecture - Instruction set - Addressing modes - Real mode - Protected mode - 80386 Architecture - Address segmentation - Paging - Segment registers.

Unit – II

Basic 486 Architecture - 486 memory system and memory management - Features of Pentium memory and I/O systems - Pentium memory management - Introduction to Pentium Pro features.

Unit – II

Introduction to PCs - Study of PC system layout - SCSI, CD-ROM & multimedia - Development of PC - PC components - Features and system design - Motherboards - Buses - BIOS.

Unit – IV

IDE Interface - Magnetic storage principles - Hard disk storage - Floppy disk storage - Optical Storage - Physical drive installation and configuration - Video hardware - Audio hardware.

Unit – V

Input devices - Power supply chassis - Building/upgrading systems - PC diagnostics - Testing and maintenance.

Text Book

- D. V. Hall, "Microprocessor and Interfacing Programming and Hardware", McGraw Hill, II Edition, 1999.

Reference Book

- B. B. Brey, "The Intel Microprocessors 8086/8088, 80186/ 80188, 80286, 80386, 80486 and Pentium and Pentium Pro Processor", Prentice Hall of India, V Edition, 2006.

CS451: Principles of Cryptography

Credit: 3

Objectives

- To gain knowledge about the mathematics of the cryptographic algorithms.
- To get an insight into the working of different existing cryptographic algorithms.
- To learn how to use cryptographic algorithms in security.

Outcomes

- Design and implement a new unbreakable cryptosystem
- Blend the existing cryptographic algorithms with the existing communication protocols
- Analyze and application of cryptography for secure e-Commerce and other secret transactions

Unit – I

Origins of Cryptography - Issues - Codes and ciphers - Preliminary ideas of factoring and testing - gcd and its complexity.

Unit – II

Symmetric Key Cryptosystems - Block ciphers - Substitution ciphers - DES and Feistel ciphers and the problem of breaking them - The field Z/pZ - Euler's φ function.

Unit – III

Stream Ciphers - Linear feedback shift registers and associated results - Geffe generator - Diffe-Hellman key exchange - Bit commitment using symmetric key.

Unit – IV

Public-key Cryptosystems - Discrete logarithm - RSA and Miller-Rabin - Authentication - Digital signatures - Merkle-Hellman Knapsack public key cipher.

Unit – V

Factoring and other topics - Pollard ρ-heuristic - Pollard p-1 algorithm - Quadratic sieve algorithm - Zero-knowledge proof idea - Recent developments.

Text Book

- A. J. Menezes, P. Van Oorschot , and S. Vanstone, "Handbook of Applied Cryptography", CRC Press

Reference Book

- William Stallings, "Cryptography and Network Security", Pearson Education, 3rd Edition, Reprint 2003

CS453: Network Principles and Protocols

Credit: 3

Objectives

- Understand the architecture of the Internet protocols as a layered model
- To understand the fundamentals of data transmission, encoding and multiplexing
- To understand how the various components of wide area networks and local area networks work together

Outcomes

- Conceptual design of MAC, IP, and Transport layer protocols
- Problem solving skills in MAC, IP, and Transport layers
- Coding design and development of MAC, IP, Transport, and Application Layer protocols

Unit – I

Introduction to Networks - Applications of networks - Architecture - Topology - Switching - SLIP - PPP - ALOHA protocols - CSMA/CD - IEEE 802.3, 802.4, 802.5.

Unit – II

Network Layer Issues - Routing - Congestion control - Internetworking - Issues - Address learning bridges - Spanning tree - Source routing - Bridges - Routers - Gateways.

Unit – III

Network Protocols - IP datagram - hop by hop routing - ARP/RARP - Subnet addressing - Address masking - ICMP - RIP/RIPV2 - OSPF - DNS - LAN and WAN multicast.

Unit – IV

Transport Layer - Design issues - Connection management - Transmission Control Protocol (TCP) - User Datagram Protocol (UDP).

Unit – V

Application Layer - Telnet - TFTP - FTP - SMTP - Ping - Finger - Bootstrap - Network Time Protocol - SNMP.

Text Books

1. Andrew S. Tanenbaum and David J. Wetherall, “Computer Networks”, 5th Edition, Pearson, 2011
2. William Stallings, "Data and Computer Communications”, 9th Edition, Pearson, 2011

Reference Book

1. W Richard Stevens and G. Gabrani, "TCP/IP Illustrated - Volume I, The protocols", Pearson Education, 2009

CS455: Mobile Computing

Credit: 3

Objectives

- To understand the fundamentals of Mobile communication systems.
- To understand the different multiplexing scheme.
- To understand the significance of different layers in mobile system

Outcomes

- Knowledge of mobile and wireless communication concepts
- Apply the knowledge gained in exploring application and protocol development

Unit – I

Introduction to Wireless Networks – Applications – History – Simplified Reference Model – Wireless transmission – Frequencies – Signals – Antennas – Signal propagation – Multiplexing – Modulation – Spread spectrum – Cellular Systems.

Unit – II

MAC – Motivation – SDMA, FDMA, TDMA, CDMA –Telecommunication Systems – GSM – DECT – TETRA – UMTS – IMT-2000.

Unit – III

Wireless LAN – Infrared Vs Radio transmission – Infrastructure – Adhoc Network – 802.11 – HIPERLAN – Bluetooth – Mobile Network Layer – Mobile IP – Dynamic Host Configuration Protocol.

Unit – IV

Adhoc Networks – Mobile Transport Layer – Traditional TCP – Indirect TCP – Snooping TCP – Mobile TCP – Fast retransmit / Fast recovery – Transmission / Time-out freezing – Selective retransmission – Transaction Oriented TCP.

Unit – V

Support for Mobility – File Systems – WWW – Wireless Application Protocol.

Text Book

- Jochen Schiller, “Mobile Communications”, Pearson Education, Asia Publications, 2000.

Reference Book

- William Stallings, “Wireless Communication and Networks”.

CS457: Computer Graphics and Image Processing

Credit: 3

Objectives

- To understand basic algorithms for computer graphics and image processing.
- To understand various filters, Point processing, and Arithmetic operations in image processing.
- To understand different applications of graphics and image processing.

Outcomes

- Ability to create software tools for Games and Animation
- Knowledge of various image processing techniques

Unit – I

Graphics Systems and Graphical User Interface - Pixel, Resolution – Graphical devices: input and output devices – Hard copy devices – Direct screen interaction – Color models.

Unit – II

Geometric display primitives - Points, Lines and Polygons. Point display method, 2D Transformations and Viewing : Transformations – Types. Homogeneous coordinates – Window to view port transformations. Clipping: Point, Lines, Polygons.

Unit – III

Image Formation and types – Image operations – Arithmetic, Geometric and Morphological Operations - Basic geometric transformations - Sampling and Quantization.

Unit – IV

Image segmentation and Feature extraction - Detection of Discontinuities – Edge Operators – Edge Linking and Boundary Detection –Thresholding – Region Based Segmentation – Morphology - WaterSheds – Motion Segmentation, Feature Analysis and Extraction.

Unit – V

Image Classification – Image Recognition – Image Understanding – Video Motion Analysis – Image Fusion – Steganography – Mosaics – Color Image Processing.

Text Books

- Donald Hearn & M. Pauline Baker, and warren R. Carithers, "Computer Graphics", Prentice-Hall of India, Fourth edition 2011.
- Rafael C. Gonzalez and Richard E. Woods, "Digital Image Processing", Pearson Education, Third edition, 2011.

Reference Books

- Newmann, W. M. and Sproull, R. F., "Principles of Interactive Computer Graphics", Tata McGraw-Hill, Second edition, 2008.
- Foley, J. D., Van Dam, A., Fiener, S. K., and Hughes J. F., "Computer Graphics", Second edition, Pearson education, 2008.
- Anil Jain, K., "Fundamentals of Digital Image Processing", Prentice-Hall of India, 2001.

CS452: Real Time Systems

Credit: 3

Objectives

- To study issues related to the design and analysis of systems with real-time constraints.
- To learn the features of Real time OS.
- To study the various Uniprocessor and Multiprocessor scheduling mechanisms.
- To learn about various real time communication protocols.
- To study the difference between traditional and real time databases

Outcomes

- Knowledge about Schedulability analysis
- Ability to use real time programming concepts

Unit – I

Introduction to real-time computing - Structure of a real-time system - Characterization of real-time systems and tasks - Performance measures.

Unit – II

Task Assignment and Scheduling - Uniprocessor scheduling algorithms - Task assignment - Mode changes - Fault tolerant scheduling.

Unit – III

Real-time Communication - Network topologies and architecture issues - Protocols - Contention-based, token-based, polled bus - Fault tolerant routing.

Unit – IV

Real-time Databases - Transaction priorities and aborts - Concurrency control issues - Scheduling algorithms - Two-phase approach to improve predictability.

Unit – V

Programming Languages and Tools - Hierarchical decomposition - Run-time error handling - Overloading - Timing specification - Recent trends and developments.

Text Book

- C. M. Krishna and Kang G. Shin, "Real-Time Systems", International Edition, McGraw Hill Companies, Inc., New York, 1997

CS454: Data Warehousing and Data Mining

Credit: 3

Objectives

- To understand the principles of Data warehousing and Data Mining.
- To know the Architecture of a Data Mining system and Data preprocessing Methods.
- To perform classification and prediction of data.

Outcomes

- Technical knowhow of the Data Mining principles and techniques for real time applications
- Design and develop schema for Data Warehouse

Unit – I

Introduction - Relation To Statistics, Databases- Data Mining Functionalities-Steps In Data Mining Process-Architecture Of A Typical Data Mining Systems

Unit – II

Data Preprocessing and Association Rules-Data Cleaning, Integration, Transformation, Reduction, Discretization Concept Hierarchies-Data Generalization And Summarization

Unit – III

Predictive Modeling - Classification And Prediction-Classification By Decision Tree Induction-Bayesian Classification-Prediction-Clusters Analysis: Categorization Of Major Clustering Methods: Partitioning Methods - Hierarchical Methods

Unit – IV

Data Warehousing Components -Multi Dimensional Data Model- Data Warehouse Architecture-Data Warehouse Implementation-Mapping The Data Warehouse To Multiprocessor Architecture- OLAP.

Unit – V

Applications of Data Mining-Social Impacts Of Data Mining-Tools-WWW-Mining Text Database-Mining Spatial Databases.

Text Books

1. Jiawei Han and Micheline Kamber, "Data Mining: Concepts and Techniques", Morgan Kaufmann Publishers, 2002.
2. Alex Berson and Stephen J. Smith, “Data Warehousing, Data Mining, & OLAP”, Tata McGraw- Hill, 2004.

Reference Books

1. Usama M. Fayyad, Gregory Piatetsky - Shapiro, Padhrai Smyth, and Ramasamy Uthurusamy, "Advances In Knowledge Discovery And Data Mining", The M.I.T Press, 1996.
2. Ralph Kimball, "The Data Warehouse Life Cycle Toolkit", John Wiley & Sons Inc., 1998.
3. Sean Kelly, "Data Warehousing In Action", John Wiley & Sons Inc., 1997.

CS456: Advanced Topics in Algorithms

Credit: 3

Objectives

- To introduce fundamentals of contemporary topics in algorithms
- To provide an exposure to graduate level topics in algorithms

Outcomes

- Ability to use advanced algorithmic techniques
- Ability to design approximation algorithms for NP hard problems

Unit – I

Review of first level portions – different paradigms – different problems from various domains.

Unit – II

Randomized Algorithms – Los vegas and Moute Carlo-Chernoff Bound – Probabilistic Amplification – Typical randomised algorithms e.g. Min cut, Randomised Quick Sort, Randomised Selection, Primdity testing.

Unit – III

Graph algorithms – Review – BFS, DFS, Topological Sort, Shortest paths – B-Trees, AVL Trees.

Unit – IV

Graph Algorithms – MIS, Coloring problems, vertex cover, introduction to perfect graphs.

Unit – V

Approximation algorithms – Ratio bound vertex cover, Set covering, Travelling Salesman problem, Subset sum.

Text Books

1. T. H. Cormen, C. E. Leiserson, and R. L. Rivest, "Introduction to Algorithms", The MIT press, Cambridge, Massachusetts and McGraw Hill, 1990.
2. H. S. Wilf, Algorithms and complexity, Prentice hall.

Course Outcome Survey Form

Date: __/__/____

Course Code :_____

Course Name : _____ Year/Semester: _____

Faculty : _____

Sl. No.	Your satisfaction on the following statements	Very Satisfied	Generally Satisfied	Generally dissatisfied	Very dissatisfied	Don't know	Does not apply
1	Faculty has made the subject interesting						
2	Faculty is enthusiastic about what is taught						
3	Faculty is good at explaining things						
4	The course is well organized						
5	The course is intellectually stimulating						
6	Any changes in the course or teaching have been communicated effectively						
7	The criteria used in assessment have been clearly stated in advance						
8	Assessment and marking have been fair						
9	I have been able to contact faculty when I needed to						
10	I have received detailed comments on my work						
11	I have received sufficient advice and support from the faculty for my studies						
12	I have been able to access general IT resources when I needed to						
13	My communication skills have improved						
14	Feedback on my work has been prompt						
15	Feedback on my work has helped me clarify things I did not understand						
16	As a result of the course, I feel confident in tackling problems related to this course						
17	Overall I am satisfied with the quality of the course						

Signature of student

B. Tech. (CSE) Program Survey Form

(By Final Year B. Tech. Students)

Date: __/__/____

1. Course Outcomes

Overall, Your satisfaction on the following statements:	Very Satisfied	Generally Satisfied	Generally dissatisfied	Very dissatisfied	Don't know	Does not apply
How current the content is in most subjects in your courses?						
How interesting the teaching is in most subjects in your courses?						
The variety of courses offered in your programme.						
How helpful and accurate the academic advising is in your course?						
How helpful and accurate the career counseling is in your programme?						
How challenging the work is intellectually in most courses in your programme?						
The overall educational experience in your Programme.						

2. About Faculty

To what extent do you agree or disagree with the following statements:	Strongly Agree	Agree	Disagree	Strongly Disagree	Don't know	Does not apply
Faculties are good at explaining things						
Faculties are good at motivating me to do my best work						
Faculties normally give me helpful feedback on how I am doing.						
Faculties give feedback promptly						
Faculties work hard to make the subjects interesting.						
Faculties grading method are fair						
Faculties treat students with respect						
Faculties are available when I need them						
Course objectives are clear in most courses						
Course objectives are met in most courses						

3. Teaching and learning environment

What extent are you satisfied with the following aspects of the teaching and learning environment?	Very Satisfied	Generally Satisfied	Generally dissatisfied	Very dissatisfied	Don't know	Does not apply
Intellectual stimulation of most courses						
Amount of work required in most courses						
Relevance of lab / practical classes						
Group work for assignments						
Level of class interactions in most courses						
Course content in most courses						
Assistance from most faculty outside of class						
Library access to reading materials						

What extent are you satisfied with the following aspects of the teaching and learning environment?	Very Satisfied	Generally Satisfied	Generally dissatisfied	Very dissatisfied	Don't know	Does not apply
Opportunities to be involved with other students outside of class						
Being informed about things in the department						

4. Skill Development

What extent does your course work in your major improve the following skills?	Strongly Agree	Agree	Disagree	Strongly Disagree	Don't know	Does not apply
Communication skills						
Writing skills						
Interpersonal relationship skills						
Self-reliance skills						
Decision-making skills						
Ability to execute plans						
Ability to work in groups on projects						
Leadership skills						
Analytical skills						
Research skills						
Making logical judgments						
Producing independent work						
Understanding my strengths and weaknesses						
Achieving personal goals						
Achieving career goals						
My education from NIT-T is important to me						

5. Professional Ethics

What extent do you agree or disagree with the following statements.	Strongly Agree	Agree	Disagree	Strongly Disagree	Don't know	Does not apply
I show respectful behavior toward faculty and other students in most of my classes						
I actively participate in most class discussions						
I usually attend my classes						
I usually read the text or other readings prior to class						
I study extensively for exams and quizzes						
I study a few days before the cycle tests/ end semester exam						
I complete all course assignments as explained in syllabus						
I ask for help from most of my faculty when I need it						
I am motivated to learn course materials						
I care about what grade I will receive in most courses						

Signature of student

Alumni Survey Form

(Assessment of Outcomes – B. Tech. (CSE))

Date: __/__/____

Name : _____ **Year of Graduation:** _____

Organization : _____

Address : _____

Phone : _____ **E-Mail:** _____

Overall, are you satisfied with:	Very Satisfied	Generally Satisfied	Generally dissatisfied	Very dissatisfied	Don't know	Does not apply
Demonstrate basic knowledge in mathematics, science, engineering, and humanities.						
Define the problems and provide solutions by designing and conducting experiments, interpreting and analyzing data, and reporting the results.						
Demonstrate the ability to design Computer Science and Engineering systems						
Ability to participate as members of multidisciplinary design teams along with mechanical, electrical, and other engineers.						
Understand quantitative modeling and analysis of a broad array of systems-level techniques to identify, formulate and solve CSE problems.						
Broadly educated and will have an understanding of ethical responsibilities						
Proficient in English language in both communicative and technical forms						
Awareness to apply engineering solutions in global, national, and societal contexts.						
Capable of self-education and clearly understand the value of updating their professional knowledge to engage in life-long learning.						
Demonstrate the ability to apply advanced technologies to solve contemporary and new problems.						
Demonstrate the ability to choose and apply appropriate resource management techniques						

Signature of alumnus

Employer/Scholar Survey Form

B. Tech. (CSE) NITT Alumni

Date: __/__/____

Name of the Company/ Institution :
Name of the B. Tech. (CSE) NITT Alumni : **Batch: 20__ to 20__**
Designation of Alumni :
Job Spec of Alumni :
Name of the Assessor : **Designation:**

How do you rate the current potential of NITT CSE alumni working in your organization on the following criteria:	Very Satisfied	Generally Satisfied	Generally dissatisfied	Very dissatisfied	Don't know	Does not apply
Application of mathematical foundations						
Application of computer science theory and algorithmic principles						
Application of modeling and design of computer based systems						
Application of engineering knowledge in their domain Domain: Health care/ Banking/ Finance/ Medical/ Law/ Others Others, specify:						
Design and conduct of experiments and to analyze and interpret data						
Analyze the problem, subdivide into smaller tasks with well defined interface for interaction among components						
Complete the project (given task) within the specified time frame and financial constraints						
Proposal of original ideas and solutions						
Design, implement, and evaluation of hardware/software systems with security features						
Design, implement, and evaluation of hardware/software systems with assured quality and efficiency						
Effective communication of engineering solution to peers and leads						
Effective communication of engineering solution to customers and users						
Understanding of contemporary issues						
Engagement in lifelong learning						

Signature of assessor


DEPARTMENT OF COMPUTER SCIENCE
AND ENGINEERING