Course Structure & Curriculum

For
B. Tech. Programme

in

Information Technology

Motilal Nehru National Institute of Technology Allahabad

Curriculum and Syllabus for Bachelor of Technology in Information Technology

3rd Semester (Information Technology)

Sub. Code	Subject	Lectures	Tutorials	Practical	Credits
CS-13101	Data Structures	4	-	-	4
MS-13101	Management of IT Industries	3	-	-	3
EC-13103	Analog & Digital Electronics	4	-	-	4
CS-13104	Foundations of Logical Thought	4	-	-	4
CS-13105	Object Oriented Programming	3	-	-	3
CS-13201	Object Oriented Programming **(Lab.)**	-	-	3	2
CS-13202	Data Structures **(Lab)**	-	-	3	2
EC-13203	Analog & Digital Electronics **(Lab)**	-	-	3	2
	Total	**18**		**9**	**24**

Total Hr. = 27 Total Credits = 24

4th Semester (Information Technology)

Sub. Code	Subject	Lectures	Tutorials	Practical	Credits
CS-14101	Analysis of Algorithms	3	-	-	3
CS-14102	Graph Theory & Combinatorics	3	-	-	3
CS-14103	Computer Organization	3	-	-	3
CS-14104	Automata Theory	4	-	-	4
EC-14105	Communication Foundations	3	-	-	3
CS-14105	Scientific Computing	2	-	-	2
CS-14201	Programming Tools–I(Shell) **(Lab.)**	-	-	3	2
CS-14202	Analysis of Algorithms **(Lab)**	-	-	3	2
CS-14203	Automata & Compilers **(Lab)**	-	-	3	2
EC-14201	Communication Foundations **(Lab)**	-	-	3	2
	Total	**18**		**12**	**26**

Total Hr. = 30 Total Credits = 26

5th Semester (Information Technology)

Sub. Code	Subject	Lectures	Tutorials	Practical	Credits
CS-15101	Microprocessor and its Application	3	-	-	3
CS-15102	Operating Systems	4	-	-	4
CS-15103	Database Management System	4	-	-	4
CS-15104	Object Oriented Modeling	4	-	-	4
CS-15105	Operation Research	3	-	-	3
CS-15106	**Computer Architecture**	3	-	-	3
CS-15201	**Programming Tools–II (Systems Calls Lab.)**	-	-	3	2
CS-15202	Microprocessor **(Lab)**	-	-	3	2
CS-15203	Operating Systems **(Lab)**	-	-	3	2
CS-15204	Database System (Lab) (Lab)	-	-	3	2
	Total	**21**		**12**	**29**

Total Hr. = 33 Total Credits= 29

6th Semester (Information Technology)

Sub. Code	Subject	Lectures	Tutorials	Practical	Credits
CS-16101	Embedded Systems	3	-	-	3
CS-16102	**Compiler Construction**	3	-	-	3
CS-16103	**Data Mining**	3	-	-	3
CS-16104	**Cryptography & Network Security**	3	-	-	3
CS-16105	**Computer Networks**	4	-	-	4
CS-1606	Software Engineering	3	-	-	3
CS-16202	**Data Mining (Lab)**	-	-	3	2
CS-16203	Embedded Systems **(Lab)**	-	-	3	2
CS-16204	**Computer Networks (Lab)**	-	-	3	2
CS-16201	Mini Project	-	-	3	2
	Total	**19**		**12**	**27**

Total Hr. = 31 Total Credits= 27

7th Semester (Information Technology)

Sub. Code	Subject	Lectures	Tutorials	Practical	Credits
CS-17103	Image Processing	4	-	-	4
CS-17102	Wireless & Mobile Networks	3	-	-	3
CS-17501 To CS-17599	Open Elective – I	3	-	-	3
CS-17301 to CS-17310	Professional Elective – I	3	-	-	3
CS-17301 to CS-17310	Professional Elective – II	3	-	-	3
CS-17202	Image Processing **(Lab)**	-	-	3	2
CS-17601	Project	-	6	-	6
	Total	**16**	**6**	**3**	**24**

Total Hr. = 25 Total Credits= 24

8th Semester (Information Technology)

Sub. Code	Subject	Lectures	Tutorials	Practical	Credits
CS-18102	Software Project Management	4	-	-	4
CS-18103	Web Technology	3	-		3
CS-18501 to CS-18599	Open Elective – II	3	-	-	3
CS-18301 to CS-18310	Professional Elective – III	3	-	-	3
CS-18301 to CS-18310	Professional Elective – IV	3	-	-	3
CS-18601	Project	-	6	-	6
	Total	**16**	**6**	**-**	**22**

Total Hr. = 22 Total Credits= 22

List of Elective (Information Technology)

Professional Elective I & II (Pool – 1)

Sno.	Subject Name	Subject Code
1	Artificial Intelligence	CS17301
2	Data Compression	CS17302
3	Data Warehousing and Mining	CS17303
4	Design Pattern	CS17304
5	Functional Programming	CS17305
6	Genetic Algorithm	CS17306
7	Network Administration	CS17307
8	Neural Network	CS17308
9	SOSE(Service Oriented Software Engg.)	CS17309
10	XMl Based Applications	CS17310

Professional Elective III & IV (Pool 2)

Sno.	Subject Name	Subject Code
1	Distributed & Parallel Algorithms	CS18301
2	E-Commerce	CS18302
3	Gaming and Animation	CS18303
4	Information Retrieval	CS18304
5	Pattern Recognition	CS18305
6	Semantic Web (Web Ontology)	CS18306
7	Software Metrics & Quality Assurance	CS18307
8	Software Testing	CS18308
9	Theory of Virtualization	CS18309
10	Web Mining	CS18310

Note : The list of Professional Electives would be enriched further.

Curriculum for
Bachelor of Technology in
Information Technology

Summery Sheet (Semester Wise)

3rd Semester (Information Technology)

Total Hr. = 27 Total Credits = 24

4th Semester (Information Technology)

Total Hr. = 30 Total Credits = 26

5th Semester (Information Technology)

Total Hr. = 33 Total Credits= 29

6th Semester (Information Technology)

Total Hr. = 31 Total Credits= 27

7th Semester (Information Technology)

Total Hr. = 25 Total Credits= 24

8th Semester (Information Technology)

Total Hr. = 22 Total Credits= 22

Total Credits (from 3rd to 8th Semester) = 152

Data Structures (III Semester CSE & IT 4L)
Syllabus

Data Structures

Prerequisite: C Programming, Basic Mathematics.

Objective: Implementation of databases, designing efficient algorithms, memory management etc.

Data structures provide the necessary data abstraction for the development of large software systems and their central role in software engineering. Data structure covers include sets, linked lists, stacks, queues, hash tables, trees, heaps, and graphs. Students are introduced to algorithms for searching, sorting, and data structure manipulation and learn the techniques to analyze program efficiency. Programming using recursion and dynamic data structures are covered.

Course Description

This course introduces the students fundamentals of data structures and takes them forward to software design along with the course on Algorithms. It details how the choice of data structures impacts the performance of programs for given software application. This is a precursor to DBMS and Operating Systems. A lab course is associated with it to strengthen the concepts.

Course Outline (To be covered in 40 lectures)

1. Introduction, Elementary Data Organization, Data Structure Operations, Algorithms Complexity, Time-Space Trade off (6)
2. Arrays, Linked List, stacks and Queues (10)
3. Tree, Binary tree, Search tree, Heap, B+ tree (10)
4. Sorting methods, External Sorting/Searching, Hashing (8)
5. Graphs (6)

Text Books

1. The Art of Computer Programming (Volume 1 and Volume 3) - D E Knuth,
2. Data Structures Using C & C++, Langsam, Augenstein & Tenenbaum,
3. Data Structures – A Programming Approach with C, Kushwaha & Mishra,
4. R.L. Kruse, B.P. Leary, C.L. Tondo, “Data structure and program design in C”
5. Fundamentals of Data Structures in C, by Ellis Horowitz, Sartaj Sahni, and Susan Anderson-Freed

Management of IT Industries

Prerequisite: None

Objective: Competently employ broad-based analytical tools and computers for decision-making and system design, analysis and performance. Assume managerial and leadership roles in their chosen professional careers while working in multidisciplinary teams. Engage in continuous learning by seeking out opportunities for higher education or ongoing training related to their employment.

Effectively adapt to the changing demands in workplace and are able to perform increasingly complex tasks, and tasks outside their field of expertise.

Course Description

This course introduces students the working and management of IT industries. The emphasis of the course will be on the skills and knowledge needed to understand and successfully manage an IT based organization. A central concept of the course is that there is a general framework for understanding management that applies to managers in all organizations-large or small, public or private, product-oriented or service-oriented.

Course Outline (To be covered in 30 lectures)

1. Introduction, Nature & Concept of Management; Managerial skills; Evolution of management thought; Concept of functional management; Management styles, Productivity measurement, productivity index, types of production system. (3)
2. Human Resource Management: Definition and theories of Managing People for IT Industry, Human Resource Planning, responsibility assignment matrix, resource management, developing and managing the project team, Case Studies (6)
3. IT Industry Supply Chain Management: Types, Business processes, Strategic, tactical, and operational decisions in supply chains, performance measures, inventory management, bullwhip effect, e-marketplaces, e-procurement, e-logistics, e-fulfillment, customer relationship management, web services, ERP and supply chains, Case Studies (6)
4. IT Project Quality Management: Tools and techniques for quality control (Pareto Analysis, Statistical sampling, testing), process control, SQC control charts, single, double and sequential sampling, TQM. Case Studies (6)
5. Environmental Issues, Pollution Control Acts, Green IT Practices, Establishing a Green IT Action Plan, techniques and technologies available to enable Green IT Case Studies
6. Comprehensive Case studies: Any three from TCS, Cisco, Infosys, Wipro, Facebook, Accenture, Google, IBM, Microsoft etc (3)

Text Books

1. Managemenet :Global Perspectives, by Koontz and Weihrich
2. Principles of Management by Prasad, L.M.,
3. Environmental and Pollution Awareness by Sharma B.R.

Analog and Digital Electronics (III Semester CSE & IT 4L)
Syllabus

Analog & Digital Electronics

Prerequisite: Basic circuits, Semiconductor devices, digital logic.

Objective:

Analog and Digital Circuits is an introductory course on circuit design that aims to develop a combination of design, analysis and experimental skills among the students. In addition, the course will help students to understand mechanisms of sensing and actuation that are commonly used. The laboratory component will expose the student to topics in measurement and instrumentation.

Course Description

This course introduces the students fundamentals of basic electronics and takes them forward to digital circuits. The course provides introduction to (semiconductor) electronic devices. Conduction of electric currents in semiconductors, the semiconductor p-n junction, the transistor. Analysis and synthesis of linear and nonlinear electronic circuits containing diodes and transistors. Biasing, small signal models, frequency response, and feedback. Operational amplifiers. Further, this course covers combinational and sequential logic circuits. Topics include Boolean algebra, logic families, MSI and LSI circuits. This is an precursor to Computer Organization course. A lab course is associated with it to strengthen the concepts.

Course Outline (To be covered in 40 lectures)

1. Introduction to semiconductor physics. Diode, Zener Diode, Diode as a switch, Rectifier, Clipping and Clamping Circuits (6)
2. Bipolar Junction Transistor, Biasing of Transistor, Transistor configurations, Transistor as an Amplifier, Transistor as a Switch. (8)
3. Introduction to FET, MOSFET, Operational Amplifier, SCR, UJT and other devices (6)
4. Introduction to Boolean Algebra and fundamental theorems, Basic Logic Gates, Realization of combinational circuits using universal gates, Gate level minimization (8)
5. Important Digital Circuits Decoder, Multiplexer, PLA, ROM, RAM (4)
6. Flip Flops, Design of Sequential Circuits, Registers, Counters (8)

Text Books

1. Digital Design by M Morris Mano, M D Ciletti
2. Integrated Electronics by Millman & Halkias
3. Electronic Principles by Malvino
4. Foundations of Analog and Digital Electronic Circuits by Anant Agarwal and Jeffrey Lang

Foundations of Logical Thought

Prerequisite: None

Objective:

This course is aimed at Computer Science majors who have never taken any type of mathematical theory courses before, though it is also a useful course for developing general reasoning and problem solving skills. For those that continue studying Computer Science, this course serves as excellent preparation for the required course Discrete Math For Computer Scientists. However, all students taking this course should benefit by improving their reasoning and abstract thinking skills, learning how to construct sound, logical arguments, and by learning to detect flaws in unsound arguments.

Course Description

This course offers a presentation of fundamental tools required in advanced computer science. The main topics covered in this subject include propositional and first-order logic, recursion, proofs, other kinds of logic. This forms the basis for the subjects like Automata theory and formal methods.

Course Outline (to be covered in 40 lectures)

1. Introduction, Set theory, Notion of proofs , Linear congruence (8)
2. Formal logic: Propositional Logic, Relational logic, First order logic, and related issues (8)
3. Lattices and related issues (8)
4. Group Theory and related issues (6)
5. Finite Fields and related issues (6)
6. Generating Functions and related issues (4)

Text Books

1. The Essence of Logic, by John Kelly, Ed.
2. Logic for Applications, Anil Nerode and Richard A. Shore, Ed.
3. Logic, Sets, and Recursion, by Robert L. Causey, Ed.
4. Concrete mathematics: a foundation for computer science, by R. Graham, D. Knuth, O. Patashnik,
5. A Mathematical Introduction to Logic, Enderton, H
6. Discrete Mathematical Structure with Application to Computer Science", J.P Trembley,. & R. Manohar

Object Oriented Programming (III Semester CSE & IT 3L)
Syllabus

Course Description

This is an introductory course, where students learn and practice essential programming skills using the Java programming language. This course provides an overview of Object Oriented Programming (OOP) concepts using Java/C++. It helps to understand basic OOP concepts and assist in applying these concepts. The principles behind OOP discussed. It covers object-oriented principles such as classes, objects, abstraction, composition, Inheritance, polymorphism, and interfaces. These concepts can be implemented in the Java language. Along the way, many of the Java library classes are seen that can be organized to solve a variety of problems. The Java collection classes are studied. Additional topics include exception handling, database connectivity with JDBC, and multi-threading. The course is programming intensive. By the end of this course student will able to understand the basics of OOP and be prepared to take on more complex challenges. A lab course is associated with it to strengthen the concepts.

Course Outline (To be covered in 30 lectures)

1. *Core Java*: Introduction to Object Oriented Software development through Java. Classes and Objects. (6)
2. Inheritance, Polymorphism, Nested classes and interfaces, Exceptions, Strings, Packages, The I/O Package.(10)
3. *Advanced Java*: Event Handling, AWT, Swing, Applets, Multi-Threading, Generic, The collection frameworks.(8)
4. Networking, Java Server Pages (JSP), Java Servlet, Enterprise Java Beans (EJB), Java Messaging Service (JMS), Java Database connectivity (JDBC).(6)

Text Books

1. Kathy Sierra and Bert Bates, “Head First Java”, 2nd edition, O’Reilly
2. Herbert Schildt , “Java : The Complete Reference”, 9th edition, Oracle Press
3. Cay S. Horstmann and Gary Cornell , “Core Java Volume I & II”, 10th edition, Prentice-Hall
4. Tony Gaddis, “Starting Out with Java: From Control Structures through Objects”, 6th edition, Pearson
5. David Flanagan, “Java in a Nutshell”, 5th edition, O’Reilly

Analysis of Algorithms (IV Semester CSE & IT 3L)
Syllabus

Analysis of Algorithms

Prerequisites: Discrete Mathematics (counting arguments, induction, recurrence relations and discrete probability)

Objectives:

This is an introductory course in the analysis and design of combinatorial algorithms. Emphasis is given on (i) familiarizing the students with fundamental algorithmic paradigms and (ii) rigorous analysis of combinatorial algorithms. This is a modern introduction to combinatorial algorithms and it maintains some consistency with previous courses.

Course Description

This course teaches techniques for the analysis of efficient algorithms, emphasizing methods useful in practice. Algorithms are recipes for solving computational problems. In this course we will study fundamental algorithms for solving a variety of problems, including sorting, searching, divide-and-conquer, dynamic programming, greediness, and probabilistic approaches. Algorithms are judged not only by how well they solve a problem, but also by how effectively they use resources like time and space. Techniques for analyzing time and space complexity of algorithms and to evaluate tradeoffs between different algorithms. Analysis of algorithms is studied - worst case, average case, and amortized - with an emphasis on the close connection between the time complexity of an algorithm and the underlying data structures. NP-Completeness theory is examined along with methods of coping with intractability, such as approximation and probabilistic algorithms. A basic understanding of mathematical functions and data structures is a prerequisite for the subject. A lab course is associated with it to strengthen the concepts.

Course Outline (To be covered in 30 lectures)

1. Introduction, Review of basic concepts, advanced data structures like Binomial Heaps, Fibonacci Heaps (5)
2. Divide and Conquer with examples such as Sorting, Matrix Multiplication, Convex hull etc(6)
3. Dynamic programming with examples such as Kanpsack, All pair shortest paths etc (4)
4. Backtracking, Branch and Bound with examples such as Travelling Salesman Problem etc (6)
5. Algorithms involving Computational Geometry (4)
6. Selected topics such as NP-completeness, Approximation algorithms, Randomized algorithms, String Matching (5)

Text Books

1. Introduction to Algorithms by Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest
2. Fundamentals of Computer Algorithms by E. Horowitz & S Sahni
3. The Design and Analysis of Computer Algorithms by Aho, Hopcraft, Ullman,

Graph Theory and Combinatorics (IV Semester CSE & IT 3L)
Syllabus

Graph Theory & Combinatorics

Prerequisites: Discrete Mathematics, Computer Algorithms and Programming
Objectives: The course aims to introduce the students about topics and techniques of Graph Theory and Combinatorial analysis. The course provides a large variety of applications and, through some of them, the algorithmic approach to the solution of problems in computer science and related areas. This helps in developing mathematical maturity skills of students. To present a survey of essential topics for computer science students who will encounter some of them again in more advanced courses.

Course Description

The course provides an introduction to graph theory and combinatorics, the two cornerstones of discrete mathematics. The student will gain an insight into the basic definitions of relevant vocabulary from graph theory and combinatorics, and know the statements and proofs of many of the important theorems in the subject. It helps to simulate real world problems, with applications in communication and networks, operating systems, robotics, wireless and sensor networks, VLSI and many more. Topics that will be discussed include Euler formula, Hamilton paths, planar graphs and coloring problem; the use of trees in sorting and prefix codes; useful algorithms on networks such as shortest path algorithm, minimal spanning tree algorithm and min-flow max-cut algorithm. The Prerequisite is basic knowledge of set and matrix theory

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Course Outline (To be covered in 30 lectures)

1. Combinatorics Basic counting techniques, pigeon-hole principle, recurrence relations, Polya's counting theorem. Introduction to probabilistic method in combinatorics (6)
2. Fundamental concepts of graphs and digraphs, (4)
3. Spanning tree, connectivity, optimal graph traversals (5)
4. Planarity of Graphs, Drawing graphs and maps, graph coloring (5)
5. Special digraph models, network flow and applications (6)
6. Algebraic specifications of Graphs, Non planar layouts (4)

Text Books

1. Introduction to Enumerate Combinatorics, M. Bona,
2. Introduction to Graph Theory, D.B.West
3. Graph Theory and Applications J.A. Bondy and U.S.R.Murty: (Freely downloadable from Bondy's website; Google-Bondy)
4. Graph Theory: Modeling, Applications, and Algorithms, by Geir Agnarsson and Raymond Greenlaw
5. Introductory Combinatorics by R A Brualdi,

Computer Organization (IV Semester CSE & IT 3L)
Syllabus

Computer Organization

Prerequisites: Discrete Structures and Digital Logic

Objectives: The objective of this course is to master the basic hardware and software issues of computer organization. The students are expected to know the inner workings of a computer and have the ability to analyze the hardware and software issues related to computers and the interface between the two. This allows the students to work out the trades off involved in designing a modern computer.

Course Description

This is a first course dealing with layout and design principles of a computing system and its peripherals. It requires understanding of digital electronics. It prepares foundations for the operating system, microprocessor and embedded systems courses.

Course Outline (To be covered in 30 lectures)

1. Introduction, Register Transfer Language, Bus and Memory Transfers, Bus Architecture, Arithmetic Logic Unit (6)
2. Fundamental concepts of controller design. (6)
3. Processor design and related issues (8)
4. Input/Output Organization and related concepts(4)
5. Optical, magnetic and semiconductor memory devices, Memory organization (6)

Text Books

1. Computer Organization and Design: The Hardware-Software Interface, by David Patterson and John Hennessy.
2. Computer Organization, by Vravice, Zaky & Hamatcher
3. Structured Computer Organization, by Tannenbaum
4. Computer System Architecture, by M. Mano

Automata Theory (IV Semester CSE & IT 4L)
Syllabus

Automata Theory

Prerequisites: Knowledge corresponding to the Formal languages and automata, Computability and complexity.

Objectives: At the end of the course students should be able to understand and explain selected advanced parts of automata theory, including parsing techniques for deterministic context-free languages, relationship between finite-state automata and MSO logic, automata on infinite words, and process specifications. Further, students should be able to make reasoned decisions about computational models appropriate for the respective area and to understand methods and techniques of their applications.

Course Description

Automata theory is the study of abstract computational devices. They have applications in modelling hardware, lexical analysis, machine design, syntax analysis, parser generation, program verification, text editing and so on. The class of formal languages, context free grammar, DFA, NFA and PDA are being covered up in the course. The knowledge of these concepts form the foundations of computer science and continues towards the development of the student's skills in understanding mathematical models. The prerequisite is basic knowledge of mathematics. A lab course is associated with it to strengthen the concepts.

Course Outline (To be covered in 40 lectures)

1. Introduction, inductive Proofs Relations and Functions (4)
2. Regular Languages DFA, NFA Machines and their equivalence, Regular Expressions, Equivalence of Regular Expressions and Finite State Machines, Closure Properties of Regular Languages Proving Non-Regularity (8)
3. Context-free Languages Context-free Grammars, Derivations, Leftmost, Rightmost, Inherent Ambiguity, Parse Trees, Normal Forms, Proof of Containment of the Regular Languages Pushdown Automata, Equivalence of PDAs and Context-free Grammars Closure Properties of Context-free Languages (12)
4. Pumping Lemma for both Regular & Context-free Languages, Proving Some Languages are not Context-free. (6)
5. Recursive and Recursively Enumerable Languages, Turing Machines Definition of Recursive and Recursively Enumerable, Church's Hypothesis, Computable Functions, Methods for Turing Machine Construction (10)

Text Books

1. Introduction to the Theory of Computation, by Michael Sipser
2. Introduction to Automata Theory, Languages, and Computation, by Hopcroft, Motwani, and Ullman (ISBN 0-321-45536-3)
3. Theory of Computer Sciences Korral,
4. Automata, Computability and Complexity: Theory and Applications. by E Rich

Communication Foundations (IV Semester CSE & IT 3L)
Syllabus

Communication Foundations

Prerequisites: Fourier Transformation, Basic Calculus.
Objectives: After completing this course students must be able to understand about different types of antennas, different modulation demodulation techniques, signal detection and system performance in the presence of noise.

Course Description

In this course students will study fundamentals of analog and digital communication. The course includes the basics of Electromagnetic waves, antennas, modulation, information theory, sampling and quantization, coding, signal detection and system performance in the presence of noise. This is a prerequisite for the course on Computer Networks. A lab course is also associated with it.

Course Outline (To be covered in 30 lectures)

1. Introduction, Elements of communication systems, review of signal representations in time and frequency domain, bandwidth, filters, Electromagnetic spectrum (6)
2. Sky waves, ground waves and space waves, Antenna fundamentals and types of antennas (4)
3. Amplitude Modulation, Frequency modulation, Radio receivers (4)
4. Sampling theorem, quantization and pulse code modulation, digital modulation techniques (6)
5. Fundamentals of guided waves, wave guides, coaxial cables, fiber optic cables, cable types and specifications. (6)
6. Case studies: FM Broadcast, satellite communication, telephone systems, mobile telephony

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Text Books

1. Communication Systems Engineering by Proakis, John, and Masoud Salehi
2. Electronic Communication Systems by Kennedy D
3. Computer Networks by Tanenbaum, Andrew
4. Communication Systems by Haykin, Simon.

Scientific Computing

Prerequisites: Calculus, Algebra, The ability to write and run programs under a UNIX operating system, in one of the languages C, C++, or Fortran.The ability to create executables involving multiple files and libraries either by a script or a makefile .Write programs that read and write formatted data from and to files.

Objective: The goal of this course is to introduce students to the fundamental concepts of Scientific Programming using Matlab/Octave and similar programming languages (e.g. sage math) and we will introduce the necessary mathematical concepts as we go (including linear algebra, differential equations, probability and statistics). The course will cover the syntax and semantics of Matlab/Octave including data types, control structures, comments, variables, functions, and other abstraction mechanisms.

Course Description

Scientific computing has become an indispensable tool in many branches of research, and is vitally important for studying a wide range of physical and social phenomena. This course will examine the mathematical foundations of well-established numerical algorithms and explore their use through practical examples drawn from a range of scientific and engineering disciplines. It gives the computational algorithms for analyzing and solving mathematical problems such as model fitting, calculus operations, finding roots for equations and other statistical computation. The prerequisites for this course are linear algebra, calculus, and elementary probability theory along with computer programming.

Course Outline (To be covered in 20 lectures)

1. Introduction, Algebraic and Transcendental Equations and related issues (4)
2. Discussion on different Interpolation concepts and methods (4)
3. Curve Fitting, Cubic Spline & Approximation(4)
4. Numerical Integration and Differentiation. (4)
5. Numerical Linear Algebra (2)
6. Statistical Computations (2)

Text Books

1. Numerical Recipes in C The Art of Scientific Computing by W H Press, S A Teukolesky, W T Vellerling and B P Flannery
2. Numerical Methods for Scientific and Engineering by M.K.Jain, S.R.K.Iyenger and R.K.Jain
3. Numerical Methods and Analysis by James I. Buchman and Peter R.Turner
4. Applied Numerical Analysis by C.F.Gerald and P.O.Wheatley

Microprocessor and its Applications (V Semester CSE 3L)
Syllabus

Microprocessor and its Application

Prerequisite: Digital Design
Objective: The objective of this course is to provide extensive knowledge of microprocessor based systems and interfacing techniques.

Course Description

In this course students will study microprocessor over the foundations of Analog and Digital Electronics and Computer organization. This course will introduce students to current state-of-the-art hardware, architecture and elementary programming of microprocessor and microcontrollers. Among the various topics covered include instruction sets, fundamental software concepts, interfacing microprocessors to external devices (sensors and actuators) and analog and digital circuits, and microprocessors in control systems. This course forms the basis for the course on Embedded Systems. This course has a lab course associated with it.

Course Outline (To be covered in 30 lectures)

1. Introduction, Overview of microprocessors (3)
2. Microprocessor Programming Concepts with case study of 8086 and other microprocessors (7)
3. Memory interfacing and related issues (4)
4. Interrupts and Interrupt Applications with case study of 8086 and other microprocessors (6)
5. Peripheral device control and interfacing (10)

Text Books

1. Microprocessors and Interfacing by Douglas V. Hall
2. Microprocessor Architecture, Programming and Applications by R. Gaonkar
3. Microprocessors Theory and Applications: Intel and Motorola by M. Rafi Quazzaman

Operating System (V Semester CSE & IT 4L)
Syllabus

Operating Systems

Prerequisite: C, Java, and data structures.
Objective: - gain extensive knowledge on principles and modules of operating systems
- understand key mechanisms in design of operating systems modules
- understand process management, concurrent processes and threads, memory management, virtual memory concepts, deadlocks
- compare performance of processor scheduling algorithms
- produce algorithmic solutions to process synchronization problems
- use modern operating system calls such as Linux process and synchronization libraries

Course Description

In this course students will study the basic facilities provided in modern operating systems. The emphasis will be on understanding general concepts that are applicable to a wide range of operating systems, rather than a discussion of the features of any one specific system. Topics that will be covered in the course include: protected kernels, processes and threads, concurrency and synchronization, memory management, virtual memory, file systems, secondary storage, protection, and security. This course requires as prerequisite the course on computer programming, data structures and computer organization. This course has an associated lab with it.

Course Outline (To be covered in 40 lectures)

1. Introduction and Overview (2)
2. Process fundamentals, scheduling, synchronization (12)
3. Inter-process communication, Deadlock (8)
4. Memory management and virtual memory (7)
5. File system and secondary storage (5)
6. Protection and security issues, Case studies e.g. Linux, Solaris and Android (6)

Text Books

1. Operating Systems, by William Stallings
2. Operating Systems Concepts by Silberschatz, Galvin, and Gagne
3. The Design of the UNIX Operating System, by Maurice J. Bach
4. Advanced Programming in the UNIX Environment, by W. R. Stevens & S. A. Rago.
5. The Design and implementation of the 4.4 BSD UNIX operating system by Marshall Kirk McKusick, Keith Bostic, Michael J. Karels, John S. Quarterman.

Database Management System (V Semester CSE & IT 4L)
Syllabus

Database Management System

Prerequisites: Elementary knowledge about computers including some experience using Unix or Windows. Knowledge of programming in some common programming language. Understanding of data structures and algorithms are required.

Objective: This course will give principles and practical solutions for storage and retrieval of information using a computer system, particularly for large quantities of data, and with an emphasis both on the use of relational database management systems.

Course Description

In this course students will study the basic functions and capabilities of database management systems (DBMS). Emphasis is placed on the use of DBMS in solving information processing problems which will include database design case studies as well as SQL programming assignments along with transactions. A lab course is associated with it to strengthen the concepts.

Course Outline (To be covered in 40 lectures)

1. Database system concept and architecture, Entity Relationship and Enhanced E-R (5)
2. Relational Data Model and Relational Algebra, SQL, Indexing, Query Optimization (10)
3. Relational Database Design, Normalization principles and normal forms (8)
4. Transaction concept and concurrency control (8)
5. Web Interface to DBMS, Semi-structured databases, Object oriented databases (6)
6. DBMS Case studies (3)

Text Books

1. Database system concepts, by Korth, Silberschatz, and Sudarshan
2. Fundamentals of Database Systems by Elmasari and Nawathe
3. Databases by O Neil,
4. Database Systems The Complete Book by Garcia-Molina, Ullman, & Widom
5. Database Management System by Ramakrishnan and Gehrke

Object Oriented Modeling (V Semester CSE & IT 4L)
Syllabus

Object Oriented Modeling

Prerequisite : Basic Concepts of Object Oriented Programming, Software Engineering.
Objective:

- Analyze and Design a real – world problem into Object- Oriented form.
- Create a requirements model using UML class notations and use-cases based on statements of user requirements, and to analyze requirements models given to them for correctness and quality.
- Create the OO design of a system from the requirements model in terms of a high-level architecture description, and low-level models of structural organization and dynamic behavior using UML class, object, and sequence diagrams.
- Comprehend enough Java to see how to create software that implements the OO designs modeled using UML.
- Comprehend the nature of design patterns by understanding a small number of examples from different pattern categories, and to be able to apply these patterns in creating an OO design.
- Given OO design heuristics, patterns or published guidance, evaluate a design for applicability, reasonableness, and relation to other design criteria.

Course Description

In this course students will study the fundamental principles of object-oriented approaches to modeling software requirements and design. Topics include strategies for identifying objects and classes of objects, specification of software requirements and design, the design of class hierarchies, software reuse considerations, graphical notations, system implementation using object-oriented and object-based programming languages, and comparison of object-oriented approaches to more traditional approaches based on functional decomposition.

Course Outline (To be covered in 40 lectures)

1. Introduction, Need for formal and semi-formal modeling, UML-2 Meta-model (7)
2. UML-2 Concepts and Examples: Object, Class, Relationship, Interface, Types, roles, Use Case, Interaction and Activity Diagrams, State Machine and State-chart Diagram, Events, signals, Process and threads (10)
3. Software System Design, Design Patterns, Pattern Classification, Creational, Structural and Behavioral patterns, Idoms (15)
4. Agents and Agent Modeling, Multi-Agent Systems Modeling, Case Study (8)

Text Books

1. Object-Oriented Modeling and Design with UML - Michael Blaha, James Rumbaugh
2. Pattern-Oriented Software Architecture A System of Patterns, Volume 1 - Frank Buschmann, Regine Meunier, Hans Rohnert, Peter Sommerlad, Michael Stal
3. Object-Oriented Analysis and Design with Applications - Grady Booch et al
4. Object-Oriented Design with UML and JAVA - K. Barclay, J. Savage
5. Practical Object-Oriented Design with UML - Mark Priestley

Operations Research (V Semester CSE & IT 3L)
Syllabus

Operation Research

Prerequisite: Basic Engineering Mathematics.
Objective: This module aims to introduce students to use quantitative methods and techniques for effective decisions–making; model formulation and applications that are used in solving business decision problems.

Course Description

In this course students will study some common operations research models and algorithms. Operations Research (OR) refers to the science of informed decision making. The goal is to provide rational basis for decision-making by analyzing and modeling complex situations, and to utilize this understanding to predict system behaviour and improve system performance. The application of OR involves problem formalization, model construction and validation; other activities include a computational part, analysis of solutions, arriving at conclusions, and implementation of the decision. It extensively uses the concepts of mathematical modeling, statistical analysis and optimization techniques. The emphasis is on applications rather than the details of methodology. This would act as a tool to the courses namely data mining, business intelligence and decision support systems.

Course Outline (To be covered in 30 lectures)

1. Introduction, Linear programming (LP) models (4)
2. Simplex & revised simplex algorithms, Duality and sensitivity analysis in LP (6)
3. Basics of Game theory, Transportation and assignment problems, Project scheduling (critical path method & PERT) (10)
4. Integer programming models, Stochastic processes: Markov chains and birth/death processes, Queuing theory (6)
5. Network Analysis and Inventory Control(4)

Text Books

1. Operations Research Models and Methods, by Paul A. Jensen and Jonathan F. Bardto
2. Operation Research by Hamdy.A Taha
3. Introduction to Operations Research, by Frederick Hillier & Gerald Lieberman
4. Linear Programming by Hadely G.

Computer Architecture (V Semester CSE 3L)
Syllabus

Computer Architecture

Prerequisites: Course assumes significant prior knowledge of computer organization and architecture. You should already be familiar with hardware caches, instruction execution pipelines, basic logic design, and some assembly-level programming.

Objective: The course covers the fundamentals of classical and modern processor design: performance and cost issues, instruction sets, pipelining, caches, physical memory, virtual memory, I/O superscalar and out-of-order instruction execution, speculative execution, long (SIMD) and short (multimedia) vector execution, multithreading, and an introduction to shared memory multiprocessors.

Course Description

In this course students will study computer architecture with an emphasis on a quantitative approach to cost/performance design tradeoffs. The course covers the performance and cost issues, instruction sets, pipelining, caches, physical memory, virtual memory, I/O superscalar and out-of-order instruction execution, speculative execution, vector execution, and multithreading in the context of classical and modern processor design.

Course Outline (To be covered in 30 lectures)

1. Introduction, History of Computing, (3)
2. Fundamentals of computer Design,Performance related issues- Performance Parameters- Measuring Performance- Instruction Set Architecture Design – compiler related issues. (7)
3. Instruction Pipelining- Pipeline hazards- Overcoming hazards- Instruction set design and pipelining- Parallelism Concepts – Dynamic Scheduling – Dynamic hardware branch prediction. (7)
4. Multi-core, Super scalar, VLIW and vector processors – compiler support for ILP – extracting parallelism – speculation – performance. (6)
5. Centralized shared memory architectures, Distributed shared memory architectures – synchronization – memory organisation and cache coherence issues (7)

Text Books

1. Advanced Computer Architecture: Parallelism, Scalability and Programmability by Kai Hwang
2. Computer Organization and Design, The Hardware/Software Interface by Patterson and Hennessey,
3. Advanced Computer Architecture: A System Design Approach by Richard Y. Kain
4. Microprocessor Architecture: From Simple Pipelines to Chip Multiprocessors by Jean-Loup Baer

Cryptography & Network Security (VI Semester CSE & IT 3L)
Syllabus

Cryptography

Prerequisite: Coding Theory, Information Security.
Objective:
Appreciate the core techniques of cryptography and how they can be applied to meet various security objectives. Understand both the importance of cryptographic key management, and the different key management requirements and practices associated with the use of different security techniques. Appreciate how the techniques described are employed in practice in a variety of security applications, from SSL enabled websites through to disk encryption.

Course Description

In this course students will study the essential mathematical foundations for Information Security. This course features a rigorous introduction to modern cryptography, with an emphasis on the fundamental cryptographic primitives of public-key encryption, digital signatures, pseudo-random number generation, and basic protocols and their computational complexity requirements. After crediting this course students can look forward to wireless network security and E-commerce courses.

Course Outline (To be covered in 30 lectures)

1. Introduction, Prime Number Generation, Shannon's Theory of Perfect Secrecy (5)
2. Asymmetric Key Cryptosystem and related issues (3)
3. Public Key Cryptography and related concepts/methodologies (4)
4. Cryptographic Hash Functions design and implementation issues. (4)
5. Digital Signatures and related issues (5)
6. E-Mail, IP and Web security (6)
7. Malicious Programs & Firewall(3)

Text Books

1. Modern Cryptography : Theory and Practice by W Mao
2. Applied cryptography by Bruce Schiener
3. “Cryptography: Theory & Practice” D R Stinson,
4. Introduction to cryptography by Johannes A Buchmann
5. Network Security and Cryptography by Bernard Menezes

Embedded Systems (VI Semester CSE 3L)
Syllabus

Embedded Systems

Prerequisites: Knowledge of microprocessor architecture and assembly language, microprocessor peripherals, digital design, and the C programming language is a prerequisite for this course. Although not listed as formal prerequisites computer organization is highly recommended. An understanding of compilers, assemblers, linkers, operating systems, analog design, diodes, transistors, and electromagnetic fields and waves will be useful.

Objective: In this course, the fundamentals of embedded system hardware and firmware design will be explored. Issues such as embedded processor selection, hardware/firmware partitioning, glue logic, circuit design, circuit layout, circuit debugging, development tools, firmware architecture, firmware design, and firmware debugging will be discussed. The Intel 8051, a very popular microcontroller, could be studied. The architecture and instruction set of the microcontroller will be discussed.

Course Description

In this course students will study basic concepts pertaining embedded systems. Embedded systems are employed in consumer electronics such as cameras, DVD players and cable descramblers, in cars, airplanes, factories, offices and hospitals. Their large numbers and ever growing complexity call for research oriented approach to their design. Knowledge of microprocessor architecture and assembly language, microprocessor peripherals, digital design, and the C programming language is a prerequisite for this course. A lab course is associated with it to strengthen the concepts.

Course Outline (To be covered in 30 lectures)

1. Introduction, Different perspectives of embedded systems (4)
2. Design considerations for Processors (4)
3. Microcontroller programming concepts in Assembly language and C (5)
4. Processors and peripherals for embedded systems (7)
5. Serial port programming and interrupts (4)
6. Microcontrollar interfacing with a case study of 8051 (6)

Text Books

1. Embedded System Design: A Unified Hardware/Software Introduction by Frank Vahid and Tony Givargis.
2. 8051 Microcontroller and Embedded Systems by Muhammad Ali Mazidi, Janice Mazidi and Janice Gillispie Mazidi.
3. Fundamentals of Embedded Software Where C and Assembly Meet by D W Lewis

Computer Networks (VI Semester CSE & IT 4L)
Syllabus

Computer Networks

Prerequisite: C or Java programming, Course in algorithms, Course in probability.

Objective:

1. Build an understanding of the fundamental concepts of computer networking.
2. Familiarize the student with the basic taxonomy and terminology of the computer networking area.
3. Introduce the student to advanced networking concepts, preparing the student for entry Advanced courses in computer networking.
4. Allow the student to gain expertise in some specific areas of networking such as the design and maintenance of individual networks.

Course Description

In this course students will study computer networks within the context of the Internet. It will build on prior knowledge in Communication foundations, computer organization, basic algorithms, data structures and C programming. Students will study the fundamental principles, elements, and protocols of computer networks. Course will investigate how the different protocols work, why they work that way, and their performance trade-offs. This course prepares foundations for wireless networks and distributed systems. This has a lab course associated with it.

Course Outline (To be covered in 40 lectures)

1. Introduction, Fundamental requirements of network, OSI & TCP/IP model (3)
2. Physical and Link layer issues (4)
3. Medium Access protocols (IEEE 802.3 ...) and related issues (8)
4. Network layer: IP and other protocols, Routing protocols, and LAN design. (11)
5. Transport layer Protocols and related Issues (8)
6. Basic client server architecture, introduction to different application layer protocols like ftp, telnet, mail(SMTP), HTTP, DNS, DHCP and peer to peer (6)

Text Books

1. Computer Network – Top down approach by James. F. Kurose & Keith W. Rose,
2. Compuer Network – A system approach by Larry.L.Peterson & Bruce.S.Davie
3. Data Communication & Networking by Behrouz Forouzan
4. Unix Network Programming –volume-I by W.Richard Stevens

Data Mining (VI Semester CSE & IT 3L)

Syllabus

Course Description

This course will offer a comprehensive coverage of well known Data Mining topics including classification, clustering and association rules. A number of specific algorithms and techniques under each category will be discussed. Methods for feature selection, dimensionality reduction and performance evaluation will also be covered. Students will learn and work with appropriate software tools and packages in the laboratory. They will be exposed to relevant Data Mining research. A separate lab course is associated with this course.

Course Outline (to be covered in 30 lectures)

UNIT-I (8)

DATA MINING, DATA PROCESSING AND DATA WAREHOUSES

Data Mining – History – Strategies – Techniques – Applications – Challenges – Future- Types of Data – Data Warehouses – Data Processing - Quality Measure – OLAP – Sampling.

DATA TYPES, INPUT AND OUTPUT OF DATA MINING ALGORITHMS

Different Types of features – Concept Learning – Output of Data Mining Algorithms.

PREPROCESSING IN DATA MINING

– Steps – Discretization – Feature Extraction, Selection and construction – Missing Data and Techniques for dealing it.

UNIT-II CLASSIFICATION TASK: (8)

Introduction – Decision trees – Naïve Bayes' classification- Artificial Neural Networks and Support Vector Machines.

UNIT-III MODEL EVALUATION TECHNIQUES (6)

Accuracy Estimation- ROC-Lift Charts- Cost –Bagging and Boosting- Model Ranking Approach.

ASSOCIATION RULE MINING:

Concepts, Relevance, Functions of Association rule Mining – Apriori Algorithm- Strengths and Weak nesses of ARM- Applications.

UNIT IV - CLUSTERING AND ESTIMATION (8)

CLUSTERING TASK:

Introduction- Distance Measure – Types – KNN for clustering – validation -Strengths and Weaknesses of Algorithms – Applications.

ESTIMATION TASK:

Scatter Plots and Correlation – Linear regression Models – Logistic regression – Regression Analysis - Strengths and Weaknesses of Estimation- Applications.

Text Books

1. Shawkat Ali A B M, Saleh A. Wasimi "Data Mining: Methods and Techniques" Third Indian Reprint, Cengage Learning, 2015
2. Soman K. P., Shyam Diwakar, Ajay V. "Insight into Data Mining Theory and Practice" ,Fifth Printing, PHI Learning, 2011.

Software Engineering (VI Semester CSE & IT 3L)
Syllabus

Software Engineering

Prerequisites: Data Structures & Algorithms, Programming Language abstract and Concrete Syntax, Logic Propositional and Predicate Logic, Proofs - Inference Rules, Proof Methods.
Objective: The course assists to understand the basic theory of software engineering, and to apply these basic theoretical principles to a group software development project.

Course Description

In this course students will study the fundamentals of software engineering, including understanding system requirements, finding appropriate engineering compromises, effective methods of design, coding, and testing, team software development, and the application of engineering tools. The course will combine a strong technical focus with a mini project (offered alongside), providing the opportunity to practice engineering knowledge, skills, and practices in a realistic development setting.

Course Outline (To be covered in 30 lectures)

1. Introduction, Software life-cycle models (4)
2. Software requirements, Requirements Specification (6)
3. Software design and Software user interface design(7)
4. Coding Issues, Software integration and testing. (6)
5. Software support processes and Quality Assurance, IEEE Software Engineering Standards (4)
6. Software maintenance, Software reuse, (3)

Text Books

1. Software Engineering – A Practitioner's Approach, by Pressman R. S. and Ince D
2. Software Engineering by Sommerville
3. Software Engineering, Volume 1 and Volume 2, by Thayer, and Christiansen,
4. Fundamentals of Software Engineering by Rajib Mall

Compiler Construction

Course Description

The course is intended to teach the students the basic techniques that underlie the practice of Compiler Construction. The course will introduce the theory and tools that can be standardly employed in order to perform syntax-directed translation of a high-level programming language into an executable code. This course explores the principles, algorithms, and data structures involved in the design and construction of compilers. It provides the student with an experience of the design and construction of a working compiler. The course emphasizes techniques that have direct application to the construction of compilers and optimization. In addition to the exposition of techniques for compilation, the course will also discuss various aspects of the run-time environment into which the high-level code is translated. The only meaningful way to learn about compilers is to build them. This has a lab course associated with it.

Course Outline (To be covered in 30 lectures)

1. Introduction to Compiler
2. Lexical Analysis, Grammars, Top-down parsing, Bottom-up parsing
3. Syntax Directed Translation, Semantic Analysis
4. Symbol Table Design
5. Intermediate Code Generation, Code Generation & Optimization

Reference Books

1. Alfred V. Aho, Monica S. Lam, Ravi Sethi, and Jeffrey D. Ullman, “Compilers: Principles, Techniques and Tools”, 2nd edition, Pearson
2. K.D. Cooper, and L. Torczon, “Engineering a Compiler”, 2nd edition, Elsevier
3. Andrew W. Appel, “Modern Compiler Implementation in ML”, Cambridge University Press

Image Processing (VII Semester IT 4L)
Syllabus

Image Processing

Prerequisites: This course assumes that students have strong programming skill in MATLAB, and a working knowledge of Intermediate Calculus, Linear Algebra, basic estimation techniques, and some statistical topics on the level of introductory courses in statistics.

Objective: This course will provide students a detailed overview of Digital Image Processing and its applications. Image processing has found applications in many areas from medical imaging to computer graphics. This course covers the fundamental concepts of visual perception and image acquisition, basic techniques of image manipulation, segmentation and coding, and a preliminary understanding of Computer Vision. With successful completion of the course, students will be able to perform image manipulations and analysis in many different fields.

Course Description

In this course students will study the theoretical foundations and modern applications in digital image processing. Insight into the basic operations like image acquisition, enhancement, restoration, transformations, compression, segmentation, object recognition and visual interpretation would be taken up along with the numerical interpretation. Wide variety of research applications ranging from pattern recognition, security measures such as digital signatures, watermarking; traffic video surveillance, medical imaging, remote sensing applications would be illustrated. Pre-requisite is the basic knowledge of mathematics and programming. A lab course is associated with it to strengthen the concepts.

Course Outline (To be covered in 40 lectures)

1. Introduction, digital image fundamentals Elements of digital image processing systems, Elements of visual perception, brightness, contrast, hue, saturation, Color image fundamentals - RGB, HSI models, Image sampling, Quantization, dither, Two-dimensional mathematical preliminaries, 2D transforms - DFT, DCT, KLT, SVD. (6)
2. Image enhancement Histogram equalization and specification techniques, Noise distributions, Spatial averaging, Directional Smoothing, Median, Geometric mean, Harmonic mean, Contraharmonic mean filters, Homomorphic filtering, Color image enhancement. (8)
3. Image Restoration - degradation model, Unconstrained restoration - Lagrange multiplier and Constrained restoration, Inverse filtering-removal of blur caused by uniform linear motion, Wiener filtering, Geometric transformations-spatial transformations. (8)
4. Image segmentation, Edge detection, Edge linking via Hough transform – Thresholding - Region based segmentation – Region growing – Region splitting and Merging – Segmentation by morphological watersheds – basic concepts – Dam construction – Watershed segmentation algorithm. (8)
5. Need for image compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, Vector Quantization, Transform coding, JPEG standard, MPEG. (8)

Text Books

1. Digital Image Processing by Rafael C. Gonzalez, Richard E. Woods,
2. Fundamentals of Digital Image Processing by Anil K. Jain,
3. Digital Image Processing by William K. Pratt
4. Professional Ethics(VII Semester CSE & IT 2L)

Wireless and Mobile Networks
(VII Semester CS & IT 3L)
Syllabus

Course Description

This course will cover the area of mobile and wireless networking, looking at the unique network protocol challenges and opportunities presented by wireless communication and host or router mobility. Although the course will touch on some of the important physical layer properties of wireless communications, the focus will be on network protocols above the physical layer, with an emphasis on the media access control, network, and transport protocol layers.

Course Outline (to be covered in 30 lectures)

1. Wireless medium access control (MAC) protocols, including MACA, MA CAW, and IEEE 802.11. (6).
2. Routing techniques for mobile nodes in the Internet, particularly Mobile IP. Network Mobility (6)
3. Routing techniques in multi-hop wireless ad hoc networks.(6)
4. Effects of mobility and wireless transmissions on reliable transport protocols such as TCP.(6)
5. Application layer for mobile networks. Mobile P2P networks. Context aware mobile networking (6)

Text Books

1. Mobile Communications 2ndEdition by Jochen Schiller, Pearson 2010.2.
2. Adhoc Networking by Charles Perkins, Pearson , 2008

Software Project Management
(VIII Semester IT 4L)
Syllabus

Software Project Management

UNIT -I: (08 Lecture)

Overview of Software Project Planning
Software Project, Categorization of software Project, Introduction to Stepwise Project Planning, Project Scope, Infrastructure, Resource Allocation etc, Project Plan Execution.

UNIT- II: (08 Lecture)

Project Evaluation
Strategy assessment, Technical Assessment, Cost Benefit Analysis, Cash flow forecasting, Risk Evaluation, Selection of Technologies, Rapid application Development, Prototyping Example.

Unit III: (08 Lecture)

Software Effort Estimation & Activity Play Over & under estimation problem, basis for software estimation, Estimation by analogy, COCOMO, Parameter Model function, point analysis, Project schedule, Planning Model, Project Time management, Activity duration estimation.

Unit IV : (08 Lecture)

Risk management, Identification, Analysis and abatement of risk, Nature of resources, critical, county cost, schedule, Monetary & control, Cost Monitoring, Priority by monetary, Managing Control, Contract Management, Human Resource Management.

Unit V (08 Lecture)

Software quality Assurance, Software quality in project planning, Software quality definition, ISO 9126 standards, Product quality management, SEICMM model

Reference Books :

1. Software Project Management, A Unified Framework "WALKER ROYCE" "First Edition" "Peason Education".
2. Software Project Management, 6th Edition (TMH)
3. Quality Software Project Management by Robert T. Futrel, Pearson Education.

Web Technology
(VIII Semester IT 3L)
Syllabus

Course Outline (To be covered in 30 lectures)

The wide spread use of the Internet and WWW by common people has made it compulsion to provide web based interface for the applications to access the application from anywhere, anytime, anyone. The subject covers the wide range of web technologies both client side and server side to provide the exposure to the students to develop Rich Internet Applications using them. It covers the basics WWW, client side technologies like HTML, CSS and DHTML including JavaScript, server side scripting with PHP and database connectivity using PHP and related technologies.

Course Outline

UNIT I - INTRODUCTION (6 hours)

Internet Principles – Basic Web Concepts – Client/Server model – retrieving data from Internet – HTM and Scripting Languages – Standard Generalized Mark –up languages – Next Generation – Internet –Protocols and Applications.

UNIT II - COMMON GATEWAY INTERFACE PROGRAMMING (8 hours)

HTML forms – CGI Concepts – HTML tags Emulation – Server – Browser Communication – E-mail generation – CGI client Side applets – CGI server applets authorization and security.

UNIT III - SCRIPTING LANGUAGES (8 hours)

Dynamic HTML-Cascading style sheets-Object model and Event model- Filters and Transitions-Active X Controls-Multimedia-Client side script - VB Script programming – Forms – Scripting Object.

UNIT IV - SERVER SIDE PROGRAMMING (8 hours)

XML – Server side includes – communication – DTD – Vocabularies – DOM methods –Firewalls– Proxy Servers. Introduction to active server pages (ASP), Introduction to Java Server Page (JSP), JSP Application Design, JSP objects, Conditional Processing, Declaring variables and methods, Sharing data between JSP pages, Sharing Session and Application Data, Database Programming using JDBC, development of java beans in JSP, Introduction to Servlets, Lifecycle, JSDK, Servlet API, Servlet Packages, Introduction to COM/DCOM/CORBA.

Reference Books

1. Deitel H.M. and Deitel P.J., “Internet and World Wide Web How to program”, Pearson International, 2012, 4th Edition.
2. Gopalan N.P. and Akilandeswari J., “Web Technology”,Prentice Hall of India, 2011.
3. Uttam K.Roy, “Web Technologies”, Oxford University Press, 2011.

Professional Elective I & II
(Pool – 1)

Artificial Intelligence (Professional Elective for CSE & IT 3L)
Syllabus

Artificial Intelligence: (OE)

Prerequisites: Basic Program, Logical Program, Probability, Discrete Mathematics.

Objective:

- Identify problems that are amenable to solution by AI methods, and which AI methods may be suited to solving a given problem.
- Formalize a given problem in the language/framework of different AI methods (e.g., as a search problem, as a constraint satisfaction problem, as a planning problem, as a Markov decision process, etc).
- Implement basic AI algorithms (e.g., standard search algorithms or dynamic programming).
- Design and carry out an empirical evaluation of different algorithms on a problem formalisation, and state the conclusions that the evaluation supports.
- Develop an expert system.
- Learn Logical Programming Skills.

Course Description

This course introduces students to the basic knowledge representation, problem solving, and learning methods of artificial intelligence (AI). It covers basic elements of AI, such as knowledge representation, inference, machine learning.

Course Outline (To be covered in 30 lectures)

1. Introduction, Intelligent agents, reactive, deliberative, goal-driven, utility-driven, and learning agents, Artificial Intelligence programming (5)
2. Defining problems at state space search, Production system, Problem and production system characteristics, Forward and backward, state-space, blind, heuristic, problem-reduction, A, A*, AO*, minimax, constraint propagation, neural, stochastic, and evolutionary search algorithms, sample applications. Issues in design of search programs (7)
3. foundations of knowledge representation and reasoning, issues in knowledge representation, representing and reasoning about objects, relations, events, actions, time, and space; predicate logic, situation calculus, description logics, reasoning with defaults, sample applications. (6)
4. Planning as search, partial order planning, construction and use of planning graphs, planning and acting in the real world (3)
5. Basics of utility theory, decision theory, sequential decision problems, elementary game theory, sample applications. (4)
6. Learning from memorization, examples, explanation, and exploration. Supervised and un-supervised learning, learning nearest neighbor, naive Bayes, and decision tree classifiers, Q-learning for learning action policies, applications. Sample Applications of AI (5)

Text Books

1. Artificial Intelligence: A Modern Approach, by Stuart Russell and Peter Norvig,
2. Artificial Intelligence by Eliane Rich, Kevin Knight and Shivashankar B Nair,
3. Introduction to Artificial Intelligence by Charniak, McDermott

Data Compression (Professional Elective for CSE & IT 3L)
Syllabus

Data Compression (OE)

Prerequisites:
Basic data structures and algorithms, Fundamental concepts of computer architecture.

Objective:
Develop theoretical foundations of data compression, concepts and algorithms for lossy and lossless data compression, signal modeling and its extension to compression with applications to speech, image and video processing.

Course Description

The course discusses the theory and methods of data compression of signals, images, and video. Data Compression is the computational problem of how to encode a data file (text, image, audio, video) so that the new file has fewer bits the original file. Techniques covered include: Quantization, Vector Quantization, Differential Schemes, Filterbanks and Subband Coding, Wavelet Transform, JPEG 2000, and MPEG. Coverage of selected topics of recent research issues in data compression is also taken up.

Course Outline (To be covered in 30 lectures)

1. Information theoretic foundations, Arithmetic coding (6)
2. Dictionary techniques, Context modeling (6)
3. Lossless image compression, Lossy coding preliminaries (6)
4. Scalar and vector quantization (6)
5. Differential encoding, Transform coding (6)

Text Books

1. Introduction to Data Compression by Sayood, Khalid,
2. Data Compression: The Complete Reference by M. Nelson,

Data Warehousing and Mining (OE)

Prerequisites: An upper-level undergraduate course(s) in algorithms and data structures, a basic course on probability and statistics programming in Java, C++, C.

Objective:

Understand data mining principles and techniques: Introduce DM as a cutting edge business intelligence method and acquaint the students with the DM techniques for building competitive advantage through proactive analysis, predictive modeling, and identifying new trends and behaviors. Learning objectives include:

a. Building basic terminology.
b. Learning how to gather and analyze large sets of data to gain useful business understanding.
c. Learning how to produce a quantitative analysis report/memo with the necessary information to make decisions.
d. Describing and demonstrating basic data mining algorithms, methods, and tools .
e. Identifying business applications of data mining
f. Overview of the developing areas - web mining, text mining, and ethical aspects of data mining.
Develop and apply critical thinking, problem-solving, and decision-making skills.

Course Description

The course is an introduction to data mining techniques for the data stored in a data warehouse. Data mining, or knowledge discovery in databases, has during the last few years emerged as one of the most exciting fields in Computer Science. Data mining aims at finding useful regularities in large data sets. Interest in the field is motivated by the growth of computerized data collections which are routinely kept by many organizations and commercial enterprises, and by the high potential value of patterns discovered in those collections. This course will cover data warehousing and data cleaning, clustering, classification, and association rules mining.

Course Outline (To be covered in 30 lectures)

1. Introduction and overview of data mining processes (3)
2. Data Warehousing: Overview, Definition, Delivery Process, Multi Dimensional Data Model, Data Cubes, Stars, Snow Flakes, Fact Constellations, Concept hierarchy, Process Architecture, 3 Tier Architecture, Data Marting. (5)
3. Data clustering and classification techniques (9)
4. Association rule mining (5)
5. Tuning Data Warehouse, Testing Data Warehouse Data Mining interface, Historical information, Query Facility, OLAP function and Tools. OLAP Servers, ROLAP, MOLAP, HOLAP, Security, Backup and Recovery (5)
6. Applications and case studies (3)

Text Books

1. Data Mining: Concepts and Techniques by J. Han and M. Kamber,
2. Introduction to Data Mining by Pang-Ning Tan, Michael Steinbach and Vipin Kumar
3. Data Warehousing in the Real World : A Practical Guide for Building Decision Support Systems by Sam Anahory, Dennis Murray

Design Patterns (Professional Elective for CSE & IT 3L)
Syllabus

Design Pattern (OE)

Prerequisites: Prior knowledge of object-oriented programming is essential for this course. The students are expected to be proficient in Java, Principle of Programming Languages.

Objective:

- Understand and be able to apply incremental/iterative development
- Understand common design patterns
- Be able to identify appropriate patterns for design problems
- Be able to evaluate the quality software source code
- Be able to refactor badly designed program properly using patterns

Course Description

This course is an introduction to software design patterns. Each pattern represents a best practice solution to a software problem in context of some application. The course will cover both the rationale and benefits of object-oriented software design patterns. Several example problems need to be studied to investigate the development of good design patterns. Specific patterns, such as Observer, State, Adapter, Strategy, Decorator and Abstract Factory would be covered.

Course Outline

1. Introduction To Design Patterns, Introduction To Java, Some OO Design Principles , The Observer Pattern, The Template Method Pattern (6)
2. Factory Patterns: Factory Method and Abstract Factory, The Singleton Pattern, The Iterator Pattern, The Composite Pattern, The Facade Pattern (6)
3. The State and Strategy Patterns, Functors and the Command Pattern, The Proxy Pattern (5)
4. RMI, The Adapter Pattern, The Decorator Pattern (4)
5. Dynamic Proxies In Java, The Chain of Responsibility Pattern, Concurrency Patterns, The Visitor Pattern, Anti Patterns (5)
6. Layer, Pipe and Filters, Black Board Broker, Case Studies (4)

Text Books

1. Design Patterns - Elements Of Reusable Object-Oriented Software, Erich Gamma, Richard Helm, Ralph Johnson, and John Vlissides,
2. Head First Design Patterns, Eric Freeman and Elisabeth Freeman
3. Applied Java Patterns, Stephen Stelting and Olav Maassen,
4. Java Design Patterns - A Tutorial, James W. Cooper,
5. Refactoring To Patterns, Joshua Kerievsky,

Functional Programming (Professional Elective for CSE & IT 3L)
Syllabus

Functional Programming: (OE)

Prerequisites: Basic Mathematics.

Objective:

- master foundational techniques from the paradigm of functional programming.
- be trained in using abstraction to structure programs.
- be able to explain and use recursion in general, as well as know how to distinguish between recursive and iterative processes.
- be able to write and use higher-order functions.
- master techniques for delayed evaluation for working with infinite data structures such as streams.
- have insight in different models for understanding how code is evaluated.

Course Description

This course aims to make functional techniques and thought patterns part of programming skills of the students. This course presents the functional programming paradigm, based on the idea of functions as "first-class" values that can be computed and operated. Functional languages provide great power of expression while maintaining simplicity, making it easier to write correct and maintainable software. Upon successful completion of the course, students would be able to analyze problems and apply functional programming concepts and techniques to solve the problems.

Course Outline (To be covered in 30 lectures)

1. Introduction, Problem Solving with Functional Language, Programming with functions, List constructors and selectors, Recursive functions, Accumulating parameters, Local definitions, Higher Order functions, Dot notation, and example simple functional programs (12)
2. Un-typed and Typed Lambda Calculus and Combinators, Term structure and substitution, alpha and Beta reductions and Beta Equality, Normal Form, Combinators, Church Numerals, Reduction Rules, Y-Combinator, Bracket Abstraction, Standard Combinator Expressions, Typed Lambda Calculus and Reduction Rules (10)
3. Lambda Calculus Semantics: Reduction Machines SECD Machine , Graph Reduction Machine, Lazy/delayed Evaluation, (8)

Text Books

1. Functional Programming : Application and Implementation by Peter Henderson
2. Lambda Calculus, Combinators and Functional Programming by G. Revesz
3. Lambda Calculus and Combinators : An Introduction by J. Roger Hindley and Jonathan P. Seldin

Genetic Algorithm (Professional Elective for CSE & IT 3L)
Syllabus

Genetic Algorithm: (OE)

Prerequisites: Fundamentals of Artificial Intelligence, Basic Mathematics, Knowledge of a programming language.

Objective: The aim of the course is to introduce genetic algorithms and to give students practical experience in implementing and experimenting with them. The course will equip them to be able to assess the suitability of genetic algorithms for specific problems.

Course Description

In this course students will study Genetic Algorithm and its application to optimization problems. The course covers Basics of Optimization, Optimization Problems, Point to Point Algorithms, Simulated Annealing, Population Based Algorithms, Brief Overview of Evolutionary Computation, Genetic Algorithms (Theory and Advanced Operators), Genetic Representation, search operators, selection schemes and selection pressure, Operators on Real-valued Representations, Niche and fitness sharing, Particle Swarm Optimization, Memetic Algorithms and Real Life application of Evolutionary Algorithms.

Course Outline (To be covered in 30 lectures)

1. Basics of Optimization, Optimization Problems, Point to Point Algorithms, Simulated Annealing (3)
2. Population Based Algorithms, Brief Overview of Evolutionary Computation, Genetic Algorithms (Theory and Advanced Operators), Genetic Representation, search operators, selection schemes and selection pressure. (7)
3. Operators on Real-valued Representations, Niche and fitness sharing, Particle Swarm Optimization, Memetic Algorithms (7)
4. Evolution Strategies, Genetic Programming, Evolutionary Programming, Differential Evolution (6)
5. Constraint Handling in optimization problems , Real Life application of optimization Algorithms, Introduction of Multi-objective Evolutionary Algorithms (7)

Text Books

1. Genetic Algorithms in Search, Optimization & Machine Learning by D E Goldberg
2. Multi-Objective Optimization Using Evolutionary Algorithms by K.Deb
3. Handbook on Evolutionary Computation by T. Baeck, D. B. Fogel, and Z. Michalewicz (eds.)

Network Administration (Professional Elective for CSE & IT 3L)
Syllabus

Network Administration: (OE)

Prerequisites: Basic knowledge of Computer Networks.

Objective: To learn about the network and how the data route.

Course Description

The course is designed to provide students with essential knowledge and skills that an effective network administrator must possess. It provides an overview of the essential TCP/IP protocols, and discusses how to properly configure and manage the network services based on these protocols (including DNS, DHCP, AD/LDAP directory services, print and file servers, NFS/NIS, and routing services). The course also takes up various issues like Configuration management, accounting management, Fault and disaster management, security management and performance management.

Course Outline (To be covered in 30 lectures)

1. Introduction, Basic System Administration (3)
2. Windows Installation, Linux Installation and Package Management, Backup and Security, Monitoring and Managing Processes/Daemons, Scripting basics and start-up scripts (8)
3. Unix Networking, Network Protocols - TCP, IP, UDP, NetBIOS, TCP/IP Concepts and Configuration - the basics, Sub netting Implementation, Basic Network Trouble-Shooting and Monitoring Tools (8)
4. Server configuration and management, DHCP, NIS, NFS, LDAP and Samba (6)
5. Apache Web Server with PHP, DNS, BIND and Sendmail, Tools like Webmin, Webalizer, and Phpmyadmin; Security and firewall (5)

Text Books

1. TCP/IP Network Administration?, by Craig Hunt,
2. Neural Networks and Learning Machines by S. Haykin
3. Artificial Neural Networks by Robert J. Schalkoff
4. Multi-Objective Optimization Using Evolutionary Algorithms by Deb Kalyanmoy
5. Genetic Algorithms + Data Structures = Evolution Programs by Z Michalewicz

Neural Networks (Professional Elective for CSE & IT 3L)
Syllabus

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1. Neural Network(OE)

Prerequisites: Multivariate calculus and linear algebra.

Objective:

- gain familiarity with a wide variety of neural network models and their applications
- Develop capabilities for creating and using neural network models.
- develop knowledge of the state-of-the-art in neural networks, and
- Gain some mathematical understanding of neural network models.
- Gain experience in using computational tools such as neural networks to perform computational experiments leading to new theoretical insights.

Course Description

The course is an introduction to neural networks. Neural networks provide a model of computation drastically different from traditional computers. Typically, neural networks are not explicitly programmed to perform a given task; rather, they learn to do the task from examples of desired input/output behavior. The course introduces biological information processing followed by an overview of the most important artificial neural network architectures and algorithms such as perceptrons, backpropagation, Hopfield and Boltzmann networks, self-organizing maps, adaptive resonance theory, reinforcement learning, and neuroevolution.

Course Outline (To be covered in 30 lectures)

1. Introduction, Brain Physiology, Neuron Model and Network Architectures (4)
2. Nonlinear dynamical system theory (6)
3. The Hopfield Model, Spin Glasses, Stochastic Neural Networks, Boltzmann Machine (8)
4. Multilayer Feedforward Networks For Supervised Learning(6)
5. Unsupervised and Competitive Learning Algorithms, Bifurcating Neural Networks (6)

Text Books

1. Neural Networks: A Comprehensive Foundation by S. Haykin,
2. Neural Networks and Learning Machines by S. Haykin
3. Artificial Neural Networks by Robert J. Schalkoff
4. Multi-Objective Optimization Using Evolutionary Algorithms by Deb Kalyanmoy
5. Genetic Algorithms + Data Structures = Evolution Programs by Z Michalewicz

Service Oriented Software Engineering (Professional Elective for CSE & IT 3L)
Syllabus

Service Oriented Software Engineering (OE)
Objective:

1. To introduce the idea of service-oriented architectures
2. To explain the notion of a reusable service, based on web service standards, that provides a mechanism for inter-organisational computing;
3. To describe the service engineering process that is intended to produce reusable web services.
4. To introduce service composition as a means of application development;
5. To show how business process models may be used as a basis for the design of service-oriented systems

Prerequisites: Software Engineering, Service-oriented analysis and design, Service oriented Modeling.

Course Description

Service oriented software development paradigm is becoming the delivery model by all major IT companies. This course is intended to introduce the students with this paradigm. In this course students shall study the fundamentals of Service Oriented Software Engineering. Prerequisite for this course is course on Software Engineering.

Course Outline (To be covered in 30 lectures)

1. Concepts of Service orientation (8)
2. Service oriented Software architecture concepts (5)
3. Requirements Analysis & Design Process (7)
4. Service Testing and Estimation models (6)
5. Cloud based services models (4)

Text Books

1. Service Oriented Architecture – Concept Technology & Design by Thomas Earl
2. Enterprise SOA – Designing IT for Business Innovation by Woods & Mattem
3. Web Service Essentials, Eiban Cerami, O'Reilly

XML and Applications (Professional Elective for CSE & IT 3L)
Syllabus

XML Based Applications (OE)

Objective:

1. To familiarize students with various XML based applications with the help of case studies.
2. To be able to develop new applications using XML schema.

Prerequisites: Fundamental concepts of XML including document and language creation and implementation, XML Schema

Course Description

This course introduces students to the basic concepts of the extensible markup language (XML). XML has made a major impact in almost every aspect of software development. Designed as an open, extensible, self-describing language, it has become the world-wide standard for data and document delivery on the Web. Students will be instructed as to the purpose of an XML document and what it consists of, in how a Document Type Definition (DTD) or schema is used to validate an XML document and the extensible style language (XSL) to transform XML documents into HTML/XHTML. XML-related technologies continue to develop, to enable validation, navigation, transformation, linking, querying, description, and messaging of data. Students would be exposed to such wide range of application domains.

Course Outline (To be covered in 30 lectures)

1. Emerging Technologies; XML Documents: Syntax, Well formed and Valid; CCS and XHTML; Document Type Definition(DTD); XML Schema : XSD, XDR, Examples; JavaScript (12)
2. SAX and DOM Parser and APIs, Example of API usage; XPATH, XLink, Xpointer; XSL: XSLT (10)
3. Applications: RDF and RDFS, JENA API, Case Study (8)

Text Books

1. XML The Microsoft Way By Peter G. Aitken
2. Learning XML By Erik T. Ray and Christopher R. Maden
3. XML How to Program By Harvey M. Deitel, Paul J. Deitel, Tem R. Nieto, Ted Lin and Praveen Sadhu

Professional Elective III & IV
(Pool – 2)

Distributed and Parallel Algorithms (Professional Elective for CSE & IT 3L-0T)
Syllabus

Distributed & Parallel Algorithms (OE)

***Prerequisites*:** Basic Algorithms and Data Structures.
Objective: Parallel and distributed architectures appear in a wide range of areas including networking, computer architecture, databases, image processing, artificial intelligence, numerical computing, symbolic computing, and other areas. Distributed and parallel systems are characterized by concurrency, large scale, peculiar demands for resources, etc. Such systems require skills and knowledge that dicer substantially from sequential programming experience. This course serves to introduce the students to the computational and algorithmic aspects of parallel and distributed computing. Thus, this course is appropriate for students wishing to do research and thesis work in a variety of areas of computer science.

Course Description

This course is an introduction to distributed and parallel algorithms design. Aim is to acquaint students with the basic concepts of parallel and distributed computing. The course aims to look into the general principles of parallel and distributed algorithms and their time complexity.

Course Outline (To be covered in 30 lectures)

1. Introduction, architectures and languages for parallel and distributed processing. (3)
2. Abstract models of parallel computing, PRAM (Parallel Random Access Machine). Distributed and parallel algorithms and their complexity. Interaction between processes, communication, synchronization. (9)
3. Topologies, synchronous and asynchronous algorithms. Algorithms for parallel sorting. Algorithms for parallel searching. (6)
4. Parallel matrix operations. All prefix sums and their applications. Graph and list algorithms. Synchronization algorithms and tasks. (6)
5. Mechanisms and language constructs for synchronization. Recently published algorithms.(6)

Text Books

1. Parallel Computation, Model and Methods by Akl,
2. An Introduction to Parallel Algorithms, by J'aJ'a, J
3. Introduction to Parallel Algorithms and Architectures: Arrays, Trees, Hypercubes by Leighton,
4. Synthesis of Parallel Algorithms by J. H. Rief,
5. Introduction to Distributed Algorithms by Gerard Tel,

E-Commerce (OE)

Prerequisites: Computer Information Systems , Business Data Management , System Analysis and Design .

Objective:

- have an understanding of essential e-Commerce concepts and technologies and skills related to the management and application of e-Commerce and e-Business approaches .
- have an understanding of the technological, capital and social infrastructure for commercial activities such as buying and selling, marketing and advertising, supply-chain management etc.
- have hands on, real-life experience with electronic commerce applications .
- be able to define and explain the main issues facing businesses engaged in the planning and implementation of e-Business strategies .
- identify and define the main e-Business models currently being adopted by organizations
- have an understanding and ability to assess the strategic relevance of e-Commerce in shaping both inter-organisational relationships and intra-organisational structures and processes
- critically evaluate the design of e-Business sites and discuss human, organisational and social implications of electronic commerce

Course Description

The growth of the Internet continues to have a tremendous influence on business. Companies and organizations of all types and sizes are rethinking their strategies and how they run their operations. This new course in the Temple E-Marketing program challenges students to explore the realities and implications of e-commerce from a marketer's perspective. Business-to-consumer (B2C) and business-to-business (B2B) e-commerce markets are examined. The course introduces students to a wide range of electronic commerce issues for marketers, as a foundation for continual learning in the dynamic e-commerce environment.

Course Outline (To be covered in 30 lectures)

1. Introduction to e-Commerce and Network Infrastructure for e-commerce. [4]
2. E-commerce Models, e-Advertising & Marketing [6]
3. Electronic Payment Systems and Electronic Data Exchange [6]
4. E-commerce Security [4]
5. e-CRM [6]
6. Mobile Commerce [4]

Text Books

1. Introduction to E-commerce by Jeffrey F.Rayport & Bernard J.Jaworski
2. Frontiers of E-commerce by Kalakota & Winston
3. E-Commerce- Strategy technologies and Applications by David Whiteley
4. E-Commerce-Concepts, Models & Strategies by C.S.V. Murthy
5. E-Commerce by Perry

Gaming and Animation (Professional Elective for CSE & IT 3L)
Syllabus

Gaming and Animation (OE)

Prerequisites: This course requires general familiarity with computer concepts, an interest in and experience with games, and a vivid imagination.
Objective: This course gives students a solid understanding of designing, modeling and implementing a game.

Course Description

The purpose of this course is to give students a thorough understanding of computer animation and gaming. The course introduces camera and vehicle animation, parent/child hierarchies, character rigging, character animation, facial animation, lip syncing, physical simulations, motion capture for gaming.

Course Outline (To be covered in 30 lectures)

1. Introduction, Fundamental Principles of Animation and gaming (6)
2. Rigging & Posing Techniques, Fundamentals of Character Animation, Facial Animation and Lip Sync Techniques (8)
3. Fundamentals of Motion Capture, Principles of Motion Simulation (6)
4. Game design principles and processes (8)

Text Books

1. Fundamentals of Game Design. By E. Adams.
2. The Art of Game Design by J. Schell
3. Computer Animation: Algorithms and Techniques by Rick Parent

Information Retrieval (Professional Elective for CSE & IT 3L)
Syllabus

Information Retrival (OE)

Prerequisites:
Basic knowledge of web design, Basic Programming, data structures, Algorithms, Basic linear algebra, Basic statistics.

Objective:

To give students a solid understanding of:

- the genesis and variety of information retrieval situations.
- the variety of information retrieval models and techniques.
- design principles for information retrieval systems.
- methods for implementing information retrieval systems.
- characteristics of operational and experimental information retrieval systems.
- methods and principles for the evaluation of information retrieval systems.

Course Description
This course will cover traditional material, as well as recent advances in Information Retrieval (IR). The course includes the study of indexing, processing, and querying textual data basic retrieval models, algorithms, and IR system implementations. The course will also address advanced topics in IR, including Natural Language Processing techniques, and Web agents.

Course Outline (To be covered in 30 lectures)

1. Introduction to IR models and methods, Text analysis / Web spidering Text properties (5)
2. Vector-based model, Boolean model, Probabilistic model, other IR models; IR evaluation and IR test collections; Relevance feedback, query expansion (8)
3. Web search: link based and content based; Query-based and content sensitive link analysis; Search engine technologies (8)
4. Text classification and clustering; Question answering on offline and online collections (5)
5. Personalized IR, Cross-language IR, Web 2.0, (4)

Text Books

1. Introduction to Information Retrieval by Christopher D. Manning, Prabhakar Raghavan, Hinrich Schütze (available online)
2. Information Retrieval: Algorithms and Heuristics. By D.A. Grossman, O. Frieder
3. Readings in Information Retrieval by K.Sparck Jones and P. Willett

Pattern Recognition (Professional Elective for CSE & IT 3L)
Syllabus

Pattern Recognition (OE)

Prerequisites: Analysis of algorithms, Calculus, Introductory Statistics, Linear Algebra.

Objective:

- Learn the fundamental concepts and applications of pattern recognition.
- Learn the concepts of Bayes decision theory.
- Understand the concepts of linear and nonlinear classifiers.
- Understand the concepts of feature selection and generation techniques.
- Understand the concepts of supervised learning and system evaluation.
- Develop some applications of pattern recognition.

Course Description

The emphasis of the course is on algorithms used for pattern recognition. Pattern Recognition is assigning a meaningful or classifying label to the elements of the input data. It uses the concepts of classification and clustering to separate the interclass elements. This information can then be used to classify or recognize new data using supervised or unsupervised learning methods and classifiers such as Support Vector Machine, Hidden Markov Model and Linear Discriminant Analysis. Pattern recognition has several important applications in the fields of data mining, artificial intelligence, networking and image processing. The prerequisites of the course are basic knowledge of statistics and linear algebra along with the concepts of probability theory.

Course Outline (To be covered in 30 lectures)

1. Introduction to Pattern Recognition, Feature Detection, Classification, Decision Theory, ROC Curves, Likelihood Ratio Test, Linear and Quadratic Discriminants, Fisher Discriminant, Sufficient Statistics, Coping with Missing or Noisy Features, Template-based Recognition, Feature Extraction, Eigenvector and Multilinear Analysis (10)
2. Training Methods, Maximum Likelihood and Bayesian Parameter Estimation, Linear Discriminant/Perceptron Learning, Optimization by Gradient Descent, Support Vector Machines, K-Nearest-Neighbor Classification (6)
3. Non-parametric Classification, Density Estimation, Parzen Estimation,Unsupervised Learning, Clustering, Vector Quantization, K-means, Mixture Modeling, Expectation-Maximization (6)
4. Hidden Markov Models, Viterbi Algorithm, Baum-Welch Algorithm, Linear Dynamical Systems, Kalman Filtering, Decision Trees, Multi-layer Perceptrons, Reinforcement Learning with Human Interaction (8)

Text Books

1. Pattern Classification by Richard O. Duda, Peter E. Hart and David G. Stork
2. Pattern Recognition and Machine Learning by C. M. Bishop
3. Pattern Recognition by S. Theodoridis and K. Koutroumbas

Semantic Web (Professional Elective for CSE & IT 3L)
Syllabus

Semantic Web (OE)

Prerequisites: Basic Web technology like html.

Objective: The aim of the course is to make the students familiar with the Semantic Web, with technologies used on the Semantic Web, and with applications using Semantic Web technologies. The course will focus on the theoretical background of various languages on the Semantic Web such as RDF, SPARQL, OWL, and F-Logic (Programming), and the practical use of these languages on the Semantic Web. In addition, the course will focus on important application areas for Semantic Web technology, namely Web Services and Life Sciences.

Course Description

This course introduces techniques that are useful stand-alone and can be integrated for building a semantic web. It will review XML with Document Type Definitions and Schemas; transformation/inference rules in XSLT, metadata with RDF (Resource Description Framework); metadata taxonomies with RDF Schema; description logic and the W3C ontology language OWL 2; as well as integrating these techniques for ontology/rule-based multi-agent systems. Students may note that besides enabling quick and accurate web search, semantic web may also allow the development of intelligent internet agents and facilitate communication between a multitude of heterogeneous web-accessible devices.

Course Outline (To be covered in 30 lectures)

1. Review of XML; Meta-model and Meta-data, RDF & RDFS; OWL; Ontology Engineering and tools (12)
2. Description Logic(DL); Programming with DL; Example Application (12)
3. Knowledge Acquisition and Management System, (6)

Text Books

1. A Semantic Web Primer by Antoniou, Grigoris and Frank van Harmelen
2. The Description Logic Handbook: Theory, Implementation and Applications by Franz Baader, Deborah L. Guinness, Daniele Nardi, and Peter F. Patel-Schneider (Eds.)
3. An Introduction to Description Logic by Daniele Nardi and Ronald J. Brachman

Software Metrics & Quality Assurance (Professional Elective for CSE and IT 3L)
Syllabus

Software Metrics & Quality Assurance (OE)

Prerequisites: Software engineering process, analysis, design etc.
Objective: This course introduces concepts, metrics, and models in software quality assurance. The course covers components of software quality assurance systems before, during, and after software development. It presents a framework for software quality assurance and discuss individual components in the framework such as planning, reviews, testing, configuration management, and so on. It also discusses metrics and models for software quality as a product, in process, and in maintenance. The course will include case studies and hands on experiences. Students will develop an understanding of software quality and approaches to assure software quality.

Course Description

In this course students will study the foundational concepts of measurement of various aspects of software during the entire course of its development. The course takes up various existing metrics and tools that measure various activities of the software development. Topics such as Property-oriented measurement, Meaningfulness in measurement, Measurement quality, Measurement process, Scale, Measurement validation, Object-oriented measurement are covered. Students may note that the course is credited only after having undergone Software Engineering.

Course Outline (To be covered in 30 lectures)

1. The state of IT project management & basics of measurement (6)
2. Measuring internal product attributes: size and structure (6)
3. Measuring cost and effort (6)
4. Measuring external product attributes: Quality & Reliability (6)
5. Software test metrics (6)

Text Books

1. Software Metrics: A Rigorous and Practical Approach by N.E. Fenton and S.L. Pfleeger
2. Metrics and Models in Software Quality Engineering by Stephen H. Kan
3. Software Project Management in practice by Pankaj Jalote
4. Software Project Management by Bob Hughes and Mike Cotterell

Software Testing (Professional Elective for CSE & IT 3L)
Syllabus

Software Testing (OE)

Prerequisites: Software engineering and Software project management.
Objectives: To understand the fundamental of software testing, different approaches to testing, managing test cases and different testing strategies.

Course Description

In this course students shall study the fundamentals of testing, various approaches to testing, managing test cases and various testing strategies. Students may note that the course is credited only after having undergone Software Engineering and/or Software Project Management.

Course Outline (To be covered in 30 lectures)

1. Fundamentals of Testing and its current state of art (8)
2. Various approaches to Testing (6)
3. Test planning and Management (6)
4. Test Strategies - Preventive, Reactive Approach, Analytical, Heuristic, Configuration Management (6)
5. Mutation Testing & Testing Object Oriented Software (4)

Text Books

1. Software Testing Techniques by Borris Beizer
2. Software Testing – A Craftman's Approach by Paul C. Jorgensen
3. Software Testing by Hambling, Samaroo & Williams.
4. Software Testing Practice: Test Management by Spillner, Rossner, Winter & Linz

Theory of Virtualization (OE)

Prerequisites: Operating system and Computer network.
Objectives: Understanding the skills and knowledge related to the concepts and principles of virtualization, the mechanisms and techniques of building virtualized system and virtualization-enabled processing scenario.

Course Description

This course provides description of the concepts of virtualization and the properties of virtualization that make it a powerful technology. It contrast different forms of virtualization and focus on system level virtualization which has become very popular lately in the computer industry. It describes various architectures for implementing system-level virtualization. Upon completion of this course, students will possess the skills and knowledge related to the concepts and principles of virtualization, the mechanisms and techniques of building virtualized systems, as well as the various virtualization-enabled computing paradigms. Further, they will also gain knowledge about some State-of-the-art virtualization software and systems through their course projects. The basic courses on Operating System and Computer Networks are prerequisites.

Course Outline (To be covered in 30 lectures)

1. Introduction, Overview of virtualization (8)
2. Hardware/Server virtualization (8)
3. Network virtualization (8)
4. Virtual machines (6)

Text Books

1. Virtual Machines: Versatile Platforms for Systems and Processes by James E. Smith, Ravi Nair,
2. Virtualization: From the Desktop to the Enterprise by Chris Wolf, Erick M. Halter
3. Network virtualization by Kumar Reddy, Victor Moreno,
4. Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Center by David Marshall, Wade A. Reynolds,

Web Mining (Professional Elective for CSE & IT 3L)
Syllabus

Web Mining (OE)

Prerequisites: Data mining, Data Base.
Objectives: Web usage mining is the process of extracting useful information from server. Web Usage Mining is the application of data mining techniques to discover interesting usage patterns from Web data in order to understand and better serve the needs of Web-based applications.

Course Description

The course is an introduction to web mining technologies. Though the Web is rich with information, gathering and making sense of this data is difficult because the documents of the Web are largely unorganized. The course will cover machine learning techniques to mine the Web and other information networks, social networks, and social media. Applications to search, retrieval, classification, and recommendation would be studied. Various models to explain the dynamics of Web processes will also be emphasized.

Course Outline (To be covered in 30 lectures)

1. Introduction, Practical web mining applications overview (3)
2. Natural Language Processing methods used for web information retrieval (6)
3. Web Content Mining (5)
4. Web Structure Mining (5)
5. Web Usage Mining (6)
6. Specific applications and case studies (5)

Text Books

1. Web data mining: exploring hyperlinks, contents, and usage data by LIU, B.
2. Mining the Web - Discovering knowledge from hypertext data, by Soumen Chakrabarti,
3. Ontology learning and population from text : algorithms, evaluation and applications by CIMIANO, P.

Programming Tools I (III Semester CSE and IT 3P)
Lab Description

This is first independent lab course in programming tools which intends to introduce shell programming skills. UNIX is popular alternative to the Windows environment, especially in high-performance PC Linux servers and other UNIX-based web servers. Topics include: Unix utilities and file structure, Links and symbolic links, Data processing and process control in the Unix shell, Shell programming, Regular expressions, Exposure to different shells like bash, csh, ksh. Introduction to the Python/Perl programming in the Unix environment.

Programming Tools II (IV Semester CSE and IT 3P)
Lab Description

This is second independent lab course in programming tools which intends to introduce programming involving system calls. System calls are commands that are executed by the operating system. System calls are the only way to access kernel facilities. In this lab course students would learn to use these system calls as file system, multitasking mechanisms and the interprocess communication primitives.

Note: Other labs are associated with respective theory courses and hence do not require explicit description.

Computer Programming (I/II Semester All Branches)
Syllabus

Course Description

This is a first course in programming which intends to introduce students to the foundations of computing, programming and problem-solving. Aim is to develop basic programming skills necessary for engineering education. Students would learn C/C++ programming in a Linux environment. This course has an associated lab with it.

Course Outline

1. Introduction, LINUX Commands, editors, Files & Directories, Design of algorithms (4)
2. Writing a Simple Program: Learning the form of a C program, Declaring variables, designing program flow and control, using standard terminal I/O functions. (4)
3. Fundamental Data Types and Storage Classes, Operators and Expressions Conditional Program Execution Loops and Iteration, Introduction to Abstraction, functions, (6)
4. Arrays, Pointers, Structures (6)
5. Introduction to Object Oriented Programming concepts, Classes and Objects, Important C++ constructs (6)
6. The Standard C/C++ Preprocessor, The Standard C/C++ Library (4)

Text Books

1. How to solve it by Computer by R. J. Dromey
2. The C Programming Language by Brian W. Kernighan, Dennis M. Ritchie
3. On to C++ by P H Winston (also available online)
4. Structure and Interpretation of Computer Programs by Harold Abelson and Gerald Sussman with Julie Sussman, (Also available online)
5. Herbert Schield, Complete reference in C,