Curriculum for
Master of Computer Application
(MCA)

1st Semester

Sub. Code	Subject	Lectures	Tutorials	Practical	Credits
	Programming & Problem Solving	4	-	-	4
	Programming & Problem Solving **(Lab)**	-	-	3	2
	Principles of IT Industries Management	3	-	-	3
	Digital & Computer Organization	4	-	-	4
	Digital Computer Organization (Lab)			3	2
	Foundation of Logic	3	--	--	3
	Shell Programming Lab	-	-	3	2
	Total	**14**		**9**	**20**

Total Hr. = 23 Total Credits= 20

2nd Semester

Sub. Code	Subject	Lectures	Tutorials	Practical	Credits
	Data Structures	4	-	-	4
	Data Structure **(Lab)**	-	-	3	2
	Graph Theory & Combinatorics	3	-	-	3
	XML Applications	3	-	-	3
	XML Applications(Lab)	-	-	3	2
	Automata Theory	3	-	-	3
	Technical Writing	2	-	-	2
	Kernel Programming Lab	-	-	3	2
	Total	**15**		**09**	**21**

Total Hr. = 24 Total Credits= 21

3rd Semester

Sub. Code	Subject	Lectures	Tutorials	Practical	Credits
	Operating System	4	-	-	4
	Operating System **(Lab)**	-	-	3	2
	Computer Networks	4	-	-	4
	Computer Networks **(Lab)**	-	-	3	2
	Soft Computing	3	-	-	3
	Analysis of Algorithms	3	-	-	3
	Analysis of Algorithms **(Lab)**	-	-	3	2
	Object based Modeling	3	-		3
	Web Programming **(Lab)**			3	2
	Total	**17**	**--**	**12**	**25**

Total Hr. = 29 Total Credits= 25

4th Semester

Sub. Code	Subject	Lectures	Tutorials	Practical	Credits
	Computer Graphics	4	-	-	4
	Computer Graphics **(Lab)**	-	-	3	2
	Software Engineering	3	-	-	3
	Mini Project I (SRS and Design)		-	3	2
	DBMS	4	-	-	4
	DBMS (Lab)	-	-	3	2
	Distributed and Parallel Algorithms	3	-	-	3
	Professional Elective – I	3			3
	Total	**17**		**09**	**23**

Total Hr. = 26 Total Credits= 23

5th Semester

Sub. Code	Subject	Lectures	Tutorials	Practical	Credits
	Multimedia Technology	3	-	-	3
	Multimedia Technology **(Lab)**	-	-	3	2
	E-Commerce	4	-	-	4
	E-Commerce **(Lab)**	-	-	3	2
	Professional Ethics	2			2
	Professional Elective – II	3	-	-	3
	Data Warehousing and Mining	3			3
	Mini Project II (Implementation and Testing)			3	2
	Total	**15**	**-**	**09**	**21**

Total Hr. = 24 Total Credits= 21

6th Semester

Sub. Code	Subject	Lectures	Tutorials	Practical	Credits
	Industrial Training	--	-	-	20
	Total	**--**	**--**	**-**	**20**

Total Hr. = 00 Total Credits= 20

List of Elective (MCA)

Professional Elective - I

Sl. No.	Subject
1.	Artificial Intelligence
2.	Design Pattern
3.	Functional Programming
4.	Genetic Algorithm
5.	Network Administration
6.	Advanced Computer Network
7.	SOSE (Service Oriented Software Engg.)
8.	Simulation & Modeling
9.	Mobile Computing
10.	Cryptography & Network Security
11.	Image Processing

Professional Elective - II

Sl. No.	Subject
1.	Business Intelligence
2.	Data Compression
3.	Information Retrieval
4.	Pattern Recognition
5.	Semantic Web
6.	Software Metric & Quality
7.	Web Mining
8.	Wireless Network Security
9.	Distributed Database
10.	Real Time Systems
11.	Software Testing

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

Curriculum for
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(MCA)

Summery Sheet (Semester Wise)

1st Semester (Computer Science & Engineering)

Total Hr. = 23 Total Credits= 20

2nd Semester (Computer Science & Engineering)

Total Hr. = 24 Total Credits= 21

3rd Semester (Computer Science & Engineering)

Total Hr. = 29 Total Credits= 25

4th Semester (Computer Science & Engineering)

Total Hr. = 26 Total Credits= 23

5th Semester (Computer Science & Engineering)

Total Hr. = 24 Total Credits= 21

6th Semester (Computer Science & Engineering)

Total Hr. = 00 Total Credits= 20

Total Credits (from 1st to 6th Semester) = 130

Programming and Problem Solving (I Semester 4L)

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 Unix/Linux environment. This course has a associated lab with it.

Course Outline (To be covered in 40 lectures)

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. (6)
3. Fundamental Data Types and Storage Classes, Operators and Expressions Conditional Program Execution Loops and Iteration, Introduction to Abstraction, functions, (8)
4. Arrays, Pointers, Structures (7)
5. Introduction to Object Oriented Programming concepts, Classes and Objects, Important C++ constructs, Brief introduction to few other object oriented languages (10)
6. The Standard C/C++ Preprocessor, The Standard C/C++ Library (5)

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. Thinking in Java by Bruce Eckel

Principles of IT Industries Management (I Semester 3L)

Syllabus

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.

Digital Computer Organization (I Semester 4L)

Syllabus

Course Description

This is a first course dealing with layout and design principles of a computing system and its peripherals. It prepares foundations for the operating system, microprocessor and embedded systems courses. This course has associated lab with it.

Course Outline (To be covered in 40 lectures)

1. Introduction, Boolean Algebra and fundamental theorems, Basic Logic Gates, Realization of combinational circuits using universal gates, Gate level minimization, Important Digital Circuits Decoder, Multiplexer, PLA, ROM, RAM Design of Sequential Circuits, Flip Flops, Registers, Counters (10)
2. Register Transfer Language, Bus and Memory Transfers, Bus Architecture, Arithmetic Logic Unit (6)
3. Fundamental concepts of controller design, Processor design and related issues (10)
4. Input/Output Organization and related concepts(4)
5. Optical, magnetic and semiconductor memory devices, Memory organization (6)
6. Case Studies of Microprocessors (4)

Text Books

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

Foundation of Logic (I Semester 3L)

Syllabus

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 30 lectures)

1. Introduction, Set theory, Notion of proofs , Linear congruence (4)
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, Finite Fields and related issues (6)
5. 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

Data Structures (II Semester 4L)

Syllabus

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 (12)
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

Graph Theory and Combinatorics (II Semester 3L)

Syllabus

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, Rudin Series
2. Introduction to Graph Theory, D.B.West Prentice-Hall of India/Pearson
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, Pearson Education

XML and Applications (II Semester 3L)

Syllabus

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. A lab course is associated with it.

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

Automata Theory (II Semester 3L)

Syllabus

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 30 lectures)

1. Introduction, inductive Proofs Relations and Functions, 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 (6)
2. 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 (9)
3. Pumping Lemma for both Regular & Context-free Languages, Proving Some Languages are not Context-free. (6)
4. Recursive and Recursively Enumerable Languages, Turing Machines Definition of Recursive and Recursively Enumerable, Church's Hypothesis, Computable Functions, Methods for Turing Machine Construction (9)

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

Technical Writing (II Semester 2L)

Syllabus

Course Description

This course is an introduction to Technical Writing. To help students analyze the communication situation fully and accurately: which includes needs, audiences, and users. To gather, interpret, and document information logically, efficiently, and ethically. To develop professional work and teamwork habits. To be able to design usable, clear, persuasive, accessible documents. To educate the students to select the appropriate format for presenting information and organize information using reader-based principles. To motivate them to use graphics effectively. And finally develop an effective, clear writing style.

Course Outline (To be covered in 20 lectures)

1. Introduction, Introduction To Latex, Introduction to Xfig and other drawing software. (8)
2. English usage, when English is a foreign language. (6)
3. Reading a draft, Writing a draft, revising a draft, Introduction to IEEE, ACM style files (6)
4. Writing a technical talk, presenting the technical talk (4)
5. Writing a project/thesis. Introduction to various styles. (4)
6. Copyright issues and plagiarism (2)

Text Books

1. Handbook of Writing for the Mathematical Sciences By Nicholas J. Higham
2. *The Elements of Style*, William Strunk, ISBN 0-205-30902-X
3. LaTeX: A document preparation system, User's guide and reference manual
   Leslie Lamport, ISBN 0-201-52983-1
4. Cambridge English for Engineering, Mark Ibbotson

Operating System (III Semester 4L)

Syllabus

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

Computer Networks (III Semester 4L)

Syllabus

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) Physical and Link layer issues (4)
2. Medium Access protocols (IEEE 802.3 ...) and related issues (8)
3. Network layer: IP and other protocols, Routing protocols, and LAN design. (11)
4. Transport layer Protocols and related Issues (8)
5. 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

Soft Computing (III Semester 3L)

Syllabus

Course Description

This course has a associated lab with it. This course introduces soft computing methods. The principal constituents of soft computing are fuzzy logic, neural network theory, and probabilistic reasoning. The course studies the methods and explores how they are employed in associated techniques such as Case-Based Reasoning and expert systems for pattern recognition, clustering, diagnosis, and control both individually and in hybrid arrangement. The basics of each technique will be discussed and industrial applications will illustrate the strengths of each approach.

Course Outline (to be covered in 30 lectures)

1. Introduction, Learning Processes, Neural Network (NN) (9)
2. Single and Multi-Layer Perceptron, Fuzzy Logic and Fuzzy Set Theory (9)
3. Fuzzy Systems, Neuro-Fuzzy Modeling (8)
4. Applications of Soft Computing (4)

Text Books

1. Neuro-Fuzzy and Soft Computing by J.-S.R. Jang, C.-T. Sun, E. Mizutani;
2. Applying Case-Based Reasoning by I. Watson
3. Fuzzy Logic with Engineering Applications by T J ross

Analysis of Algorithms (III Semester 3L)

Syllabus

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 (Not Applicable)

1. Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, “Introduction to Algorithms”, Printice Hall of India
2. E. Horowitz & S Sahni, "Fundamentals of Computer Algorithms"
3. Aho, Hopcraft, Ullman, “The Design and Analysis of Computer Algorithms” Pearson Education

Object Modeling (III Semester 3L)

Syllabus

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 30 lectures)

1. Introduction, Need for formal and semi-formal modeling, UML-2 Meta-model (4)
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 (8)
3. Software System Design, Design Patterns, Pattern Classification, Creational, Structural and Behavioral patterns, Idoms (12)
4. Agents and Agent Modeling, Multi-Agent Systems Modeling, Case Study (6)

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

Computer Graphics (IV Semester 4L)

Syllabus

Course Description

In this course students will study the fundamental concepts in creating graphical images on the computer. Computer graphics uses ideas from Art, Mathematics, and Information Technology to create images. The students are expected to be comfortable writing programs in an upper level language, and have sound background in mathematics, as a great deal of computer graphics is best described mathematically. This course leads to courses on multimedia and image processing. This course has an associated lab course with it.

Course Outline (To be covered in 40 lectures)

1. Introduction, Input-Output devices, Line Scan algorithms, Mid –point Circle and Ellipse Generating algorithms, Polygon Filling, Clipping (7)
2. Geometrical Transformations (2D & 3D), Projections, Visible-Surface Determination (9)
3. Representation of Curves and Surfaces, Solid Modeling (6)
4. Color models and applications(4)
5. CAD/CAM and Applications of computer Graphics (4)

Text Books

1. Computer Graphics, by Hearn and Bakerand
2. Procedural Elements of Computer Graphics by Rogers
3. Principle of Interactive Computer Graphics by Newman and Sproul
4. Computer Graphics, A programming Approach by Steven Harrington

Software Engineering (IV Semester 3L)

Syllabus

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. This course has a associated Mini Project with it.

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

Database Management System(IV Semester 4L)

Syllabus

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

Distributed and Parallel Algorithms (IV Semester 3L)

Syllabus

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,

Multimedia Technology (VI Semester 3L)

Syllabus

Course Description

In this course students will study multimedia technologies, both standard and newly developed. Course coverage will include both theoretical understanding of multimedia technologies, and hands-on experience with applications and hardware. Topics may include perception, cognition, and communication issues, multimedia interface standards, multimedia evaluation, digitizing and manipulating images, voice, and video materials. Courses namely Computer graphics, Operating System and Computer Networks are prerequisites. A lab course is associated with it to strengthen the concepts.

Course Outline (To be covered in 30 lectures)

1. Introduction, Multimedia Information, Multimedia Objects, Convergence of Computer, Communication and Entertainment products, Digital representation (6)
2. Multimedia hardware, Memory & storage devices, Communication devices, Multimedia software's, presentation tools, tools for object generations, video, sound, image capturing, authoring tools, card and page based authoring tools (6)
3. Introduction to Text, hypertext & hypermedia, Sound, MIDI, Digital Audio concepts, audio file formats Sampling Variables, Loss less compression of sound, Audio Capture. (6)
4. Introduction to video& images :Multiple monitors, bitmaps, Vector drawing, Image format conversion, image compression, JPEG Compression, image & video file formats, animation, animation file formats. Video representation, Video Compression, color models, MPEG standards, Video Streaming on net, Video on demand. (6)
5. Introduction to multimedia communications. multimedia over I.P, multimedia Over ATM Networks, multimedia Data Base, content based retrieval in Digital libraries, multimedia over wireless networks. Serial port programming and interrupts (6)

Text Books

1. Fundamental of Multimedia by Li and Drew
2. Principle of Multimedia by Rajan Parekh
3. Multimedia, Making it Work by Tay Vaughan

E-Commerce (V Semester 4L)

Syllabus

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. This course has a associated lab with it.

Course Outline (To be covered in 30 lectures)

1. Introduction to e-Commerce and Network Infrastructure for e-commerce. (6)
2. E-commerce Models, e-Advertising & Marketing (8)
3. Electronic Payment Systems and Electronic Data Exchange (8)
4. E-commerce Security (6)
5. e-CRM (7)
6. Mobile Commerce (5)

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

Professional Ethics (V Semester 2L)

Syllabus

Course Description

In this course students will study application of moral reasoning to established profession of computer engineering. Moral reasoning entails the search for values and principles that promote a good life and human flourishing. As a professional, one has to employ ones expertise in the ways that greatly affect the lives of others. After crediting the course the students are expected to identify ethical conflicts, identify their responsibilities and options, and think through the implications of possible solutions to ethical conflicts.

Course Outline (To be covered in 20 lectures)

1. Introduction, Ethical theories (4)
2. Ethics in IT societies, Intellectual rights and privacy (6)
3. Professional Relationships, Professional Responsibilities, Professional Ethics in Computing (6)
4. Online crime, hacking, Legal aspects of Professional Ethics (4)

Text Books

1. **IEEE/ACM** Software Engineering Code of Ethics and Professional Practice (online)
2. Computer Ethics by Deborah Johnson
3. Ethics in Engineering by Martin M.W., Schinzinger R.
4. Ethics in Information Technology by George Reynolds
5. Readings in Cyber Ethics, Edited by Richard Spinello and Herman Tavani.

Data Warehousing and Mining (V Semester 3L)

Syllabus

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*

Professional Elective – I

Artificial Intelligence (Professional Elective 3L)

Syllabus

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

Design Patterns (Professional Elective 3L)

Syllabus

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 3L)

Syllabus

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 3L)

Syllabus

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 3L)

Syllabus

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 3L)

Syllabus

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 3L)

Syllabus

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

Software Testing (Professional Electives 3L)

Syllabus

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. A mini project has been associated with this course.

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

Professional Elective - II

Business Intelligence (Professional Elective 3L)

Syllabus

Course Description

In this course students will study the features, uses, and design strategies for IT-enabled managerial decision support and business intelligence. The course includes an overview of business intelligence framework, business process management and application-based business analytics and reporting.

Course Outline (To be covered in 30 lectures)

1. Introduction, Overview of Business Intelligence, deduction, induction, machine learning and neural networks, (5)
2. Introduction to analysis, quantitative methods for data analysis and knowledge extraction: classification and regression, Bayesian approaches, belief networks. (8)
3. Introduction to DSS development, Traditional system development life cycle, Alternate development methodologies, Prototyping: DSS Methodology, Tools for DSS development, DSS Technology levels and tools (8)
4. Enterprise system : Concept and definition, Enterprise Decision Support System, Evolution of executive and enterprise information system (EIS), Characteristics and capabilities of EDSS , Comparing and integrating EIS and DSS (6)
5. BI applications: Knowledge management, Decision analysis, Investment Strategies, Marketing Campaigns (3)

Text Books

1. Decision Support Systems and Intelligent Systems by Efrain Turbon.
2. Adaptive Business Intelligence by Michalewicz Z., Schmidt M., Michalewicz M. and Chiriac C.
3. Business Intelligence: A Managerial Approach by Turban E., Sharda R., Aronson J.E. and King, D.
4. Advanced Management Information Systems by W.S. Jawadeka

Data Compression (Professional Elective 3L)

Syllabus

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,

Information Retrieval (Professional Elective 3L)

Syllabus

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 3L)

Syllabus

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 3L)

Syllabus

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 3L)

Syllabus

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 Metrics and Models in Software Quality Engineering by Stephen H. Kan
2. Software Project Management in practice by Pankaj Jalote
3. Software Project Management by Bob Hughes and Mike Cotterell

Web Mining (Professional Elective 3L)

Syllabus

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.

Wireless Network Security (Professional Elective 3L)

Syllabus

Course Description

In this course students will study wireless networks and their security. In this course, many recent, current and emerging developments will be discussed including advances in cellular, personal communications systems (PCS), wireless LANs, satellites, and fixed wireless networks. Significant details of wireless devices and middleware will be included. Many emerging challenges and solutions including ad hoc wireless networks, broadband wireless and quality of service, and location management besides security would be taken up. Communication Foundations, Computer Network and cryptography are prerequisite courses. A lab course is associated with it to strengthen the concepts.

Course Outline (To be covered in 30 lectures)

1. Introduction, Wireless Communications (2)
2. Wireless devices and Middleware, Design of Wireless Networks (2)
3. Ad-hoc wireless networks, wireless sensor networks(2)
4. Security threats in wireless networks. Security requirements of wireless networks (4)
5. Security case studies for Wireless LAN and Ad-hoc wireless networks (6)
6. Speech Cryptology (5)
7. Protocols and Applications of Cellular, Personal Communications Systems, and Bluetooth. Security issues and services. (9)

Text Books

1. Wireless Security Models, Threats, and Solutions By: Randall K. Nichols, Panos C. Lekkas
2. Wireless Communications: Principles & Practice, by Ted Rappaport,
3. Wireless Network Design: Optimization Models and Solution Procedures, by J. Kennington et. al.
4. Security and Cooperation in Wireless Networks, by Levente Buttyán and Jean-Pierre Hubaux [Available Online]
5. The IEEE 802.11 Handbook: A designers companion by Bob O Hara, Al Petrick

Shell Programming (I Semester 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.

Kernel Programming (II Semester 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.

Web Programming (III Semester 3P)

Lab Description

This is third independent lab course in programming tools which intends to introduce web programming skills. The web is an integral part of society and our lives. The web browser has also grown to be a critical piece of software on many platforms: PC, Laptop, mobile devices, and video game consoles. This course will follow the course tradition of "looking under the hood," exploring ways to create web content and applications.

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