Course Structure & Curriculum
For
B. Tech. Programme

In
INFORMATION TECHNOLOGY

Department of Computer Science & Engineering
Motilal Nehru National Institute of Technology Allahabad

Curriculum for
Bachelor of Technology in
Information Technology

3rd Semester (Information Technology)

Course Code	Course name	L	T	P	Credit
CS-1301	Data Structures	4	-	-	4
MS-1301	Management of IT Industries	3	-	-	3
EC-1303	Analog & Digital Electronics	4	-	-	4
CS-1304	Foundations of Logical Thought	4	-	-	4
CS-1305	Technical Writing	3	-	-	3
CS-1351	Programming Tools – I (Shell) (Lab)	-	-	3	2
CS-1352	Data Structures (Lab)	-	-	3	2
EC-1353	Analog & Digital Electronics (Lab)	-	-	3	2
	Total	18		9	24

4th Semester (Information Technology)

Course Code	Course name	L	T	P	Credit
CS-1401	Analysis of Algorithms	3	-	-	3
CS-1402	Graph Theory & Combinatorics	3	-	-	3
CS-1403	Computer Organization	3	-	-	3
CS-1404	Automata Theory	4	-	-	4
EC-1405	Communication Foundations	3	-	-	3
CS-1405	Contemporary Issues in Information Technology	2	-	-	2
CS-1451	Programming Tools – II (System Call) (Lab)	-	-	3	2
CS-1452	Analysis of Algorithms (Lab)	-	-	3	2
EC-1454	Communication Foundations (Lab)	-	-	3	2
CS-1453	Automata & Compilers (Lab)	-	-	3	2
	Total	18		12	26

5th Semester (Information Technology)

Course Code	Course name	L	T	P	Credit
CS-1507	Computer Graphics	3	-	-	3
CS-1502	Operating Systems	4	-	-	4
CS-1503	Computer Network	4	-	-	4
CS-1504	Object Oriented Modeling	3	-	-	3
CS-1505	Operations Research	3	-	-	3
CS-1506	Cryptography	3	-	-	3
CS-1551	Programming Tools – III (Web) (Lab)	-	-	3	2
CS-1555	Computer Graphics (Lab)	-	-	3	2
CS-1553	Operating Systems (Lab)	-	-	3	2
CS-1554	Computer Network (Lab)	-	-	3	2
	Total	20		12	28

6th Semester (Information Technology)

Course Code	Course name	L	T	P	Credit
CS-1607	Multimedia Technology	3	-	-	3
CS-1602	Scientific Computing	3	-	-	3
CS-1608	Business Intelligence	3	-	-	3
CS-1604	Wireless Network Security	3	-	-	3
CS-1605	Database Management System	4	-	-	4
CS-1606	Software Engineering	3	-	-	3
CS-1652	Network Security (Lab)	-	-	3	2
CS-1654	Database Management System (Lab)	-	-	3	2
CS-1655	Multimedia Technology (Lab)	-	-	3	2
CS-1651	Mini Project	-	-	3	2
	Total	19		12	27

7th Semester (Information Technology)

Course Code	Course name	L	T	P	Credit
CS-1703	Image Processing	4	-	-	4
CS-1702	Professional Ethics	2	-	-	2
OE-1781 to 1790	Open Elective – I	3	-	-	3
CS-1731 to 1740	Professional Elective – I	3	-	-	3
CS-1741 to 1750	Professional Elective – II	3	-	-	3
CS-1791	Project	-	6	-	6
CS-1754	Image Processing (Lab)	-	-	3	2
	Total	15	6	3	23

8th Semester (Information Technology)

Course Code	Course name	L	T	P	Credit
CS-1803	Privacy Preserving Publishing	4	-	-	4
CS-1804	Research Trends in IT	3	-	-	3
CS-1831 to 1840	Professional Elective – III	3	-	-	3
CS-1841 to 1850	Professional Elective – IV	3	-	-	3
OE-1881 to 1890	Open Elective – II	3	-	-	3
CS-1891	Project	-	6	-	6
	Total	16	6	-	22

1st digit; 1: UG, 2nd digit; 2, 3, etc.: Semester

Code	Description
01-30	Theory Courses
31-40	Professional Elective –I
41-50	Professional Elective –II
51-70	Practical Courses
81-90	Open Elective
91-99	Project

DATA STRUCTURES (CS-1301)

UNIT 1: Introduction, Elementary Data Organization, Data Structure Operations, Algorithms Complexity, Time-Space Trade off 6(L)

UNIT 2: Arrays, Linked List, stacks and Queues 10(L)

UNIT 3: Tree, Binary tree, Search tree, Heap, B+ tree 12(L)

UNIT 4: Sorting methods, External Sorting/Searching, Hashing 8(L)

UNIT 5: Graphs 6(L)

Text/Reference Books:

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

MANAGEMENT OF IT INDUSTRIES (MS-1301)

UNIT 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(L)

UNIT 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(L)

UNIT 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(L)

UNIT 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(L)

UNIT 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

UNIT 6: Comprehensive Case studies: Any three from TCS, Cisco, Infosys, Wipro, Facebook, Accenture, Google, IBM, Microsoft etc. 3(L)

Text/Reference Books:

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

ANALOG & DIGITAL ELECTRONICS (EC-1303)

UNIT 1: Introduction to semiconductor physics. Diode, Zener Diode, Diode as a switch, Rectifier, Clipping and Clamping Circuits 6(L)

UNIT 2: Bipolar Junction Transistor, Biasing of Transistor, Transistor configurations, Transistor as an Amplifier, Transistor as a Switch. 8(L)

UNIT 3: Introduction to FET, MOSFET, Operational Amplifier, SCR, UJT and other devices 6(L)

UNIT4: Introduction to Boolean Algebra and fundamental theorems, Basic Logic Gates, Realization of combinational circuits using universal gates, Gate level minimization 8(L)

UNIT 5: Important Digital Circuits Decoder, Multiplexer, PLA, ROM, RAM 4(L)

UNIT 6: Flip Flops, Design of Sequential Circuits, Registers, Counters 8(L)

Text/Reference Books

- Digital Design by M Morris Mano, M D Ciletti
- Integrated Electronics by Millman & Halkias.
- Electronic Principles by Malvino
- Foundations of Analog and Digital Electronic Circuits by AnantAgarwal and Jeffrey Lang

FOUNDATIONS OF LOGICAL THOUGHT (CS-1304)

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

Text/Reference Books:

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

TECHNICAL WRITING (CS-1305)

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

Text/Reference Books:

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

PROGRAMMING TOOLS – I (SHELL) (LAB) (CS-1351)

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.

DATA STRUCTURES (LAB) (CS-1352)

Data structures represents the logical way for organizing the stored data. The study of data structures is very necessary because it enables the student to learn, analyze and then subsequently apply, proper the efficient operations over the data items used in the programs or software applications. This lab course is in alignment with the subject's theory classes and it will strengthen the basic concepts which are mandatory prequisites for understanding any other field related to computer science and engineering. In this lab course would learnb, use of different data structures for the same algorithms (Wherever applicable) to see its effect on time and space, comparison of different algorithms for the same problem etc. programs include: stack, queue linked list, heap, tree, binary search tree and graph using C/C++.

ANALOG & DIGITAL ELECTRONICS (LAB) (EC-1353)

This lab course introduces the students fundamentals of basic electronics and takes them forward to experiments on digital circuits.

ANALYSIS OF ALGORITHMS (CS-1401)

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

Text/Reference Books:

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

GRAPH THEORY & COMBINATORICS (CS-1402)

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

Text/Reference Books:

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

COMPUTER ORGANIZATION (CS-1403)

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

Text/Reference Books:

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

AUTOMATA THEORY (CS-1404)

UNIT 1: Introduction, inductive Proofs Relations and Functions 4(L)
UNIT 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(L)
UNIT 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(L)
UNIT 4: Pumping Lemma for both Regular & Context-free Languages, Proving Some Languages are not Context-free. 6(L)
UNIT 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(L)

Text/Reference Books:

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

COMMUNICATION FOUNDATIONS (EC-1405)

UNIT 1: Introduction, Elements of communication systems, review of signal. 4(L)
UNIT 2: Representations in time and frequency domain, bandwidth, filters, Electromagnetic spectrum 6(L)
UNIT 3: Sky waves, ground waves and space waves, Antenna fundamentals and types of antennas 4(L)
UNIT 4: Amplitude Modulation, Frequency modulation, Radio receivers 4(L)
UNIT 5: Sampling theorem, quantization and pulse code modulation, digital modulation techniques 6(L)
UNIT 6: Fundamentals of guided waves, wave guides, coaxial cables, fiber optic cables, cable types and specifications. 6(L)
UNIT 7: Case studies: FM Broadcast, satellite communication, telephone systems, mobile telephony. 4(L)

Text/Reference Books

- Communication Systems Engineering by Proakis, John, and MasoudSalehi
- Electronic Communication Systems by Kennedy D
- Computer Networks by Tanenbaum, Andrew
- Communication Systems by Haykin, Simon.

CONTEMPORARY ISSUES IN INFORMATION TECHNOLOGY (CS-1405)

UNIT 1: Introduction, Information technology in the past, present, and in the future 4(L)

UNIT 2: Contemporary theoretical and research issues which include the digital divide, optical and quantum computing, human computer interfaces and computing limitations. 8(L)

UNIT 3: Applying information technology across disciplines 4(L)

UNIT 4: Case study of famous IT professionals 4(L)

Text/Reference Books:

- CSI Communications (latest 12 issues)
- Communications of ACM (latest 12 issues)
- IEEE Software (latest 12 issues)
- IEEE Computer (latest 12 issues)
- IEEE Spectrum (latest 12 issues)

PROGRAMMING TOOLS -II (SYSTEM CALL) (LAB) (CS-1451)

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 inter-process communication primitives.

ANALYSIS OF ALGORITHMS (LAB) (CS-1452)

Implementation of algorithms covered in class: This will involve running the algorithms under varying input seat and measuring running times, use of different data structures for the same algorithms (wherever applicable) to see its effect on time and space , comparison of different algorithms for the same problem etc.

Following areas should be covered: Dynamic Programming, Divide and conquer, Branch and Bound, Backtracking.

Programming language: C/C++.

COMMUNICATION FOUNDATIONS (LAB) (EC-1454)

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 students would do experiments on compiler construction.

AUTOMATA & COMPILERS (LAB) (CS-1453)

Lex and Yacc- Generation of Intermediate Code for Expression Grammar – Construction of Predictive Parsing Table –LR Parsing Tables – Parsing Actions. The aim is to write a compiler for a small language. Familiarity with complied codes (assembly language) of RISC and CISC machine, writing a scanner, writing a predictive parser for a small language, a small experiment with scanner (lex/ flex) and parser (Yacc/ byson) generator (such as translation as regular expressions to NFA or the construction of parse tree), writing scanner –parse specification for a small language, translation of language to an intermediate form (e.g. three-address code), generation of target code (in assembly language). Code improvement (optional).

Programming languages and Tools: Lex, Yacc/ byson

COMPUTER GRAPHICS (CS-1507)

UNIT 1: Introduction, Input-Output devices, Line Scan algorithms, Mid –point Circle and Ellipse Generating algorithms, Polygon Filling, Clipping 7(L)

UNIT 2: Geometrical Transformations (2D & 3D), Projections, Visible-Surface Determination 9(L)

UNIT 3: Representation of Curves and Surfaces, Solid Modeling 6(L)

UNIT 4: Color models and applications 4(L)

UNIT 5: CAD/CAM and Applications of computer Graphics 4(L)

Text/Reference Books:

- Computer Graphics, by Hearn and Bakerand
- Procedural Elements of Computer Graphics by Rogers
- Principle of Interactive Computer Graphics by Newman and Sproul
- Computer Graphics, A programming Approach by Steven Harrington

OPERATING SYSTEMS (CS-1502)

UNIT 1: Introduction and Overview 2(L)

UNIT 2: Process fundamentals, scheduling, synchronization 12(L)

UNIT 3: Inter-process communication, Deadlock 8(L)

UNIT 4: Memory management and virtual memory 7(L)

UNIT 5: File system and secondary storage 5(L)

UNIT 6: Protection and security issues, Case studies e.g. Linux, Solaris and Android 6(L)

Text/Reference Books:

- Operating Systems, by William Stallings
- Operating Systems Concepts by Silberschatz, Galvin, and Gagne
- The Design of the UNIX Operating System, by Maurice J. Bach
- Advanced Programming in the UNIX Environment, by W. R. Stevens & S. A. Rago
- 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 (CS-1503)

UNIT 1: Introduction, Fundamental requirements of network, OSI & TCP/IP model 3(L)

UNIT 2: Physical and Link layer issues 4(L)

UNIT 3: Medium Access protocols (IEEE 802.3 ...) and related issues 8(L)

UNIT 4: Network layer: IP and other protocols, Routing protocols, and LAN design. 11(L)

UNIT 5: Transport layer Protocols and related Issues 8(L)

UNIT 6: Basic client server architecture, introduction to different application layer protocols like ftp, telnet, mail(SMTP), HTTP, DNS, DHCP and peer to peer 6(L)

Text/Reference Books:

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

OBJECT ORIENTED MODELING (CS-1504)

UNIT 1: Introduction, Need for formal and semi-formal modeling, UML-2 Meta-model 4(L)

UNIT 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(L)

UNIT 3: Software System Design, Design Patterns, Pattern Classification, Creational, Structural and Behavioral patterns, Idoms 12(L)

UNIT 4: Agents and Agent Modeling, Multi-Agent Systems Modeling, Case Study 6(L)

Text/Reference Books:

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

OPERATIONS RESEARCH (CS-1505)

UNIT 1: Introduction, Linear programming (LP) models, 4(L)

UNIT 2: Simplex & revised simplex algorithms, Duality and sensitivity analysis in LP 4(L)

UNIT 3: Basics of Game theory, Transportation and assignment problems, Project scheduling (critical path method & PERT) 10(L)

UNIT 4: Integer programming models, Stochastic processes: Markov chains and birth/death processes, Queuing theory 6(L)

UNIT 5: Network Analysis and Inventory Control 4(L)

Text/Reference Books:

- *Operations Research Models and Methods*, by Paul A. Jensen and Jonathan F. Bardto
- Operation Research by Hamdy.ATaha
- *Introduction to Operations Research*, by Frederick Hillier & Gerald Lieberman
- Linear Programming byHadely G.

CRYPTOGRAPHY (CS-1506)

UNIT 1: Introduction, Prime Number Generation, Shannon's Theory of Perfect Secrecy 5(L)
UNIT 2: Asymmetric Key Cryptosystem and related issues 5(L)
UNIT 3: Public Key Cryptography and related concepts/methodologies 10(L)
UNIT 4: Cryptographic Hash Functions design and implementation issues. 5(L)
UNIT 5: Digital Signatures and related issues 5(L)

Text/Reference Books:

- Modern Cryptography : Theory and Practice by W Mao
- Applied cryptography by Bruce Schiener
- "Cryptography: Theory & Practice" D R Stinson,
- Introduction to cryptography by Johannes A Buchmann
- Network Security and Cryptography by Bernard Menezes

PROGRAMMING TOOLS – III (WEB) (LAB) (CS-1551)

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. Include search, retrieval and classifications for web. T he student would learn XML, ontology language (OWL), resource description framework to development of intelligent internet agent.

COMPUTER GRAPHICS (LAB) (CS-1555)

In this lab course students will do experiments for creating graphical images on the computer.

OPERATING SYSTEMS (LAB) (CS-1553)

Unix command implementation (6-10), Signal handling , Matrix and Graph operations using pthreads, Classical synchronization problems using IPC and pthreads, Thread Library implementation, CPU scheduling algorithms as part of thread library and also using IPC, Deadlock handling algorithms , Page replacement algorithms using pthreads and IPC, sample file system inside disk image file.

COMPUTER NETWORKS (LAB) (CS-1554)

In the of course computer network students will learning about hardware component like RJ-45 connector, CAT-6 Cable, configuration of router, hub switch etc, configuration of server in programming mode they will lean about socket programming , client server programming for deeply understanding TCP/ IP model and various protocols.
In simulation area they will work on Cisco networking, NS-2 or NS-3 tools for more clearly understanding about computer network.

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MULTIMEDIA TECHNOLOGY (CS-1607)

UNIT 1: Introduction, Multimedia Information, Multimedia Objects, Convergence of Computer, Communication and Entertainment products, Digital representation 6(L)

UNIT 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(L)

UNIT 3: Introduction to Text, hypertext & hypermedia, Sound, MIDI, Digital Audio concepts, audio file formats Sampling Variables, Loss less compression of sound, Audio Capture. 6(L)

UNIT 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(L)

UNIT 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(L)

Text/Reference Books:

- Fundamental of Multimedia by Li and Drew
- Principle of Multimedia by Rajan Parekh
- Multimedia, Making it Work by Tay Vaughan

SCIENTIFIC COMPUTING (CS-1602)

UNIT 1: Introduction, Algebraic and Transcendental Equations and related issues 8(L)

UNIT 2: Discussion on different Interpolation concepts and methods 8(L)

UNIT 3: Curve Fitting, Cubic Spline & Approximation 7(L)

UNIT 4: Numerical Integration and Differentiation. 6(L)

UNIT 5: Numerical Linear Algebra 5(L)

UNIT 6: Statistical Computations 6(L)

Text/Reference Books:

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

BUSINESS INTELLIGENCE (CS-1608)

UNIT 1: Introduction, Overview of Business Intelligence, deduction, induction, machine learning and neural networks, 5(L)

UNIT 2: Introduction to analysis, quantitative methods for data analysis and knowledge extraction: classification and regression, Bayesian approaches, belief networks. 8(L)

UNIT 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(L)

UNIT 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(L)

UNIT 5: BI applications: Knowledge management, Decision analysis, Investment Strategies, Marketing Campaigns 3(L)

Text/Reference Books:

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

WIRELESS NETWORK SECURITY (CS-1604)

UNIT 1: Introduction, Wireless Communications 2(L)

UNIT 2: Wireless devices and Middleware, Design of Wireless Networks 2(L)

UNIT 3: Ad-hoc wireless networks, wireless sensor networks 2(L)

UNIT 4: Security threats in wireless networks. Security requirements of wireless networks 4(L)

UNIT 5: Security case studies for Wireless LAN and Ad-hoc wireless networks 6(L)

UNIT 6: Speech Cryptology 5(L)

UNIT 7: Protocols and Applications of Cellular, Personal Communications Systems, and Bluetooth. Security issues and services. 9(L)

Text/Reference Books:

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

DATABASE MANAGEMENT SYSTEM (CS-1605)

UNIT 1: Database system concept and architecture, Entity Relationship and Enhanced E-R 5(L)

UNIT 2: Relational Data Model and Relational Algebra, SQL, Indexing, Query Optimization 10(L)

UNIT 3: Relational Database Design, Normalization principles and normal forms 8(L)

UNIT 4: Transaction concept and concurrency control 8(L)

UNIT 5: Web Interface to DBMS, Semi-structured databases, Object oriented databases 6(L)

UNIT 6: DBMS Case studies 3(L)

Text/Reference Books:

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

SOFTWARE ENGINEERING (CS-1606)

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

Text/Reference Books:

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

NETWORK SECURITY (LAB) (CS-1652)

The lab work will include implementation of algorithms of cryptography (RSA, AES, and DES etc). In network security, the lab work will indlude firewall implementation, SSH certificates and security tools implementation , database security, program security etc. The lab work will also include configuring DNS, DHCP,NAT etc, router configuration , WAN networking, Building VPN and network security tools (Nmap, Nessus, and Wireleshark etc.)
Programming Languages and Tools: Java (Security Library, JCE, JCA)/C or C++, Nmap, wireshark, cain n able, Nessus etc.

DATABASE MANAGEMENT SYSTEM (LAB) (CS-1654)

Familiarization of Oracle RDBMS,SQL* Plus, Design and development of database using Oracle , implementation of application with GUI, Implementation of relational operators using C/C++,DSL, Front end development. Web interface to DBMS (using PHP/.Net/JSP)

MULTIMEDIA TECHNOLOGY (LAB) (CS-1655)

In this lab course students will do the experiments to develop basic understanding of the working of the multimedia systems.

MINI PROJECT (CS-1651)

In this mini project students will do the experiments to develop basic understanding of the software requirement specification and design issues.

IMAGE PROCESSING (CS-1703)

UNIT 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(L)

UNIT 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(L)

UNIT 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(L)

UNIT 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(L)

Need for image compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, Vector Quantization, Transform coding, JPEG standard, MPEG. 8(L)

Text/Reference Books:

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

PROFESSIONAL ETHICS (CS-1702)

UNIT 1: Introduction, Ethical theories 4(L)

UNIT 2: Ethics in IT societies, Intellectual rights and privacy 6(L)

UNIT 3: Professional Relationships, Professional Responsibilities, Professional Ethics in Computing 6(L)

UNIT 4: Online crime, hacking, Legal aspects of Professional Ethics 4(L)

Text/Reference Books:

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

PROFESSIONAL ELECTIVE – I

ARTIFICIAL INTELLIGENCE (CS-1731)

UNIT 1: Introduction, Intelligent agents, reactive, deliberative, goal-driven, utility-driven, and learning agents, Artificial Intelligence programming 5(L)

UNIT 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(L)

UNIT 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(L)

UNIT 4: Planning as search, partial order planning, construction and use of planning graphs, planning and acting in the real world 3(L)

UNIT 5: Basics of utility theory, decision theory, sequential decision problems, elementary game theory, sample applications. 4(L)

UNIT 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(L)

Text/Reference Books:

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

DATA COMPRESSION (CS-1732)

UNIT 1: Information theoretic foundations, Arithmetic coding 6(L)

UNIT 2: Dictionary techniques, Context modeling 6(L)

UNIT 3: Lossless image compression, Lossy coding preliminaries 6(L)

UNIT 4: Scalar and vector quantization 6(L)

UNIT 5: Differential encoding, Transform coding 6(L)

Text/Reference Books:

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

DATA WAREHOUSING AND MINING (CS-1733)

UNIT 1: Introduction and overview of data mining processes 3(L)

UNIT 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(L)

UNIT 3: Data clustering and classification techniques 9(L)

UNIT 4: Association rule mining 5(L)

UNIT 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(L)

UNIT 6: Applications and case studies 3(L)

Text/Reference Books:

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

DESIGN PATTERNS (CS-1734)

UNIT 1: Introduction to Design Patterns, Introduction To Java, Some OO Design Principles, The Observer Pattern, The Template Method Pattern 6(L)

UNIT 2: Factory Patterns: Factory Method and Abstract Factory, The Singleton Pattern, The Iterator Pattern, The Composite Pattern, The Facade Pattern 6(L)

UNIT 3: The State and Strategy Patterns, Functors and the Command Pattern, The Proxy Pattern 5(L)

UNIT 4: RMI, The Adapter Pattern, The Decorator Pattern 4(L)

UNIT 5: Dynamic Proxies In Java, The Chain of Responsibility Pattern, Concurrency Patterns, The Visitor Pattern, Anti Patterns 5(L)

UNIT 6: Layer, Pipe and Filters, Black Board Broker, Case Studies 4(L)

Text/Reference Books:

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

FUNCTIONAL PROGRAMMING (CS-1735)

UNIT 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(L)

UNIT 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(L)

UNIT 3: Lambda Calculus Semantics: Reduction Machines SECD Machine , Graph Reduction Machine, Lazy/delayed Evaluation, 8(L)

Text/Reference Books:

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

PROFESSIONAL ELECTIVE – II

GENETIC ALGORITHM (CS-1741)

UNIT 1: Basics of Optimization, Optimization Problems, Point to Point Algorithms, Simulated Annealing 3(L)

UNIT 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(L)

UNIT 3: Operators on Real-valued Representations, Niche and fitness sharing, Particle Swarm Optimization, Memetic Algorithms 7(L)

UNIT 4: Evolution Strategies, Genetic Programming, Evolutionary Programming, Differential Evolution 6(L)

UNIT 5: Constraint Handling in optimization problems, Real Life application of optimization Algorithms, Introduction of Multi-objective Evolutionary Algorithms 7(L)

Text/Reference Books:

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

NETWORK ADMINISTRATION (CS-1742)

UNIT 1: Introduction, Basic System Administration 3(L)

UNIT 2: Windows Installation, Linux Installation and Package Management, Backup and Security, Monitoring and Managing Processes/Daemons, Scripting basics and start-up scripts 8(L)

UNIT 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(L)

UNIT 4: Server configuration and management, DHCP, NIS, NFS, LDAP and Samba 6(L)

UNIT 5: Apache Web Server with PHP, DNS, BIND and Sendmail, Tools like Webmin, Webalizer, and Phpmyadmin; Security and firewall 5(L)

Text/Reference Books:

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

NEURAL NETWORKS (CS-1743)

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

Text/Reference Books:

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

SERVICE ORIENTED SOFTWARE ENGINEERING (CS-1744)

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

Text/Reference Books:

- Service Oriented Architecture – Concept Technology & Design by Thomas Earl
- Enterprise SOA – Designing IT for Business Innovation by Woods &Mattem
- Web Service Essentials, EibanCerami, O'Reilly

XML AND APPLICATIONS (CS-1745)

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

Text/Reference Books:

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

PROJECT (CS-1791)

IMAGE PROCESSING (LAB) (CS-1754)

In this lab course students will do the experiments to develop basic understanding of the working of the image processing systems.

PRIVACY PRESERVING PUBLISHING (CS-1803)

UNIT 1: Introduction, Attack Models and Privacy Models 7(L)

UNIT 2: Anonymization Operations and Algorithms, Anonymization for Cluster Analysis. 9(L)

UNIT 3: Anonymizing Incrementally Updated Data Records, Collaborative Anonymization for Vertically Partitioned Data and Horizontally Partitioned Data. 8(L)

UNIT 4: Anonymizing Complex Data e.g. Anonymizing Transaction Data, Anonymizing Trajectory Data. 8(L)

UNIT 5: Anonymization for data mining, Anonymizing Social Networks. 8(L)

Text/Reference Books:

- Introduction to Privacy-Preserving Data Publishing Concepts and Techniques By Benjamin C.M. Fung, Ke Wang, Ada Wai-Chee Fu, Philip S. Yu
- Privacy-Preserving Data Publishing: An Overview by Raymond Chi-Wing Wong & Ada Wai-Chee Fu
- Research papers.

RESEARCH TRENDS IN IT (CS-1804)

UNIT 1: Introduction, History of information technology, 2(L)

UNIT 2: Presentation Schedule. 1(L)

Text/Reference Books:

- DBLP to identify areas and TOC of Journals and Conference Proceedings
- INDEST, ACM digital Library, IEEE Digital Library etc to browse papers
- Handbook of Writing for the Mathematical Sciences By Nicholas J. Higham

PROFESSIONAL ELECTIVE – III

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

DISTRIBUTED AND PARALLEL ALGORITHMS (CS-1831)

UNIT 1: Introduction, architectures and languages for parallel and distributed processing. 3(L)

UNIT 2: Abstract models of parallel computing, PRAM (Parallel Random Access Machine). Distributed and parallel algorithms and their complexity. Interaction between processes, communication, synchronization. 9(L)

UNIT 3: Topologies, synchronous and asynchronous algorithms. Algorithms for parallel sorting. Algorithms for parallel searching. 6(L)

UNIT 4: Parallel matrix operations. All prefix sums and their applications. Graph and list algorithms. Synchronization algorithms and tasks. 6(L)

UNIT 5: Mechanisms and language constructs for synchronization. Recently published algorithms. 6(L)

Text/Reference Books:

- Parallel Computation, Model and Methods by Akl,
- An Introduction to Parallel Algorithms
- Introduction to Parallel Algorithms and Architectures: Arrays, Trees, Hypercubes by Leighton,
- Synthesis of Parallel Algorithms by J. H. Rief,
- Introduction to Distributed Algorithms by Gerard Tel,

E-COMMERCE (CS-1832)

UNIT 1: Introduction to e-Commerce and Network Infrastructure for e-commerce. 4(L)

UNIT 2: E-commerce Models, e-Advertising & Marketing 6(L)

UNIT 3: Electronic Payment Systems and Electronic Data Exchange 6(L)

UNIT 4: E-commerce Security 4(L)

UNIT 5: E-CRM 6(L)

UNIT 6: Mobile Commerce 4(L)

Text/Reference Books:

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

GAMING AND ANIMATION (CS-1833)

UNIT 1: Introduction, Fundamental Principles of Animation and gaming 6(L)

UNIT 2: Rigging & Posing Techniques, Fundamentals of Character Animation, Facial Animation and Lip Sync Techniques 8(L)

UNIT 3: Fundamentals of Motion Capture, Principles of Motion Simulation 6(L)

UNIT 4: Game design principles and processes 8(L)

Text/Reference Books:

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

INFORMATION RETRIEVAL (CS-1834)

UNIT 1: Introduction to IR models and methods, Text analysis / Web spidering Text properties 5(L)

UNIT 2: Vector-based model, Boolean model, Probabilistic model, other IR models; IR evaluation and IR test collections; Relevance feedback, query expansion 8(L)

UNIT 3: Web search: link based and content based; Query-based and content sensitive link analysis; Search engine technologies 8(L)

UNIT 4: Text classification and clustering; Question answering on offline and online collections 5(L)

UNIT 5: Personalized IR, Cross-language IR, Web 2.0, 4(L)

Text/Reference Books

- Introduction to Information Retrieval by Christopher D. Manning, PrabhakarRaghavan, HinrichSchütze (available online)
- Information Retrieval: Algorithms and Heuristics. By D.A. Grossman, O. Frieder
- Readings in Information Retrieval by K.Sparck Jones and P. Willett

PATTERN RECOGNITION (CS-1835)

UNIT 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(L)

UNIT 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(L)

UNIT 3: Non-parametric Classification, Density Estimation, Parzen Estimation,Unsupervised Learning, Clustering, Vector Quantization, K-means, Mixture Modeling, Expectation-Maximization 6(L)

UNIT 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(L)

Text/Reference Books:

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

PROFESSIONAL ELECTIVE – IV

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

SEMANTIC WEB (WEB ONTOLOGY) (CS-1841)

UNIT 1: Review of XML; Meta-model and Meta-data, RDF & RDFS; OWL; Ontology Engineering and tools 12(L)

UNIT 2: Description Logic(DL); Programming with DL; Example Application 12(L)

UNIT 3: Knowledge Acquisition and Management System, 6(L)

Text/Reference Books:

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

SOFTWARE METRICS & QUALITY ASSURANCE (CS-1842)

UNIT 1: The state of IT project management & basics of measurement 6(L)

UNIT 2: Measuring internal product attributes: size and structure 6(L)

UNIT 3: Measuring cost and effort 6(L)

UNIT 4: Measuring external product attributes: Quality & Reliability 6(L)

UNIT 5: Software test metrics 6(L)

Text/Reference Books:

- 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
- Software Project Management in practice by PankajJalote
- Software Project Management by Bob Hughes and Mike Cotterell

SOFTWARE TESTING (CS-1843)

UNIT 1: Fundamentals of Testing and its current state of art 8(L)

UNIT 2: Various approaches to Testing 6(L)

UNIT 3: Test planning and Management 6(L)

UNIT 4: Test Strategies - Preventive, Reactive Approach, Analytical, Heuristic, Configuration Management 6(L)

UNIT 5: Mutation Testing &Testing Object Oriented Software 4(L)

Text/Reference Books:

- Software Testing Techniques by BorrisBeizer
- Software Testing – A Craftman's Approach by Paul C. Jorgensen
- Software Testing by Hambling, Samaroo& Williams.
- Software Testing Practice: Test Management by Spillner, Rossner, Winter & Linz

THEORY OF VIRTUALIZATION (CS-1844)

UNIT 1: Introduction, Overview of virtualization 8(L)

UNIT 2: Hardware/Server virtualization 8(L)

UNIT 3: Network virtualization 8(L)

UNIT 4: Virtual machines 6(L)

Text/Reference Books:

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

WEB MINING (CS-1845)

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

Text/Reference Books:

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

PROJECT (CS-1891)