Harcourt Butler Technological Institute, Kanpur-208002

(An Autonomous Institute Affiliated to U. P. Technical University, Lucknow)

Revised Syllabus

B. Tech. III Year
Computer Science and Engineering

(Effective from the session 2015-16)

WEB TECHNOLOGY (IIT-502)

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Unit-I

History of the web, Protocols governing the web, Growth of the Web, Web 2.0 and its features.

Introduction to Cyber Laws in India, Introduction to International Cyber laws, Web project, Web Team, Team dynamics. Communication Issues, the Client, Multi-departmental & Large scale Websites, Quality Assurance and testing, Technological advances and Impact on Web Teams.

Unit-II

HTML: Formatting Tags, Links, List, Tables, Frames, forms, Comments in HTML, DHTML, Introduction to HTML 5.

JavaScript: Introduction, Documents, Documents, forms, Statements, functions, objects in JavaScript, Events and Event Handling, Arrays, FORMS, Buttons, Checkboxes, Text fields and Text areas, Introduction to jQuery.

Unit-III

XML: Document type definition, XML Schemas, Document Object model, Presenting XML, **Using XML Processors**: DOM and SAX parsers, **Java Beans**: Introduction to Java Beans, Advantages of Java Beans, BDK , Introspection, Using Bound properties, Bean Info Interface, Constrained properties , Persistence, Customizes, Java Beans API, Introduction to EJBs.

Unit-IV

Web Servers and Servlets: Tomcat web server, Introduction to Servelets: Lifecycle of a Serverlet, JSDK, The Servelet API, The javax.servelet Package, Reading Servelet parameters, Reading Initialization parameters. The javax.servelet HTTP package, Handling Http Request & Responses, Using Cookies-Session Tracking, Security Issues.

Introduction to JSP: The Anatomy of a JSP Page. JSP Application Design with MVC , JSP Application Development: Generating Dynamic Content, Using Scripting Elements Implicit JSP Objects, Conditional Processing Sharing Session and Application Data Memory Usage Considerations

Unit-V

Database Access: Database Programming using JDBC, Studying Javax.sql.* package, Accessing a Database from a JSP Page, Application – Specific Database Actions, Deploying JAVA Beans in a JSP Page, Introduction to struts framework.

Semantic Web: Introduction , growth and evolution, goals and vision , need , problems, Architecture, applications.

Text and Reference Books:

1. Burdman, "Collaborative Web Development", Addison W esley.
2. Sharma &Sharma, "Developing E-Commerce Sites", Addison Wesley
3. Ivan Bayross, "Web Technologies Part II", BPB Publications.
4. Deitel & Deitel, Internet and world wide web – How to Program", Goldberg, Pearson Education
5. Eric Ladd, Jim O' Donnel,Using HTML 4, XML and JAVA", Prentice Hall of India
6. Hans Bergsten, Java Server Pages ",SPD O'Reilly
7. Patrick Naughton and Herbert Schildt, The complete Reference Java 2 Fifth Edition by TMH
8. Sebesta, Programming world wide web- Pearson
9. Michael C Daconta, Leo, Kelvin Smith , "The Semantic Web:A guide to the future of XML,Web services, and knowledge management", Wiley.

OPERATING SYSTEMS (ICS-502)

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Unit -I

Introduction: Operating System and its functions, Evolution of Operating System, Batch, Interactive, Time Sharing and Real Time Operating System, System Protection. Operating System Structure: System Components, System Structure, Operating System Services.

Unit-II

Process Management: Process Concept, Process State, Process Control Block, Threads.

Concurrent Processes: Principle of Concurrency, Mutual Exclusion, Inter Processes Communication,Critical Section Problem, Semaphores, Classical Problems in Concurrency, Producer / Consumer Problem,Readers-Writers Problem, Dining Philosophers Problem.

Unit-III

CPU Scheduling: Scheduling Concept, Scheduling Techniques, Performance Criteria for Scheduling Algorithm, Evolution, Multiprocessor Scheduling.

Deadlock: System Model, Deadlock Characterization, Prevention, Avoidance and Detection, Recovery From Deadlock Combined Approach.

Unit-IV

Memory Management: Basic Machine, Resident Monitor, Multiprogramming with Fixed Partition, Multiprogramming With Variable Partition, Multiple Base Register, Paging, Segmentation, Paged Segmentation.

Virtual Memory: Virtual Memory Concept, Demand Paging, Performance, Paged Replaced Algorithm, Allocation of Frames, Thrashing, Cache Memory Organization, Impact on Performance.

Unit-V

I/O Management & Disk Scheduling: I/O Devices, Organization of I/O Function, Operating System Design Issues, I/O Buffering, Disk Scheduling(FCFS, SCAN, C-SCAN).

File Management: File Concept, File Organization, File Directories, File Sharing, Allocation Methods, Free Space Management, Implementation Issues.

Text & Reference Books:

1. Milenekovik, "Operating System Concept", McGraw Hill.
2. Petersons, "Operating Systems", Addison Wesley.
3. Dietal, "An Introduction to Operating System", Addison Wesley.
4. Tannenbaum, "Operating System Design and Implementation", PHI.
5. Gary Nutt, "Operating System, A Modern Perspective", Addison Wesley.
6. Stalling, Williums, "Operating System", Maxwell Macmillan
7. Silveschatz, Peterson J., "Operating System Concepts", Willey.
8. Crowley, "Operating System", TMH.

DESIGN & ANALYSIS OF ALGORITHMS (ICS-503)

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Unit -I

Algorithms definition and introduction, Analysis of algorithms, Growth of Functions, Master's Theorem, Designing of Algorithms, Partitioning Algorithms, Divide and Conquer design and analysis techniques: Merge Sort and Quick Sort, Sorting and order Statistics: Heap sort, Sorting in linear time, Medians and Order Statistics.

Unit -II

Advanced Data Structures: Introduction of Red-Black Trees, Augmenting Data Structure, B-Trees, Binomial Heaps, Fibonacci Heaps, Data Structure for Disjoint Sets, Amortized Analysis.

Unit -III

Advanced Design and Analysis Techniques: Dynamic Programming, Greedy Algorithms, Back Tracking, Branch and Bound with their applications.

Unit -IV

Graph Algorithms: Elementary Graphs Algorithms, Minimum Spanning Trees, Single-source Shortest Paths, All-Pairs Shortest Paths, Traveling Salesman Problem and Maximum Flow.

Unit -V

Selected Topics: Randomized Algorithms, String Matching,

Non deterministic Algorithms: P, NP, NP Hard and NP Completeness, Approximation Algorithms, PRAM Algorithms.

Text & Reference Books:

1. Coreman, Rivest, Lisserson: “Algorithm", PHI.
2. Basse, "Computer Algorithms: Introduction to Design & Analysis", Addison Wesley.
3. Horowitz & Sahni, "Fundamental of Computer Algorithm", Universities Press.

THEORY OF AUTOMATA & FORMAL LANGUAGES (ICS-504)

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Unit – I

Defining Languages and Grammars, Chomsky hierarchy, Kleene closures, Regular Expressions, Finite Automata (FA), Transition graph, Generalized Transition Graph.

Unit – II

Nondeterministic finite Automata (NFA), Deterministic finite Automata (DFA), Construction of DFA from NFA and optimization, Partitioning Algorithm, Equivalence of DFA and NFA and their optimization, FA with output: Moore machine, Mealy machine and their Equivalence, Applications and Limitation of FA.

Unit – III

Arden Theorem, Pumping Lemma for regular expressions, Myhill-Nerode theorem, Context free grammar: Ambiguous Grammars and Simplification, Normal forms for CFGs, Pumping lemma for CFLs, Decidability of CFGs, Ambiguous to Unambiguous CFG.

Unit – IV

Push Down Automata (PDA): Description and definition, Working of PDA, Acceptance of a string by PDA, PDA and CFG Equivalence, Deterministic and non-deterministic PDA, Introduction to auxiliary PDA and Two stack PDA.

Unit – V

Turing machines (TM): Basic model, definition and representation, Language acceptance by TM, TM and Type – 0 grammar, Integer function computation by TM, Halting problem of TM, Modifications in TM, Universal TM, Properties of recursive and recursively enumerable languages, decision problem, Undecidability of Post Correspondence Problem, Church's Thesis, Recursive function theory, Godel Numbering.

Text & Reference Books:

1. Hopcroft, Ullman, "Introduction to Automata Theory, Language and Computation", Nerosa Publishing House
2. K.L.P. Mishra and N. Chandrasekaran, "Theory of Com puter Science (Automata, Languages and Computation)", PHI.
3. Martin J. C., "Introduction to Languages and Theory of Computations", TMH
4. Papadimitrou, C. and Lewis, C.L., "Elements of theo ry of Computations", PHI
5. Cohen D. I. A., "Introduction to Computer theory", John Wiley & Sons
6. Kumar Rajendra, "Theory of Automata (Languages and Computation)", PPM

WEB TECHNOLOGY LAB (IIT-552)

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A web based application incorporating HTML, DHTML, JavaScript, jQuery, XML, JSP, Servlet is highly desirable besides small programming assignments on these technologies.

OPERATING SYSTEMS LAB (ICS-552)

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1. Simulation of the CPU scheduling algorithms a) Round Robin b) SJF c) FCFS d) Priority Simulation of MUTEX and SEMAPHORES.
2. Simulation of Bankers Deadlock Avoidance and Prevention algorithms.
3. Implementation of Process Synchronization (Reader-Writer, Sleeping Barber and Dining Philosopher's Problem)
4. Simulation of page Replacement Algorithms a) FIFO b) LRU c) LFU
5. Simulation of paging techniques of memory management.
6. Simulation of file allocation Strategies a) Sequential b) Indexed c) Linked
7. Simulation of file organization techniques a) Single Level Directory b) Two Level c) Hierarchical d) DAG

DESIGN AND ANALYSIS OF ALGORITHMS LAB (ICS-553)

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Programming assignments on each of the following algorithmic strategy:

1. Divide and conquer method (quick sort, merge sort, Strassen's matrix multiplication).
2. Greedy method (knapsack problem, job sequencing, optimal merge patterns, minimal spanning trees).
3. Dynamic programming (multistage graphs, OBST, 0/1 knapsack, traveling salesperson problem).
4. Back tracking (n-queens problem, graph coloring problem, Hamiltonian cycles).
5. Searching: Sequential and Binary Search.
6. Selection: Minimum/ Maximum, K_{th} smallest element.
7. Graph Algorithms: Shortest Path, network flow.
8. Graph Algorithm implementation as discussed in DAA Theory.
9. Implementation of Advanced Data Structure for operations: addition, deletion, search.

COMPILER DESIGN (ICS-603)

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Unit-I

Introduction to Compiler, Phases and passes, Bootstrapping, Finite automata and regular expressions and their applications to lexical analysis, Implementation of lexical analyzers, lexical-analyzer generator, LEX-compiler. The syntactic specification of Programming languages: Context free grammars, derivation and parse trees, capabilities of CFG.
Application of grammars in syntax analysis, ambiguity and BNF notation, YACC.

Unit-II

Basic Parsing Techniques: Parsers, top down parsing, Shift reduces parsing, operator precedence parsing, predictive parsers. Automatic Construction of efficient Parsers: LR parsers, the canonical Collection of LR(0) items, constructing SLR parsing tables, constructing Canonical LR parsing tables, Constructing LALR parsing tables, using ambiguous grammars, an automatic parser generator, implementation of LR parsing tables, constructing LALR sets of items.

Unit-III

Syntax-directed Translation: Syntax-directed Translation schemes, Implementation of Syntax directed Translators, Intermediate code, postfix notation, Parse trees & syntax trees, three address code, quadruple & triples, translation of assignment statements, Boolean expressions, statements that alter the flow of control, postfix translation, translation with a top down parser. More about translation: Array references in arithmetic expressions, procedures call, declarations, case statements.

Unit-IV

Symbol Tables: Data structure and representing scope information. Run-Time Administration: Implementation of simple stack allocation scheme, storage allocation in block structured language. Error Detection & Recovery: Lexical Phase errors, syntactic phase errors semantic errors.

Unit-V

Introduction to code optimization: Loop optimization, the DAG representation of basic blocks, value numbers and algebraic laws, Global Data-Flow analysis.

Text and Reference Books:

1. Aho, Sethi & Ullman, "Compiler Design", Addition Wesley.
2. Kenneth C. Louden, “Compiler Construction: Principl es and Practice”, Thomson Brooks Publication.
3. Allen I. Holub, “Compiler Design in C”, PHI Publications.

COMPUTER NETWORKS (ICS-604)

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3 1 0

Unit -I

Introduction Concepts: Goals and Applications of Networks, Network structure and architecture, The OSI reference model, services, Network Topology Design - Delay Analysis, Back Bone Design, Local Access Network Design. Physical Layer Transmission Media, Switching methods, ISDN, Terminal Handling.

Unit-II

Medium Access sub layer: Medium Access sub layer - Channel Allocations, LAN protocols - ALOHA protocols - Overview of IEEE standards - FDDI. Data Link Layer - Elementary Data Link Protocols, Sliding Window protocols, Error Handling.

Unit - III

Network Layer: Network Layer - Point - to Pont Networks, routing, Congestion control Internetworking -TCP / IP - IP packet, IP address, IPv6. '

Unit - IV

Transport Layer: Transport Layer - Design issues, connection management, session Layer-Design issues, remote procedure call. Presentation Layer-Design issues, Data compression techniques, cryptography - TCP - Window Management.

Unit-V

Application Layer: Application Layer: File Transfer, Access and Management, Electronic mail, Virtual Terminals, Other application, Example Networks - Internet and Public Networks.

Text and Reference Books:

1. Forouzen, "Data Communication and Networking", TMH
2. A.S. Tanenbaum, “Computer Networks”, 3rd Edition, P rentice Hall India, 1997.
3. S. Keshav, “An Engineering Approach on Computer Net working”, Addison Wesley, 1997
4. W. Stallings, “Data and Computer Communication”, Ma cmillan Press, 1989.

COMPUTER GRAPHICS (ICS-501)

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Unit-I

Line generation: Points and Lines, Planes, Pixels and Frame buffers, vector and character generation. Graphics Primitives: Display devices, Primitive devices, Display File Structure, Display control text, Line-drawing Algorithms**:** DDA Algorithm Bresenham's line Algorithm, Circle-generating Algorithm**:** Midpoint Circle of Algorithm, Polygon Filling Algorithm.

Unit-II

2-D and 3-D Transformations: Basic Transformations: Translation, Rotation, Scaling, Shear, Composite Transformations: Rotations about a point, Reflection about a line, Homogeneous Coordinate Systems, 3-D Transformations, 3-D geometry primitives, Viewing Transformation, Projections: Parallel Projection, Orthographic & Oblique Projections, Perspective Projections. Interaction: Hardware input devices handling algorithms, Event handling echoing, Interactive techniques.

Unit-III

2-D Viewing and Clipping: Point Clipping, Line Clipping, Cohen-Sutherland Line Clippings, Cyrus-Beck Line Clipping Algorithm, Polygon Clipping: Sutherland Hodgman Algorithm. Polygon: Polygon Representation, Entering polygons, Filling polygons, Segments: Segments table, Creating deleting and renaming segments, Visibility.

Unit-IV

Hidden Line and Surface: Back face removal algorithms, hidden line methods. Rendering and Illumination: Introduction to curve and Surfaces generation, Bezier, Hermite and B-spline algorithms and their comparisons, Ray Tracing.

Unit-V

Multimedia and Animation: Basic of Animation, Types of Animation, Simulating, Accelerations, Computer Animation Tools, Multimedia Applications, Concepts of Hypertext/Hypermedia, Images, Audio and Video**,** Multimedia Tools.

Text and References Books:

1. Rogers, "Procedural Elements of Computer Graphics", McGraw Hill
2. Baker and Hearn, "Computer Graphics", PHI Publication.
3. Newman and Sproul, "Principle of Interactive Computer Graphics", McGraw Hill
4. Steven Harrington, "Computer Graphics", A Programming Approach, 2nd Edition
5. Rogar and Adams, "Mathematical Elements of Computer Graphics", McGraw Hill.

COMPILER DESIGN LAB (ICS-653)

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1. Simulation of a Finite state Automata to recognize the tokens of various control statements.
2. Simulation of a Finite state machine to distinguish among Integers, Real Numbers & Numbers with Exponents.
3. Program in LEX tool to recognize the tokens and to return the token found for a C like Language.
4. Parsing of arithmetic and algebraic expressions and equations.
8. Use of YACC tool to parse the statements of C like Language.

COMPUTER NETWORKS LAB (ICS-654)

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1. Implementation of the Data Link Layer framing method such as character stuffing and bit stuffing in C.
2. Implementation of CRC algorithm in C.
3. Implementation of a Hamming (7,4) code to limit the noise. We have to code the 4 bit data in to 7 bit data by adding 3 parity bits. Implementation will be in C.
4. Implementation of LZW compression algorithm in C.
5. Write a socket program in C to implement a listener and a talker.
6. Simulation of a network of 3 nodes and measure the performance on the same network.
7. Write a program in C to encrypt 64-bit text using DES algorithm.

COMPUTER GRAPHICS LAB (ICS-551)

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1. Implementation of line generation using slope's method, DDA and Bresenham's algorithms.
2. Implementation of circle generation using Mid-point method and Bresenham's algorithm.
3. Implementation of ellipse generation using Mid-point method.
4. Implementation of polygon filling using Flood-fill, Boundary-fill and Scan-line algorithms.
5. Implementation of 2D transformation: Translation, Scaling, Rotation, Mirror Reflection and Shearing (write a menu driven program).
6. Implementation of Line Clipping using Cohen-Sutherland algorithm and Bisection Method.
7. Implementation of Polygon Clipping using Sutherland-Hodgman algorithm.
8. Implementation of 3D geometric transformations: Translation, Scaling and rotation.
9. Implementation of Curve generation using Interpolation methods.
10. Implementation of Curve generation using B-spline and Bezier curves.
11. Implementation of any one of Back face removal algorithms: Depth-Buffer algorithm, Painter's algorithm, Warnock's algorithm, Scan-line algorithm.