

Harcourt Butler Technological Institute, Kanpur-208002

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



Revised Syllabus

B. Tech. III Year Information Technology

(Effective from the session 2015-16)

UNIT-I: Introduction

Introduction: Electronic Commerce- Technology and Prospects, Definition of E-Commerce, Brief history of Ecommerce, Economic Potential of E-Commerce, Incentives of Engaging in E-commerce, Forces behind E-Commerce, Advantages and Disadvantages of E-commerce, Industry Framework, , Inter Organizational E-Commerce Intra Organizational E-Commerce, and Consumer to Business Electronic Commerce,

UNIT-II: Network Infrastructure and Mobile Commerce

Network Infrastructure: Network Infrastructure for E-Commerce, Architectural framework, Market forces behind I Way, Component of I way Access Equipment, Global Information Distribution Network, Broad band Telecommunication (ATM, ISDN, Frame Relay).

Mobile Commerce: Introduction to Mobile Commerce, Mobile Computing Application, Wireless Application Protocols, WAP Technology, Mobile Information Devices,

UNIT-III

Web Security: Security Issues on Web- World Wide Web & Security, Importance of Firewall, Components of Firewall, Factors to consider in Firewall Design, Limitations of Firewalls, Transaction Security, Client Server Network, Emerging Client Server Security Threats, Network Security.

UNIT-IV: Encryption

Introduction: Encryption Techniques, Symmetric Encryption- Keys and Data Encryption standard, Triple encryption, Asymmetric encryption- Secret Key Encryption, Public and Private pair key encryption, Digital Signatures. Virtual Private Network (VPN), Implementation Management Issues.

UNIT-V: Electronic Payments

Overview of Electronics payments, The SET Protocol, Payment Gateway, Certificates, Digital Token, Smart Cards, Credit Cards, Magnetic Strip Cards, E-Checks, Credit/ Debit card EPS, Mobile Payments, Online Banking, Home banking, Emerging financial Instruments, EDI Application in Business, E-commerce laws, Forms of Agreement, Government Policies and Agenda, Mobile Payment.

Text and Reference Books:

1. Greenstein and Feinman, "E-Commerce", TMH
2. Ravi Kalakota, Andrew Whinston, "Frontiers of Electronic Commerce", Addison Wesley.
3. Denial Amor, "The E-Business Revolution", Addison Wesley.
4. Diwan, Sharma, "E-Commerce" Excel.
5. Bajaj & Nag, "E-Commerce: The Cutting Edge of Business", TMH.

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. Milnekovik, "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, Williams, "Operating System", Maxwell Macmillan
7. Silveschatz, Peterson J., "Operating System Concepts", Willey.
8. Crowley, "Operating System", TMH.

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, JDK , 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 Servlets: Lifecycle of a Servlet, JSDK, The Servlet API, The javax.servelet Package, Reading Servlet 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 Wesley.
2. Sharma & Sharma, “Developing E-Commerce Sites”, Addison Wesley
3. Ivan Bayross, “Web Technologies Part II”, BPB Publications.
4. Shishir Gundavarma, “CGI Programming on the World Wide Web”, O’Reilly & Associate.
5. DON Box, “Essential COM”, Addison Wesley.
6. Greg Buczek, “ASP Developer’s Guide”, 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.

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

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.

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.

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:

2. Aho, Sethi & Ullman, "Compiler Design", Addison Wesley.
3. Kenneth C. Loudon, "Compiler Construction: Principles and Practice", Thomson Brooks Publication.
4. Allen I. Holub, "Compiler Design in C", PHI Publications.

COMPUTER NETWORKS (ICS-604)

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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 Point 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, Prentice Hall India, 1997.
3. S. Keshav, "An Engineering Approach on Computer Networking", Addison Wesley, 1997
4. W. Stallings, "Data and Computer Communication", Macmillan Press, 1989.

SOFTWARE PROJECT MANAGEMENT (IIT-602)

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UNIT-I: Introduction and Software Project Planning

Fundamentals of Software Project Management (SPM), Need Identification, Vision and Scope document, Project Management Cycle, SPM Objectives, Management Spectrum, SPM Framework, Software Project Planning, Planning Objectives, Project Plan, Types of project plan, Structure of a Software Project Management Plan, Software project estimation, Estimation methods, Estimation models, Decision process.

UNIT-II: Project Organization and Scheduling

Project Elements, Work Breakdown Structure (WBS), Types of WBS, Functions, Activities and Tasks, Project Life Cycle and Product Life Cycle, Ways to Organize Personnel, Project schedule, Scheduling Objectives, Building the project schedule, Scheduling terminology and techniques, Network Diagrams: PERT, CPM, Bar Charts: Milestone Charts, Gantt Charts.

UNIT-III: Project Monitoring and Control

Dimensions of Project Monitoring & Control, Earned Value Analysis, Earned Value Indicators: Budgeted Cost for Work Scheduled (BCWS), Cost Variance (CV), Schedule Variance (SV), Cost Performance Index (CPI), Schedule Performance Index (SPI), Interpretation of Earned Value Indicators, Error Tracking, Software Reviews, Types of Review: Inspections, Deskchecks, Walkthroughs, Code Reviews, Pair Programming.

UNIT-IV: Software Quality Assurance and Testing

Testing Objectives, Testing Principles, Test Plans, Test Cases, Types of Testing, Levels of Testing, Test Strategies, Program Correctness, Program Verification & validation, Testing Automation & Testing Tools, Concept of Software Quality, Software Quality Attributes, Software Quality Metrics and Indicators, The SEI Capability Maturity Model (CMM), SQA Activities, Formal SQA Approaches: Proof of correctness, Statistical quality assurance, Cleanroom process.

UNIT-V: Project Management and Project Management Tools

Software Configuration Management: Software Configuration Items and tasks, Baselines, Plan for Change, Change Control, Change Requests Management, Version Control, Risk Management: Risks and risk types, Risk Breakdown Structure (RBS), Risk Management Process: Risk identification, Risk analysis, Risk planning, Risk monitoring, Cost Benefit Analysis, Software Project Management Tools: CASE Tools, Planning and Scheduling Tools, MS-Project.

Text and Reference Books:

1. Software Project Management, M. Cotterell, Tata McGraw-Hill Publication.
2. Information Technology Project Management, Kathy Schwalbe, Vikas Pub. House.
3. Software Project Management, S. A. Kelkar, PHI Publication.

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.

SOFTWARE PROJECT MANAGEMENT LAB (IIT-652)

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Do the exercises based on the following aspects of SPM:

1. Creating Work Breakdown Structure (WBS).
2. Preparing and Comparing Gantt Chart.
3. Drawing Pert Chart and finding critical paths.
4. Resource Management
5. Time Scheduling and Management.

Exercises can be done on any of the following using MS Project or any other CASE Tool.

- Intranet
- Library Automation
- Academic Management
- Departmental Store Management.
- Hotel management