SIR PADAMPAT SINGHANIA UNIVERSITY, UDAIPUR
SCHOOL OF ENGINEERING

Semester - V

Principles of Compiler Construction

Code: CS301

L	T	P	C
3	0	1	4

Objective: This course discusses principles and techniques involved in the designing and implementation of a lexical analyzer, parser, code generation schemes and for the optimization of codes and run-time environment.

Introduction: Compilers, Analysis of the source program, the phases of a compiler, Compilation and interpretation.

Lexical Analysis: The need for lexical analyzers. Tokens and their attributes. Specification & recognition of tokens, Expressing tokens through regular expressions. Notion of a recognizer. Finite state Machines as recognizers. Converting regular expressions to deterministic finite automate (DFA). Minimization of DFA. Generation of lexical analyzer from DFA. Introduction to LEX.

Syntax Analysis: The need for syntax analysis and its scope. Introduction to basic concepts in parsing, context free grammars (CFG), derivations and parse trees, ambiguous grammars, top down and bottom up parsing. Top down parsing: LL (1) parsers and their automatic generation, recursive descent parsing. Bottom up parsing. Basics of shift reduce parsers. Introduction to the LR. Family of parsers. LR (0) items and the SLR (1) parsing table. Look ahead symbols and their propagation. LALR (1) and LR (1) parsers. Introduction to YACC.

Error Analysis: Introduction to error analysis, detection, reporting and recovery from compilation errors. Classification of errors-lexical, syntactic and semantic with examples. Desirable features of error reporting. Lexical errors and their handling. Detection of syntactic errors in LL and LR parsers. General syntactic error recovery methods such as panic mode error recovery and error recovery through use or error symbols (as in YACC). Semantic errors and their handling.

Static Semantics and Intermediate Code Generation: The need for various static semantic analyses in declaration processing, type analysis, name and scope analysis and intermediate code generation. Limitations of context free grammar specifications. Augmenting CFGs- attribute and attribute grammars. S-attributed definitions and their evaluation in different parsing strategies. Semantic analyses through S-attribute grammars, type analysis, name and scope analysis, intermediate code generation. Limitations of S-attributed definitions, L-attributed definition and their evaluation. Semantic Analysis through L-attribute definition declaration processing.

Runtime Environment: Need for runtime memory management. Address resolution of runtime objects at compile time. Language features influencing runtime memory management, data types, scoping rules, recursion, parameter-passing mechanism Division of memory into code, stack and heap areas. The notion of an activation record. Static and stack allocation of memory. Handling languages with non-trivial nesting and scope rules-static and dynamic links, displays. Handling different parameter passing mechanisms, call by value, call by reference, and call by value, result. Memory allocation for dynamic data structures. Architectural support for memory management.

Code Generation: Code generation for expressions, operand descriptors, handling of partial results. Issues in efficient code generation, instruction costs, register utilization and evaluation order. The Sethi Ullman algorithm. The machine model, kinds of operands, address abilities and instruction costs. Cover of an expression tree. The dynamic programming approach for optimal code generation tree. The dynamic programming approach for optimal code generation.

Introduction to retargetable code generation. Code generation for control structures.

Code Optimization: The need for code optimization. Fundamental optimizing transformations. Local and global optimization. Control flow analysis, concepts from graph theory. Data flow analysis, setting up data flow equations. Solution of data flow equations. Performing global optimizations. Global register assignment, live ranges of runtime values. Graph coloring heuristics for assignment.

Books:

1. Alfred V Aho , Jeffrey D. Ullman, “Principles of Compiler Design”, Narosa
2. A.V. Aho, R. Sethi and J.D Ullman, “Compiler: principle, Techniques and Tools”, AW
3. H.C. Holub “Compiler Design in C”, Prentice Hall Inc.
4. Compiler Design by O.G. Kakde, 1995, Laxmi Publ.

Artificial Intelligence

Code: CS302

L	T	P	C
3	0	1	4

Objective: The aim of the course is to give an overview of the principles and techniques used in artificial intelligence, and to develop an understanding of the basic concepts of AI presented in terms of intelligent agents, logic, learning and expert systems.

Introduction: Artificial intelligence problems, artificial intelligence techniques, production system and characteristics.

Problem Solving: Problem definition, state space search tree, problem characteristics, search strategies for artificial intelligence productions system: backtracking, graph search, uniformed graph search, heuristic graph search techniques-generate and test, hill climbing, best-first search, problem redcuction: AO* algorithm for AND/OR graphs.

Understanding Natural Languages: Parsing techniques, context free and transformational grammars, transition nets, augmented transition nets, Fillmore's grammars, Shanks Conceptual Dependency, grammar free analyzers, sentence generation, and translation.

Knowledge Representation: Representation and mappings, Approaches and issues in knowledge representation, First order predicate calculus, Horn Clauses , procedural versus declarative knowledge, Matching, Non-monotonic reasoning,Probability theory and Fuzzy logic,

Expert System & Game Theory: Existing Systems (DENDRAL , MYCIN) ,domain exploration ,Meta Knowledge , Expertise Transfer, Self Explaining System, Mini-Max search, Alpha-Beta cutoffs

Programming Language: Introduction to programming LISP and PROLOG

Books:

1. Char nick, Introduction to Artificial Intelligence, Addision Wesley
2. Rich & Knight, Artificial Intelligence.
3. Winston, LISP, Addison Wesley
4. Marcellous, Expert Systems Programming ,PHI
5. Elamie, Artificial Intelligence, Academic Press
6. Lioyed , Foundation of Logic Programming , Springer Verlag

Web Technology

Code: IT301

L	T	P	C
2	0	2	4

Objective : This course aims at developing an in-depth understanding of the tools and technologies necessary for web application design and development. The course covers client side scripting like HTML, JavaScript and server side technologies and web servers and database interfacing.

Introduction: Introduction to Internet and Intranet, impact of Internet on society, Internet protocols: TCP/IP, FTP, HTTP, Telnet, Gopher, WAIS. World Wide Web.

HyperText Markup Language and CSS: Basics, document tags, text, hyperlinks, lists, color, images, tables, frames, forms, introduction of CSS, using styles, defining styles, properties and values in styles.

JavaScript and DHTML: Basics of JS, variables, strings, functions, statements, operators, arrays, data and objects, regular expressions, exception handling, cookies, events. Data validation, messages and confirmations, rollover buttons, moving objects, a text-only menu system.

Perl and CGI: Basics, scalars**,** arrays, hashes, control structures**,** processing text, regular expressions, files, subroutines, developing CGI applications, creating HTML pages dynamically.

PHP and MySql: PHP introduction, including PHP in a page, data types, program control, arrays, user-defined and built-in functions, regular expressions, files, tracking user, MySql introduction, database connectivity using MySql.

Books:

1. Web Technologies by Godbole, Tata Mc Graw .
2. Html: Css/ Javascript/ Dhtml (I Performance Series) by Steven E. Callihan
3. Learning PHP & MySQL: Step-by-Step Guide to Creating Database-Driven Web Sites by Michele Davis and Jon Phillips
4. Web programming Building Internet Applications, Chris Bates, Wiley
5. Web enabled commercial application development using HTML,DHTML, JavaScript, Perl CGI, Ivan Bayross, BPB.

Computer Networks

Code: IT302

L	T	P	C
3	0	1	4

***Objective*:** This course discusses the principles of data communication, the functions of different layers, IEEE standards employed in computer networking and the different protocols and network components.

Introductory Concepts: **Goals and Applications of Networks, Client Server Concepts, Basic** Concept of layering & connection oriented & connection less services, Network structure and architecture, the OSI reference model, TCP/IP Architecture, Networks topology, Physical Layer design issues, Connecting Devices: Repeaters, Active & Passive Hubs, Head End, Bridges, Switches, Routers, Gateway

Medium access sub layer: Channel allocations, Random Access overview, LAN protocols, Pure ALOHA, slotted ALOHA, Carrier Sense Multiple Access Protocols, CSMA with Collision Detection, Collision free Protocols, IEEE standards, FDDI,

Data Link Layer: Elementary data link protocols, sliding windows protocols, error handling, Parity Bit Check, CRC, Checksum, Hamming Code, Hamming Distance. High Level Data Link Control (HDLC), Overview of Ethernet.

Network Layer: Point-to Point networks, X.25, Layers of X.25, Routing algorithms, congestion control algorithms, internetworking, TCP/IP packet, IP addresses, IPv6, Internet Control Protocol: ICMP, ARP, RARP, Interior Gateway routing Protocol: OSPF, Exterior Gateway Protocols: BGP.

Transport Layer: Design issues, connection management, User Datagram Protocol: UDP protocol & Header, Transmission Control Protocol: TCP protocol, TCP segment Header Format, TCP window Management, TCP Timer Management

Application Layer: WWW, Hyper Text Transfer Protocol, Domain Name System, Simple Network, Management Protocol, Electronic mail, File Transfer Protocol, TFTP, RTP, RTCP, Telnet Virtual Terminal and terminal handling.
VOIP: SIP & H.323.

Books:

1. A. S Tanenbaum, “Computer Networks, 3rd Edition”, PHI
2. Forouzan, A. Behrouz “Data Communication and Networking”, TMH, Special Indian Edition 2006
3. Comer, “Computer Networks & Internet”, PHI.
4. Comer, “Internetworking with TCP/IP”, PHI
5. W. R. Stevens, “TCP/IP illustrated, Volume 1: The protocols”, Addison Wesley, 1994.
6. G. R. Wright. “TCP/IP illustrated, Volume 2: The implementation”, Addison, Wesley 1995

Advanced JAVA

Code: IT303

L	T	P	C
3	0	2	5

Objective: This course discusses advanced concepts of Java applied to distributed computing environment. It also introduces the concept of servlets, java server side programming, JDBC and provides an in depth study of current technologies such as RMI, Corba, J2EE.

JDBC and Java Beans: JDBC versus ODBC, different types of drivers, two tier versus three tier model, creating JDBC program. Java Beans – properties of java beans, study existing java beans, creating own java beans.

Distributed computing: Overview of current technologies (J2EE, RMI, CORBA, DCOM), RMI and ORBs, patterns for distributed components, defining interfaces to active objects, remote RMI interfaces, RMI, clients ,server ,and registry. creating simple RMI application.

Servlets: Advantages of Servlets over CGI, Servlet API, life cycle of servlet. Creating simple Servlet, installing and configuring Apache Tomcat 4 as a standalone servlet , processing the request: form data, generating the response, handling cookies, session tracking.

JSP: Introduction to JSP, JSP processing, JSP Application Design, JSP scripting elements: expression, scriptlets and declarations, JSP directives, Implicit JSP objects, Error Handling, JDBC using JSP, using of java beans in JSP.
Fundamentals of EJB: Introduction to J2EE architecture, EJB – introduction, understanding stateful and stateless session beans life cycle, writing stateless session bean, introduction to entity beans, writing first entity bean.

Books:

1. Joe, “The Complete Reference: J2EE”, TMH.
2. Hans Bergsten, “Java Server Pages”, SPD O’Reilly
3. Bryan Basham, “Head first servlet and JSP”, O’Reilly
4. Marty Hall, “Core Servlets and JSP”, Sun

Microprocessor & Interfaces

Code: EC304

L	T	P	C
3	0	1	4

Objective*: :* This course helps students understand the different aspects of hardware, peripheral interfaces and programming which are required for developing low cost software based applications.

Introduction To Microprocessor:
Microprocessor evolution and development, system buses and operation, 8085 microprocessor: Architecture, instruction set, addressing modes and assembly language programming.

Microprocessor Architecture And System Bus:
Architecture, block diagram of 8086,Comparison of 8086 with 8088,Minimum and maximum mode of operation, details of sub-blocks such as EU, BIU, memory segmentation and physical address computations, program relocation, addressing modes, instruction formats, pin diagram and description of various signals, memory organization and interface.

Instructions Of 8086 And Assembly Language Programming:
Instruction execution timing, assembler instruction format, data transfer instructions, arithmetic instructions, branch instructions, looping instructions, NOP and HLT instructions, flag manipulation instructions, logical instructions, shift and rotate instruct ions, directives and operators, assembly language programming examples.

I/O Programming And Real-Time Interfacing:
Fundamental of I/O, Programmed and interrupt I/O, parallel communication interface, The 8255 PPI chip: Architecture, Functional description of various pins, modes of operations and programming examples, ADC and DAC interfacing with microprocessor and real-time applications.

Peripheral Interfacing And Programming:
Introduction to DMA process, 8257 DMA controller with operation and programming, Programmable timer and counter operation , programming examples using 8254 timer chip in different mode of operation, Serial communication interface and programming using 8251(USART),Interrupt process, Interrupt priority management using single and multiple of 8259 chip, Keyboard interface 8279.

Text Books:
1. Microprocessor Architecture, Programming and Application by Ramesh S.Gaonkar,Penram Publication.
2. Advanced Microprocessors and Peripherals by Ray and Bhurchandi,Tata Mc Graw-Hill
3. The Intel Microprocessors 8086/8088/80186/286/386/486 and Pentium processor by Barry B.Brey,PHI Pub.

Reference Books:
1. The 8088/8086 Microprocessor by Tribel & Abtar Singh, PHI Pub.
2. Microprocessors and Interfacing by D.V Hall,TMH Pub.
3. An Introduction to Intel family of Microprocessor by Antonakos, Pearson Education.
4. The 8086/8088 Family by Uffenbeck,PHI Pub.
5. Microcomputer System by Liu and Gibson, PHI Pub.