

Core Courses

(CT-22001) Compiler Construction

Teaching Scheme:

Lectures: 3 Hrs/week

Examination Scheme:

Assignment/Quizzes – 40 marks

End Sem Exam - 60 marks

Course Outcomes:

Students will be able to:

1. Demonstrate the understanding of different phases of compilation.
2. Demonstrate the ability to generate and code lexical and syntax analyzer.
3. Analyze and differentiate different parsing techniques and syntax directed translation schemes and choose the optimal parsing technique.
4. Apply different intermediate code generation representation for program construct.
5. Identify different code optimization techniques for the various statements

Introduction: The role of language translation in the programming process, Translator Issues, Types of translators, Design of an assembler Introduction to phases of compilation, Front end and Back end model of compiler, Cross compiler, Incremental compiler.

Lexical Analysis: Concept of Lexical Analysis, Regular Expressions, Tokens, Lexemes, and Patterns, Block Diagram of Lexical analyser, Revision of finite automata, Introduction to LEX Tool and LEX file specification, Error detection and recovery in LEX.

Syntax Analysis: Context Free Grammars(CFG), Concept of parsing, Parsing Techniques, Top- Down Parsers : Introduction, Predictive Parsing - Removal of left recursion, Removal of left factoring, Recursive Descent Parsing, Predictive LL(k) Parsing Using Tables, Bottom Up parsing: Introduction, Shift-Reduce Parsing Using the ACTION/GOTO Tables, Table Construction, SLR(1), LR(1), and LALR(1) Grammars, Introduction to YACC Tool & YACC file specification, Error detection and recovery in YACC.

Semantic Analysis & Intermediate Representation: Need of semantic analysis, Abstract Parse trees, Syntax directed definitions, Syntax directed translation schemes, Symbol Tables, Symbol Table management, Data type as set of values and with set of operations Type Checking, Intermediate code generation: **Intermediate languages, Design issues**, Intermediate code representations: three address code, abstract & concrete syntax trees,.

Code Optimization: Introduction, **Principal sources of optimization**, Machine Independent Optimization, Machine dependent Optimization, Various Optimizations: Function preserving transformation, Common Sub-expressions, Copy propagation,

Backpatching

Dead-code elimination, Loop Optimizations, Code Motion, Induction variables and strength reduction, Peephole Optimization, Redundant –instruction elimination.

Run-Time Memory Management & Code generation: Model of a program in execution, Stack and static allocation, Activation records , Issues in the design of code generation, Target machine description, Basic blocks & flow graphs, Expression Trees, Unified algorithms for instruction selection and code generation.

Text Books:

Alfred V. Aho, Monica S. Lam, A. V. R. Sethi and J.D. Ullman, “Compiler Principle, Techniques and Tools” Addison Wesley, Second Edition, ISBN: 978-0321486813.

Reference Books:

1. Barrent W. A., J. D. Couch, “Compiler Construction: Theory and Practice”, Computer Science series, Asian student edition, ISBN: 9780574217653.
2. Dhamdhere D.M., “Compiler Construction Principle and Practice”, Macmillan India, New Delhi, 2003, Second Edition, ISBN: 0333904060.
3. Ravendra Singh, Vivek Sharma, Manish Varshney, “Design and Implementation of Compiler”, New Age Publications, 2008, ISBN: 978-81-224-2398-3.
4. Holub, A.J., “Compiler design in C”, Prentice Hall, 1994, ISBN: 978-0133049572.
5. John Levine, Tony Mason & Doug Brown, “Lex and Yacc”, O’ Reilly, 1995, Second Edition, ISBN: 978-1565920002.