



## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

### DEPARTMENT OF INFORMATION TECHNOLOGY

III Year – I Semester		L	T	P	C
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<b>COMPILER DESIGN</b>					

#### Course Objectives:

- To study the various phases in the design of a compiler
- To understand the design of top-down and bottom-up parsers
- To understand syntax directed translation schemes
- To introduce LEX and YACC tools
- To learn to develop algorithms to generate code for a target machine

#### Course Outcomes:

At the end of the course, the students will be able to:

- Design, develop, and implement a compiler for any language
- Use LEX and YACC tools for developing a scanner and a parser
- Design and implement LL and LR parsers
- Design algorithms to perform code optimization in order to improve the performance of a program in terms of space and time complexity
- Apply algorithms to generate machine code

#### UNIT I

Introduction: Language Processors, the structure of a compiler, the science of building a compiler, programming language basics.

Lexical Analysis: The Role of the Lexical Analyzer, Input Buffering, Recognition of Tokens, The Lexical-Analyzer Generator Lex, Finite Automata, From Regular Expressions to Automata, Design of a Lexical-Analyzer Generator, Optimization of DFA-Based Pattern Matchers.

#### UNIT II

Syntax Analysis: Introduction, Context-Free Grammars, Writing a Grammar, Top-Down Parsing, Recursive and Non recursive top down parsers, Bottom-Up Parsing, Introduction to LR Parsing: Simple LR, More Powerful LR Parsers, Using Ambiguous Grammars, Parser Generators.

#### UNIT III

Syntax-Directed Translation: Syntax-Directed Definitions, Evaluation Orders for SDD's, Applications of Syntax-Directed Translation, Syntax-Directed Translation Schemes, and Implementing L-Attributed SDD's. Intermediate-Code Generation: Variants of Syntax Trees, Three-Address Code, Types and Declarations, Type Checking, Control Flow, Back patching, Switch-Statements, Intermediate Code for Procedures.

#### UNIT IV

Run-Time Environments: Storage organization, Stack Allocation of Space, Access to Nonlocal Data on the Stack, Heap Management, Introduction to Garbage Collection, Introduction to Trace-Based Collection. Code Generation: Issues in the Design of a Code Generator, The Target Language, Addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, A Simple Code Generator, Peephole Optimization, Register Allocation and Assignment, Dynamic Programming Code-Generation.



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#### UNIT V

Machine-Independent Optimizations: The Principal Sources of Optimization, Introduction to Data-Flow Analysis, Foundations of Data-Flow Analysis, Constant Propagation, Partial-Redundancy Elimination, Loops in Flow Graphs.

#### Text Books:

- 1) Compilers: Principles, Techniques and Tools, Second Edition, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, Pearson.
- 2) Compiler Construction-Principles and Practice, Kenneth C Louden, Cengage Learning.

#### Reference Books:

- 1) Modern compiler implementation in C, Andrew W Appel, Revised edition, Cambridge University Press.
- 2) The Theory and Practice of Compiler writing, J. P. Tremblay and P. G. Sorenson, TMH
- 3) Writing compilers and interpreters, R. Mak, 3rd edition, Wiley student edition.

#### e-Resources:

- 1) <https://nptel.ac.in/courses/106/104/106104123/>