

COMPILER DESIGN SYLLABUS

Module 1: Introduction to Compilation and Lexical Analysis

- Introduction to LLVM
- Structure and Phases of a Compiler
- Design Issues
- Patterns
- Lexemes
- Tokens
- Attributes
- Specification of Tokens
- Extended Regular Expression
- Regular Expression to Deterministic Finite Automata (Direct Method)
- Lex: A Lexical Analyzer Generator

Module 2: Syntax Analysis

- Role of Parser
- Parse Tree
- Elimination of Ambiguity
- Top-Down Parsing
 - Recursive Descent Parsing
 - LL(1) Grammars
- Shift-Reduce Parsers
- Operator Precedence Parsing
- LR Parsers
 - Construction of SLR Parser Tables
 - Parsing
- CLR Parsing
- LALR Parsing

Module 3: Semantics Analysis

- Syntax Directed Definition
- Evaluation Order
- Applications of Syntax Directed Translation
- Syntax Directed Translation Schemes
- Implementation of L-Attributed Syntax Directed Definition

Module 4: Intermediate Code Generation

- Variants of Syntax Trees
- Three Address Code
 - Types
 - Declarations
 - Procedures
 - Assignment Statements
 - Translation of Expressions
 - Control Flow
 - Backpatching
 - Switch Case Statements

Module 5: Code Optimization

- Loop Optimizations
- Principal Sources of Optimization
- Introduction to Data Flow Analysis
- Basic Blocks
 - Optimization of Basic Blocks
- Peephole Optimization
- DAG Representation of Basic Blocks
- Loops in Flow Graphs
- Machine Independent Optimization
- Implementation of a Naïve Code Generator for a Virtual Machine
- Security Checking of Virtual Machine Code

Module 6: Code Generation

- Issues in the Design of a Code Generator
- Target Machine
- Next-Use Information
- Register Allocation and Assignment
- Runtime Organization
- Activation Records

Module 7: Parallelism

- Parallelization
- Automatic Parallelization
- Optimizations for Cache Locality and Vectorization
- Domain Specific Languages
- Compilation
- Instruction Scheduling and Software Pipelining
- Impact of Language Design and Architecture Evolution on Compilers
- Static Single Assignment (SSA)

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