Lexical Analysis
- Tokens, patterns, lexemes
- Regular expressions
- Transition Diagrams
  - NFA
  - DFA

Syntax Analysis
- Context-Free Grammar
  - Derivation
  - Parse-Tree
- Writing Grammar
  - Eliminating Ambiguity
  - Eliminating Left-Recursion
  - Left-Factoring
- Top-Down Parsing
  - Recursive-Descent
    - Predictive-Parsing
  - LL(1) Parsing
    - LL(1) Grammar
    - FIRST and FOLLOW
    - Predictive Parsing table
- Bottom-Up Parsing
  - Shift-Reduce Parsing
  - LR(0) Parsing
    - Constructing LR(0) Automaton
    - LR Parsing Algorithm
    - Constructing SLR Parsing Table
  - LR(1) parsing
  - LALR

Syntax-Directed Translation
- Syntax-Directed Definition
  - Inherited and Synthesized Attributes
- Syntax-Directed Translation Schemes

Intermediate Code Generation
- Three-Address Code
- Syntax Tree
  - Handling: declarations, expressions, control-flow, arrays, …

Run-Time Environment
- Storage Organization
- Stack: activation records
- Heap

Code Generator
For the following regular expression: \(((c|a)b^*)\)^*

a. Give example of expressions generated by this expression
b. Derive NFA from the regular expression
c. Give the transition table for the NFA
d. Derive a DFA from the NFA
e. Is the resulting DFA optimized? or we can minimize it?
f. Does NFA always need to be larger than DFA?

For the following grammar: \(S \rightarrow SS^+ \mid SS^* \mid a\)

a. Construct the LR(0) automaton (similar to Fig 4.31)
b. From the automaton construct the SLR parsing table (see Fig 4.37)
c. Show the action of your parsing table for the input: aa*a+
d. Construct the GOTO graph of LR(1) sets of items

What is an activation record? Why do we need it?

If a program has X functions/procedures, what is the minimum and maximum number of activation records it can have?

What are basic blocks? Why do we need them?