University

U.PORTO

FEUP FACULDADE DE ENGENHARIA
UNIVERSIDADE DO PORTO

Compilers: Design and Implementation

Spring 2024
L.EIC026

List of Key Materials for First Mini-Test

April 4, 2024

1. Context-Free Grammars

- Definition, the terminals, non-terminal, start symbol and productions.
- Left-factoring and left-recursivity and their elimination.
- Ambiguity – what does it mean and how to identify it.
- Top-down, LL parsing method: table driven; basic algorithm and how it operates; FIRST and FOLLOW sets and the LL(1) property.
- Bottom-up parser operation with the Shift-Reduce parser and its advantages over top-down parsing methods regarding left-recursion (**Note:** No need to understand the table-construction algorithm, but you need to know what the key actions of a shirt-reduce parser are and what they do).

2. Syntax-Directed Translation

- Attributive grammars and examples. Attributes and semantic rules.
- Inherited and synthesized attributes.
- Rule evaluation order and attribute dependence graph.
- L-attributed schemes and how to implement then using depth-first search traversal

3. Intermediate Code Generation and Symbol Tables

- AST representation and Three-address code generation using SDT: arithmetic expressions, Booleans expression and short-circuit evaluation.
- Code generation templates for control-flow constructs if-then-else and loop constructs.
- The role of the symbol table and its relationship for languages with nested scopes.
- Attributes and other information in a symbol table.
- Data layout for scalar and array variables and the code generation to evaluate expressions that involve these variables.

Final Notes:

1. We can bring one typed, double-side A4 sheet with all your notes.
2. You cannot use calculator, or any other form of electronic support. Recent fraud cases have prompted us to ban having with you cell-phone, smart-watches during the test.
3. You can use a blue or black pen or a pencil (graphite only) for the test. Bring the adequate eraser. Also, bring your own extra answer sheets in case you need them for scratch only, as you will answer on the provided answer sheets only.
4. This test, while not multiple-choice but will be computer processed with each of your having an individual test with your name on it. Please check room assignment
5. **A note on calligraphy:** Remember, if you do not make any effort in your writing, and therefore make your work understandable, why should we make any effort in grading your work?