

School of Computing, Clemson University  
CpSc 827 – Language Translation  
Syllabus, August 23, 2017

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**1. Language Review**

- C++: Basics, classes, inheritance
- Python: Basics, functions

**2. Formal Grammars**

- Definition
- Chomsky
- Regular grammar
- Context free grammar
- Ambiguous grammar
- Handling ambiguity

**3. Scanner**

- Uses regular expressions
- FSM
- What can FSM recognize
- Generate tokens
- *lex* and *flex*
- Overview of a lex file
- Using lex/flex
- yywrap
- Lexical analysis

**4. Parser**

- Definition
- How parser cooperates with scanner
- Errors detected by scanner and parser
- Symbol table
- Parse tree
- Abstract syntax tree
- Constructs that are not context free
- Using a CFG for parsing
- Yacc and Bison

- Graph Exchange Language (GXL)
- Purdom's algorithm
- Parse tree visualization

**5. Graphs for Language Translation**

- Semantic analysis
- Abstract semantic graph (ASG)
- Generating intermediate code
- Control flow graph
- Call graph
- Object Relation Diagram (ORD)
- Strongly connected components
- Depth first search
- DAG
- Graph visualization

**6. The Clang Front-end**

- Introduction to Clang
- Using Clang tools
- Writing Visitors for Clang
- Using Clang to build a graph
- Visualization of Clang graphs
- Writing a plug-in for Clang
- Using Clang::LibTool

**7. Data Flow Analysis**

- Definition
- Uses of dfa
- Data flow equations
- Algorithm to compute data flow