# School of Computing, Clemson University
# CpSc 827 – Language Translation
# Syllabus, August 18, 2016

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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 cooporates 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