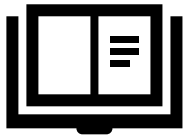
CS335: Compiler Design

Swarnendu Biswas

Semester 2019-2020-II

CSE, IIT Kanpur

Course Details



- CS 335: Compiler Design
- Semester 2019-2020-II
- Class hours: MWF 9:00-9:50 AM RM 101
- Office hours: TuTh 4-5 PM PM KD 302
- Webpage: https://www.cse.iitk.ac.in/~swarnendu/courses/cs335/
- Discussion forum: **REGISTER** for CS335 on Piazza
- Submission portal: We will use Canvas

Instructor Details

- Name: Swarnendu Biswas
- Office: KD 302
- Webpage: https://www.cse.iitk.ac.in/~swarnendu
- Email: swarnendu@cse.iitk.ac.in

TA Details

Name	Email (@cse.iitk.ac.in)
Nimisha Agarwal	nimisha
Manish Kumar Bera	mkbera
K Karthikeyan	kkarthi
Anuj Mishra	anujmi
Vipin Patel	vipinpat
Bidya Sarkar	bidya
Prafulla Saxena	prafulla
Krishna Kumar Tayal	ktayal
Nilesh Vasita	nilesh

Course Outline

- Overview of Compilation: analysis-synthesis model of compilation, various phases of a compiler, tool based approach to compiler construction.
- Lexical Analysis: interface with input, parser and symbol table, token, lexeme and patterns, difficulties in lexical analysis, error reporting, implementation, regular definition, transition diagrams, LEX.
- Syntax Analysis: context-free grammars, ambiguity, associativity, precedence, top-down parsing, recursive-descent parsing, transformation on the grammars, predictive parsing, bottom-up parsing, operator precedence grammars, LR parsers (SLR, LALR, LR), YACC.
- Syntax-directed Definitions: inherited and synthesized attributes, dependency graph, evaluation order, bottom-up and top-down evaluation of attributes, L- and S-attributed definitions.
- Type Checking: type system, type expressions, structural and name equivalence of types, type conversion, overloaded functions and operators, polymorphic functions.

Course Outline

- Runtime Systems: storage organization, activation tree, activation record, parameter passing, symbol table, dynamic storage allocation.
- Intermediate code generation: intermediate representations, translation of declarations, assignments, control flow, Boolean expressions and procedure calls, implementation issues.
- Code generation and instruction selection: issues, basic blocks and flow graphs, register allocation, code generation, DAG representation of programs, code generation from DAGs, peep hole optimization, code generator generators, specifications of machine.

What do we expect to learn?

- Concepts to help understand, develop, and modify compilers for programming languages
- Use language processing technology for software development
- Exercise in software engineering

Prerequisites

- ESC101, ESO207/CS210, CS220, CS340
- Familiarity with one high-level programming language such as C, C++ and Java is required
  - We will have a few programming assignments and one substantial project

Course Policies

- Be **ON TIME** to class!
- Try to **AVOID** using laptops and/or mobile devices in class!
- Turn **OFF** your mobile phones!
- Email subjects **SHOULD** start with [CS335]
- Submitting your assignments late will mean losing points automatically. You will lose 20% for each day that you miss, for up to two days.

Evaluation

- Assignments – 15%
- Mid semester exam – 20%
- End semester exam – 30%
- Semester Project – 35%

Academic Integrity

- You **MAY** discuss concepts with classmates
- All assignments **MUST** be your own or your team's work when teamwork is permitted
- You **MAY NOT** search online for existing solutions related to the assignments, even as a reference
- Students caught **CHEATING/PLAGIARIZING** will be punished

Resources

- A. Aho, M. Lam, R. Sethi, and J. Ullman. Compilers: Principles, Techniques, and Tools, 2nd edition.
- K. Cooper and L. Torczon. Engineering a Compiler, 2nd edition.
- A. Appel. Modern Compiler Implementation in Java, 2nd edition.
- M. Scott. Programming Language Pragmatics, 4th edition.

- Other handouts and research papers

Teaching Philosophy

- I am happy to discuss **EVERY REASONABLE** question
  - You are encouraged to use Piazza so that the whole class can benefit

- Slides will primarily be pointers to concepts and materials
  - You should read the optional reading material to get more familiarity

Extending Collaborative Learning

- Make use of the office hours

Office hours: TuTh 4-5 PM KD 302

- You are welcome to **PROVIDE** feedback anytime during the semester

Questions?