CS 5363: PROGRAMMING LANGUAGES AND COMPILERS
SPRING 2013, COURSE SYLLABUS

CS 5363: Mon./Wed. 5:30-6:45pm in MH 3.04.14

Instructor

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Course Description and Goals

A study of programming languages with an emphasis on their implementation. Topics include lexical analysis, language syntax, control structures, the binding of names, procedures, and their implementation in compilers.

The goals of this course are for students . . .

1. to have an opportunity to experience a substantial programming project,
2. to understand how programs are implemented using compilers,
3. to develop a conceptual framework in which to students can compare and evaluate programming language features and paradigms, and
4. to become familiar with a substantial portion of the material that may appear on the PhD qualifying exam for Programming Languages and Compilers.

Prerequisites

The prerequisites for this course are:

1. CS 2233: Discrete Mathematical Structures
2. CS 3343: Analysis of Algorithms

The course work will involve writing a complete compiler. This will require the ability to take a description of an algorithm or data structure and then implement it in Java, C++, or Scala, and integrate with the other compiler components. Students with limited programming experience are encouraged to consider whether they might be better off in a different course.

Textbooks

The primary textbook for this course is Keith Cooper and Linda Torczon’s “Engineering a Compiler, 2nd ed.” (2011). Secondarily, the presentation of some of the material in the course will be based on Michael Scott’s “Programming Language Pragmatics, 3rd Ed.” (2009). Many topics are covered in both books. In addition, research papers on compilers and programming languages may be provided to supplement and the textbook’s coverage of certain topics.
You may also find it useful to have a language reference / tutorial for Java, Scala, or C++. while working on the project. For Java, I recommend Arnold, Gosling, and Holmes’s “The Java Programming Language,” and for Scala, I recommend Odersky, Spoon, and Venner’s “Programming in Scala.”

Course Outline

The topics to be covered this semester are expected to include:

1. Overview of Compilation and Interpretation (Scott, Ch. 1; Cooper, 1)
2. Programming Language Syntax (Cooper, Ch. 2, 3)
3. Attribute Grammars (Cooper, Ch. 4)
4. Intermediate Representations (Cooper, Ch. 5)
5. Activation Records and Code Shape (Cooper, Ch. 6, 7)
6. Machine-Independent Optimizations (Cooper, Ch. 8, 10)
7. Machine-Dependent Optimizations (Cooper, Ch. 11, 12, and 13)
8. Data-Flow Analysis (Cooper, Ch. 9)
9. Data Types (Cooper Ch. 4; Scott, Ch. 7)
10. Programming Language Paradigms (Scott, Ch. 9, 10)

Assignments, Exams, and Grading

The course work will consist of several homework assignments, a multi-phase compiler project, a midterm exam, and a final exam.

Grades are expected to be computed as follows:

- homeworks: 50pts
- midterm exam: 200pts
- final exam: 300pts
- compiler project:
  - parser: 100 pts
  - core: 250 pts
  - extensions: 100 pts

900 pts out of 1000 pts will be sufficient to earn an “A”.

Students will be assigned grades of “B” and below based on the points excluding project extensions. 700 points (excluding extensions) will be sufficient for a “B”, 600 points (excluding extensions) will be sufficient for a “C”, 500 points (excluding extensions) will be sufficient for a D.

The instructor, however, reserves the right to adjust the weights of individual components if necessary. In addition, the instructor may, after reviewing class performance and specific grading criteria for individual components (esp. exams), adopt more lenient criteria for each grade.
Course web page and Piazza

Information related to the course (including project information, homework assignments, tentative schedule, and exam dates) will be posted periodically at [http://www.cs.utsa.edu/~vonronne/classes/cs5363-s13](http://www.cs.utsa.edu/~vonronne/classes/cs5363-s13). There is a piazza discussion forum for the class at [https://piazza.com/utsa/spring2013/cs5363](https://piazza.com/utsa/spring2013/cs5363). Please, enroll in the course at piazza, and monitor piazza for announcements related to the course. Certain material, such as solutions to homeworks may also be posted through piazza.

Late Assignments

Homeworks will not be accepted late, but the lowest homework score will be dropped.

Compiler project submissions will normally be allowed to be turned up to 48 hours late with a 10% penalty. In addition, there will be an opportunity to submit a revised compiler at the end of the semester for a higher grade (up to 80%) on the parser and core parts of the compiler.

Attendance

Students are **expected to attend all lectures**. Although absences will not result in a direct grade penalty, students are responsible for knowing all material provided and announcements made during lectures. If a student finds it necessary to miss a lecture, they should find out what was covered from a classmate.

Makeup Examinations and Incomplete Grades

Makeup examinations and grades of Incomplete will only be considered by the instructor if there are serious extenuating circumstances (such as hospitalization or death of an immediate family member) that are beyond control of the student. Such circumstances need to be documented and discussed with the instructor as early as possible.

Student who miss more than 1/4 of the sessions in a semester are ineligible for a grade of incomplete. Makeup exams may be in a different format and/or harder than the exam that is being made up.

Roadrunner Creed

The University of Texas at San Antonio is a community of scholars where integrity, excellence, inclusiveness, respect, collaboration, and innovation are fostered.

As a Roadrunner, I will:

- Uphold the highest standards of academic and personal integrity by practicing and expecting fair and ethical conduct;
- Respect and accept individual differences, recognizing the inherent dignity of each person;
- Contribute to campus life and the larger community through my active engagement; and
- Support the fearless exploration of dreams and ideas in the advancement of ingenuity, creativity, and discovery.

Guided by these principles now and forever, I am a Roadrunner!
Scholastic Dishonesty

Unless stated otherwise in the instructions for a particular assignment, students may collaborate with each other on the homework assignments, but must complete compiler projects and exams independently.

For the project, it is OK to discuss the assignment, strategies, algorithms, and compiler error messages with your classmates in general terms, but you should not be discussing the details of, looking at, or copying each others code. Your code should be your own and not look like anyone else’s. It is, however, permitted to re-implement known/published algorithms (from textbooks or research papers) in the context of your own compiler, but you should cite the source for any such algorithms not found in your text book. In any case, you must understand everything, and you are expected to be able to explain the purpose of every line of code that you turn in.

If students collaborate on homework assignments, they should only submit solutions they understand and list everyone they collaborated with.

Cases of academic dishonesty will be referred to Student Judicial Affairs. The UTSA’s Student Code of Conduct (http://www.utsa.edu/infoguide/appendices/b.html) contains a description of expected behavior and the potential penalties for scholastic dishonesty.

Accommodations

Students who have a disability that may impact your classroom performance are encouraged to contact Disability Services (http://www.utsa.edu/disability/). If accommodations are determined to be appropriate, please notify the instructor as early as possible.

Subject to Change

This syllabus is provided for informational purposes regarded the anticipated course content and schedule of this course. It is based upon the most recent information available on the date of its issuance and is as accurate and complete as possible. The instructor reserves the right to make any changes he deems necessary and/or appropriate. The instructor will makes his best efforts to communicate any changes in the syllabus in a timely manner. Students are responsible for being aware of any such changes.