CS522 - Programming Language Semantics

General Information and Introduction

Grigore Roşu

Department of Computer Science
University of Illinois at Urbana-Champaign

General Information

- Class Webpage and Newsgroup:
  `http://fsl.cs.uiuc.edu/~grosu`, then Teaching, then CS522
  `news://class.cs522`
- Lectures: Wednesdays/Fridays 12:30 - 1:45, 1131 Siebel Center
- Office hours: By appointment, 2110 Siebel Center
- Instructor: Grigore Roşu
  - Office: 2110 Siebel Center
  - Email: grosu@illinois.edu
  - WWW: `http://cs.uiuc.edu/grosu`
- Prerequisites: CS422 or instructor's approval

- Textbooks

  None required! Lecture notes and/or articles will be posted on class' webpage. This class will integrate and present in a uniform format various semantic concepts that are accepted as useful/interesting the programming language community. The lecture notes of CS422 should suffice.
- Other sources
  - The Maude Language: `http://maude.cs.uiuc.edu`
  - The K Framework: `http://k.cs.uiuc.edu`
  - Proceedings of Conferences on Programming Languages
    - **POPL** (ACM Symp. on Principles of Prog. Lang.)
    - **PLDI** (ACM Symposium on Programming Language Design and Implementation)
    - **OOPSLA** (ACM Conference on Object Oriented Programming Systems, Languages and Applications)

Grading

Each of the following will count one third of the final grade:

- 75% – Homework assignments (6-7 of them)
- 25% – Either a Final Exam or a Project

The final will be take-home (48 hours).

The Project

The project will consist of defining an executable semantics of a programming language or paradigm. Students will work in teams of two people. Each team will have to define a different language!

Contact me as soon as you form a team, to agree on a programming language or paradigm to define. We will be very flexible with respect to the syntax of the language and with the number and type of features included. Java, Scheme, etc., will be provided as examples.

When you contact me, please also propose a language that you'd like to define. I will most certainly propose to add or remove features to it, so do it early. Please send messages on the newsgroup as soon as a language is "taken".

Collaboration and Other Policies

- You are free to discuss the homeworks and the take-home exam with other students (and are encouraged to do so!). The focus of any such discussion should be limited to figuring the problem specification, not coming up with a solution. You may *not* jointly write homeworks or the final exam. To do so will be considered cheating! All cheating will be penalized by automatically assigning a failing grade for the course and instigating further disciplinary action with the appropriate university disciplinary body.
- You are encouraged to collaborate on projects, including exchanging code. For example, those defining languages that have arrays may wish to exchange code and ideas. If several groups decide to share the same module defining a common language feature, which is considered a very good thing to do,

please also let me know.

- You should retain copies of your exams until you receive your final grade. Your grade may be adversely affected by an inability to explain your work or by failure to retain copies of it. All students are required to take the final exam in order to receive a grade in the course.

- The course has a newsgroup. You are encouraged to use this group to ask questions, answer mundane system questions for other students, discuss exams, etc. In consideration for your peers, please don't use it to post flames, irrelevant messages, ads, etc.

Course Description

- Advanced course on programming language semantics
- Major language semantics paradigms will be investigated and mathematically defined, including:
  - Various approaches to programming language semantics, such as operational, executable, denotational, axiomatic, and rewriting logic semantics
  - λ-calculi
  - Types and type theory
  - Categorical models and category theory
  - Recursion and polymorphism
  - etc