New Course for Fall 2001 (Preliminary Announcement)

Advanced Topics in Programming Languages
CSCI 8980, Section 1

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Course Overview: As the primary vehicles for encoding computations, programming languages play a major role in the software world. With the growing pervasiveness of information technology, this role is only exaggerated. The widespread use of programming languages brings many new burdens: amongst other things, the structure of these languages must address issues such as usability, reliability, modularity and implementability. The language Java has been designed to address many of these problems but it is, unfortunately, not a panacea. At a language level, it does not support as high a level of abstraction as some functional and logic programming languages do, nor does it provide as close an access to actual machines as a language such as C does. Furthermore, many existing and emerging issues of security and reliability must still be addressed.

Programming language research aims to understand and develop solutions to these kinds of problems. The purpose of this course is to explore the current themes in such work. The precise set of topics is still to be decided, but it will represent a mix of pragmatic and foundational issues. Some possibilities are to examine the functional and (constraint) logic programming languages of the 1990’s with the intention of understanding the important ideas embedded in them, to study the usability and the implementability of these languages, to study type systems and their power and flexibility across different languages and to understand the emerging practical uses of ideas from logic in addressing reliability and security questions.

Course Format and Requirements: The course will mix lectures on basic material by the instructor with presentations of research papers by students. Attendance will be required in general and will be mandatory for student presentations. Every participating student will be expected to make a class presentation and to scribe the presentation of another student. Finally, a term paper of about 10 pages will be required that provides a critical survey of a few papers on a chosen topic, possibly related to the presentation. The grade will be determined by the term paper (50%), the class presentation (25%), the scribing (15%) and participation in class discussions (10%). As an estimate of workload, in addition to the written work, students should expect to read the equivalent of a research paper of about 20 pages every week.

Prerequisites: The formal prerequisite is the permission of the instructor. This translates into the following: a prior substantive exposure to concepts and constructs in programming languages and a basic understanding of implementation issues relating to a language such as C or Pascal. Both components might have been obtained from a properly designed first course on programming languages. Note that programming experience alone will not suffice. Some familiarity with formal systems and with logical reasoning will also be very helpful.

Time and Place: TTh 12:45-2:00, Smith Hall 121.