Contact information, office hours

- **Instructor:** Eric Van Wyk, email: evw@cs.umn.edu, phone: 612-625-0329.
  Office hours: Tuesday, Thursday, 10:00am - 11:00am; or by appointment; in Keller Hall 6-203.

Important Dates

- Class meets on Tuesday and Thursday from 11:15am to 12:30pm in Keller 2-260.

Course Prerequisites

Students are expected to have some experience with functional programming. This can be satisfied by completing CSci 1901, CSci 2041, or CSci 5106. Students without experience with functional programming can conceivably take the course but need to discuss this with the instructor prior to signing up.

Course Texts

- One book that will be used is *Purely Functional Data Structures* by Chris Okasaki, published by Cambridge University Press.
- We will also read a number of papers and book chapters from other texts. These will be provided electronically as PDF files from the course web page.

Course Description

Students in this course will study advanced programming techniques in functional languages such as Haskell and OCaml. Topics include the following:

- Data structures and algorithms in a pure functional language using immutable data.
- Rich type systems that include parametric polymorphism.
- Techniques such as lazy functional programming, monadic programming, seeing monads as a design pattern, functional reactive programming, effective use of lazy evaluation, and continuation-passing style.
- Foundational topics such as the lambda-calculus, type checking and inference algorithms, and different evaluation strategies.
- Support for programming-in-the-large such as through type classes in Haskell and the modules language in Standard ML.
- Implementation using techniques like compiling with continuations and specialized virtual machines.

While we will divide attention between theory, programming techniques and implementation, a special emphasis will be placed on learning to use the programming ideas effectively in practice.
Required Work and Grading: This course is offered as both CSci 5980 Section 002 and CSci 8980 Section 004. Upper level undergraduates interested in studying functional programming languages should register for CSci 5980. Graduate students can take the course at either level, bearing in mind that the 8000-level version will have additional expectations. Specifically, all students registered for the course will have to solve the same homework problems that will include significant programming exercises but performance on this component may be assessed separately for the two categories.

For students in 5980, programming assignments will count for 80% of the final grade with 20% being based on course and classroom participation.

Students registered for 8980 will be expected to complete all the programming assignments as well as take on a term-project. These students will pick a topic covered in the course and explore it in more depth or pick a different topic to explore. This project may include a significant programming component in a functional language or it could have a more theoretical flavor. In the latter case students will be expected to read a few intellectually challenging papers on the topic. All 8980 students will need to write a term paper describing their work, either describing the programming project or summarizing and critiquing the papers that were read. In addition, this work will be presented to the class in the last few weeks of the semester. The contributions to the final grade for these students are computed as follows: 40% for programming assignments, 10% for class participation, 35% for the term paper, and 15% for the presentation.

To keep on schedule, term projects have the following deadlines:

- Speak to the instructor about your project ideas by February 26.
- Submit a 1-page document describing your plans for your project, based on the agreed upon topic by March 8.
- Be prepared to present your project by April 22. Also provide reading material to your fellow students so that they can be prepared for your presentation. This must be done 2 weeks before your presentation.
- Turn in the final term paper and project by May 5.

This course does not count as a “projects course” in the CS curriculum.

Academic Integrity
You are encouraged to discuss homework problems with your fellow students. A large part of solving a problem is getting a precise and complete understanding of what the problem asks. This also helps to resolve any misunderstanding you may have of the problem or unintentional ambiguities in the problem description.

Discussing answers to problems, however, is not allowed. The work that you turn in to be graded is to be your own independent work representative of your independent thinking. Your discussions should stop long before you get to details of a solution. If you are still in need of assistance at this point, seek it from the instructor.

If you have a good understanding of the material, please answer the questions posted on the forum by your fellow students. But keep in mind that providing too much information may be detrimental to someone else’s learning. We all want the thrill of discovering the answers on our own. Providing insights to help people make these discoveries is welcome, but not the discoveries themselves.

Discussing solutions to problems or copying solutions from others is considered cheating and there are penalties for such action, including the following: On the first offense, no credit will be given on the assignment or exam and a final grade of A or A- will be converted to a B+. The second offense
results in failing the class. All incidents are reported to the Office for Student Conduct and Academic Integrity and the Director of Graduate or Undergraduate Studies.

The Computer Science and Engineering Department recently formalized its policies on student academic conduct. These policies can be found on the course Moodle web page and you are expected to read, in full, this document. Lack of understanding of these policies does not prevent them from being enforced.

Disability Resource Center
The University is committed to providing all students equal access to learning opportunities. Disability Services (DS) is the campus office that works with students who have disabilities to provide and/or arrange reasonable accommodations. Students who have, or think they may have, a disability (e.g. mental health, attentional, learning, vision, hearing, physical or systemic), are invited to contact DS to arrange a confidential discussion at 612-626-1333 (V/TTY) or drc@umn.edu. Students registered with DS, who have a letter requesting accommodations, are encouraged to discuss accommodations outlined in the letter with the instructor early in the semester.

Mental Health resources
You may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce your ability to participate in daily activities. University of Minnesota services are available to assist you with addressing these and other concerns you may be experiencing. You can learn more about the broad range of confidential mental health services available on campus via http://www.mentalhealth.umn.edu.