

MSCS Mess

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Department of Mathematics, Statistics and Computer Science

20 October 2011

St. Olaf College, Northfield, MN 55057

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This Week's Colloquium

Title: So You Want To Major in Math

Speaker: MSCS Faculty

Date: Thursday, October 27th

Time: 2:30pm

Location: RNS 310

Information on the Talk:

This "talk" will be more of an information session for anyone interested in being a Math major. So stop on by to learn more about being a mathematics major at St. Olaf!

First Annual MAA Halloween Math-o-lanterns Competition

Work in groups or alone on a math themed jack-o-lantern. Pumpkins and carving supplies will be provided, as well as Halloween candy. The carving will be from 7-9 PM on Thursday October 27th with the location TBD. There will also be an award for the best math-o-lantern so start thinking of cool designs.

Devaney Coming Soon

Robert Devaney (coauthor of the Diff Eq textbooks used here) will be giving a colloquium talk on Thursday, November 3rd. His talk is titled The Fractal Geometry of the Mandelbrot Set.

Upcoming Courses

Are you not sure what to take over interim or next semester? Well, here is a list of some upcoming courses in MSCS or related to MSCS in some way.

Math 382: Algebraic Geometry

Algebraic geometry uses algebra to describe geometric objects and geometry to analyze algebraic objects. It is a beautiful area of modern mathematics that has developed rapidly over the last forty years, and has found applications in physics, cryptography, and other areas of mathematics. We will start with a review of rings and ideals and learn what they mean in geometry, and then work on understanding curves and surfaces. This course will be offered 2nd semester.

Math 382: Cryptology

Instructor: Kay Smith; offered over Interim

Cryptology involves making and breaking secret codes. Historically, cryptology was important in military and diplomatic affairs. While these applications remain important today, cryptology also underpins secure electronic communication. In this course we will study a variety of methods for creating and deciphering secret messages and the mathematics on which they are based. We also will cover topics related to computer security including digital signatures and read a history of cryptology. Prerequisites: Math 238 (Number Theory) or Math 252 (Abstract Algebra I). For purposes of the IMAP, this course can form a sequence with either of the prerequisites. Contact Kay Smith at smithk@stolaf.edu if you have questions about the course.

Knot Theory (Canceled)

Unfortunately, Knot Theory will *not* be offered this interim. The MSCS department had to cancel it to make room for other courses.

Math 236: Mathematics of Biology

Discover how mathematics can be used to better understand various biological questions. This course will be taught by the new mathematical biologist in MSCS. Discrete and continuous models will be used to explore questions such as the following: Can we predict the number of people who will be infected during a flu season? How can we model the pulsatile release pattern of hormones? What is the effect of oil spills on a sea turtle population? How would we model the dynamics of a predator-prey system? In Math 236, we will develop, analyze, and evaluate mathematical models for problems of current research interest in biology. Both analytical and numerical techniques will be used. Prerequisites: Math 126 or 128, and Math 220. If you have questions, please contact Becky Vandiver (vandiver@stolaf.edu).

Math 390: Mathematics Practicum

The Mathematics Practicum (Math 390) is an interim course that gives you the chance to work on real life math problems in cooperation with local (Northfield, Twin Cities and Rochester) companies and nonprofit organizations. The course begins with a visit to the offices of the sponsoring organization, a chance to meet the people with a serious interest in the problem. Three weeks of hard on-campus work on the problem follow. The course ends with group presentations given to executives at the company offices.

The entire course is an intense group project. Groups of five students work on one problem that is separate from the problems being tackled by other groups. The course faculty will be helpful, meeting with each group daily, but will not be actively engaged in the research. Faculty will be present at, but will not participate in, the final presentation to client personnel. The course involves hard work, but is unusually satisfying.

The course is intended for junior and senior mathematics majors. Enrollment is limited to 15 students. Admission to the course involves a short application. **Applications are due Friday Oct 28.**

Applications are available at:

<https://docs.google.com/a/stolaf.edu/spreadsheet/viewform?formkey=dGxLbk9ybUk3OTI1Y180Y0FheVJQTGc6MA>

Please contact either Prof. Richey or Roback if you have any questions.

CS 273: Operating Systems

Just what is an operating system, anyway? It's *not* a computer's windowing system, which enables you to start and operate applications, although some operating systems include a windowing system.

It's not even a command prompt (shell) that enables you to start up a program manually.

Instead, an operating system is a collection of computer functions and data structures that operate behind the scenes, making it easier to create and run programs. It directs input/output traffic, makes a hard disk or flash drive magically look like an organized collection of files, and controls the "brains" of a computer (CPU and main memory).

In CS 273, we study the basic algorithms and data structures used in modern computer operating systems. Within the core areas (process management, memory management, input/output devices, file systems) we will visit topics such as process scheduling, virtual memory, swapping, and security. We will use Linux, Windows, OS/X to illustrate concepts, and will look at Linux source code to get more specific. Programming assignments will involve system programming, programming with threads, and modifying Linux to extend its capabilities or to try different design choices.

Prerequisite: CS 251 and prior or concurrent enrollment in CS 241 or permission of instructor (R. Brown).

Math 266: Operations Research

Operations Research (OR), also known as Management Science, is the mathematical

discipline of identifying decisions that solve problems in an optimum way. St. Olaf is one of the few undergraduate liberal arts colleges to offer an undergraduate OR course (Math 266), our next offering being next spring.

A prototypical OR problem would be figuring out how to allocate airplanes and airplane flight crews to routes, a central problem to all airlines, large and small. Inefficient allocations can be extremely expensive, forcing an airline to lease more planes (at tens of thousands of dollars per day per plane) and hire more crew staff than is necessary. An even more complicated problem occurs regularly when bad weather or other unplanned disruptions leave an airline's fleet at unexpected locations at the end of a day, giving the airline's management the task of figuring out the best way to move around planes (and crews) in order to resume normal operations as quickly as possible. (St. Olaf grads have handled these problems for Northwest Airlines, now Delta, and Southwest Airlines.)

Beyond transportation, operations research finds application in just about any situation involving a quantifiable objective, a set of decisions, and one of more limited resources. Many examples involve the management of manufacturing or service operations, like a refinery deciding how to allocate its various grades of crude oil and distilling equipment to the production of various grades of gasoline, jet fuel and lubricating oils.

Operations research also has applications in areas outside the corporate environment. For example, political campaigns often use OR techniques to target campaign activities. Government agencies responsible for natural resources management use OR techniques to optimize the operation of state parks, national forests and wildlife refuges.

Our operations research course (Math 266) is a great experience for students interested in the application of mathematics to a wide range of optimization problems in the real world. The prerequisite is linear algebra (Math 220).

Have questions? Please contact Prof. Steve

McKelvey (mckelvey@stolaf.edu) for more information.

IS 201: Power Computing in All Disciplines (HiPerCiC)

(This course will be offered 2nd Semester)

Computers keep getting more and more powerful over time, and recent developments (multi-core computer design and cloud computing) mean that this trend will continue for the foreseeable future.

How can we harness all of that computing power for research and teaching **in fields all across campus**, ranging from arts and humanities to sciences and more?

The goal of IS 201 is to find out, by creating new applications of high-performance computing to other disciplines. We intend to make new programs to do things in those disciplines that could never be done without powerful computing. We seek two different types of student for this course: *domain* students, who know about a field of application (but may not know anything about Computer Science); and *CS* students, who have Computer Science (CS) background for designing and building custom applications for domain students and professors.

- The domain students will work together with a professor in their domain to decide what a new program should do, and work with CS student teams to design that program, give feedback as it is built, consider new features, etc. They will also read about new trends in computations. Prerequisite: interest in or major in one of the target domain fields. (*No prior CS or programming required*).
- The CS students will work together according to their backgrounds and interests for team design and creation of user interfaces and (potentially parallel) “back end” computations for the reusable HiPerCiC framework. Prerequisite: CS 251.

We currently have plans to create custom programs for projects in Linguistics, Psychology, Finance, Mathematics, and Environmental Science. This course carries a WRI credit, and CS students can count IS 201 as an elective in the CS major.

We are forming teams now, with potential pre-registration. Please contact Dick Brown (rab@stolaf.edu), whether you're a domain student or a CS student, to hear more about the course or become part of a team!

Interested in Education?

Are you interested in becoming a math teacher? Have you thought about it, but are unsure if it's the right career path for you? Or are you looking for a fun class to take and satisfy a GE at the same time? If you've answered "yes" to any of these questions, consider the courses below. Both offer a nice introduction to our Education Department and to the world of education in general. You'll also get some "field experience," where you'll spend some time in actual schools. And you'll come out of each course with a GE -- so you really can't go wrong. In fact, convince a couple of friends (or more) into taking these courses with you! If you have any questions, contact Prof. Matsuura (matsuura@stolaf.edu).

Education 170: Schools & Communities (Interim, satisfies MCD, first-years and sophomores only):

In this course, students examine how schools and communities in the Twin Cities interact to provide support and developmental opportunities for school-age children. Through lectures, readings, discussions, field trips, and in-school and co-curricular placements, students gain an understanding and awareness of how race, class, ethnicity, national origin, and gender shape the complex character of urban youth and schools. Students spend one week in orientation activities on campus and two weeks in the Twin Cities. During the time in the Twin Cities, St. Olaf students participate as tutors and classroom assistants during the school day and then assist in various after-school and community programs. The last week of interim is spent back on campus discussing the experience.

Education 290: Educational Psychology (Spring semester, satisfies HBS, sophomores and above only):

Students study theories of and research into human behavior, growth, and development. Through lectures, discussions, case studies and field experiences, students analyze the impact of applied psychology upon schools, teachers, and students. Students also examine the interaction between individual characteristics and needs and political, economic and philosophical issues confronting contemporary American students. Required 20-hour field experience.

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If you would like to submit an article or math event to be published in the Math Mess, e-mail jacobsoj@stolaf.edu.