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Fall Term in the Mathematics & Statistics Department:

Registration is almost here, and there are, of course, a new batch of classes to take in the Mathematics & Statistics Department during next fall term. From classes on statistical sampling techniques to topology and from probability to the history of mathematics, there is something for everyone with an interest in math. Get excited and take a moment to browse through what we have for you!

Fall Term Courses

Math 236: Introduction to Mathematical Structures
Instructor: Eric Egge
Time: 3a
Prerequisite: Math 232 or permission of the instructor

If mathematics is a city, then this course is all about how we build its various parts. We'll study set theory, formal logic, and axiomatic systems, which are the raw materials that go into every building. We'll learn about techniques for discovering (or inventing) proofs, common methods of proof, and how to write good proofs; these are the construction methods we use to build everything in the city. And we'll study some fascinating problems and results that everyone should know, such as the many sizes of infinity; these are our city's major landmarks, our St. Basil's Cathedral, our Pyramids of Giza, our Taj Mahal, our Terra Cotta Warriors Museum.

Math 236 is the first course that suggests what being a math major (as opposed to a math user) is all about. If you are considering majoring in math, then this course should help you decide. This course is also a prerequisite for many upper-level mathematics courses, so taking it gives you the keys to a whole new mathematical world.

Math 244: Geometries
Instructor: Deanna Haunsperger
Time: 3a
Prerequisite: Math 236

Goethe described it as Gœthe fountain of all truth. Plato said it's how god thinks. Poincare said it's how *you* think. Edna St. Vincent Millay called it "beauty bare." It has been inspiring poets, philosophers, scientists and schoolkids for 3000 years. It's geometry! Come see what all the fuss is about. We will start with a quick visit to Euclid's Elements, skim over a couple of millennia of progress and then revel in the creations of the last few centuries. We will learn some fabulous theorems about circles and triangles that, had they been known, would have delighted Euclid. Then we will wander in non-Euclidean space

and learn some stuff that would have absolutely flipped him out -- it should have the same effect on you. Required for prospective high-school teachers, recommended for anyone interested in really cool ideas.

Math 245: Applied Regression Analysis
Instructor: Laura Chihara
Time: 3a
Prerequisite: Math 215 (AP statistics 4/5) or Math 275

On the night of January 27, 1986, engineers at Morton Thiokol teleconferenced with engineers and managers at the Marshall Space Flight Center and Kennedy Space Center to determine whether it was too cold (31 ° F) to launch space shuttle Challenger. Data from previous flights seemed to suggest that temperature had an effect on the integrity of the O-ring seals on the booster rockets, but the final recommendation was to launch the Challenger on schedule. Could a statistical analysis of the pre-accident data have predicted the catastrophic failure of the shuttle? In this class, we will investigate the Challenger data and more generally learn about statistical model building and model-checking techniques. We will use the software package R to aid in the modeling.

Math 255: Survey Sampling
Instructor: Katie St. Clair
Time: 2a
Prerequisite: Math 215 (AP statistics 4/5) or Math 275

We will cover a wide range of statistical sampling techniques that are used to make inferences about a population. You'll learn how to form estimates and quantify the sampling error when data is collected using a complex sampling design. By the end of the term you will know how to graph, run chi-square tests, and fit basic regressions models for complex survey data. The course will cover sampling techniques used in the study of both human populations and natural resources, and we will use the R survey package extensively throughout the course.

Math 265: Probability
Instructor: Bob Dobrow
Time: 5a
Prerequisite: Math 211 or permission of the instructor

The Roman philosopher Cicero described probability as Gœthe very guide of life. The French mathematician Pierre-Simon Laplace thought it remarkable that €œwhat began as a consideration of games of chance should have become the most important object of human knowledge. Today probability is one of the core pillars of mathematics, standing alongside algebra, geometry and analysis. This course will serve you in almost any mathematical and scientific direction you wish to go -- it is essential for statistics, a prerequisite for stochastic processes, and an important tool in biology, computer science, physics, and economics. Productive class hours will be spent flipping coins, rolling dice and dealing cards. The subject is also ripe with surprise and paradox, from the likely chance that two students in your class have the same birthday, to the certainty that a monkey pounding away on a keyboard will eventually produce the complete works of Friedrich Schiller, and will do it infinitely often!

This year we will offer both Fall and Winter sections of Math 265. For those planning to take the Math 265/275 Probability/Statistics sequence, Math 275 will be offered in the Winter and Spring.

Math 280: Statistical Consulting
Instructor: Laura Chihara
Time: 2/3c
Prerequisite: Math 245 and permission of the instructor

Apply your statistical knowledge by analyzing data-driven projects solicited primarily from the Northfield

community. You will also learn about the practice of consulting (including ethics and professional courtesy) and develop your problem-solving and communication skills. This is a two-credit course, which will be offered each term next year. Repeating the course is allowed.

Math 295: History of Mathematics
Instructor: Stephen Kennedy
Time: 4a

Abel, when asked how he had to come to his understanding of mathematics, is said to have replied, "By studying the masters." Somehow that quote and the fact of Carleton's ten-week terms tumbled together in my head and every since I've been walking around the department asking my colleagues about the top ten masterworks of mathematics. The idea of this course is to come to know some of the enduring advances of our discipline through the eyes of their discoverers. We'll read Euclid, Newton, Euler, and Gauss (and others) and try to understand what they were thinking. Most of the work of the course will be in reading and presenting to the class original books and papers of the great originators of mathematics.

Math 321: Real Analysis I
Instructor: Sam Patterson
Time: 2a
Prerequisite: Math 236

Why do the techniques we use in calculus work the way that they do? In this course we will take a close look at the theory behind those problems you did way back when. Everything in calculus is in some way based on looking at things up close: that is, taking a limit. For the most part, in calculus you saw examples and problems where things work out nicely. However, in truth one must proceed with caution. For example, there are times when interchanging the order of operations defined by limits give different results! In order to understand why this can happen, we will take a very close look at limits and these objects we call functions of a real variable. Issues surrounding these functions appear in many different places including differential equations, complex analysis, dynamical systems, and probability. This course is highly recommended for anyone considering grad school.

Math 354: Topology
Instructor: Helen Wong
Time: 5a
Prerequisite: Math 311

Q: What is a topologist?
A: Someone who cannot distinguish between a doughnut and a coffee cup!

After thinking a bit, you might imagine how to continuously deform a doughnut into a coffee cup and from that, figure out why a topologist would say that they are indistinguishable from each other. But what if the coffee cup was a really fancy one you got from the modern art museum shop or woot.com, with a knot in the handle? Would you then say that your knotted coffee cup is indistinguishable from a doughnut? And what if you are the kind of person who'd be completely uncomfortable saying that any doughnut was the same as any coffee cup to begin with? In this course, we €™ll look at different mathematical definitions for determining when two topological spaces are "essentially the same" and develop techniques for distinguishing spaces for each definition.

Jobs & Internships

Summer Intern: National Education Association

The NEA partners with institutions of higher education and other organizations to identify interns -- generally juniors, seniors, recent college graduates or graduate students who are interested in public education policy and education issues. Students pursuing degrees in Education, Political Science, Journalism and Communications, International Relations, Finance, Information Technology, Business Administration and Human Resources are encouraged to apply. Applications are accepted through the Tunnel.

Consulting Associate: The Abernathy MacGregor Group, Inc.

The associate is an active member of our consulting team: supporting new business, conducting client research, producing work product, and providing ongoing client support. Apply though the Tunnel.

Operations Analyst: Carlson Capital Management

The purpose of this full-time role is to serve as the primary data analysis, administration and reporting resource for the firm. This position will provide a shared service to all offices, across multiple geographic locations and act as an essential link between the operations support team and the rest of the firm. Apply through the Tunnel.

Problems of the Fortnight

Problem 7:
Two numbers x and y are chosen uniformly at random in the interval $(0, 1)$. What is the probability that the closest integer to x/y is odd?

Problem 8:
A large screen initially displays a tuple of 2^n numbers all equal to ± 1. Every hour, on the hour, the current tuple $(a_1, ..., a_{2^n})$ is replaced with the tuple $(a_1a_2, a_2a_3, ..., a_{2^n}a_1)$. Will the screen necessarily eventually display the tuple $(1, 1, ..., 1)$?

Solutions to problems of the fortnight should be submitted to Tommy Occhipinti via mailbox. Problems will remain open until they are solved; once a problem has been solved, a solution is posted in the math department hallway on the second floor of the CMC.

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