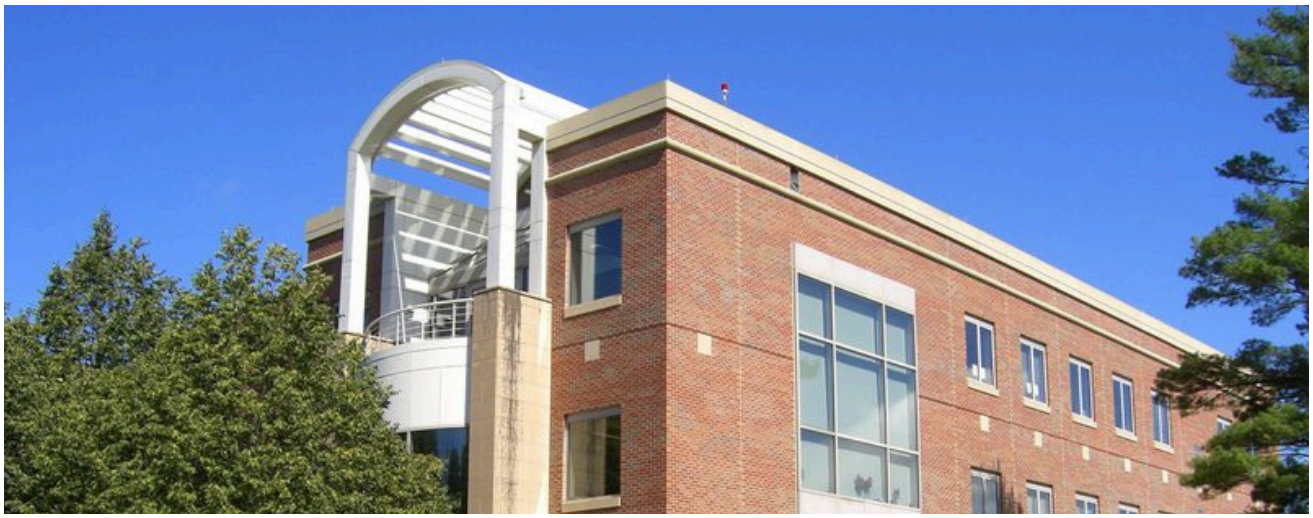
OCT 24, 2025 VOL. 44, NO. 4

MAST MESSENGER



IN THIS ISSUE

PUMPKIN CARVING CONTEST
2026 WINTER COURSES
INTERNSHIPS AND JOBS

Pumpkin Carving Contest

2026 Winter Courses

What's the Math and Stats Department Teaching in the Winter? Have you checked your registration time yet? Made a list of classes you're hoping to take in Winter 2025? Let the course descriptions below guide you into an adventurous new term with the Carleton Department of Mathematics and Statistics! There's something for everybody, from Ordinary Differential Equations to Introduction to Sampling Techniques. Find out more below.

2026 Winter Mathematics Courses

MATH 106 - A Tour of Mathematics and Statistics
Prerequisites: None.
Class time: Fridays 3:30 - 4:30 p.m.
Instructor: MurphyKate Montee

In this series of eight lectures, math and stats faculty will present striking ideas, concepts and results in an attempt to convey the breadth, beauty, and power of their areas. Credit for this 1-credit course will be based on attendance (and, at times, participation) only. Math 106 is offered annually, and you are allowed to register for it twice, in consecutive years: There should be essentially no overlap with the 2024 version of the Tour. Contact Deanna Haunsperger if you have logistical questions.

MATH 134 - Linear Algebra with Applications
Prerequisites: This course is not open to students who have received credit for MATH 232.
Class time: 3a
Instructor: Rob Thompson

In recognition of the importance of linear algebra throughout math, stats, science, and technology, the department is piloting this new course during 2025-2026 academic year. Math 134 is a "peer" to Math 232; the two courses fulfill the department's major and minor requirements equally, and students cannot take both of them. So what are the differences? First, Math 134 has no calculus prerequisite. Second, the abstract vector space material of Math 232 is replaced with rich applications to computer science, ecology, geology, and other disciplines. Even if you've already taken Math 232, tell all of your scientific (and other) friends to take Math 134 (or Math 232, which is great too).

MATH 236 - Mathematical Structures
Prerequisites: Math 232 or Math 134. Also, either Math 210 or Math 211.
Class time: 2a
Instructor: Claudio Gómez-Gonzáles

What does it mean to "prove" a mathematical statement, and how do we do it? Who makes these proofs, and who decides if they are right? This course will develop your own ability to assess and produce mathematical proofs. We'll explore various concepts that are indispensable for most areas of advanced mathematics, such as functions, relations, and sets (and their sizes). Concepts from calculus and linear algebra will show up as illustrations of these ideas, and you'll also get to see some previews of future math courses you might take. We'll also spend considerable time developing theorem-proving and problem-solving skills. If you've ever thought, "I believe this is true, but I don't know how to explain it," then this course is for you! If you're considering a math major, taking this course should help you decide; also, "Structures" is a prerequisite for the majority of upper-level math courses.

MATH 240 - Probability
Prerequisites: Mathematics 120 or Mathematics 211.
Class time: 4a
Instructor: Andy Poppick

If your laptop is still going strong after five years, how much longer can you expect it to last before it dies? If you're shopping for new headphones, should you go for the model with ten 5-star reviews or the one with three thousand reviews averaging only 4.3 stars? We all have to make decisions about what to do in uncertain situations, and this class is about quantifying that uncertainty and clarifying what we can expect when faced with uncertainty. In this course we introduce the fundamental ideas in the mathematical field of probability, which is the foundation for statistical inference, and discuss the distributions and random variables that come up most often in real-life situations.

MATH 241 - Ordinary Differential Equations
Prerequisites: Mathematics 232 or Math 134. Also, either Math 120 or Math 211.
Class time: 5a
Instructor: Rob Thompson

Differential equations are a language used by mathematicians, scientists and engineers to describe processes involving continuous change. In this course we will study differential equations from both a practical and theoretical point of view. Our focus will be on developing differential equation models from natural laws and exploring the mathematical ideas that arise within these models. Examples may include mechanical vibrations, Earth's climate, insect outbreaks, competition and cooperation of species, language coexistence, love affairs, and much more. The science will stay at an elementary level; our focus will be the mathematical ideas that arise in these models.

MATH 244 - Geometries
Prerequisites: Mathematics 232 or Math 134. Also, either Math 120 or Math 211.
Class time: 3a
Instructor: MurphyKate Montee

Geometry is one of the oldest branches of mathematics, dating back to the ancient Greeks including Euclid and Pythagoras. Despite its ancient origins, geometry, "(the) knowledge of the eternally existent", as Pythagoras put it, remains one of the most active and dynamic branches of mathematics in the present era. Part of this comes from its broad array of applications in the sciences, arts, and data analysis. But aside from applications, one of the most cherished aspects of geometry is its mathematical beauty and elegance. Join us next term as we explore the mathematics through the lens of geometry. Our journey will commence with a brief foray into classical Euclidean geometry before challenging our conventional intuition by delving into spherical and hyperbolic geometry, where parallel lines do not exist and the sum of the angles of a triangle deviates from 180 degrees!

MATH 282 - Number Theory
Prerequisites: Mathematics 236 or instructor permission.
Class time: 4a
Instructor: Deewang Bhamidipati

Number theory begins -- but certainly doesn't end -- with the prime numbers, objects whose mysteries have persisted for thousands of years. The known and the unknown live side by side: how many prime numbers are there? How many prime numbers are there that are one more than a square? Euclid beautifully answered the first question 2300 years ago, while to date no one has answered the second. We will examine properties of the primes at length, and have some opportunities for experimental discovery. Along the way, we will brush up against some spectacular open problems. In addition to primes, congruences will be our other main concern, with additional excursions into arithmetic functions, cyclotomic polynomials, and possibly other topics. For centuries number theory formed the cornerstone of "pure" mathematics -- that without any conceivable practical application. But very recently primes and congruences have been put to use in cryptography, and now play a role in vast numbers of everyday online transactions. We'll discuss how this works, and how it depends on no one being able to find a fast factorization algorithm for large numbers. Extra credit if you discover such an algorithm.

MATH 342 - Abstract Algebra I
Prerequisites: Mathematics 236 or instructor permission.
Class time: 5a
Instructor: MurphyKate Montee

Algebra is the study of structures that arise when mathematical objects can be combined via operations obeying a few fundamental rules. In its abstraction lies its power: algebraic problems crop up across mathematics, the physical sciences, art, and many other walks of life, from particle physics to textile production. In this course we will study groups, rings, and fields, which generalize ordinary arithmetic systems like "clock arithmetic," matrix multiplication, permutations, and the set of real numbers, in the same way that abstract vector spaces generalize R^n. Along the way we'll discover a remarkably rich theory and a zoo of fascinating structures.

MATH 354 - Topology
Prerequisites: Mathematics 236 or instructor permission.
Class time: 3a
Instructor: Josh Davis

A big part of mathematical problem solving is ignoring unimportant details. And sometimes these "unimportant details" can be pretty huge. (Want to know whether a series converges? Feel free to ignore the first trillion terms.) Well, topology is a way to study mathematical spaces --- kind of like geometry. Unlike geometry, topology ignores huge amounts of detail. It ignores anything that changes, when we continuously deform a space. In other words, only phenomena that are invariant under continuous deformation are considered important. It turns out that there are many such phenomena, which have relevance throughout math and applications to physics, computer science, and other disciplines. In this course, we'll spend roughly the first half learning "point-set" topology, including fundamental concepts such as compactness and connectedness. We'll spend the second half learning some "algebraic" topology, where we tackle topological problems by turning them into algebra problems. The work will be mainly theorem proving, often aided by intuition developed from examples and pictures.

MATH 361 - Complex Analysis
Prerequisites: Mathematics 321 or instructor permission. Students who have already received credit for Mathematics 261 may only take this course with instructor permission.
Class time: 2a
Instructor: Caroline Turnage-Butterbaugh

Behold the power and beauty of analysis in the complex plane! In this setting, if a function has one derivative, it has infinitely many derivatives. If two functions are differentiable in an open set and are equal in an arbitrarily small disc inside that open set, then the two functions are equal in the whole open set. If a function is bounded and differentiable everywhere then it must be... constant. As Riemann stated in 1851, "In effect, if one extends these functions by allowing complex values for the arguments, then there arises a harmony and regularity which without it would remain hidden." This course is recommended for those considering graduate school as well as anyone who loved the nuances of line integrals in Math 210/211.

2026 Winter Statistics Courses

STAT 220 - Introduction to Data Science
Prerequisites: Statistics 120, Statistics 230, or Statistics 250.
Class time: 3a
Instructor: Amanda Luby

This course will cover the computational side of statistics that is not typically taught in an intro or methodology focused course like regression modeling. Most of the data you encountered in your first (or second, or third, ..) stats course were contained in small, tidy .csv files with rows denoting your cases and columns containing your variables. Most of the messiness to these data may have been some missing values (NAs). In this course, we'll learn how to extract information from data in its "natural" state, which is often unstructured, messy and complex. To do this, we will learn methods for manipulating and merging data in standard and non-standard formats, data with date, time, or geolocation variables, text processing and regular expressions, and scraping the web for data. To effectively communicate the information contained in these data, we will cover advanced data visualization methods, including methods for creating interactive graphics. We will primarily use the statistical software R in this course, and cover best practices for reproducible analyses and sharing code.

STAT 230 - Applied Regression Analysis
Prerequisites: Statistics 120, Statistics 250, Psychology 200, or AP Statistics Exam score of 4 or 5.
Class time: 1a
Instructor: Katie St. Clair

How is air pollution associated with mortality? Does this association change after accounting for weather or socioeconomic factors? In your first statistics course you may have used a "simple" regression model to describe the relationship between a response variable and a single explanatory variable; however, many questions cannot be answered using such simple models. In this course, we will explore how to incorporate multiple covariates (explanatory variables) into our models to answer complex questions. In addition to learning how to model continuous response variables (ordinary linear regression), we will explore models for count data (logistic and Poisson regression). This course emphasizes model building (what covariates do I need?), model validation (does this this model reflect reality?), and how to correctly interpret and clearly communicate the results of our models. We will use the software R in this course for data analysis and model building.

STAT 250 - Introduction to Statistical Inference
Prerequisites: Mathematics 240.
Class time: 5a
Instructor: Adam Loy

In probability, we assumed perfect knowledge of a population and used this knowledge to grapple with properties of random samples. When doing inference, we flip the script: we now observe a random sample and wish to learn about our population. For example, we will now estimate the parameters for probability distributions based on data, rather than assuming they are known. In this course, you'll learn about different ways to estimate parameters, as well as techniques for evaluating their strengths and weaknesses. While we will focus on the theory underlying these inferential methods, we will balance this theory with data-driven applications that illustrate how these methods are applied. Modern statistical practice also requires computation, and we will use R for statistical computing.

STAT 260 - Introduction to Sampling Techniques
Prerequisites: Statistics 120, Statistics 230, or Statistics 250.
Class time: 2a
Instructor: Katie St. Clair

This course covers a wide range of statistical sampling techniques that are used to make inferences about a population. We will discuss how to form estimates and quantify the sampling error using "sampling weights" when data is collected using sampling designs that are more complex than a simple random sample. We will also cover strategies for determining an “optimal" sampling design when resources (time/money) are limited. Time permitting, we may also cover how sampling weights are used in data visualization, regression models or chi-square hypothesis tests. Applications will be drawn from both the natural and social sciences, and we will use the R survey package extensively throughout the course.

STAT 260 - Statistical Consulting
Prerequisites: Statistics 230 and instructor permission.
Class time: Tuesday 10:10 - 11:55 a.m.
Instructor: Andy Poppick

Students will work on data analysis projects solicited from the local community. We will also cover the fundamentals of being a statistical consultant, including matters of professionalism, ethics and communication.

Internships and Jobs

Internships

Summer ASP Intern Teacher
St Paul's School - Concord, N.H. Due: Thursday, November 13.

Jobs

Quantitative Analyst
Peak Energy Capital. Due: Sunday, November 16.

Editors: Joyce Li, Caroline Turnage-Butterbaugh
Web & Subscriptions: Sue Jandro