

# #GraduateMath@UD

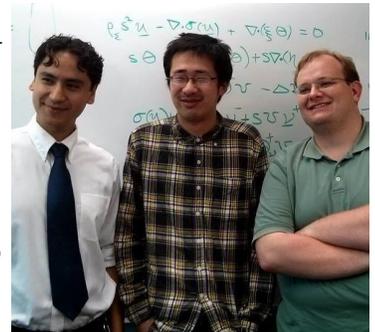
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## The usual suspects

- MS and PhD in Mathematics and Applied Mathematics.
- Guaranteed financial support for full time PhD students, including summer and travel support.
- Twenty regular graduate courses in Algebra, Analysis, Combinatorics, Numerical methods, Applied Mathematics, and Probability.

Our 2016 PhD and MS crop has found jobs in different areas of academia and industry. Six of our recent PhD graduates went to postdoctoral positions: Jiange Li to the Massachusetts Institute of Technology, Tonatiuh Sanchez-Vizuet to the Courant Institute (NYU), Shelvean Kapita and Shixu Meng to the Institute of Mathematics and Applications (Minnesota), Tianyu Qiu to Rice,

and Ryan Evans to the National Institute of Standards and Technology. Industry has lured some of our graduates from very different backgrounds and to no less diverse destinations: Matt Hassell is now working for John Bean Technologies, James Alexander moved to Silicon Valley to work for Synopsys, and 2015 graduate Weiqiang Li has recently joined Google.



Tonatiuh, Tianyu, and Matt, three happy guys after graduation, hiding key equations to the development of humankind

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## The whole nine yards

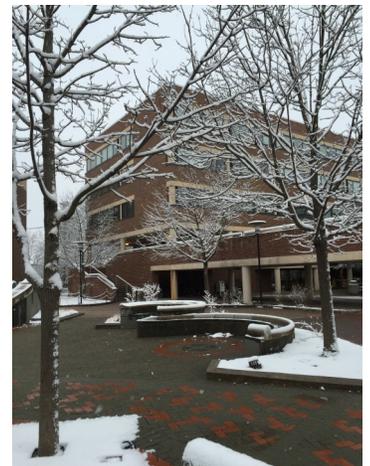
Over the past half-century, the Department of Mathematical Sciences at the University of Delaware has awarded well over one hundred doctoral degrees in **Mathematics** and **Applied Mathematics**. In 2010, the NRC rankings of doctoral programs ranked our program in the range 11-40 among all U.S. programs in mathematics, while the Academic Ranking of World Universities consistently identifies us as a top 100 department in mathematics worldwide. We offer five-year financial aid packages combining teaching, research, and fellowship opportunities, a beautiful campus in a lively town, and a central location in the mid-

Atlantic on the Eastern seaboard. Our faculty contains internationally recognized researchers in core areas of mathematics and its applications. As such, we offer a wide range of potential research topics for PhD candidates.

The department currently offers master's and doctoral degrees in Mathematics and Applied Mathematics.

Our **research areas** span Algebra, Analysis, Combinatorics, Inverse Problems, Mathematical Biology, Numerical Analysis, Physical Applied Mathematics, Probability, Scientific Computing, and Stochastics.

Five regular **research seminars** complement the academic offerings of the graduate program.



## Summer of 16

The summer is a busy time in the department. While incoming international students go through their English Language Institute training, domestic students are invited to climb The RAMP (Review of Advanced Mathematical Problems), in an intensive four week program with review of relevant results and tools.

First year graduate students get a taste at research with faculty, either through the UNIDEL summer program or joining the competitive GEMS (Groups Exploring the Mathematical Sciences) scheme, with teams coordinating undergraduate and graduate students.

The Graduate Student Mathematical Modeling Camp and the

Mathematical Problems in Industry Workshop (held in consecutive weeks in June, in RPI and Duke respectively) give some students two weeks of experience on working on industrial problems, as part of their graduate training.

Mathematical Institutes offer plenty of opportunities for summer schools. This past year UD

graduate students have had the chance to attend summer activities organized by the MSRI in Berkeley, CA and the IMA in Lawrence, KS and Houghton MI. Other students prefer to have a taste of the “real world,” interning for companies during the summer. This led Lan Zhong to work for Rofini in Boston and Tao Yuan to Bloomberg in NYC.



It's not all about taking courses and preparing for exams. Some first years and their significant others went apple picking.



There's also time for learning what your peers do. The Winter Research Symposium showcases the work of senior graduate students in the form of talks or posters.

## You are what you learn

Every academic year the department offers around 20 graduate courses in mathematics in the fall (F) and spring (S) semesters. Additionally, two sections of Topics in Mathematics are offered every spring.

### 600 level courses

- 600. Fundamentals of Real Analysis (F)
- 602. Measure, integration, and complex variables (S)
- 611. Introduction to numerical discretization (S)
- 612. Computational methods

for equation solving and function minimization (F)

- 616. Modeling in Applied Mathematics (F)
- 617. Techniques in Applied Mathematics (S)
- 630. Probability theory and applications (F)
- 631. Introduction to stochastic processes (S)
- 650. Algebra I (S)
- 672. Vector spaces (F)
- 688. Combinatorics and Graph Theory I (F)

### 800 level courses

- 806. Functional Analysis (F)
- 810. Asymptotic and perturbation methods (S)
- 817. Introduction to numerical methods for Partial Differential Equations (F)
- 835. Evolutionary Partial Differential Equations (F)
- 836. Elliptic Partial Differential Equations (S)
- 838. Finite Element and Boundary Element Methods (S)
- 845. Algebra II (F)

850. Theory of probability (F)

888. Combinatorics II (S)

### Topics courses

**Spring 2016.** Introduction to data mining and analysis (Prof. Guillot). Linear and semidefinite programming in combinatorial optimization (Prof. Cioaba)

**Spring 2017.** Nonlinear water waves (Prof. Guyenne). Information theory (Prof. Madiman)

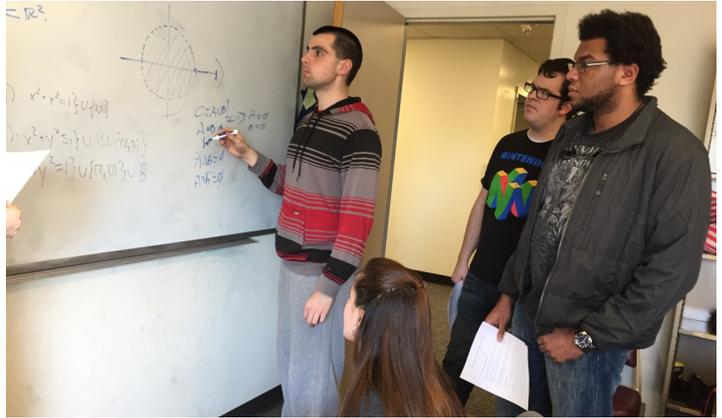
### Special courses

667. Introduction to mathematical finance (Prof. Edwards)

## The great race, or the Nightmare in Ewing Hall

A new Preliminary Exam system is being implemented in the 2016-17 academic year. Two first tier exams in Analysis and Vector Spaces start the prelim process. A second tier, with two exams chosen among five options (Advanced Analysis, Algebra, Numerical Methods, Sto-

chastic Processes, and Applied Mathematics) close the process. Prelim prep sessions in the winter, led by senior graduate students, offer the chance to get ready for the first hurdle in the program.



That looks difficult. Is this set open or closed? Nick, Melissa, Brad, and Mike work through some analysis prelim questions.



Sam, Tom, Nick, Kris, and Shuying lead the WHIMS visiting undergrads for a stroll in Curtis Mill Park on a beautiful fall afternoon.

## UD attraction

We are proud of our programs and we want the best to join us. The last two fall semesters have seen the birth of a activity to convey the excellence of the graduate programs in mathematics at UD. WHIMS (What's Hot In Mathematical Sciences) brings senior undergraduate students to a weekend long

workshop on campus, with faculty and graduate students presenting their work. There is also time for experiencing good old 'quiet' Newark and its attractions. Led by graduate students, this includes a walk around campus and dining in the local watering holes.

## Americans in Paris, or the French Connection

A long established connection between the Department of Mathematical Sciences at UD and the Centre de Mathématiques Appliquées at the École Polytechnique of Paris has led Irene de Teresa and Jake Rezac to spend the fall 2016 semester in Paris. The CMAP is placed in a multicenter campus, assembling some of France's top research and educational institutions.



Irene and Jake had a good time in Paris, but we don't have graphic proof. So here they are (Irene in red) with Shuying and James (green shirt) at the DPT.

## Pretty much alive poets society

Graduate student life during the regular semester is complemented with group activities, like those organized by the UD chapters of the Association for Women in Mathematics (AWM) and the Society for Industrial and Applied Mathematics (SIAM), as well as the weekly Hallenbeck Graduate Student Seminar (HGSS). All UD-Math graduate students get a complimentary membership for the American Mathematical Society (AMS).

# The graduate

## PhD Graduates

**James Alexander.** Selected results in combinatorics and graph theory. (Adviser. Felix Lazebnik.)

**Ryan Evans.** A mathematical journey through optical biosensors (Adviser. David Edwards.)

**Matthew Hassell.** Some applications of integral equations to the solution of transient partial differential equations. (Adviser. Francisco J Sayas.)

**Shelvean Kapita.** Plane wave discontinuous Galerkin methods for acoustic scattering. (Adviser. Peter Monk.)

**Jiange Li.** Some topics in probability theory, combinatorics and information theory. (Adviser. Mokshay Madiman.)

**Shixu Meng.** Inverse scattering for a penetrable cavity and the transmission eigenvalue problem. (Advisers. David Colton and Fioralba Cakoni.)

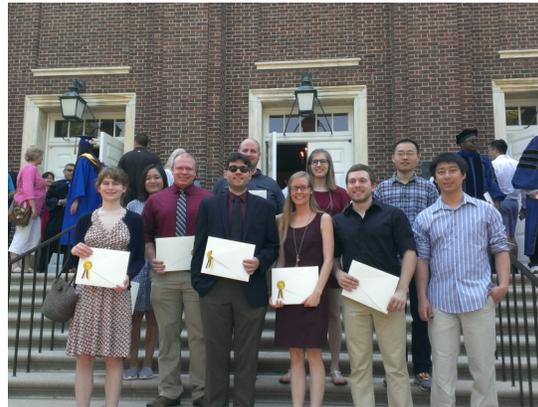
**Rafael Plaza.** Representation theory methods in extremal combinatorics. (Adviser. Qing Xiang.)

**Tianyu Qiu.** Time domain boundary integral methods in acoustics, heat diffusion and electromagnetism. (Adviser. Francisco J Sayas.)

**Tonatiuh Sanchez-Vizuet.** Integral and coupled integral-volume methods for evolutionary wave-structure interaction. (Adviser. Francisco J Sayas.)

## MSc Graduates

Ryan Caulfield, Kevin Cotter, Alexander Furia, Madelyn Houser (MS Thesis adv. Pak-Wing Fok), Matthew Jakubowski, Amy Janett (MS Thesis adv. Richard Braun), Jimin Kim, Chen Ling, Stephen Smith, Yingnan Zhang.



MS graduates in front of Mitchell Hall after the spring convocation. Back row: Yingnan, Kevin A, Amy, and Hanlin. Front row: Emma, Jake, Ben, Madelyn, Kevin C, and Chen. Burgundy was a theme.



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Most of the Mathematical Sciences department (including all research faculty and graduate student offices) are placed in Ewing Hall, on the main UD campus.