

The Sum Times

MARCH 2015

SPECIAL POINTS OF INTEREST:

- Ultimate Pi Day
- Spring Semester Dates to Remember
- Math Electives and Seminar for Fall 2015
- Math Seminar for Spring 2016
- Ultimate Pi Day Shirts are here
- Villanova Math Club Important Events
- Pi Mu Epsilon Induction

IT ONLY HAPPENS ONCE IN A LIFETIME

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ULTIMATE PI DAY

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Spring Semester Dates To Remember:

- Mar 13 (F)** - Registration Advising Begins
- Mar 26 (Th)** - Registration Begins for Fall 2015 Semester
- Apr 1 (W)** - Last Day for Authorized Withdrawal without Academic Penalty(WX)
- Apr 1 (W)** - Easter Recess Begins after last class
- Apr 7 (Tu)** - Classes Resume
- Apr 28 (Tu)** - **Pi Mu Epsilon induction** and guest speaker.(see pg. 5 for info)
- Apr 28 (Tu)** - Deemed a Friday class day and will follow a Friday class schedule for UG day classes only
- Apr 29 (W)** - Deemed a Monday class day and will follow a Monday schedule for UG day classes only.
- Apr 30 (Th)** - Final Day of Classes
- May 1 (F)** - Reading Day
- May 2-8 (Sat - Fri)** - Final Examinations (No exams on Sun. May 3)
- May 11 (M)** Final Grades Due (12:00 Noon)
- May 15-16 (Fri-Sat)** - Baccalaureate and Commencement
- June 26 (Fri)** - Last day for submission of work to remove incomplete ("N") grade

Math Electives & Seminar for Fall 2015

MAT 3930 - History of Mathematics (Dr. P. Pasles)

Development of mathematics from ancient times to the birth of calculus in the seventeenth century.

Prerequisites: MAT 1505 (min. grade: D-) and MAT 2600 (min. grade: D-)

MAT 4270 – Numerical Analysis (Dr. C. Ashley) (counts as second analysis course)

Numerical analysis is the study of computing approximations to mathematical problems. We study methods to approximate the roots of equations, derivatives, integrals, differential equations, and systems of equations to name a few. The methods often involve producing a sequence of approximations so questions of whether the sequence converges and how fast it converges are studied. This course will count as a math major's second analysis requirement. The software Maple will be used to help make our approximations, though students may use software if desired.

Prerequisite: MAT 1505

MAT 4310 – Statistical Methods (Dr. E. Pasles and Dr. P. Bernhardt)

This course is an introduction to data summarization and various statistical methods that will allow students to begin to build up a toolbox of statistical techniques for handling data analysis. The class will study probability distributions that will serve as the foundation for these methods. The statistical methods that the class will study include point estimates, interval estimates and hypothesis tests for population means, variances and proportions, categorical data analysis, regression and correlation.

Prerequisite: MAT 1505

MAT 5700 – Math Statistics I (Dr. Y. Zhang) (counts as second analysis course)

Topics covered in MAT 5700 include probability, random variables, joint distributions, expected values, covariance, correlation, the moment generating function, Chebyshev's inequality, and important families of random variables. Students who are interested either in statistics or in actuarial science should strongly consider taking this course. There is a substantial overlap between the course syllabus and the syllabus for the first actuarial exam. This course in Fall 2015 will count as a second analysis course.

Prerequisites: MAT 2500 and MAT 2705

MAT 5920 – Introduction to Bayesian Statistical Data Analysis (Dr. O. Marrero)

Briefly, Bayesian statistics allows for the use of prior information. This is a natural way to think and make inferences: we have a prior belief which we then update with data (= new information) to produce a posterior belief, which then becomes our new prior belief; thus, this process is never-ending, and we are always willing and ready to update our beliefs. Basic Bayesian statistical theory has been known for quite some time; but only relatively recently have the computing tools become generally available to effect Bayesian methods. There is currently much activity and work being done in Bayesian theory and methods. Thus, Bayesian thinking is very much a part of our time. Bayesian ideas are not limited to statistics; they are also used in physics, in particular, quantum mechanics, where the subject is called Quantum Bayesianism, or QBism for short. This is an introductory, beginner's course, and at the undergraduate level. The course will begin with a discussion about Bayesian inference and how it differs from frequentist inference (likely what you have seen in other statistics courses), and then we'll spend the rest of the semester doing data analyses, always from a Bayesian perspective. Thus, the course is intended to be very applied and hands-on. We'll use the (free!) software R; no previous experience with this software is necessary. The prerequisite is MAT 1505 Calculus II; we do not assume any prior knowledge of statistics. The course is intended as a companion and a complement—NOT a substitute—for MAT 4310 Stat Methods. It is not necessary to take MAT 4310 and the Bayesian course at the same time.



MAT 5930 – Topics in Graph Theory (Dr. A. Woldar)

Draw any number of dots on a piece of paper. Now for each pair of dots, make one of two decisions. Either connect the pair by a line, or do nothing. You have just constructed a graph.

It is hard to imagine that so simple an object could possibly generate deep mathematics. And yet, graph theory is a critical sub-area of discrete mathematics that is profound in both its theoretical development and its diversity of applications. Indeed, graphs play an essential role in modern society, providing the theoretical framework for the study of communication flows, computer circuitry design, data storage, website infrastructure, transportation and room scheduling, linguistics, etc. Graphs also find application in the hard sciences, most notably in physical chemistry and biology.

This course will aim to provide a healthy balance between theory-building and problem-solving. It will overlap with other areas of pure mathematics such as group theory, linear algebra, geometry and topology. While previous experience in these areas might prove beneficial to the student, it will definitely not be presumed.

MAT 5900 – Seminar in Mathematics (Dr. K. Haymaker)

This seminar will be organized around the broad topic of applications of mathematics from what are traditionally considered “pure” fields. We will start by looking at examples from coding theory, which applies ideas from Algebra and Combinatorics to correct errors that occur in the transmission of digital information. Although this will be our jumping off point, you will be encouraged to choose your own topic of study for the semester. There are many possible application topics within coding theory, including studying the codes used to store music on CDs or to transmit messages between satellites. As an example of a different research direction, one option is to study how algebra can be used to record the brain signals that create internal maps. For those interested in teaching, you may prefer to choose a topic that connects your undergraduate math coursework to a particular teaching application. Once you decide on a topic that interests you, the course will be focused on producing short paper drafts and in-class presentations that explain the ideas.

ATTENTION STUDENTS — With registration approaching, be sure to **contact your advisor to discuss your courses for next semester and to obtain your registration PIN number.** All advisors will post their office hours and they are the only one that has your PIN number.



Math Seminar for Spring 2016:

Course Descriptions for Seminars for **Spring 2016:**

MAT 5900 Seminar in Math: Hadamard Matrices, Combinatorial Designs, and Difference Sets (Dr. O. Marrero)

These are three easy-to-understand notions that coexist in certain cases. The students will have the opportunity to choose and study some aspects of these topics. In general, our subject is considered part of constructive combinatorics. We'll be mainly interested in the mathematical, theoretical viewpoint. However, all three topics have a variety of applications. For example, Hadamard matrices can be used to create codes; combinatorial designs are used in the design of experiments in statistics; and difference sets have found application in radar design. Mathematically, Hadamard matrices are, as the name obviously implies, matrices; the principal problems are the existence and construction of these matrices. A simple way to understand a combinatorial design is as a binary matrix that must satisfy certain conditions. And a difference set is a group subset that obeys certain requirements. The prerequisites are MAT 3400 and MAT 3500; students must have successfully completed the two prerequisite courses before enrolling in this seminar.

MAT 5900 Seminar in Math: Operations Research (Dr. B. Pollack-Johnson)

Students will have a chance to develop a project in an area of Operations Research, either Deterministic (non-probabilistic) or Stochastic (probabilistic). Topics can include, but are not limited to: linear programming, integer programming, the Assignment Problem (such as assigning graders to math courses), the Shortest Path Problem (what Google Maps does), Game Theory, project scheduling, nonlinear programming, the Traveling Salesperson Problem, heuristic algorithms, Queuing Theory, the News Vendor Problem, Inventory Theory problems, and many others. Students will research the math behind the algorithms used to solve their problem, as well as solving a real-life problem from their own life or experience.

The Ultimate Pi Day Shirts Are Here!

T-shirts are available for purchase in the Math Office in SAC305 on Monday to Friday from 11:30 a.m. to 3:30 p.m. Price is \$10



Villanova Math Club

Important Math Club Events!

This **Friday, March 13**, we will be celebrating this **monumental Pi Day**:

- **11-2PM: BAKE SALE** at the Ellipse with a multitude of pies (and other delicious baked goods)! We will also be **selling extra Pi day shirts** at this time.
- **3 PM: PI-K** starting at the ellipse. This is a 3.14 mile run/walk around all of campus. Come out to enjoy the wonderfully warm weather and celebrate Pi!

Donations for the Starfish Foundation will be accepted at both events!

Math Club Formal:

Yes, we will be having a formal with SGA and Peer Advisors this semester! The occasion will take place on **Wednesday April 8 at 9 PM** at Twenty9 in Malvern. Transportation will be provided, and more info on tickets soon to come. If you would like to **volunteer to be a party monitor** (it is necessary that we have them!) then please contact Danielle Riverso at [\(914\) 584-5170](tel:9145845170) or driverso@villanova.edu. Thanks!

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*Everyone is welcome to join Math Club - Math Majors and Minors, Liberal Arts and Sciences students, Business students, Engineering students, graduate students. **If you love math, are interested in it, need help with it, or simply want to meet new people**, then Math Club is the club for you!*

*Meetings will take place approximately every three weeks in the MLRC and will include snacks, discussions about classes and professors, as well as fun activities such as math-themed competitions.*

For more information, contact any of the officers:

Danielle Riverso ([driverso@villanova.edu](mailto:driverso@villanova.edu)), Karolina Golabek ([kgolabek@villanova.edu](mailto:kgolabek@villanova.edu)) or Anna Lake ([alake@villanova.edu](mailto:alake@villanova.edu))

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**Mathematics Learning  
And Resource Center  
(MLRC)**

**Location:** 211 Falvey Library

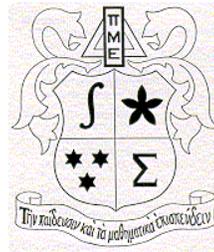
**Dates:** March 9—March 31  
April 7—April 30

**Hours:** Sunday 6:30-9:00pm  
Mon.-Thurs. 1:00-5:00pm & 6:30-9:00pm

**Phone:** 610-519-MLRC (6572)

Check out our web page at [www.villanova.edu/mlrc](http://www.villanova.edu/mlrc) for more MLRC info regarding Villanova math course, tutoring schedules, math links, and MLRC email.

# SAVE THE DATE!



## Pi Mu Epsilon Induction

Tuesday, April 28, 2015 (Friday Schedule)

2:30 – 3:30 p.m.

Monday 154

## Guest Speaker: Ivars Peterson

Topic: Pancake Sorting, Prefix Reversals, and DNA Rearrangements



**Ivars Peterson** is a freelance writer and editor. He served as Director of Publications at the [Mathematical Association of America](http://www.maa.org) in Washington, D.C. from 2007 to 2014. As an award-winning mathematics writer, he previously worked at *Science News* for more than 25 years and served as editor of *Science News Online* and *Science News for Kids*. His books include *The Mathematical Tourist*, *Islands of Truth*, *Newton's Clock*, *The Jungles of Randomness*, and *Fragments of Infinity: A Kaleidoscope of Math and Art*.