MATHEMATICS NEWSLETTER

NEWS FOR THE UNDERGRADUATE

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Editor, Bisa Meek
www.math.ncsu.edu/undergrad

Spring 2004
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Meet Daniela Valdez-Jasso ...

Daniela is a junior in the Math Department pursuing a degree in Applied Mathematics with a concentration in Biological Sciences. She is from Mexico City, Mexico, but has lived in Brazil, China, Japan, Argentina, Chile, and Canada. Daniela enjoys reading philosophy (Nietzsche) and poetry (Omar Khayan) and loves music, dance, the outdoors, and learning about different cultures.

As a math major, Daniela considers herself to be an analytical person who uses math logic to understand the world. She has enjoyed being immersed in wonders and continually facing new challenges. The Math Department is a "very active, friendly, and supportive environment," which has turned out to be very important with the heavy study demand of math majors.

A couple of Daniela's favorite classes as a math student were MA 405 (Introduction to Linear Algebra and Matrices) and MA 407 (Introduction to Modern Algebra for Mathematics Majors). Her more enjoyable instructors were Drs. Misra, Stitzinger, Charlton, and Ito.

Daniela plans to attend graduate school and conduct research in Biomathematics. She wants to be the intermediate between the abstract math world and the practical world we live in.

Daniela encourages freshman and new students to be persistent.

Advanced Math Courses

SUMMER 2004

MA 341 Applied Differential Eq. I
MA 401 Applied Differential Eq. II
MA 405 Intro. to Linear Algebra and Matrices
MA 421 Intro. to Probability
MA 425 Math. Analysis I
MA 501 Adv. Math. for Engineers and Scientists I
MA 502 Adv. Math. for Engineers and Scientists II
MA 512 Adv. Calculus II
MA 513 Intro. To Complex Variables

FALL 2004

MA 341 Applied Differential Eq. I
MA 351 Intro. to Discrete Math. Models
MA 401 Applied Differential Eq. II
MA 402* Computational Math: Models, Methods and Analysis
MA 405 Intro. to Linear Algebra and Matrices
MA 407 Intro. to Modern Algebra for Math. Majors
MA 408 Foundations of Euclidean Geometry
MA 421 Intro. to Probability
MA 422* Long-Term Actuarial Models
MA 425 Math. Analysis I
MA 426 Math. Analysis II
MA 430* Math. Models in the Physical
MA 493R Putnam Seminar
MA 501 Adv. Math. for Engineers and Scientists I
MA 513 Intro. To Complex Variables
MA 518 Intro. To Manifold Theory
MA 520 Linear Algebra
MA 521 Abstract Algebra I
MA 591F Fractals and Complex Dynamics
Ma 591I Symmetry Methods for Differential Eq.
MA 591J Intro. to Math Foundation of Quantum Computation
MA 591X Intro. to the Calculus of Variations
MA 797J Conservation Laws: Theory, Numerics, Applications I

*These classes may be used for the math modeling requirement for AMA majors (OPT 001).

Class times are listed at
www.math.ncsu.edu/Courses/Fall04.txt

Inside this issue

The Undergraduate Program has created a web page to post internships, job openings, upcoming events, and more. A Webforum was also created as a place for Undergraduate Math Majors and interested students to communicate with each other. A place for the faculty to communicate with students.

Bulletin URL: www.math.ncsu.edu/undergrad/News/
Webforum URL: courses.forum.ncsu.edu/cgi-bin/netforum/undergrad-math/a/1

"Like the crest of a peacock so is mathematics at the head of all knowledge."
Anonymous

Summer 2003 Graduates

Mathematics

*Patrick Francis Barrow
Jessica Lynn Krager
Susan Michelle Leonard
*Chris Alan Lipa
Jessica Jean Stalnaker
Caitlin Clare Whately

Applied Mathematics

Noble Darren Clary
Beth Lorene McAfee

Fall 2003 Graduates

Mathematics

Owen Thomas Baker
John Peter Brewer
John Robert Carr
Albert Daniel Daino
William Craig Hart
John David Hutchens
David Stanford Hysom
Trinita Rae Johnson
*Chirag Manmohan Lakhani
*Mark Daniel Lavin
Holly Rosalyn Morris
Maja Spadin
Agnes Nga-Sze Wong

Applied Mathematics

Randy Raymond Clark, Jr.
Toby Crandall
Anthony Dickins Dezio
*Greta Scott Grizzard
Christopher Thomas Hunt
Kimberly Moeurn
Brad Douglas Parker
Lesley June Percival

* completed Math Honors program

Fall 2003 Senior Awards

The PAMS Senior Awards recognizes outstanding graduating seniors in three categories: Scholarly Achievement, Research, and Leadership. The following students were nominated by the Math Department. Chirag Lakhani was awarded the College Senior Award in Leadership.

Scholarly Achievement Nominee
Chirag Lakhani
Research Nominee
Mark Lavin
Leadership Nominee
Chirag Lakhani

Student News

David Johnson

David R. Johnson has received a Gates Fellowship for study at Cambridge University, U.K. David graduated in May 2003 and completed the Math Honors Program.

Scholarship Information: www.gates.scholarships.cam.ac.uk/

Park Scholars

The Mathematics 2004 Park Scholars are Albert Blackmon and Casey Phillips. In addition to participating in a learning community, these graduating high-school seniors are offered full-ride scholarships if they choose to attend NCSU. Only 48 scholars are selected for the Class of 2008 -- Math continues to get more than our share of these scholarships.

DID YOU KNOW?
That the original program in 1956 included a year of pre-calculus but did not include Modern Algebra or Linear Algebra; these were introduced in 1969.
N.J. Rose

Honors News

Three students, Mark Lavin, Chirag Lakhani and GiGi Grizzard, completed the Math Honors Program in December 2003. GiGi is planning on going on to grad school in Electrical Engineering at Clemson and Mark and Chirag plan on going on to grad school in math.

Nick Vance has returned from the Budapest Semesters in Mathematics and Justin Brockman and Brian Pike are currently studying in Budapest and having a great time! Last semester, two students, Masha Bessonov and Mark Lavin presented results of their research. Masha's presentation was entitled "Shape Optimization of Microfabricated Polyimide Mounts for Cryocrystallography with the Finite Element Method," a result of her REU work last summer at Cornell. Mark talked about a "Life after AKS: An Examination of the Newest Generation of Primality Algorithms," based on his work with Dr. Kaltofen. Times and places of more presentations will be announced. Math majors have completed summer REU's at schools including Rutgers, U Ill., Lafayette Col., Hope Col., Rose-Hulman, Oregon St., Florida St., Col. School of Mines, Penn St., U Wash., U Puerto Rico, and Indiana.

Several new students have joined the Math Honors Program since last semester: Jason DeVito, Chris Cottrell, Will Davis, Jessica Page, David Roberson, Jessica Wagstaff, David Robinson, Maggie Linak, Chris Rogus, David Wilson, Ted Alff and Luke Bilbro.

Students interested in more information about the program should contact Dr. Paur, HA 202, 515-2598, sopaur@math.ncsu.edu or check out the honors program web site; www.math.ncsu.edu/honors.

"Out of nothing I have created a strange new universe."
János Bolyai (1802-1860)

COURSE ADVERTISEMENTS

Two Exciting Special Topics Courses
MA 797: Conservation Laws:
Theory, Numerics, Applications I & II
Pre-req: Some advanced Calculus, some experience with Fortran, C/C++ or MATLAB.

Conservation laws play a central role in countless applications such as fluid dynamics, solid mechanics, electromagnetism, astrophysics, etc. In this very active field, Theory and Numerics are highly intertwined. Recognizing this, Pierre Gremaud (Numerics) and Kris Jenssen (Theory) will join forces and offer TWO integrated special courses to be taught consecutively.

Fall 2004: Basic theory and numerics for Scalar Conservation Laws, Basic theory and numerics for Hamilton-Jacobi.

Spring 2005: Theory for systems of conservation laws, Numerics for systems, and Applications.

Who should attend: Advanced undergraduate and graduate students who deal with conservation laws from all areas of Engineering and Applied Mathematics.

Contact: Pierre Gremaud, gremaud@unity.ncsu.edu
Kris Jenssen, hkjensse@unity.ncsu.edu

For more information:
www.math.ncsu.edu/~hkjensse/ma797

Fractals and Complex Dynamics
MA 591F, Instructor: Dr. John Franke, franke@math.ncsu.edu

This three hour class looks at the mathematics behind and computer programming of fractals. The relationship between these intricate sets and complex dynamical systems is presented. The major prerequisite is MA 425. No programming experience is needed. Contact Dr. Franke so that a suitable time can be found for everyone wanting to take this class.

Calculus with Maple on Laptops
MA 141, 241, 242

These sections of Calculus require students to own a laptop computer with the software package Maple installed. The laptop sections will cover the usual Calculus topics. In these sections, Maple is integrated into the daily lectures. The major advantage is that modern technology will be incorporated into the classroom instruction. Maple is used on a regular basis to enhance student understanding of traditional topics and help them visualize many topics including graphs, surfaces, integrals and solutions to differential equations. Maple proves useful in checking difficult homework assignments. Students who take a laptop section learn to enjoy and appreciate the usefulness of Maple.

MA 493R—Putnam Seminar
591X—Intro. to the Calculus of Variations
More information: http://www4.ncsu.edu/~xblin/

Mathematical Models in the Physical Sciences
MA 430, Instructor: Dr. Ron Fulp, fulp@math.ncsu.edu
Pre-req: MA 341 or 301; and MA 405

I plan to provide an introduction to differential forms defined in a plane, in three dimensional space and in space-time. It will be shown how electromagnetism can be formulated in this language. This will require a discussion of how the wave equation emerges from the formalism and a discussion of gauge invariance. Additionally, it will be shown how to formulate the basic axioms of thermodynamics in terms of differential one-forms on a surface. Basic properties of the geometry of surfaces will be reviewed for this application. Finally, if time permits Hamiltonian mechanics will be formulated in terms of a Poisson algebra of functions defined on phase space. None of these topics will require physics beyond freshman physics nor mathematics beyond linear algebra and the third calculus course.

Intro. to Mathematical Foundation of Quantum Computation
MA 591J, Dr. Jing, jing@unity.ncsu.edu

Our current computer system is based on principles of classical mechanics, which makes certain cryptosystems vulnerable. Lately scientists began to study how to design better, quicker, and securer computing methods using ideas from quantum mechanics. Lots of progress has been made in the theoretical research, and this convinces us that quantum computers, if successively built, could lead to far-reaching applications. We will study mathematical foundation of this very active new theory. After a brief survey of quantum mechanics using matrix theory, we will discuss some of the basic methods and problems in quantum computation. P. Shor's famous algorithm and more examples will be discussed on how to quickly factor an integer on a quantum computer. No previous knowledge of quantum mechanics is assumed, and I will try to make everything mathematically self-contained.

Mathematical Biology

How is a disease transmitted through a population? How do Malaysian fireflies synchronize their lights with each other? How often should a patient get chemotherapy? How does a cell pinch itself in two? If you've ever wanted to answer a biological question with a mathematical answer, perhaps you should try a course in mathematical biology. Mathematical biology encompasses all of biology and most of mathematics. If you are an upper-level math major who has had some biology courses, you are prepared for these courses:

MA 432: Mathematical Models in Life and Social Sciences (pre. MA 301 or 341, 305 or 405, programming language)
BMA 567: Modeling of Biological Systems (pre. MA 131)
MA/BMA 573 or **574:** Mathematical & Experimental Modeling of Physical Processes I, II (pre. MA 341, MA 405, programming language)

"A proof tells us where to concentrate our doubts." Morris Kline

FACULTY ANNOUNCEMENTS

New Appointment for Dr. Lavon Page

Dr. Lavon Page, associate professor of mathematics, was appointed by the Provost to "head the implementation effort" of NC State's LITRE (Learning in a Technology Rich Environment) program "to create an innovative learning environment that stresses mastery of fundamentals, intellectual discipline, creativity, problem solving, and responsibility." Lavon has been heavily involved in the development of online math courses for several years. For more information see the NCSU Bulletin http://www.ncsu.edu/BulletinOnline/02_04/litreplan.htm or http://litre.ncsu.edu.

Wolfpack M6 Contest The Mathematics Department sponsors the Wolfpack Magnificent, Monthly, Mesmerizing, Money-Making, Minatory, Mathematical Problem Contest for undergraduate students of North Carolina State University. Each month of the Academic Year a problem is posted. Sometimes the problem is somewhat tame, and sometimes it is not. The student submitting the first and/or the best solution for the month's problem is recognized and receives a cash prize of one one-hundred-thousandth of one million dollars!

www.math.ncsu.edu/undergrad/contest/

Dr. Agnes Szanto receives NSF Grant

Dr. Agnes Szanto, assistant professor of mathematics, received a National Science Foundation (NSF) Faculty Early Career Development Award. The five-year grant was awarded for her proposal, "Solving Over-Constrained Systems of Non-Linear Equations by Symbolic-Numeric Methods." (This is an extension of a three-year grant for her proposal titled "Approximate Solutions of Degenerate Algebraic Systems.") The funds will be used to develop new courses in symbolic computation and provide research assistants and computer equipment to Szanto as she develops the theory and algorithms related to the research project.

UPCOMING COURSE One of these new courses is "Non-linear Algebra: Solving Non-linear Algebraic Systems." The objective of this course is to equip students with classical and modern mathematical theories and various state of the art algorithms for solving numerically and symbolically multivariate polynomial systems. This course can be viewed as the next step to the Linear Algebra where one learns the theory and algorithms for linear systems that utilize unique and remarkable properties of polynomials, not shared by other functions in general, thus the title "Non-linear Algebra". The first part of the class is devoted to solution over complex numbers, and the second part to solution over real numbers. Topics include Multivariate Weierstrass-Durand-Kerner, Groebner basis, Charateristic Sets, Multivariate Resultants, Mutivariate Sturm Theory, Cylindrical algebraic decomposition.

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Mathematics Newsletter
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