

Mathematics at Saint Michael's

A Guide for Students

An Invitation

If you happen to see some people from mathematics in the hall, we might be talking about our families or politics or the Celtics, but odds are better we are talking about our work. We like what we do.

And we're not alone. We asked some of our alumni for their thoughts on their college experience and their careers. Here are a few of the responses: "I feel I chose the right major. I love teaching math." "Having a more technical degree has certainly given me an edge in business. With each new position I have been offered I have been told that a big plus was my technical and analytical aptitude." "I was very happy with the Math Program at St. Mike's. Every course I took has been useful." "I feel my mathematics education laid an outstanding foundation for my work in the Navy and my graduate work."

If you like doing math, too, come join us. Take more courses, sign on as a minor, or look into becoming a major.

This booklet will help you window shop through our offerings. If you find something you might like, come in and ask about it. We'd love to talk.

Our Program

The mathematics requirements have been set up to both ensure you have a strong background, and allow you to explore your interests.

We have a backbone of required courses, most of which are four credits each, so you will be strong on the core mathematics. These courses include the calculus sequence, probability, abstract algebra, and analysis. In addition to that, you get to take some three-credit electives, so you can tailor your program to your taste. These electives let you work on a diversity of advanced topics. Some electives are number theory, foundations, and statistics.

Careers in Mathematics

We do mathematics because we like it. But isn't it nice to know you can be paid for it, too?

Sometimes people say, "Sure, math is fun, but you can't do anything *with* it." Actually the opposite is true – in this technical world people have trouble doing anything without math.

For one thing, no scientific career can go far without good math skills. In business and economics, building even simple models takes a solid math base. And with computers appearing in almost every field, the mathematics needed to use them effectively is sure to gain importance.

We believe a background in mathematics will help a person master whatever new comes along in the forty years they will be in the work force.

Here's what some of the people we know in mathematics do.

Industry

People certified in a series of exams to rate risks are called actuaries, and are highly valued by insurance companies. Mathematical modeling is an important part of any engineering analysis; we know people working on improving jet engines, and in detecting distant underwater sound sources. Computer programming often needs the mathematically skilled – several people we know write software. Statistics are in ever-wider use and the Statisticians to interpret them are in demand. For instance, biostatisticians are employed by many pharmaceutical firms. Some people use math as their pre-law or pre-med major (one of our students is now an optometrist). We even know people using mathematical models to predict what the stock market will do.

Government

Here too, actuaries judge the risks and benefits of proposals. Of course, the government needs lots of statisticians. Another application is the optimization of complex projects – for instance, how many toll booths will suffice at the end of a new bridge, or how many people should be interviewed as prospective jurors to be fairly sure of getting at least twelve suitable? Some mathematicians are even at work cracking secret codes.

Education

Many people in mathematics teach; the subject is fun to share. We find research fascinating, and several of our Saint Michael's students have gone on to graduate school in recent years. (All of them got financial support from their school.)

A final plug. The recent book *Jobs Rated Almanac* ranked careers on salary, working conditions, availability of positions, etc. The top career on the list was mathematician, and five of the top six careers were suitable for mathematicians. This underlines our point – mathematics is not just fun, it is in demand.

Consider the Minor

Almost any major is strengthened by a minor in mathematics. That's obvious for sciences, but majors in many other areas are also improved by the analytical sophistication our minor develops.

For instance, good M.B.A. schools expect students to know Calculus and Linear Algebra. A minor in math will help you get in, and help you succeed when you get there.

Some other majors that work well with a minor in math are economics, political science, biology, and computer science. If you are thinking about graduate school in one of those subjects, you should know that a minor in math may help you get financial support, because you'll be able to teach math methods courses.

Many people don't realize how easily a minor fits their plans. Check the requirements listed below and try the academic plan worksheet. Or just ask your advisor, or someone in math.

Course Descriptions

Sometimes a person can't understand the catalog listing of a course until after they have taken the course. Here is both the catalog listing and an informal description of our offerings.

DEPARTMENT OF MATHEMATICS

ASHLINE, CHAIR; ELLIS-MONAGHAN, HEFFERON, KADAS, SIMONS

Mathematics has, for centuries, been the foundation and language of the physical sciences. In our time, mathematical models and tools have come to pervade the biological and social sciences as well. Mathematics is an art, apprehending and creating structure and order in the universe. Mathematics is intellectually stimulating because it demands clarity and precision. Consequently, the Mathematics Department believes that some understanding of Mathematics will enhance the study of every discipline, and offers courses at a variety of levels to help all students develop their skill in Mathematical reasoning.

The major is designed to encompass diverse goals ranging from applied work in science or industry to teaching or graduate study. The required courses provide a strong foundation in the principle areas of Mathematics; the electives offer an opportunity to tailor the program to individual needs. Students should consult an advisor in the Mathematics Department to design a program consistent with their aims.

Mathematics majors are attractive to a wide variety of business and industrial firms, especially if the major is combined with some coursework in computer science, a natural science, economics, or business; many find work in the actuarial field or as analysts in the computer or communications industry. Mathematics majors may prepare to teach at the secondary school level by simultaneously completing Education courses, including a semester of student teaching, which leads to state certification.

The Mathematics major provides the background for graduate study in pure or applied mathematics, statistics, or (with some course work in biology) biostatistics. Combined with appropriate courses in other areas, the major may also be used to prepare for professional programs such as medical school, law school, or an MBA program.

Required for the major: Mathematics 109, 111, 211, 213, 251, 303, 401, 406, 410. Computer Science 111. Four more mathematics courses at or above the 200 level (three credits each), at least one of which is at the 400 level.

Required for the minor: Mathematics 109, 111, 211, 213, and any two more mathematics courses of three or more credits, at or above the 200 level

MA 101 Finite Mathematics

Three credits

An introduction to concepts of modern mathematics with application to business, economics, and the social sciences. Topics considered may include linear systems, matrices, linear optimization, sets, combinatorics, probability, logic, Markov chains and game theory, difference equations, and the mathematics of finance.

Non-majors only.

This is our distribution course. It covers a number of topics with some slant toward those of interest in Business and Economics. Not for majors or minors.

MA 102 Elementary Statistics

Three credits

Nature of statistical methods; description of sample data; probability, probability distributions; sampling; estimation; hypothesis testing; correlation and regression.

Non-majors only.

We have two different statistics courses, this one is not Calculus-based. It covers the basics of data analysis (for instance, mean and median, distributions, and hypothesis testing) at a descriptive level. Not suitable for math majors or minors.

MA 103 Elements of Calculus

Three credits

A one-semester survey calculus course. Not designed for those intending further study of calculus. Topics include derivatives and their applications, integration, applications of the definite integral.

Prerequisites: intermediate algebra and trigonometry. Credit will not be given for Mathematics 103 if credit has already been received for Mathematics 109.

Calculus with an emphasis on applying the material to Business and Economics, and Biology and Ecology. (Majors or minors should take Mathematics 109 instead of this course.)

MA 109 Calculus I**Four credits**

Scientific Calculus. Functions, limits, continuity; differentiation; integration; applications.

Prerequisites: intermediate algebra and trigonometry.

Often the first math course taken by majors or minors. This is a critical course for later success because much work in those later courses is a broadening and deepening of the material studied here.

Most of the semester is spent computing rates of change of functions. For instance, when we drop a ball, we know the formula relating elapsed time to distance fallen. Since speed is the rate of change of distance, we use Calculus to relate the elapsed time to the ball's speed.

We do those calculations for quite complicated functions, and we solve many associated problems, often from Physics or another science.

Required of all majors and minors, although those with a good high school Calculus course should apply for advanced placement credit.

MA 111 Calculus II**Four credits**

Continuation of Mathematics 109. Integration; applications; transcendental functions; plane analytic geometry; parametric equations and polar coordinates; infinite sequences and series.

Prerequisites: Mathematics 109, or permission of instructor, or Mathematics 103

We start by computing the areas of odd-shaped plane regions, and some three-dimensional regions as well. This is done by relating it to the topic differentiation, studied in 109.

Much of the semester consists of computational techniques used in this process, called integration.

The ending third of the semester considers infinite series, where hard-to-compute functions are approximated by polynomials.

Required of all majors and minors. First-year students with a good high school Calculus course should apply for advanced placement credit for Math 109 and sign up for this course.

MA 207 Discrete Mathematics**Four credits**

Topics from Discrete Mathematics and Mathematical Logic chosen for applicability to Computer Science. Propositional logic; Boolean circuits; techniques of formal proof; sets, functions, and relations; recursion and recurrence relations; graphs and networks.

Computer Science relies heavily on mathematical analysis. Deciding how fast a program runs, proving it always runs correctly, and even defining what a computer program is, all rely on ideas from mathematics.

We start with formal logic rules, show how they can be used to construct circuits like the one to add numbers, and so see how to build any electronic digital computer.

In the context of elementary number theory (prime numbers, etc.) we practice some of the advanced argument techniques used in mathematical proofs.

We apply those techniques to topics from Discrete Mathematics, which deals only (or mostly) with integers. For instance, what is the 408th term of the Fibonacci sequence

1,1,2,3,5,8,...? Another example: given a road map, how can you tell when you can take a trip that passes through each city once and only once (in computer terms, can a central computer traverse a network polling each terminal for input once and only once)?

MA 208 Theory of Computation**Four credits**

Mathematical theory of computation; computation models including finite state machines; Kleene's Theorem; push-down automata; lambda calculus; primitive recursive and recursive functions; Turing machines, computability, and the Halting Problem; NP completeness; other topics.

Prerequisites: Mathematics 207 or Mathematics 213.

We study various models of computation, considering what they can and cannot compute.

MA 211 Calculus III**Four credits**

Continuation of Mathematics 109-111. Vectors and vector-valued functions; partial differentiation; multiple integration and applications; line integrals, Green's Theorem, Stokes' Theorem.

Prerequisites: Mathematics 111.

The ideas of Calculus I and II are broadened and extended to several variables.

For instance, in Calculus II we find the two-dimensional area of odd-shaped regions. Here we find three-dimensional volumes (and even volumes of higher-dimensional shapes). We also extend the concept of a derivative. While in the plane we use tangent lines, in three-space we study tangent planes.

Required of all majors and minors.

MA 213 Linear Algebra**Four credits**

Systems of linear equations; vector spaces; linear independence and bases; direct sums; linear maps; matrices; determinants; eigenvalues and eigenvectors; canonical forms.

Prerequisites: Mathematics 211.

In Calculus I, we sometimes work with a function's tangent lines instead of with the function itself. In Calculus III, in three dimensions we similarly use tangent planes, or the higher-dimensional analog, linear surfaces. The reason we study linear things is because they are the easiest to understand.

Here we study linearity. For instance, we'll see how to intersect 7th dimensional linear surfaces. We find the volume of boxes bounded by linear surfaces. We see how to rotate or reflect objects in space, because those are linear operations. We'll see that the composition of linear operations is itself linear, and we'll find how to compute a composition from its components.

Required of all majors and minors.

MA 214 Number Theory**Three credits**

Divisibility and prime numbers; congruences and arithmetic modulo n ; Chinese Remainder Theorem; quadratic residues; Diophantine equations.

The study of the properties of the integers. This subject is as old as written history (the Babylonians knew about Pythagorean triples) and as new as today's headlines (recently a Princeton mathematician solved Fermat's Last Theorem: we know many integers x, y, z such that $x^2 + y^2 = z^2$, but there are no integer solutions when the exponent is higher than 2). In between are topics like finding the integer solutions of equations, clock arithmetic, and unsolved problems like Goldbach's Conjecture. (There are many pairs of primes like 5,7 or 34589, 34591 that are separated by 2 – are there infinitely many?)

One of the course themes is that we'll work on your skills at mathematical investigations and writing proofs. This a good course to take early in your program, so you can use these skills in later courses.

MA 216 Combinatorics**Three credits**

Selected topics from graph theory and enumeration such as isomorphism; planarity; circuits and coloring; search trees and network algorithms. Principles of counting; induction; permutations, combinations, and the binomial theorem; inclusion and exclusion principles; pigeonhole principle; partitions. Additional topics may be chosen from Stirling numbers, generating functions, graph theory, designs, partially ordered sets, codes.

Sample problems give the flavor: How many ways are there to divide a pile of 25 things into 5 different piles? What if each pile must have at least 3 things? What if each pile can have no more than 10 things?

As with MA 214, you'll write proofs. If you can, try to take this course as a first year or sophomore.

MA 251 Probability and Statistics**Four credits**

Introduction to probability and combinatorics; discrete distributions; density functions, moments; normal and exponential distributions with applications; Central Limit Theorem.

Prerequisites: Mathematics 211.

Most mathematics courses taken before the sophomore year emphasize solving problems with a single solution. Here we begin to deal with the nature of uncertainty in our world. We try to analyze problems where chance or luck cloud our vision of what's really happening. The question at the heart of this course is, "What accounts for the difference between similar events? Luck? Or is there a real difference?" An example: Why did the space shuttle Challenger explode after failures in parts called *O*-rings? Could scientists have prevented this disaster? Why hadn't there been other explosions in similar launches?

Required of all majors.

MA 303 Differential Equations**Four credits**

First order differential equations with applications including examples from biology and physics; qualitative analysis; approximation of solutions. Second order linear equations and applications; series solutions. Systems of differential equations. Other topics may include phase plane analysis, Laplace transforms, boundary value problems, difference equations.

Prerequisites: Mathematics 211.

When there is change in the physical world, differential equations are at work. Often we know how something changes and, from that, we want to predict its future behavior. For instance, we know how a plucked string springs back towards its rest position, and we would like to find its equation of motion. Describing how something changes means giving equations involving derivatives; then we look for functions satisfying those equations. We study methods for solving certain types of differential equations, and we look at many applications including population growth, mixing problems, and oscillating springs.

Required of all majors.

MA 304 History of Mathematics**Three credits**

A problem study approach to the history of mathematics emphasizing student participation. Topics may include: number systems, Babylonian and Egyptian mathematics, Pythagorean mathematics, duplication, trisection, and quadrature, Greek mathematics including Euclid's *Elements*, Hindu-Arabian and Chinese mathematics, and the prelude to and dawn of modern mathematics.

Prerequisites: Mathematics 111.

Some people find fascinating the development of our mathematical knowledge. We'll trace major threads up to and including the start of the development of Calculus and modern mathematics.

Especially suitable for future teachers.

MA 305 Numerical Analysis**Three credits**

Methods for approximating the solutions to mathematical problems that are hard to solve exactly. Topics include floating point representations; approximation of functions; roots of nonlinear equations; numerical differentiation and integration; interpolation and curve fitting; systems of linear equations; and numerical solution of ordinary differential equations.

Prerequisites: Mathematics 111.

We often approximate solutions and need to know the most accurate (or fastest) methods. For instance, if a polynomial has a root between 5 and 6, what is the fastest way to estimate that root to 8 decimal places?

MA 308 Euclidean and Non-Euclidean Geometries**Three credits**

Among the topics that are considered are Euclid's geometry, informal logic, Hilbert's axioms, neutral geometry, history of the parallel postulate, discovery of non-Euclidean geometry, independence of the parallel postulate, and some of the philosophical implications of these topics.

Prerequisites: Mathematics 111.

Euclid's geometry served for many centuries as a model of precise and exhaustive analysis. Imagine the surprise when people found geometric systems other than Euclid's. We look at Euclid's and the other systems, developing the theorems from classical axioms and discussing them from a modern viewpoint.

Especially useful for prospective teachers of mathematics.

MA 315 Complex Analysis**Three credits**

The topology and algebraic structure of the complex numbers; differentiation and integration of complex-valued functions; power series and Laurent series; Cauchy's Theorem and the residue calculus.

Prerequisites: Mathematics 211.

The equation $2x=1$ has no integer solution. If we add the solution $1/2$ to the integers and "close up" (performing usual operations on it like multiplying by 5 to get $5/2$), then there are still linear equations without solutions, such as $3x=1$ – since we've added only halves, we don't have thirds. But if we start with the reals and study $x^2 = -1$, a different thing happens. Expanding from the real number system to include a solution (denoted i) and closing up to including numbers like $5+2i$ gives us the complex numbers. Surprisingly, in this system we can solve not just $x^2 = -1$ and closely related equations, but any polynomial equation. We'll study the geometry of this number system, and the Calculus, too.

MA 380 Topics in Mathematics**1-3 credits**

Allows students and faculty the chance to study (at an introductory level) a topic or topics not normally offered by the mathematics department.

Prerequisites: Permission of the instructor.

This allows us to give courses that are not (yet) part of the regular program. Keep an eye out for these courses, or ask about having one offered if there is a subject in which you are interested.

MA 381 Mathematics Education Seminar**One credit**

Enhances the ability of teaching mathematics at the secondary level (or other levels), facilitates effective mathematics lesson preparation and presentation to a class, addresses current issues in mathematics education (such as use of technology), and encourages use of ancillary teaching resources.

Prerequisites: Permission of the instructor.

Intended for those interested in mathematics education at any level.

MA 399 Mathematics Internship**1-4 credits**

An internship provides students an opportunity to put their mathematics skills into practice in a business or organization. Connections between theoretical concepts and real world problems are explored. Students usually keep a journal detailing their experience and do outside reading or computing projects as agreed to by the site supervisor and faculty sponsor.

Prerequisites: 15 hours of mathematics courses, including Mathematics 211.

We have had a number of successful internships. Discuss with your advisor if it fits your program.

MA 401 Real Analysis I**Four credits**

A rigorous study of the real number systems: field and order axioms; completeness; topology. Limits, sequences, series. Functions and continuity; pointwise and uniform convergence.

The derivative and the Riemann integral.

Prerequisites: Mathematics 213.

We study the theory underpinnings of Calculus.

In Calculus we often touch on topics but leave them aside for lack of time. For instance, we see that a continuous function on a closed interval must have a maximum, but if the interval is open it need not have a maximum. What is so special about “closed”? Do other kinds of sets have this property?

This is “Calculus done right” in the sense that when we come to an interesting (and, perhaps, difficult) point we stick with it until we’ve analyzed it.

Required of all majors.

MA 403 Real Analysis II**Three credits**

Functions of several variables, the derivative and Riemann integral in higher dimensional real spaces; implicit and inverse functions; other topics.

Prerequisites: Mathematics 401.

A continuation and extension of MA 401.

MA 406 Abstract Algebra I**Four credits**

Basic theory of groups, rings, and fields; subgroups, normal subgroups, and quotient groups; Fundamental Theorem of Algebra; ideals and quotient rings; the homomorphism theorems.

Prerequisites: Mathematics 213.

The integers and the real numbers require two different algebra systems; in the reals the rule “if x is a number and $y \neq 0$ then x/y is another number” holds while in the integers it does not. We often run across such different kinds of algebra systems. For instance, any two 2×2 matrices can be added, subtracted, or multiplied, but only some have inverses. We’ll study some common types of algebra systems. A typical question is, “In this kind of algebra system, must every polynomial have a root?”

Required of all majors.

MA 407 Abstract Algebra II**Three credits**

Construction of extension fields; field automorphisms and Galois theory; Fundamental Theorem of Algebra; insolvability by radicals of quintic equations.

Prerequisites: Mathematics 406.

A continuation and extension of MA 406.

MA 410 Seminar in Mathematics**One credit**

Exposes students to variety of topics of current interest. Students present lectures on appropriate topics.

Prerequisites: At least Junior standing; Mathematics 213.

This course should be taken as a Junior or Senior. It involves exposure to areas people in mathematics are working on now. Topics may be Chaos and Dynamical Systems, Cryptography, the Four Color Theorem, or Graph Theory. Among other things, students study an area of mathematical research and report on it.

Required of all majors.

MA 417 Applied Mathematics**Three credits**

Focuses on mathematical models used in the sciences. Topics may include Fourier series methods for solving differential equations, vector methods such as differential operators on scalar and vector functions, applied matrix algebra.

Prerequisites: Mathematics 213, 303.

This is a topics course with applications and methods fitting student interests. The course builds on MA 211 and MA 213. For example, we consider some partial differential equations – those enable us to deal with quantities that vary in both space and time – like vibrating drum heads or populations of animals.

MA 451 Statistical Inference**Three credits**

Uses the theory and methods of MA 251 to explore in detail of one or more common statistical technique. Topics may include regression and analysis of variance; time series; multivariate statistics; nonparametric methods. Applications included through use of computer assignments and data analysis projects using real data from a variety of sources.

Prerequisites: Mathematics 213, 251.

We continue MA 251 in a slightly different direction. We look at how a particular Statistical investigation typically proceeds, emphasizing depth in a few ideas rather than surveying all available techniques.

MA 480 Advanced Topics in Mathematics**Three credits**

Offered when a group of students and an instructor wish to continue the study, at an advanced level, of a topic introduced in a previous course.

Prerequisites: At least Junior standing; permission of the instructor.

Mathematics not covered in regularly-scheduled courses. Topics may be proposed to the department chair by a group of students or an instructor with a special mathematical interest.

MA 490 Readings and Research in Mathematics**Credits/Meetings to be arranged**

An opportunity for advanced students to undertake independent study or research. Topics will be chosen and study conducted in close consultation with a member of the mathematics faculty. Generally results are submitted in written form and presented in a seminar.

Prerequisites: At least Junior standing; permission of the instructor and department chair.

A chance for an advanced student to investigate an area not covered in our regular courses.

MA 495 Honors Thesis in Mathematics**Three credits**

Independent research and thesis under the supervision of a member of the mathematics faculty. Students must have permission of a supervisor and submit their research proposal to the department chair before preregistration for the semester in which the proposed research is to take place. This course may not be used as the student's 400-level elective of the major requirements.

Prerequisites: At least Junior standing; membership in the Saint Michael's Honors Program; permission of the supervisor and department chair.

Activities

Pi Mu Epsilon

In 2003, we installed the Vermont Alpha Chapter of Pi Mu Epsilon, Honorary National Mathematics Society. PME promotes scholarly activity in mathematics among the students in academic institutions and among the staffs of qualified non-academic institutions.

We typically induct new student members each fall semester. Our chapter elects student officers and hosts speakers and other events which are open to the campus community.

Mathematics Awareness Month

Mathematics Awareness Month is held each April. Its goal is to increase public understanding of and appreciation for mathematics. During this month, national math organizations sponsor activities, and we often organize a campus lecture or event. Recent themes include Mathematics and Climate, Mathematics and Voting, and Mathematics and the Brain.

Putnam competition

This is a national mathematics contest held in December. Putnam questions are puzzles, and each contest has a dozen of them. An emphasis is on creativity with basic mathematics.

This is strictly for the fun of a challenge; anyone who has taken Calculus can join in. Talk to Prof. Simons about practice sessions.

Hudson River Undergraduate Mathematics Conference

Every spring we go to the HRUMC. This is a one-day event held at a different college each year and attended by students and faculty from a variety of schools from all over New York and New England. The goal is to provide students with the experience of attending and presenting at a professional mathematics meeting.

Consequently, in addition to a longer invited address by a noted mathematician, the main activity is many concurrent sets of shorter talks, given by student and faculty attendees. Every year some SMC students (and faculty) give talks. They are always well-received, and it is a great experience.

Actuarial and Praxis exams

These exams can be quite challenging, and students preparing for these exams may find study groups helpful. Ask if there are other people interested and we may be able to arrange a group. There may be other Education students interested in Praxis preparation.

Research opportunities

There are a number of opportunities to pursue research projects in mathematics and mathematics-related fields, including independent study courses, undergraduate research experiences, and participation in on-going research projects with various department members.

This is a chance to learn research skills beyond the classroom and often to work on open questions in mathematics and current applications. The experiences typically lead to presentations at conferences such as HRUMC and have even resulted in publication of journal articles. We also support our mathematics students in applying to a number of summer undergraduate research programs, and study abroad opportunities (such as the Budapest Semester in Mathematics).

Mathematics Department

Faculty Members: These are the full-time faculty members of our department.

George Ashline *Professor of Mathematics (Department Chair)*
B.S. St. Lawrence University; M.S., Ph.D. University of Notre Dame



Courses Taught: Elementary Statistics; Calculus; Number Theory; Probability and Statistics; Linear Algebra; History of Mathematics; Complex Analysis; Mathematics Education Seminar; Real Analysis

Areas of Expertise: Mathematics education and mathematics pedagogy; mathematical preparation of in-service and pre-service teachers; complex analysis

Recent Scholarly Achievements: Dr. Ashline co-wrote the article "Using Mathematically Rich Tasks to Deepen the Pedagogical Content Knowledge of Primary Teachers" which has been published as a chapter in the *Springer-Verlag text Tasks in Primary Mathematics Teacher Education: Purpose, Use and Exemplars* (2009). He co-developed and co-taught courses for Vermont mathematics teachers through the Vermont Mathematics Partnership. He also created course materials and co-taught other courses through the Vermont Mathematics Initiative.

Joanna Ellis-Monaghan *Associate Professor of Mathematics*
B.A. Bennington College; M.S. University of Vermont;
Ph.D. University of North Carolina, Chapel Hill



Courses Taught: Elementary Statistics; Calculus; Number Theory; Combinatorics; Real Analysis; Abstract Algebra

Areas of Expertise: Algebraic combinatorics, especially graph polynomials, and applied graph theory in statistical mechanics, computer chip design and bioinformatics.

Recent Scholarly Achievements: Dr. Ellis-Monaghan recently completed a visiting fellowship at the Isaac Newton Institute, Cambridge University in Cambridge, England. The fellowship was in the combinatorics and statistical mechanics program.

Jim Hefferon *Professor of Mathematics,*
B.S., M.S., Ph.D. University of Connecticut



Courses Taught: Elementary Statistics; Calculus; Theory of Computing; Linear Algebra; Probability and Statistics; Geometries; Numerical Methods; Real Analysis; Abstract Algebra

Areas of Expertise: Dr. Hefferon's background is in the theory of computation. In addition, he administers the CTAN archive of software for the TeX typesetting system at www.ctan.org.

Recent Scholarly Achievements: Dr. Hefferon co-wrote The TeX family in 2009 for the American Mathematical Society's *Notices*. He gave the invited address at the EuroBacho TeX 2007 conference in Tama Brodzka, Poland, on "An Experimental Upload System for CTAN."

Zsuzsanna Kadas *Professor of Mathematics*
B.S. St. John's University; M.S., Ph.D. Rutgers University



Courses Taught: Calculus; Discrete Mathematics; Linear Algebra;
Differential Equations; Real Analysis; Applied Mathematics

Areas of Expertise: Differential equations; nonlinear dynamics; chaos and fractals; reaction-diffusion systems; mathematical models in chemistry, physiology, population dynamics

Recent Scholarly Achievements: Dr. Kadas is the project director on a \$70,000 grant that's used to support undergraduate research at Saint Michael's. The grant is funded by the NASA-National Space Grant and Fellowship Program.

Lloyd Simons *Professor of Mathematics*
B.Sc. University of British Columbia;
M.Sc., Ph.D. McGill University



Courses Taught: Elementary Statistics; Calculus;
Linear Algebra; Probability and Statistics; Geometries;
Complex Analysis; Real Analysis; Abstract Algebra

Areas of Expertise: Algebraic Number Theory; Algebraic K Theory

Recent Scholarly Achievements: Dr. Simons helped to host the Spring Northeast Section Mathematical Association of America meeting at Saint Michael's in May 2008. The meeting focused on "Mathematical Modeling in Biology and the Environment."

The Math Program for You

There are two ways for you to get a Mathematics degree at Saint Michael's.

The first way is a traditional Mathematics major, which prepares you with strong courses in the core topics, while allowing you to select among a number of optional courses.

The second way allows students with specialized interests (such as elementary education) to develop a program that mixes some area of outside interest with a core of math courses.

For more information, and examples, see the *Majoring in Mathematics at Saint Michael's* document, or consult with a member of the Mathematics department.

More information about our program is available on our departmental webpage on the Saint Michael's academic server at <http://www.smcvt.edu/academics/mathematics/>. Check it out!