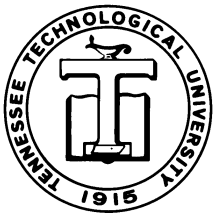
TENNESSEE TECH UNIVERSITY
DEPARTMENT OF MATHEMATICS
COOKEVILLE, TN 38505

TEL: (931) 372-3441
www.tntech.edu/cas/math/

GRADUATE STUDENT HANDBOOK



October 2020

CAMPUS AND PROGRAM OF STUDY
INFORMATION FOR GRADUATE STUDENTS IN MATHEMATICS

Dear Prospective or Current Graduate Student:

We have prepared this Graduate Student Handbook with you in mind. We have included a description of the application process, reviewed conditions for admission, described responsibilities of our graduate assistants and students and our expectations of you as a graduate student. While we hope that this handbook will answer many of your questions as you progress through our Graduate Program, we would like for you to always feel free to stop by the Mathematics Department Office or contact us by phone or e-mail. We look forward to your mathematics graduate studies at Tennessee Technological University.

Sincerely,

Graduate Faculty

Please consult the current "Graduate School Catalog" for the most current and complete information about various Graduate School policies and procedures. The graduate catalog can be found at https://catalog.tntech.edu/index.php .

A link to Tennessee Tech's Graduate Student Handbook can be found at: https://www.tntech.edu/graduatestudies/gradstudent-info.php.

Location

Tennessee Tech University (Tech) is located in Cookeville, TN, which is 80 miles east of Nashville and 100 miles west of Knoxville on Interstate 40. Major airline services are available through Nashville and Knoxville. A limousine service provides rides to both the Nashville and Knoxville airports. Another major international airport is about 214 miles away in Atlanta, Georgia. Greyhound Bus service connects Cookeville with many major cities. The city of Cookeville, which has a population of more than 34,000, is located on the eastern Highland Rim of Tennessee at an elevation of 1,140 feet and is in the Central Time Zone. In the vicinity of Cookeville, there are three large lakes, several state parks, a multitude of rivers and waterfalls, underground caves, mountain streams with white-water rafting, and more. It is a paradise for boaters, scuba divers, canoeists, fishermen, and hikers.

The Department of Mathematics is temporarily housed in Foundation Hall (see campus maps available at https://www.tntech.edu/maps/). The department will return to Bruner Hall when the renovation of that building is completed (expected August 2021).

The department's office is in FNDH 220, and most faculty offices are in FNDH 250. Our two departmental secretaries, Patsy Peavyhouse (931-372-3441) and Vickie Mayberry (931-372-3442), are able to help you with many questions you may have.

Graduate Student Advisor

Dr. Amy Chambers is the Graduate Student Advisor. Her office is in FNDH 250, and her e-mail address is achambers@tntech.edu. She serves as the initial academic advisor for graduate students. During the first year of study, each student should select his/her Advisory Committee, which then directs his/her studies.

The Graduate Student Advisor also:

1. Informs students about policies of the Mathematics Department and the Graduate School, and makes sure that these policies are followed and various deadlines are met, etc.
2. Conducts the Teaching Seminar and the Graduate Seminar.
3. Is responsible for scheduling presentations of students and faculty at the Graduate Seminar.
4. Is the first people to contact with questions outside of academic advising, e.g. about conducting classes and other matters related to your teaching duties.

Admission to the M.S. in MATH Graduate Program

Information about how to apply can be found at https://www.tntech.edu/graduatestudies/how-apply.php.

Admission to the College of Graduate Studies is open to anyone holding a Bachelor's or Master's degree from an accredited college or university. A foreign degree must be equivalent to a U.S. Bachelor's degree and must be accredited by its regional or national accreditation agency or Ministry of Higher Education. Applicants should have completed undergraduate or graduate work of sufficient quality and scope to enable them to successfully pursue graduate study.

Most incoming students start our program in the fall semester. Students interested in starting in a fall semester should complete their application materials by February 1. Admission decisions and graduate assistantship awards are typically made by the end of March.

As a necessary condition to be admitted to the Mathematics Graduate Program with Full Standing, an applicant must meet the following minimum requirements:

1. Successful completion (at least a "C" or better) of at least one semester-long undergraduate course in Abstract Algebra (MATH 4010 or equivalent)
2. Successful completion (at least a "C" or better) of at least two semester-long undergraduate courses in Real Analysis (MATH 4110-4120 or equivalent)
3. An overall undergraduate QPA of at least 2.5 (based on a 4.0 scale)
4. At least 3 letters of recommendation, each indicating an expectation for success in a graduate mathematics program
5. (International Students Only) A TOEFL score of at least 550 or an IELTS score of at least 6.0 **or** the attainment of level 9 in the FLS international Intensive ESL program
6. Demonstrated potential for success in a graduate mathematics program by attaining **at least one** of the following:
    - An overall undergraduate mathematics QPA of at least 3.5 (based on a 4.0 scale)
    - At least a 140 verbal score, 150 quantitative score, and 3.0 analytical writing score on the GRE General Examination
    - At least a 700 on the GRE Subject Test in Mathematics

It should be understood that fulfilling the above minimum requirements is not sufficient to guarantee that an applicant will be admitted with full standing. A student may be admitted to the Mathematics Graduate Program with Provisional Standing if one or more of the above requirements are not met, assuming that the student has an overall undergraduate QPA of at least 2.25 (based on a 4.0 scale) and at least 3 letters of recommendation, each indicating an expectation for success in a graduate mathematics program. Recommendations for admission (with Full or Provisional Standing) are made by the Mathematics Department Chairperson in consultation with the Mathematics Graduate Committee based upon an analysis of the applicant's mathematical background and potential for success in the Mathematics Graduate Program. A student in Provisional Standing may be reclassified to Full Standing once the student has satisfied the appropriate requirements detailed in the admission letter.

For the sake of evaluation for an assistantship, applicants are highly encouraged to take both the GRE General Examination and the GRE Subject Test in Mathematics and submit their scores with the application. To receive a graduate assistantship a student must be admitted in Full Standing.

Students who do not hold an undergraduate degree in mathematics or who have not completed an equivalent of four years of university studies in mathematics may be admitted provisionally. They will then be required to complete certain undergraduate courses in mathematics before achieving full standing. These background courses may include MATH 5110/5120 Advanced Calculus I-II, MATH 4010/4020 Modern Algebra I-II, or MATH 3400 Introduction to Concepts of Mathematics (to see course descriptions go to https://www.tntech.edu/cas/math/course-descriptions-and-syllabi.php).

Financial Aid: Graduate Assistantships, Tuition and Fee Waivers

The Department of Mathematics typically awards eight graduate assistantships. Each assistantship covers all tuition and fees and pays a stipend of $9,600 for the academic year. The stipend is paid over an 8-month period. Currently there is no summer support available. A student must be in Full Standing to be offered an assistantship. In order to remain on a graduate assistantship, all graduate assistants are required to maintain a minimum quality point average of 3.0 each semester, which is equivalent to a B average. Graduate assistantships normally do not cover more than four semesters of study.

Graduate students who are granted an assistantship are required to work 20 hours a week including attending the Teaching Seminar and Graduate Seminar. Graduate assistants with less than 18 hours of graduate course credit are typically assigned to staff the Mathematics Emporium or to serve as a teaching assistant for an instructor of a large section (this involves attending the course lectures, grading papers, and holding office hours to assist students). Graduate assistants who have earned at least 18 graduate credit hours are assigned to teach up to two courses (6 credit hours) per semester. Students normally teach during their second year at Tech after they accumulate at least 18 graduate hours in mathematics during the first two semesters.

Students supported by a graduate assistantship are expected to take 9 credit hours of MATH courses each semester. Graduate students who do not have assistantships are not required to perform any duties; however, they are expected to attend the graduate and teaching seminars.

Students interested in a graduate assistantship are encouraged to take the Graduate Record Exam (GRE).

Housing

Graduate students may live on campus or off campus. On-campus housing consists of dormitories and an apartment complex known as *Tech Village*. Dormitory rooms are furnished but the apartments are not. It is possible, for an extra charge, to request a dormitory room without a roommate. Information about on campus housing options and rental rates can be found at: https://www.tntech.edu/reslife/housing/

There are several off-campus apartment complexes located within a short five to ten-minute walk to the Tech campus. These apartments usually require a 12-month lease, a down payment for the first month and a security deposit equal to one month of rent. Various size apartments are available, and graduate students often share them to reduce costs. All units are usually rented three to four weeks before the semester begins.

Health Services

Tennessee Tech's Health Services is located at the corner of 7th and Mahler Avenue (east side of Bell Hall near the railroad tracks). Our health care providers are experienced in treating various medical problems. We offer acute and urgent care, preventive care, immunizations, and allergy shots. Our professional staff includes a physician, family nurse practitioners (FNP), nurses, and a pharmacist. Also, we have a pharmacy technician and administrative associates as our support staff.

All services are available to full-time and part-time registered students and faculty/staff at Tennessee Tech. Services are NOT available to families of students or to families of faculty/staff.

It is best to make an appointment; however, walk-ins may be available if time permits. Please call 931-372-3320, or schedule an appointment online via the Eagle Wellness Portal.

Practical Matters

The following is a list of some practical things that graduate students should know about:

1. Each graduate student will need an I-9 card as well as a Social Security Number before starting their first semester. While U.S. students already have such a number, each international student will need to apply for that number at the Social Security Office located at 1145 Perimeter Park Drive in Cookeville. Please call that office at 1-888-717-1528 to find out when the office is open. There is no charge to apply for the number.
2. Each graduate assistant will need to open a bank account at a local bank since assistantship stipends are paid via direct deposit.
3. There is one ATM (cash machine) on campus in the University Center on the ground floor.
4. A campus medical clinic (Tech Health Services) open to students is located in Bell Hall.
5. The International Education Office (located in Derryberry Hall 135, phone 372-3634) is the first and main contact point between international students and the University. It provides orientation to all incoming international students.
6. Each graduate student is issued a mailbox in the Mathematics Department Office. Thus, all mail can be sent to the student at the following address: Department of Mathematics, Box 5054, Tennessee Tech University, Cookeville, TN 38505.
7. Each graduate assistant is supplied with a desk in the Graduate Student Office located in FNDH 221.

8. Please see Vickie Mayberry in the departmental office for a key or access code to the Graduate Student Office.
9. All new incoming students at any public institution of higher learning in Tennessee who are under 22 years of age and are living in on-campus housing are required to produce proof of adequate immunization against meningococcal disease (meningitis).
10. All graduate assistants must complete two online training modules concerning Sexual Misconduct and Discrimination.
11. All graduate students should be familiar with the FERPA regulations. A quick fact sheet can be found at: https://www.tntech.edu/records/ferpa.php

Program of Study; Faculty Advisor and Advisory Committee

A few weeks before a student begins graduate study, a provisional Program of Study will be created (identifying the courses to be taken the first semester and a tentative plan for following semesters). During the first year of study each student must select a faculty member to serve as his/her Advisor to supervise the thesis or non-thesis program. The advisor will help the student select an Advisory Committee and finalize a Program of Study to be submitted to the College of Graduate Studies. The signed Program of Study must be filed with the College of Graduate Studies by the end of the semester in which the student will earn 15 graduate credit hours (typically the second semester).

The Faculty Advisor, Advisory Committee members and Program of Study should be determined no later than the middle of the second semester of study. The Graduate Advisor advises the student until the Advisory Committee is formed. Per recommendation of the departmental Graduate Committee, the first and sometimes the second semester schedule may include some additional preparatory courses such as advanced calculus or undergraduate abstract algebra.

Requirements for the Master's Degree (M.S.) in Mathematics

The Department offers the Master of Science degree in Mathematics with emphasis in applied mathematics, statistics, and pure mathematics. While the preferred academic background for applicants to the Graduate Program is a B.S. in Mathematics, the department also encourages talented students holding B.S. degrees in areas related to mathematics to apply.

If you have not taken an advanced calculus course or its equivalent or have not taken a two-semester undergraduate course in abstract algebra, you may be required to take these courses before you can take our 6000-level classes.

Requirements for the Thesis Option M.S. degree in Mathematics:

* 3 credit hours of 6000-level Algebra
* 3 credit hours of 6000-level Analysis
* Two one-year approved sequences (chosen from the list below) totaling 12 semester hours
* A written thesis and 6 credit hours of thesis credit
* A minimum of 30 graduate credit hours, including at least 21 hours at the 6000 level.

Requirements for the Non-Thesis Option M.S. degree in Mathematics:

***** 3 credit hours of 6000-level Algebra
* 3 credit hours of 6000-level Analysis

* 3 credit hours of MATH 6991 Research and Independent Study
* Three one-year approved sequences (chosen from the list below) totaling 18 semester hours
* A Comprehensive Examination in two of the three subject areas covered by the three required sequences. Selection of the two areas of the examination will be left to the graduate student and to the graduate student's advisor subject to the approval of the student's Graduate Advisory Committee.
* A minimum of 33 graduate semester hours, including at least 24 hours at the 6000-level.

Graduate School Policy on Comprehensive Examinations for Non-Thesis Option Masters Degree

"The comprehensive examination for the non-thesis Master's degree will be prepared and administered by the department offering the program. The student's performance on the examination must be reported to the Graduate School by the date for reporting grades of graduating seniors. A student will normally have a maximum of two attempts to pass the comprehensive examination. In extenuating circumstances, and on the recommendation of the student's Advisory Committee, the Chair of the Department, and the Dean of the College, the Associate Vice President for Research and Graduate Studies may grant the student one more attempt to pass the comprehensive examination. This policy was approved at the Graduate School Executive Committee Meeting on April 15, 2003."

Program Description

The Department of Mathematics offers a comprehensive program leading to a Master of Science degree in Mathematics. The program of study provides suitable preparation for further study at the doctoral level or for a career in teaching, government, or industry. The moderate size of the program encourages faculty-student interaction and allows the student an opportunity to tailor a program of study based on individual background, interest, and goals. Graduate students attend a weekly Graduate Seminar and develop teaching skills through participation in the weekly Teaching Seminar.

The flexibility of our graduate program allows students to concentrate in either pure or applied mathematics, or statistics.

Pure Mathematics: The Department regularly offers courses in complex, functional, and real analysis, abstract algebra, linear algebra, graph theory, combinatorics, and less frequently in topology, differential geometry, and number theory. These courses offer a solid background for further graduate study or for a teaching position in a community college.

Applied Mathematics: The Department frequently offers several courses in ordinary and partial differential equations and in numerical analysis. Other courses regularly taught include calculus of variations, operational mathematics, and integral equations. These classes provide a good foundation for further graduate study and also support master and doctoral programs in engineering at Tennessee Tech.

Statistics: The Department currently offers courses that cover topics in applied regression analysis, analysis of variance, design of experiments, probability theory, mathematical statistics, and stochastic processes. These courses, especially probability and mathematical statistics, provide students with a very good foundation in statistical theory. In the applied statistics courses, students are trained to formulate scientific concepts and problems in mathematical terms, to solve the resulting problems, and to prepare and interpret summary statistical reports. Overall, students learn statistical theory and

applications that prepare them for further graduate study and/or careers in business, industry and government.

Graduate Courses

The following graduate courses are offered in the Mathematics Department. Students should consult the Course Offerings Plan at https://www.tntech.edu/cas/math/course-descriptions-and-syllabi.php to find out when a course is scheduled to be offered since most of the upper level courses are not offered each semester. If there are any topics that interest a graduate student but which are not represented as a regular course (for example, algebraic geometry, theory of quadratic forms, Clifford algebras, mathematical physics, and more), a special topics course, MATH 6910, may be requested by the student. Note that MATH 6910-6920 - Special Topics counts toward the degree provided it is taught as a six-hour sequence and that it has received prior approval of the student's Advisory Committee or, if the committee has not yet been appointed, by the Graduate Committee.

Note: Our 5000-level graduate courses are dual-listed as 4000-level undergraduate courses.

MATH 4010(5010)	Modern Algebra I-II. Lec. 3. Credit 3.
MATH 4050 (5050)	Number Theory. Lec. 3. Credit 3.
MATH 4060 (5060)	Topics in Cryptography. Lec. 3. Credit 3.
MATH 4110-20 (5110-20)	Advanced Calculus I-II. Lec. 3. Rec. 1. Credit 3.
MATH 4210-20 (5210-20)	Numerical Analysis I-II. Lec. 3. Credit 3.
MATH 4250-60 (5250-60)	Advanced Ordinary Differential Equations I-II. Lec. 3. Credit 3.
MATH 4310-20 (5310-20)	Introduction to Topology I-II. Lec. 3. Credit 3.
MATH 4350 (5350)	Introductory Combinatorics. Lec. 3. Credit 3.
MATH 4360 (5360)	Graph Theory. Lec. 3. Credit 3.
MATH 4410 (5410)	Differential Geometry. Lec. 3. Credit 3.
MATH 4470-80 (5470-80)	Probability and Statistics I-II. Lec. 3. Credit 3.
MATH 4510 (5510)	Advanced Mathematics for Engineers. Lec. 3. Credit 3.
MATH 4530-40 (5530-40)	Linear Algebra I-II. Lec. 3. Credit 3.
MATH 4550-60 (5550-60)	Mathematics of Investment I-II. Lec. 3. Cr. 3.
MATH 4610 (5610)	History of Mathematics I. Lec. 3. Credit 3.
MATH 4620 (5620)	History of Mathematics II. Lec. 3. Credit 3.
MATH 4710 (5710)	Vector Analysis. Lec. 3. Credit 3.
MATH 4750 (5750)	Category Theory of Sets. Lec. 3. Credit 3
MATH 4850 (5850)	Computational Algebraic Geometry I. Lec. 3. Credit 3
MATH 4860 (5860)	Computational Algebraic Geometry II. Lec.3. Credit 3
MATH 4910-20 (5910-20)	Directed Readings. Credit 3.
MATH 4950 (5950)	Topics in Mathematics. Lec. 3. Credit 3.
MATH 4970	Senior Seminar. Credit 1, 1 hour
MATH 4991, 4992, 4993	Mathematical Research. Credit 1, 1 hour; 2, 2 hours; 3, 3 hours
MATH 6001-6002	Communicating Mathematics I-II. Lec. 3. Cr. 3.
MATH 6010-6020	Functional Analysis I-II. Lec. 3. Credit 3.
MATH 6070-6080	Applied Linear Statistical Methods I-II. Lec. 3. Credit 3.
MATH 6110-6120	Abstract Algebra I-II. Lec. 3. Credit 3.
MATH 6150	Mathematical Modeling. Lec. 3. Credit 3.
MATH 6170-6180	Experimental Design I-II. Lec. 3. Credit 3.
MATH 6210-6220	Topology I-II. Lec. 3. Credit 3.
MATH 6240-6250	Representations and Characters of Groups I-II. Lec. 3. Credit 3.

MATH 6270	Mathematical Statistics. Lec. 3. Credit 3.
MATH 6310-6320	Complex Analysis I-II. Lec. 3. Credit 3.
MATH 6370-6380	Probability Theory and Stochastic Processes I-II. Lec. 3. Credit 3.
MATH 6410-6420	Real Analysis I-II. Lec. 3. Credit 3.
MATH 6450	Advanced Theory of Computation. Lec. 3. Credit 3.
MATH 6460	Computational Methods for Graphics and Modeling. Lec. 3. Cr. 3.
MATH 6470	Environmental Statistics. Lec. 3. Cr. 3.
MATH 6510	Finite Difference Solutions of PDE's. Lec. 3. Credit 3.
MATH 6520	Finite Element Solutions of PDE's. Lec. 3. Credit 3.
MATH 6530	Integral Equations and Applications. Lec. 3. Credit 3.
MATH 6540	Calculus of Variations and Applications. Lec. 3. Credit 3.
MATH 6610	Operational Mathematics. Lec. 3. Credit 3.
MATH 6700	Graph Theory. Lec. 3. Cr. 3.
MATH 6810	Partial Differential Equations. Lec. 3. Credit 3.
MATH 6900	Mathematics Seminar. Lec. 1. Credit 0-1.
MATH 6910-6920	Special Topics in Mathematics. Credit 1-3.
MATH 6990	Research and Thesis. Credit 3,6.
MATH 6991	Research and Independent Study. Credit 1-3.

For more information go to **https://www.tntech.edu/cas/math/course-descriptions-and-syllabi.php**.

Approved Sequences

Every graduate student choosing the Thesis Option must select two sequences totaling 12 credits from among the ones listed below. Every graduate student choosing the Non-Thesis Option must select three sequences totaling 18 credits from among the ones listed below.

- MATH 6010-6020 Functional Analysis I and II
- MATH 6070-6080 Applied Linear Statistical Methods I and II
- MATH 6110-6120 Abstract Algebra I and II
- MATH 6170-6180 Experimental Design I and II
- MATH 6210-6220 Topology I and II
- MATH 6240-6250 Representations and Characters of Groups I and II
- MATH 6310-6320 Complex Analysis I and II
- MATH 6370-6380 Probability Theory and Stochastic Processes I and II
- MATH 6410-6420 Real Analysis I and II
- MATH 6450 Advanced Theory of Computation and MATH 6460 Computational Methods for Graphics and Modeling
- MATH 6910-6920 Special Topics in Mathematics
- Any two of the following courses (four must be taken in order to complete two sequences):
    - MATH 6510 Finite Difference Solutions of Partial Differential Equations
    - MATH 6520 Finite Element Solutions of Partial Differential Equations
    - MATH 6530 Integral Equations and Applications
    - MATH 6540 Calculus of Variations and Application
    - MATH 6610 Operational Mathematics
    - MATH 6810 Partial Differential Equations

Permissible Loads

Nine credit hours per semester is a full load for a graduate student. During the summer semester, six hours is considered full-time for a graduate student. A full-time graduate assistant may not exceed 12 hours of credit per semester and the graduate assistantship tuition and fee waiver only applies for up to 9 credit hours of MATH courses.

An international student must be a full-time student at Tennessee Technological University August through May. Each semester except summer, an international student must earn a minimum of 9 credit hours if a Master's candidate and 6 credit hours if a Ph.D. candidate.

A U.S. graduate student must be enrolled in at least 9 graduate hours and work no more than 20 hours per week in order to have his or her wages excluded from FICA/Medicare taxes (7.65 percent of the student's wages). (FICA/Medicare does not apply to international students.)

***In the Mathematics Department, all full-time graduate students receiving an assistantship are expected to complete 18 graduate hours of mathematics by the end of their second semester.[1]

Drop Policy

The Drop Policy for graduate students shall be consistent with the policy for undergraduate students. That is, graduate students are permitted to drop a course without a grade on the same day that undergraduate students drop a course without a grade. Graduate students are permitted to drop a course with a "W" grade on the same day that undergraduate students drop a course with a "W" grade.

Academic Resources

- Each graduate assistant is provided with a personal computer on his/her desk in the Graduate Student Office (FNDH 221). These computers are networked and are connected to a laser printer located in the same office.
- All students have on-line access to MathSciNet that contains Mathematical Reviews published on the Web by the American Mathematical Society.
- All students have access to the Tech University Library On-line Catalog.
- Tutoring, weekly teaching seminars, and interaction with other faculty members help graduate students formulate teaching philosophies and improve their teaching skills during their first year of graduate studies.
- The department makes every effort to support presentations made by graduate students at regional and national mathematics conferences and workshops.
- Weekly seminars give all graduate students the opportunity to learn about various active research topics and branches of mathematics not normally covered in regular courses.

[1] Approved by the Mathematics Department faculty on September 5, 2002.

Additional Highlights of the Program

- Each graduate student has a workspace in the Graduate Student Office in Foundation Hall Room 221. A refrigerator, microwave, and coffee maker are available for students in a nearby departmental kitchen.
- The Faculty Lounge is open to our graduate students.
- Students are encouraged and invited to interact with faculty on various research projects. This should help students in their pursuit of advanced degrees in mathematics and other fields.
- Students have easy access to mathematics typesetting software such as MiKTeX, TeX, LaTeX and a laser printer in the graduate office. A PostScript network printer, a copier, and scanner.
- A variety of mathematical, statistical, and programming software such as Maple, Matlab, SAS, StatGraph, Cyclone, C++, and more, are available on the computer network from the computer lab or from the graduate student office.
- In our program, students are able to have a significant amount of one-on-one interaction with faculty members.
- Students can apply to the College of Arts & Sciences for up to $350 to attend a conference to present the results of their research
  (see https://www.tntech.edu/cas/graduatestudenttravelsupport.php).

Advice for first year students

- Take excellent notes and work as many homework problems as you can.
- Make friends with other graduate students with whom you can study. Your teachers will tell you to what extent you may or may not collaborate on homework problems with your classmates.
- Concentrate on learning mathematics and selecting an advisor/subject area. Talk with the teachers with whom you might be interested in working with.
- Watch and learn from more advanced students.

Advice for second year students

- Plan with your advisor when to take comprehensive exams or submit thesis chapters.
- Meet with your advisor regularly. Do not be shy about seeking advice or help.
- Try to prepare a talk or poster you could present at Student Research Day.
- Do not put off writing your thesis until your last semester; it takes more time than you might expect.
- Prepare your C.V. to apply for jobs or prepare applications for Ph.D. programs.

Faculty Interests

Dr. Michael Allen, Ph.D., University of Georgia, 1997, Time Series, Bootstrapping, Re-sampling Methods and Time Series

When dealing with statistical models, there are usually conditions and criteria which must be met in order for the model to be valid. For instance, in simple linear regression, classical analysis requires that the error terms be normally distributed. If the errors terms are far from normal, then classical inference methods do not apply. My current research deals with relaxing such criteria for some more advanced statistical models, like spatial and logistic models, in order to find new robust methods of statistical inference for these models.

Dr. Amy Chambers, Ph.D., University of Colorado, 2006, Functional Analysis and Operator Theory.

My current research began in the area of multiresolution wavelet theory, but the connection between multiresolution wavelet theory and representations of the Cuntz algebras led into the realm of tensor products, conditional expectations, and graph C*-algebras. The Cuntz algebras have proved very useful in the classification of certain types of C*-algebras. These algebras show up as examples in many mathematical contexts, including the area of multiresolution wavelet theory. They are prototypes of those simple, purely infinite, separable, and nuclear C*-algebras that have recently been classified up to *-isomorphism. Since the classification of these algebras is understood, it then becomes of interest to see how Cuntz algebras, and more generally graph C*-algebras, can be embedded into other such algebras as subalgebras, and if so, whether or not conditional expectations exist onto these subalgebras.

Dr. Christopher Davis, Ph.D., University of North Carolina at Charlotte, 2011, Meshless Boundary Particle Methods for Boundary Integral Equations and Meshfree Particle Methods for Plates

Dr. Andrew Hetzel, Ph.D., University of Tennessee Knoxville, 2003, Multiplicative ideal theory with an emphasis on the study of prime ideals, and probabilistic studies in linear algebra and number theory.

In my first area of research, I explore the connections prime ideals have with some of the most powerful and useful properties in algebra, such as integrality, flatness, and unique factorization of elements. Often, topological considerations and notions from the theory of partially ordered sets are central to such an exploration. In this area of research, I am currently interested in certain generalizations of the notion of "prime ideal", contractions of chains of prime ideals, and the study of particular non-chains of prime ideals. In my second area of research, I examine the probabilities that certain properties hold either within special subsets of matrices or within special subsets of the rational numbers. I have recently led a productive undergraduate research project in this area, and am currently interested in answering several open questions (potentially well-suited for a graduate student) that remain from that project. A major thread that runs through both of my areas of research is the extension of results predicated on a finite set of data to results predicated on a corresponding infinite set of data.

Dr. Damian Kubiak, Ph.D., University of Memphis, Memphis, TN, 2012, Banach Spaces, Function Spaces, Operator Theory, Functional Analysis and Interpolation Theory.

My research interests lie mainly it the theory of Banach spaces. Among others, I am interested in geometry of general Banach spaces, that is these properties which are preserved by linear isometries but not necessarily by isomorphisms. I also study and characterize certain geometric properties in specific classes of function spaces (Orlicz spaces, Lorentz spaces, Musielak-Orlicz spaces, Orlicz-

Lorentz space, Cesaro spaces and others). In case of (at least some) infinite dimensional spaces many interesting geometric peculiarities occur, which are not present in finite dimensional cases.

Dr. Richard Le Borne, Ph.D., University of California, San Diego, 1993, Numerical analysis, scientific computation, signal processing

Signal processing can be characterized as the study of problems involving information that, after having been transmitted, is altered in some undesirable way before being received at its desired destination. The aim is to intelligently and efficiently separate from the collected data that part which is not desired. Applications that can be associated with signal processing are ever growing and include such diverse fields as biomedical engineering, radar, control and communications.

My research has concentrated on the numerical analysis of adaptive filtering algorithms in signal processing. In particular, I have worked to improve the theoretical understanding of algorithmic performance, i.e., analyzing the numerical behavior of adaptive filtering algorithms. Additionally, and to address the apparent confusion regarding numerical analysis techniques employed on algorithms and their meaning with respect to the value of an algorithm's computed result, I have worked to facilitate the correct interpretation given by numerical analysis that is employed on signal processing algorithms.

My current and ongoing research continues in this direction and devotes attention to the interconnectiveness relating an analysis involving exact arithmetic (perturbation analysis) to one assessing the effect from finite precision arithmetic. Results have been applied to specific solution methods such as the so-called lattice and transverse-based algorithms.

Dr. Yung-Way Liu, Ph.D., University of Delaware, 1987, Partial Differential Equations

My research interests include Differential Equations and Integral Equations with applications. My graduate teaching interests are Partial Differential Equations, Integral Equations, Calculus of Variations, Numerical Analysis and Numerical Solutions to PDE. During the past ten years I have supervised many graduate students who have written theses on various applied areas. Thesis topics include Integral Equations, Singular Perturbations, Liapunov Stability, Bifurcations of Chaotic Systems, and Linear Programming.

Dr. Motoya Machida, Ph.D., The Johns Hopkins University, 1999, Probability and Statistics; Perfect sampling methods, Markov chain Monte Carlo, and Bayesian inference.

Markov chain Monte Carlo (MCMC) is extremely useful when it is intractable to sample directly from distribution of interests. In MCMC methodology, one designs a Markov chain whose stationary distribution is the target distribution, and runs the Markov chain for a long time. The analysis of rate of convergence can provide information necessary to decide the running time, but such analysis is very difficult or even found impossible in practice. The emergence of perfect sampling---coupling from the past (CFTP) algorithm is largely studied and used for its ease of implementation; my research is motivated by the development of the prefect rejection algorithm---a currently less-used alternative.

The practicality of perfect sampling is of great interest in Bayesian inference. For example, Hobert, Robert, and Titterington (1999) studied the CFTP algorithm for the MCMC evaluation of simple mixtures. I began my own investigation on the perfect rejection algorithm for the mixture model. In doing so, I hope to demonstrate that the perfect rejection algorithm has its own advantage in practice and can be a genuinely useful alternative to the CFTP algorithm.

Dr. Jeffrey Norden, Ph.D., SUNY at Binghamton, 1988, General and Geometric Topology and Set Theory

My research interests are primarily in the areas of topology and set theory. Topology can be described as a sort of "messy geometry". Topologists are interested in geometric notions such as shape and connectedness, but we do not study the "exact" shape of objects. For example, a square and a circle are equivalent in topology, but are very different from an interval (an interval has endpoints, while the other examples do not).

Set theory is the study of collections of objects. While it seems like this would be a simple and perhaps boring research area, it becomes quite interesting as soon as one introduces various kinds of *infinite* collections. The resulting research has important connections with logic and the foundations that underlie all mathematics.

The topology that interests me the most has connections with set theory, in that topological properties can depend upon the set-theoretic assumptions one chooses to adopt. This often produces what are called "relative consistency results" which show that we are fundamentally *unable* to answer certain questions in any absolute sense. This is a relatively new mathematical phenomenon, and there are many ways to view it. My own philosophy is a somewhat Zen one, which we are investigating the ways in which our own thoughts and assumptions about the world can affect the (mathematical) world, in which we find ourselves living.

Dr. Brian O'Connor, Ph.D., University of Illinois, 1977, Numerical Analysis, Partial Differential Equations

My area of expertise is in the areas of numerical analysis and partial differential equations. Specifically, I am interested in the finite element method as a tool for solving partial differential equations, usually elliptic PDE's. I have taught a course, Finite Element Solutions of PDE's, Math 6520, several times. I also regularly teach, on the graduate level, Math 6510 - Finite Difference Solutions of PDE's, and Math 6610 - Operational Mathematics, which deals with Laplace and Fourier transforms. Undergraduate courses taught frequently include the calculus sequence, advanced math for engineers, and numerical analysis.

Master theses that I have supervised have been in the areas of Laplace transforms, Fourier series, integral and differential equations, PDE's in several variables, infinite series, and optimal paths.

Other areas of interest include pedagogy, mathematical puzzles, and mathematical aspects of baseball.

Dr. Chuda Poudyal, Ph.D., University of Wisconsin-Milwaukee, 2018, Mathematics, Actuarial Science and Statistics

My research interests lie at the intersection of actuarial and data science, computational statistics, quantitative risk management, robust statistics, and statistical machine learning. Currently, the primary focus of my research is to introduce and develop a robust, efficient, and computationally tractable alternative to the likelihood-based inference for insurance benefit payment severity and models.

Dr. Alexander Shibakov, Ph.D., Auburn University, 1998, Topology, Functional, and Set Theory

Topology can be defined as a branch of mathematics that studies shape and continuity, while Functional Analysis concentrates on studying functions and families of functions and Set Theory provides the

foundation for mathematics. I'm also interested in the theory of Partial Differential Equations, and (outside of mathematics) image synthesis and hardware simulation.

Dr. David Smith, Ph.D., University of Georgia, 2001, Small Area Estimation, Kernel Density Estimation, and Minimum Hellinger Distance Estimation.

Small area estimation seeks to provide reliable and accurate estimates when sample sizes are small. Linear models can be used to develop such estimates. My current research studies the performance of several methods of constructing confidence intervals for the means of a linear model through simulation.

I am interested in developing a bivariate extension to a univariate kernel density estimator when the bounds of the data are known. An example of this type of data comes from the bivariate exponential distribution.

A minimum Hellinger distance estimate (MHDE) is the value that minimizes the distance between a kernel density estimator and a model density. Such an estimator has very nice properties in terms of efficiency and robustness. I am interested in studying MHDE's in a multivariate context. One such application is for the bivariate exponential distribution previously mentioned. I am also interested in developing a robust approach to the One-way ANOVA using minimum Hellinger distance.

Dr. Padmini Veerapen, Ph.D., University of Texas at Arlington, 2013, Noncommutative Algebra and Noncommutative Algebraic Geometry

I work in the general area of Noncommutative Algebra. In particular, I work with quadratic algebras that are Artin Schelter-regular. Such algebras can be thought of as noncommutative analogues of the polynomial ring. A good way to think about some of these things is to think of activities in your daily life that requires a certain order. E.g., when doing laundry, you need to wash clothes first and then dry them, not the other way around! Our daily life is full of such instances! In noncommutative algebra, I've used noncommutative algebraic geometry to describe graded skew Clifford algebras. I've also worked on a notion of rank for noncommutative quadratic forms and my two advisees have continued that work. I have devoted some time to associating noncommutative algebraic geometry to Lie algebras as well. I am currently interested in applying the newly-defined notion of a discriminant by Ceken, Palmieri, Wang, & Zhang to study graded Clifford and graded skew Clifford algebras. My interest in the discriminant of Artin Schelter-regular algebras has also led me to explore their fixed rings.