CONTENTS

INTRODUCTION

The purpose of this handbook is to provide information to mathematics graduate students at the University of Tennessee, Knoxville. It does not supersede any material found in the Graduate Catalog. The Mathematics Department (Aconda Court 104) and the Office of Graduate Records (111 Student Services Bldg.) are good sources for additional information.

I. GENERAL INFORMATION

To obtain a graduate degree, a student must fulfill requirements of both The Graduate School and the Mathematics Department. The requirements of the Graduate School for advanced degrees may be found in the Graduate Catalog (now available online only). Departmental requirements are described in subsequent sections of this handbook.

A Graduate Student Advising Committee will advise most entering mathematics graduate students for the first two semesters of their programs. No later than the end of the second semester of the student's program, the committee will consult with the student and faculty involved to consider recommending an appropriate supervisory committee to be appointed by the Director of Graduate Studies. A supervisory committee may be appointed later than the student's second semester, if doing so seems in the best interest of the student.

Until a supervisory committee is formed, a student must promptly inform the Graduate Student Advising Committee Coordinator of any changes in the student's program, including all drops, adds, and changes of hours or type of credit; and a copy of each student scan form and request for registration changes must be given to the Graduate Student Advising Committee Coordinator, the Director of Graduate Studies, or the Head.

After a student's supervisory committee is formed, the Director of Graduate Studies or Head must be informed promptly by the student of any changes in the student's program; and a copy of each student scan form and request for registration change must be given to the Director of Graduate Studies or Head. In each case, the Supervisory Committee's approval must be obtained first.

In the following material describing the various degrees available, we shall use the terms "preliminary examination" and "comprehensive examination" according to the following definitions. The comprehensive examination is the complete examination required for admission to Ph.D. candidacy. In mathematics, the comprehensive examination consists of written examinations and an oral specialty examination. The preliminary examination is an "in house" term referring to any of the written examinations required in the comprehensive examination. Section III describes other requirements which must be met before the comprehensive examination may be completed.

II. MASTER'S DEGREE PROGRAMS

A. Master of Science Degree (M.S.)

Candidates have six calendar years from the time of enrollment in The Graduate School to complete the Master's degree. Students who change degree programs during this six-year period may be granted an extension after review and approval by The Graduate School. In any event, courses used toward the degree must have been taken within six years of graduation.

1. Departmental Requirements.

a. Thesis Option.

i. A total of 30-credit hours in courses numbered above 400, including at least 6 credit hours of thesis (Math 500) and 15 hours in mathematics courses numbered above 500. Of the 24 nonthesis credit hours, 6 may be earned in courses approved by the Supervisory Committee in fields other than mathematics. (More than 6 hours of Math 500 may be taken, but only 6 hours will count toward the degree.)

ii. Sequence Requirement (see c.).

iii. Thesis and Oral Examination.

b. Nonthesis Option.

i. Approval of this option by the Supervisory Committee after one semester of graduate study.

ii. A total of 30 credit-hours numbered above 400, including 21 credit hours (with at least 15 in mathematics) numbered above 500. A student must take the reading course, Math 598, in which a term paper or project is required. The instructor and student must agree that the term paper or project will be the student's nonthesis Master's project, and the student must make an oral presentation of the results of the project to the director and the reader of the project. Of the 30 credit hours, 9 may be earned in courses approved by the Supervisory Committee in fields other than mathematics.

iii. Sequence Requirement (see c.).

iv. A written final examination. The Ph.D. preliminary examinations in mathematics may be taken as an option instead of the Master's final examination. The successful completion of one Ph.D. preliminary examination in mathematics will constitute successful completion of a portion of the written Master's final examination. The successful completion of three Ph.D. written preliminary examinations in mathematics will constitute successful completion of the entire Master's final examination. In the case of a substitution of a passed preliminary examination in mathematics for a portion of the Master's final examination, the preliminary examination must be passed before the Master's comprehensive examination period and a faculty representative from the preliminary examination subject must participate in the determination of whether the student passes the comprehensive examination.

c. Sequence Requirements.

A student completing the requirements of the concentration in applied mathematics must pass at least one 500-level sequence. Eligible sequences are those which (1) appear as sequences in the Graduate Catalog and (2) have at least the first semester of the sequence listed in either requirement iii or one of the program specializations of the concentration in applied mathematics.

All other M.S. degree candidates must pass three year-long sequences. Any pair of graduate-level mathematics courses appearing as a sequence in the Graduate Catalog is acceptable. One of the three sequences may be at the 400-level and may have been taken at UT or elsewhere for undergraduate or graduate credit. All pairs of 400-level mathematics courses appearing as sequences in the Graduate Catalog (available online) are acceptable and so are the following pairs of courses: 423-424, 423-425, 431-435, any two of 460-462-467, 471-472. A graduate sequence from a field other than mathematics may be used with approval of the student's supervisory committee.

d. Concentration in Applied Mathematics

For this concentration, available under the thesis or the non-thesis option, the student must complete the following:

i. Required prerequisite courses:
   a. Numerical Algorithms 371 or Numerical Analysis 471 or Numerical Algebra 472,
   b. Methods in Applied Mathematics 512 or both Differential Equations II 431 and Partial Differential Equations 435,
   c. Honors Advanced Calculus I, II 447-48 or Advanced Calculus I, II 445-46, and
   d. Matrix Algebra II 453.

ii. One hour in Seminar in Applied Mathematics 519 or Seminar in Mathematical Ecology 589.

iii. One course from each of the following five areas:
   a. Foundations of Applied Mathematics - Methods in Applied Mathematics 511, Analytical Applied Mathematics I 515, Analytical Applied Mathematics II 516.
   b. Optimization - Linear and Nonlinear Programming 576, Scientific Computing: Optimization 577, Optimal Control Theory 585.
   c. Numerical Mathematics - Scientific Computing: Partial Differential Equations 578, Numerical Mathematics 571, Numerical Mathematics 572.
   d. Modeling - Mathematical Principles of Continuum Mechanics 537, Industrial Mathematics 475, Mathematical Ecology 581.
   e. Statistics - Statistics 525, Stochastic Modeling 527, Statistical Methods 571 (Department of Statistics), Biometry 560 (Department of Ecology and Evolutionary Biology).

A student who successfully completes the requirements of the concentration in applied mathematics will receive a departmental certificate signifying that fact.

For the student who is well-prepared and able to take optional coursework, there are three possible program specializations representing strengths of the department in Applied Mathematics. The courses listed here are additional to the courses in i, ii, and iii above. These lists represent the faculty consensus about which courses are appropriate choices for various student interests; a Master's degree student normally does not have time to take all the courses in a list.

Analytic Specialization. Mathematical Principles of Fluid Mechanics 513-14, Ordinary Differential Equations 531-32, Calculus of Variations 534, Partial Differential Equations 535-36, Linear and Nonlinear Programming 576, Mathematical Principles of Continuum Mechanics II 538.

Computational Specialization. Numerical Analysis 471-72, Finite Element Methods 574, Special Topics in Computer Science (Parallel Computing) CS 594.

Mathematical Ecology Specialization. Mathematical Ecology II 582, Mathematical Evolutionary Theory 583, Systems Theory 584, Ordinary Differential Equations 531-32, Partial Differential Equations 535-36, courses from the Department of Ecology and Evolutionary Biology.

2. General Comments

a. The purpose of the thesis option is to give students an opportunity to study an area of mathematics under the supervision of a faculty member and to organize and present their findings in writing. The Master's Committee for the thesis option consists of the major professor and two other faculty members. The Committee reads the thesis and administers the oral examination in which the student usually summarizes the thesis and answers any questions the Committee may ask.

b. The purpose of the nonthesis option is to give the qualified student an opportunity to take additional course work in mathematics or related areas. The written final examination consists of three two-hour tests in mathematics of which at least two are at the 500 level. Each semester the department will offer the non-thesis Master's examinations in a period consisting of the ten (10) days of classes on or before the day of The Graduate School deadline. A non-thesis Master's student must take all three of his/her examinations during the specified ten days.

After consultation with the student, the Graduate Committee specifies the three areas from which the test questions will be taken. At least two of the three areas must cover material from at least two semesters of study. The third area must cover material from at least one semester of study. The three parts of the examination are graded as a unit and, in case of failure, must be repeated as a unit. A candidate who fails the examination may not repeat the examination until the following semester. The examination may be repeated only once. In borderline cases, the Examination Committee may give a follow-up oral examination. The Department will not report the results of the written Master's Final Examination to The Graduate School until the Master's project is completed with approval indicated in writing to the Mathematics Department by the project director and the second reader. This regulation will have the effect of making the project due each semester two weeks before nonthesis examination results are due in the Office of Graduate Admissions and Records.

c. The concentration in applied mathematics is intended to prepare students for careers primarily in industry or government. The goal is to develop students' abilities to think mathematically, formulate and analyze mathematical models, and function as a member of a multidisciplinary team.

Toward this goal, a student should understand a wide range of mathematics and have practical experience applying analytical and computational methods to realistic problems.

Each course in this program should provide a wide background in its area and provide practical experience with applications. The emphasis should be on analytic concepts, methods, modeling, hands-on computation, data analysis, and communication.

The required prerequisite courses represent knowledge that the faculty believe every applied mathematics Master's degree student must have. The required prerequisite courses are to be taken as early as possible in one's program, but one may proceed with other courses in the program for which one has the necessary background. If a student has passed one or more of the required prerequisite courses (or their equivalents) as an undergraduate or as a graduate student elsewhere, then those courses do not have to be repeated as a graduate student at UT. However, neither undergraduate credits nor graduate credits used for a previous degree may be counted toward a Master's degree; consult the Graduate Catalog for details.

3. Procedures for Fulfilling Requirements.

a. Begin course work.

b. Obtain a thesis advisor and Master's Committee, or obtain written approval of Supervisory Committee for nonthesis option (obtain appropriate form in Aconda Court 105E).

c. Apply for admission to candidacy (at least one semester prior to graduation--consult the Graduate Studies web site at http://gradstudies.utk.edu/gradforms.shtml for all deadlines).

d. Complete course work and write thesis, if necessary.

e. Place name on graduation list (during registration for the final semester).

f. Apply for diploma.

g. Schedule oral examination (not later than three weeks before thesis deadline), or, for nonthesis option, schedule written final examination (obtain form for departmental approval of examination plans in Aconda Court 105E).

h. Pass oral examination or written final examination.

i. Submit project report approved by project supervisor and reader, if in non-thesis program.

j. Remove all incompletes (not later than one week before commencement).

k. Obtain approval by the Graduate School of final copy of thesis if thesis option has been elected (after oral examination and no later than two weeks before commencement).

B. Master of Mathematics Degree (M.M.)

This degree is intended primarily for teachers of high school or 2-year college mathematics. Before admission to this program, the applicant must have either (a) certification for teaching secondary mathematics in at least one state, or (b) three years of teaching experience. In exceptional circumstances, part of admission requirement (b) might be satisfied concurrently with course work. Applicants for admission to this program must have successfully completed one year of calculus (141-42 or equivalent) and a course in matrix algebra (251 or equivalent).

1. Departmental Requirements.

a. A total of 30 credit hours, of which 21 must be at the 500 level and include core courses Math 504 (Discrete Mathematics for Teachers), 505 (Analysis for Teachers), 506 (Algebra for Teachers), 507 (Probability and Statistics for Teachers) and 6 hours in 509 (Seminar for Teachers). At most, 6 hours may be taken outside the Department of Mathematics and must be selected in consultation with the advisor.

b. Pass a final examination.

2. General Comments

The purpose of the M.M. degree program is to allow mathematics teachers to extend their knowledge of mathematics through the study of a broad spectrum of subjects at less depth than required for the M.S. degree. Professor David Anderson may be consulted for information concerning the M.M. degree.

3. Procedure for fulfilling Requirements.

a. Begin course work.

b. Apply for admission to candidacy (at least one semester prior to graduation--consult Graduate Schools web site at http://gradschool.utk.edu/gradforms.shtml for all deadlines).

c. Place name on graduation list (during registration for the final semester).

d. Apply for diploma.

e. Remove all incompletes.

f. Schedule final examination (6 hours).
– Comprised of five questions each from Math 504, 505, 506, and 507 and three questions each from two courses chosen by the student at the 400 level or above.

g. Complete all course work and pass final examination.

III. DOCTOR OF PHILOSOPHY (Ph.D) PROGRAMS

THE DOCTORAL PROGRAM

For the Ph.D. program in Mathematics, the student must meet the following five requirements in addition to those of the Graduate School:

1. Demonstrate competency in Advanced Calculus and Linear Algebra by either a satisfactory performance on a Diagnostic Examination or by passing the appropriate 400-level course with a grade of B or better by the end of the student's first year of graduate school. The appropriate course for Advanced Calculus is the 447-48 sequence and for Linear Algebra is the 457-58 sequence or 453.

2. Satisfy either the standard program or the interdisciplinary mathematical ecology/evolution concentration. A student intending to work in mathematical ecology/evolution may complete either, but is encouraged to complete the interdisciplinary mathematical ecology/evolution concentration.

3. Take at least two different one-semester research seminars and 599.

4. Pass an examination in the field of specialization after requirements 1 - 3 have been met. This examination will be given by a committee appointed by the department head. A student may take this specialty examination at most twice.

5. Pass a one-year, 600-level sequence in mathematics outside the student's area of specialization. The sequence selected to fulfill this requirement must be approved by the department head and the student's doctoral committee.

Requirements 1 - 5 must be completed no later than the start of the student's seventh year (as a mathematics graduate student at UT).

Standard Program

1. A student must pass written examinations on two of the following year-long sequences: algebra (551-52), analysis (545-46), computational and applied mathematics (571-72), differential equations (535-36), stochastics (523-24), and topology-geometry (561-62).

A student must pass one examination by the middle of his/her third year and both examinations by the middle of his/her fourth year. A student may not take any examinations after four failures.

2. In addition to the two year-long sequences chosen for the written examinations, a student must take six other one-semester 500-level courses. At least five of these courses must be chosen from the following list grouped by examination area: algebra (551-52, 555-56), analysis (545-46, 545-47), computational and applied mathematics (571-72, 574, 576, 577, 578), differential equations (513-14, 515-16, 531-32, 535-36, 537-38, 581-82, 585), stochastics (521-22, 523-24, 525-26), and topology-geometry (561-62, 567-68). The sixth course may be either a 500-level course listed above or a 600-level mathematics course not used to satisfy bullet #5. These six courses must contain a year-long sequence in an area different from the two written examinations and at least two areas different from the two written examinations. A grade of B or better is required in each of the six courses.

Mathematical Ecology/Evolution Concentration

1. A student must pass written examinations on mathematical ecology (581-82) and one of the following year-long sequences: analysis (545-46), computational and applied mathematics (571-72), differential equations (535-36), and stochastics (523-24). A student must pass one examination by the middle of his/her third year and both examinations by the middle of his/her fourth year. A student cannot take any examinations after four failures.

2. In addition to the two year-long sequences chosen for the written examinations, a student must take six other one-semester 500-600-level courses. At least five of these courses must be chosen from the following list grouped by examination area: analysis (545-46, 545-47), computational and applied mathematics (571-72, 574, 576, 577, 578), differential equations (513-14, 515-16, 531-32, 535-36, 537-38, 585), stochastics (521-22, 523-24, 525-26, 527), and mathematical ecology/evolution (583, EEB 509, 511). The sixth course may be either a 500-level course listed above or a 600-level mathematics course not used to satisfy bullet #5.

These six courses must contain a year-long sequence in an area different from the two written examinations and at least two areas different from the two written examinations. A grade of B or better is required in each of the six courses.

General Comments

1. The written examinations are scheduled in early January and immediately before the fall semester every year. To help the student prepare for the written examinations, the faculty has compiled lists of topics and references which the student may obtain from the departmental office. Copies of previous examinations may also be obtained in the departmental office.

2. Each written examination is created, administered, and scored by an Examination Committee of faculty appropriate to the topic. At the end of the examination cycle, the various Examination Committees present their recommendations at the departmental Preliminary Examination Meeting where the final decisions are reached. Only then are results communicated to the student.

3. Each written examination results in a "pass" or "fail". Students are strongly encouraged to discuss his/her performance on each examination with members of the appropriate Examination Committee.

4. Upon passing the written examinations, the student selects a field of specialization (i.e., a field in which to do his/her doctoral research) and must then pass an intensive examination in that field of specialization. This examination will be given by a committee appointed by the Department Head. The specialty examination may be taken at most twice.

5. If a graduate student changes the major area of study after completing his/her comprehensive examination, that student must satisfy the new doctoral committee as to level of competency in the new area.

6. The dissertation is a written presentation of original and significant research completed by the student. The student's dissertation director, a faculty member who works closely with the student in this project, also serves as chair of the student's Doctoral Committee. The student's Doctoral Committee, consisting of at least four faculty members (including one from outside the math department), reads the dissertation and administers the defense of dissertation. In this oral examination, the student usually describes the work in the dissertation and answers any questions the committee may ask.

Any mathematics student wishing to write a dissertation under the direction of someone who is not a regular member of the Department of Mathematics at the rank of assistant professor or above must first obtain approval from the Graduate Committee and Graduate School. The student must have successfully completed the written preliminary examination requirements before requesting approval. To support the request for approval, the student must provide to the Graduate Committee a written statement describing the proposed dissertation area and the reason(s) for (i) working with someone from outside the department and (ii) not working with a member of the department. The proposed dissertation director's curriculum vitae must also be provided. The Graduate Committee may request additional information or actions to assist its consideration of the matter. If the request is approved, then to assure appropriate and substantial mathematical content in the student's dissertation, the student's Ph.D. committee must include at least two Department of Mathematics faculty, at least one of whom is approved to direct doctoral dissertations.

7. The department requires that a student take a one-year 600-level graduate sequence in mathematics outside his/her area of concentration. The course selected must be approved by the student's Doctoral Committee and by the Department Head. Such approval may occur after completion of the course.

Procedures for Fulfilling Requirements

1. Begin course work.

2. Pass two preliminary examinations.

3. Take at least 2 difference one-semester research seminars and 599.

4. Establish a doctoral committee.

5. Pass intensive examination in field of specialization.

6. Pass a one-year 600-level course outside the area of specialization.

7. Write dissertation (while registered continuously for Math 600- dissertation hours).

8. Apply for admission to candidacy (at least one-semester prior to graduation). http://gradschool.utk.edu/gradforms.shtml

9. Place name on graduation list.

10. Apply for diploma.

11. Schedule defense of dissertation with us and Graduate Records Office (P105 Student Services Building), at least 2 weeks prior to defense.

13. Submit dissertation to doctoral committee (at least 2 weeks prior to defense).

14. Defend dissertation.

15. Obtain approval from the Graduate School of final copy of dissertation (after dissertation defense and at least 2 weeks prior to commencement).

**Dates for fulfilling these requirements are posted outside Aconda Court 105E as well as on the Graduate School web site.*

IV. INTERCOLLEGIATE GRADUATE MINORS

The ***Interdisciplinary Graduate Minor in Computational Science*** (IGMCS) is a formal academic program at the University of Tennessee established to allow students to earn a minor in Computational Science simultaneously with a master's or doctorate in another academic discipline. The program is open to graduate students in all departments, which have an approved minor. The program is administered by a committee composed of representatives, including program faculty, from all colleges that have approved the IGMCS program and which have minor programs.

For more information contact Dr. Terry Moore at tmoore@eecs.utk.edu or visit http://igmcs.utk.edu.

The ***Intercollegiate Graduate Statistics Program*** (IGSP) is a formal University of Tennessee, Knoxville, academic program established to enable students to earn either a minor or an MS in statistics simultaneously with a master's or doctoral degree in another department. Approved coursework taken to meet doctoral requirements in the student's home department may also be credited toward the MS in statistics. Similarly, approved coursework in statistics taken to meet the requirements for a master's or doctoral degree in another department may also count toward the minor in statistics. The program is open to graduate students in all departments, which have an approved minor, and/or MS joint major curriculum offered through the program. The program is administered by an executive committee, consisting of college representatives from all colleges with approved programs, with advisory input from the program faculty.

For more information contact Dr. Younger at msyounger@utk.edu or http://www.bus.utk.edu/stat/igsp.

V. UNIVERSITY RETENTION STANDARDS

The department has established guidelines for continuation of assistantships, which are given in the next section. In addition, the university has academic retention standards for all graduate students.

Academic Standards: Graduate education requires continuous evaluation of the student. This evaluation includes not only periodic objective evaluation, such as the cumulative grade-point average, performance on comprehensive examinations, and acceptance of the thesis or dissertation, but also judgements by the faculty of the student's progress and potential. Continuation in a program is determined by consideration of all these elements by the faculty and the head of the academic unit.

The academic records of all graduate students are reviewed at the end of each semester, including the summer term. Graduate students must maintain a cumulative grade-point average (GPA) of at least 3.0 on all graduate courses taken for a letter grade of A-F. Grades of S/NC, P/NP, and I, which have no numerical equivalent, are excluded from this computation.

Academic Probation: Upon completion of nine hours of graduate coursework, a graduate student will be placed on academic probation when his/her cumulative GPA falls below 3.0. A student will be allowed to continue graduate study in subsequent semesters if each semester's grade-point average is 3.0 or greater. Upon achieving a cumulative GPA of 3.0, the student will be removed from probationary status.

Dismissal: If a student is on academic probation, the degree or non-degree status will be terminated by the Graduate School if the student's semester GPA falls below a 3.0 in a subsequent semester. When the particular circumstances may be deemed to justify continuation and upon recommendation of the appropriate academic unit and approval of the Graduate School, a student on probation whose semester GPA is below a 3.0 may be allowed to continue on a semester-by-semester basis.

Dismissal of a graduate student by a department or program is accomplished by written notice to the student, with a copy to the Graduate School. In those cases where the department's requirements for continuation are more stringent than the Graduate School requirements, the Graduate School will evaluate the student's record to determine whether the student is eligible to apply for a change of status and register in another area of study. Registration for courses in a department from which a student has been dismissed will not be permitted, except by written authorization from that department.

Academic Honesty: Each graduate student in the Department of Mathematics is expected to conform to the highest standards of academic honesty in all classwork, homework, examinations, research and writing, and to the highest standards of professional behavior in teaching. Any violation of this policy, such as plagiarism or other forms of academic dishonesty, will result in penalties such as penalty grades, loss of financial support, and/or expulsion from a degree program. Each punitive action taken by the Department or any of its professors against a student must be documented by a letter to the Department describing the violation and the penalty assigned. A copy of the letter must be sent to the affected student. Each punitive action taken may be appealed through the following channels, successively: Graduate Committee, Department Head, Dean of the College, and Dean of the Graduate School.

VI. GRADUATE STUDENT ASSISTANTSHIPS

This section contains information for those graduate students who have accepted an offer of a graduate assistantship and its associated responsibilities.

A. TYPES OF ASSISTANTSHIPS

The Faculty Handbook describes four categories of assistantships:

Graduate Teaching Assistant: Graduate Teaching Assistants work under the direct supervision of a regular faculty member in activities such as helping to prepare lectures, teaching discussion sections, conducting laboratory exercises, grading papers and keeping class records. In consultation with the supervisor, the Teaching Assistant works to gain teaching skills and an increased understanding of the discipline. Appointments are normally on a one-fourth to one-half time basis, and the annual stipend is payable in either nine or twelve monthly installments. The assistantship is accompanied by a waiver of fees[1] for the period of appointment in accordance with university policy.

Graduate Teaching Associate: Exceptionally experienced graduate students may be assigned primary responsibility for teaching undergraduate courses, including the assignment of final grades. The Teaching Associate usually carries one-fourth to one-half of a normal teaching load. The annual stipend is payable in either nine or twelve monthly installments. The associateship is accompanied by a waiver of fees[1] for the period of appointment in accordance with university policy.

Graduate Assistant: Graduate Assistants are appointed primarily to perform various types of duties other than teaching. Any assigned instructional activity is conducted under careful supervision. The annual stipend is payable in either nine or twelve monthly installments. The assistantship is accompanied by a waiver of fees[1] for the period of appointment in accordance with university policy.

Graduate Research Assistant: Research assistantships are generally financed through gift, grant, or contract funds. Persons holding such appointments pursue a work and study program like that expected under the other types of awards. Graduate research assistantships are accompanied by a waiver of fees[1] for the period of appointment in accordance with university policy[2].

B. REQUIREMENTS FOR TEACHING ASSISTANTS

1. Your selection as a graduate assistant (when written without capitalization, "graduate assistant" refers to all four categories of assistantship) at the University of Tennessee was based on your record and the recommendations of your references. It is our expectation that you can complete a degree program. Continuation of your appointment depends on the Department's evaluation of your performance as student and as assistant. This evaluation involves various matters, such as course grades, performance on special examinations (Master's final exam, prelims, oral specialty exam, etc.), work on a thesis or dissertation, and subjective appraisal by the faculty of your progress and potential. **The Department will notify you by April 15 concerning your progress and the renewal of your assistantship.**

The Department has established the following guidelines for continuation of assistantships:

a. Each graduate assistant should be registered for credit in at least six hours of mathematics during each academic-year semester and must be registered for at least one hour of mathematics any summer term that he/she has assistantship duties.

b. Each graduate assistant should be registered for credit in at least six hours of course work at the 500- or 600-level each academic year beyond the first year.

c. By the end of a graduate assistant's second year, he/she will have completed successfully (with an average of B or better) at least two semesters of at least one 500- or 600-level sequence in mathematics.

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[1] University fees include a maintenance fee (required of all students), tuition (additional for out-of-state students) and an activity, facilities and technology fee. The waiver of fees for assistantships applies to maintenance and tuition fees only; it does not include the activity, facilities and technology fee.

[2] The waiver of fees for Graduate Research Assistants applies to maintenance and tuition fees only; it does not include the activity, facilities and technology fee. As of December 31, 1986, the maintenance fee is paid by the granting agency. The maintenance fee is in addition to the stipend paid.

d. It is the Department of Mathematics' policy that a Graduate Teaching Assistant/Associate whose native language is not English and who has not passed (at the conditional level or above) the University's English Certification Requirement for classroom teaching (ECR) by March 1 of his/her second year in the Mathematics program will not have his/her teaching assistantship renewed for the following year. Resumption of support for a student will be considered only after he/she obtains a pass on the ECR.

Priority for awarding and renewing graduate assistantships is given to students pursuing a graduate degree in mathematics. Exceptions to the guidelines, particularly for students pursuing interdisciplinary programs, may be made. Prior to the creation of the Supervisory Committee, any exception must be approved in advance by the Graduate Student Advising Coordinator; after creation of the Supervisory Committee, any exception must be approved in advance by the Supervisory Committee and the Director of Graduate Studies (or Head).

2. A graduate assistant teaching two courses or doing equivalent work should have no outside employment. A graduate assistant teaching one course or doing equivalent work who has outside employment is expected to report that employment to the Director of Graduate Studies. The no-work rule applies to those whose teaching is reduced by Science Alliance or grants.

3. The Graduate School limits the number of years a graduate assistant may be appointed to an assistantship. A Master's student is limited to three years, a doctoral student with a Master's degree is limited to five years, and a doctoral student with only a baccalaureate degree is limited to eight years. The department may request an extension beyond the applicable limit.

The Department of Mathematics limits assistantships to 6 years. Extensions of assistantships beyond the 6th year will be granted only in exceptional cases and will be subject to approval by the Graduate Committee.

4. All teachers in the department are required to use teaching evaluation questionnaires in each class they teach. Furthermore, all first-year GTAs are required to discuss their student evaluations with a representative of the department who will initiate the discussion. You are encouraged to use teaching evaluations to assess your teaching performance and to keep the results in case you decide to participate in the department's GTA Teaching Awards competition. A memorandum is distributed near the middle of each semester to remind teachers about the department's policy and how to obtain the questionnaires.

5. **Meeting your classes at all scheduled times is imperative.** Since it is occasionally necessary to miss a class, the Department has established the following procedure. **At the beginning of each semester, provide the office, Aconda Court 105E, with the name of another teaching assistant who is willing to substitute for you, if necessary. Before missing a class, inform the office (974-2464) of your expected absence and indicate who will be substituting for you. There are absentee forms in the departmental office that you are to fill out prior to leaving.**

6. Seek advice and assistance from faculty members about teaching problems. Teaching assistants who do not yet have 18 semester hours of graduate credit in mathematics normally are assigned to teach recitation sections associated with a large lecture taught by a regular faculty member, and this faculty member serves as an advisor on matters related to teaching. Other assistants are assigned a regular staff member who will be available for advice and consultation, and who will assist in constructing tests and assigning grades.

7. Each 100-level course has a course coordinator. They will supervise your teaching of that course. Attendance at course meetings prior to the start of each semester, as well as during the semester, is mandatory. You will also be asked to provide copies of your course materials (exams, syllabus, etc.) to the coordinator; this is also mandatory.

8. Grading of final examinations in lecture/recitations usually is done as a group in one sitting or divided among those involved in teaching the course and completed by a specified time. GTAs are also expected to assist with proctoring the final examination. Any GTA involved in teaching such a course needs to do a fair and reasonable part of the proctoring and grading, but the proctoring and grading effort should not impact the GTA's own performance on a final examination. Lecturers and their GTAs should work out mutually satisfactory conditions for proctoring and grading; in any case, GTA's should have at least two hours of free time before taking a final examination.

C. MATHEMATICS GRADUATE STUDENT TEACHER TRAINING PROGRAM

The Mathematics Department has a teacher training program whose purpose is to better prepare graduate students to teach at the college level, either as a GTA or as a future faculty member. It will be offered each fall as a one credit seminar (590) for all incoming graduate students. Discussion topics include: 1) developing assessments, 2) rubrics and grading assessments, 3) motivating students, 4) technology in the classroom, and 5) developing or adapting a course syllabus. The entire course syllabus may be found on the Mathematics Department web site. The program also includes a mentor match-up with either more experienced GTAs, instructors, or faculty.

First-year GTAs are required to register for this seminar. Second year, and beyond, GTAs are also strongly encouraged to register for this seminar or are welcome to attend individual sessions. Completion of this seminar is also a requirement for the Certificate Program for Teaching College Mathematics. Students interested in continuing the dialog on teaching mathematics are encouraged to complete the Certificate Program and participate in the advanced topics in Teaching College Mathematics group that meets in the spring.

Professional development training is also offered as part of the Graduate Student Forum.

UT Mathematics Teaching Certificate Program

The following is a list of requirements for completion of Level I and Level II of the certificate program. Note, Level II requirements are in addition to Level I requirements, i.e. Level I must be completed first.

Type of Requirement	**Level I**	**Level II**
Teaching Experience	6 contact hours 3 hrs must be a class for which you have sole responsibility	6 contact hours must include 2 classes for which you have sole responsibility 1 class must be different from other previously taught
Teaching Seminar	TA Training Seminar 1 semester advanced teaching seminar -or- completion of Best Practices	1 semester advanced teaching seminar
Mentoring	1 semester mentoring seminar	1 semester mentoring seminar
Teaching Evaluation	1 lecture evaluated by lecturer, course coordinator, or faculty	1 lecture evaluated by faculty teaching mentor
Attend Regional MAA Conference	not required	required funding guaranteed for attendance of 1 conference after completion of Level I
Teaching Pedagogy Presentation	not required	required
Demonstration of Leadership in Teaching & Administration	not required	required may be fulfilled in a variety of ways to be approved by the Certificate Program coordinator and/or your faculty teaching mentor
Teaching Certificate Portfolio	required	required

Portfolio must include a teaching statement and appropriate documents demonstrating completion of desired certificate level.

Note: Official completion of the Certificate Program will be approved by the Certificate Program coordinator after submission of Teaching Certificate Portfolio. All certificates of completion of the program will be awarded at the Mathematics Department Honors Day.

D. ADMINISTRATIVE PROCEDURES

The following comments cover situations likely to arise in all classes. When other administrative difficulties arise in your classes, consult with Dr. Amy Szczepanski, Service Course Coordinator.

1. Adding and Changing Sections

The department has a centralized system for dealing with student requests to add or change registration in math classes. When the section is closed (most math sections are closed, that is, full, at the time classes begin), a departmental stamp is required to enter the section. Your signature, as instructor, is NOT sufficient. Please DO NOT SIGN ANY registration documents. Your signature will embarrass you and the department if we have to deny the student's request. Students should be told to see Jessica Daugherty in Aconda Court 105D.

2. Drops and Late Drops

Students may drop courses until the 10th calendar day from the start of classes with no notation on the academic record. From the 11th calendar day until the 42nd calendar day, students may drop courses and will receive the notation of "W" (Withdrawn). The "W" grade is not computed in the grade point average. Courses may be dropped through the telephone registration system. After the 42nd calendar day and to the 84th day of classes, courses may be dropped and will be assigned a "WP" (Withdrawn Passing) or a "WF" (Withdrawn Failing). Instructor's signature is required. The form, once signed, should be taken to the Office of the University Registrar for processing. The "WF" is calculated in the grade point average as an F. After the 84th day, no drops are permitted. Failure to attend a course is not an official withdrawal and will result in the assignment of an F grade. The Timetable of Classes will contain the official withdrawal deadline calendar dates.

Withdrawal from a course after the WP/WF Deadline is called a Late Drop. Neither instructors nor departments can award Late Drops; only the appropriate Dean's Office can approve a Late Drop request. Therefore, send students asking for a Late Drop to the Dean of their college. Some colleges request that the instructor fill out and sign a form that asks for objective information such as, "Is the student passing the course?" Some of the forms ask for exam grades and number of absences. It is appropriate to fill out and sign these forms. You should provide objective information only. Never offer your opinion as to whether the drop should be awarded.

3. Other Registration Problems

About ten days after the semester starts, you will receive a roll that should be complete. If you have students attending your class whose names are not on that roll, promptly send them to Aconda Court 105D so that we can investigate the problem. Students must be officially on the roll to receive a grade.

4. Room Assignments

Your class meets in the room(s) shown on your teaching assignment. This is frequently different from the room shown in the schedule book, which is published months in advance. DO NOT CHANGE ROOMS.

If you need an additional room for a review session, or have another problem related to room assignment, contact Jessica Daugherty, Aconda Court 105D.

5. Grades

The valid grades at UT are A, A-, B+, B, B-, C+, C, C-, D+, D, D-, F, FX, WF, WP. We urge you to use this scale exclusively, not only for the final grades but also for all tests and quizzes throughout the semester. The grades have the following numerical equivalents: A = 4, A- = 3.7, B+ = 3.3, B = 3, B- = 2.7, C+ = 2.3, C = 2, C- = 1.7, D+ = 1.3, D = 1, D- = .7, F = 0, FX=0, WF=0, WP=0.

Although you have some freedom to construct your own grading system, it is important that your students know what it is. Furthermore, students need to know how they are doing in the course. For this purpose, it is almost essential that you use letter grades on tests and quizzes. Whatever grade system you decide on, explain it to the students. It is imperative to be fair to the student; so if you decide your system is too lenient, do not try to toughen it during the semester. If you decide your system is too strict or makes too many demands on you, talk to Dr. Szczepanski about adjustments you might make.

6. Incomplete Grades

Students may ask you to give them a grade of I (incomplete) for various reasons. Although it is possible for you to give the

grade, GIVING AN I IS A BAD IDEA. If there is a valid reason why the student cannot complete your course, send the student to seek a Late Drop. Otherwise, give the student an F on the incomplete work. If you give a grade of I, you are personally responsible for supervising the work to be made up. Students have one calendar year to complete your course. They may wait until after you have left UT, which would certainly be awkward. If you think the circumstances warrant the grade (refer to the departmental policy on I grades), get a written agreement with the student as to how and when the work will be made up and file it with Main Office. The staff in the Department office will not accept a grade sheet bearing an I unless you describe, on a form they will provide, how the course will be completed.

7. Change of Grades

You occasionally may need to change a grade after it has been given. For example, you may discover an error in the grade calculations. The Department Office, Aconda Court 104, has forms for this purpose.

8. Students with Extracurricular Activities

You are likely to have one or two students in your class who are athletes, members of the Band, or members of some other organization sponsored by the University that requires them to miss class occasionally. Department policy is that work missed by students who are off campus under university sponsorship will be made up, provided the student notifies you in advance that he/she will be absent, presents a letter from the organization involved stating the dates, and that the interruptions do not prevent the student from making normal progress in the course.

If difficulties arise involving the Athletic Department or some other campus organization, consult with Dr. Collins.

9. Student Problems

When students have a problem, of whatever nature, they may approach you first. In other instances, you may be the first to realize that a student has a serious problem.

The Math Information Office, Aconda Court 105D, has been established to handle curricular problems of all kinds. Send students there whenever they ask about placement, course prerequisites, transfer credits, degree requirements, University academic regulations, or related topics. Don't venture an answer yourself unless you are 100% sure it is correct; in the beginning, this will almost never be the case.

For personal problems and crises of all kinds, the University has a Counseling Center located at 900 Volunteer Boulevard. Please encourage students who need that type of assistance to go there.

10. Syllabus Policy

Every student in each of your sections must receive a written course syllabus within the first 10 calendar days of the semester. Your syllabus is a contract between you and your students. Explicitly explain all class policies in your syllabus.

Your syllabus should contain:
--General information: course name and number, meeting time and place, instructor name and contact information, office hours, course description and prerequisites, text information, calculator policy.
--A detailed grading scheme, showing how each student's average will be calculated. Keep it simple whenever possible. A good grading policy allows a student to know with reasonable certainty where he or she stands at any given time during the semester, and what he or she needs to do for the remainder of the semester to make a certain grade.
--A detailed grading scale, showing the point range needed to earn each letter grade, A, A-, B+, B, B-, C+, C, C-, D+, D, D-, F.
--Your policy about make-up exams, quizzes, and late homework assignments. This policy should be applied to ALL students in class, regardless of membership on an athletic team or other University group. Recommendation: spell out the circumstances that will qualify a student to either take a make-up exam or replace a missed exam grade with another grade.
--Academic Standards of Conduct discussion or statement (see item #11).
--Projected dates of exams and projects due and other important dates (such as add/drop dates and UT holidays). A calendar outlining the order of topics covered and assignments for each class are encouraged.

Other Syllabus ideas: Provide a list of course objectives: statements of what students should be able to do or know after participating in class sessions and completing the homework. This gives the students a written list of important items that must be learned for successful completion of the course.

Include a section in your syllabus titled "How to Succeed in This Class." Be specific about how much time they should invest

in the course, how important attendance will be for their grade, how to approach homework assignments, how to work for understanding, and how to study for exams.

Include a section outlining "Classroom Etiquette." Many of our younger students simply do not know the rules for proper classroom behavior, and it may be part of our responsibility to help them grow and mature. Some problems that you might want to address are: side-talking, arriving late, leaving early, preparing to leave before class is over, skipping class, reading the newspaper or working on items for other courses during lecture, and cell phone use during class. Most students will appreciate knowing your expectations (whatever they are) at the beginning of the course. You might want to state that these rules acknowledge respect for professors, for class time, and for fellow students (from "Teaching Large Classes," by Elisa Carbone).

11. Academic Integrity Policy

Each faculty member is responsible for defining, in specific terms, guidelines for preserving academic integrity in a course. Included in this definition should be a discussion of the Honor Statement. Faculty members at their discretion may also encourage their students to acknowledge adherence to the Honor Statement by "pledging" all graded class assignments and exams. The form of pledge may include writing the honor statement on the assignment, signing the printed statement, or simply writing "Pledged." Additionally, it will be the responsibility of each faculty member, graduate teaching assistant, and staff member to act on any violation of the Honor Statement. It is also incumbent upon faculty to maintain an atmosphere conducive to academic integrity by insuring that each quiz, test, and exam is adequately proctored.

Academic Standards of Conduct

All students are expected to abide by the University Honor Statement. In mathematics classes, violations of the honor statement include copying another person's work on any graded assignment or test, collaborating on a graded assignment without the instructor's approval, using unauthorized "cheat sheets" or technical devices such as calculators, cell phones or computers for graded tests or assignments, or other infractions listed in "***Hilltopics***". These violations are serious offenses, subject to disciplinary action that may include failure in a course and/or dismissal from the University. The instructor has full authority to suspend a student from his/her class, to assign an "F" in an exercise or examination, or to assign an "F" in the course. The instructor shall give written notification (countersigned by the department head) of the penalty and the route of appeal to the student. Students who contest the penalty should first appeal to the instructor, then the Head of the Mathematics Department. If the student is unable to resolve the penalty with the instructor and department head, he/she may appeal to the Academic Review Board within 7 calendar days of receiving written notice of the penalty. See "***Hilltopics***" for more complete information.

The Honor Statement

"An essential feature of the University of Tennessee is a commitment to maintaining an atmosphere of intellectual integrity and academic honesty. As a student of the University, I pledge that I will neither knowingly give nor receive any inappropriate assistance in academic work, thus affirming my own personal commitment to honor and integrity."

E. SUGGESTIONS FOR TEACHING ASSISTANTS

Either of your roles at U.T.--graduate student or teaching assistant---can be more than a full-time job. You should plan for an adequate amount of preparation time for each lecture you give and for each class you take. How much lecture preparation is needed depends on how much experience you have with the material. Inadequate preparation is usually apparent to most students, and a chronically unprepared instructor will soon lose the respect of the class. Before meeting your classes for the first time, think about the items listed below. Where necessary, decide what your policy will be and **LET YOUR STUDENTS KNOW THIS POLICY IN WRITING AT THE BEGINNING OF THE SEMESTER**. You should also give your students a brief course outline and a schedule.

1. Best Practices in Teaching Program

The Best Practices in Teaching program provides opportunities to discuss teaching-related issues with new and experienced faculty and peers from across the university. This program does not take the place of programs in pedagogy that an academic department may offer but supplements that coursework. This program will, however, offer broader discussion of best practices in teaching than any one department or unit can offer and will introduce participants to excellent teachers/mentors from across the disciplines.

Graduate Teaching Assistants and Associates, Postdoctoral Lecturers, and New Faculty are encouraged to participate in this two-

semester program by registering online at http://gradschool.utk.edu/orientation/teaching.shtml. You can also find more information about the program at that site.

The first session is normally scheduled for the first week of September and registration is required before that session.

2. Record Keeping

At the beginning of each semester, be sure that students are properly enrolled in your class. Either they should show you a computer-printout specifying your section, or their names should appear on a computer list that you will receive during the first ten days of the term. Until the class roster arrives, it is helpful to have students sign their names on a new sheet each day. The office may ask for the number of students attending your first few class meetings. As soon as the class membership has stabilized, establish a well-annotated grade book. Your grade book should contain an explanation of your grading scheme as well as class records. At some time in the future, you or the department may have to defend the grades you have given. Grade books are available in the supply closet. When your employment as a teaching assistant ceases, you will be asked to turn in grade books. SUGGESTION: KEEP A RECORD OF TEST GRADES AT HOME IN CASE YOUR PRIMARY GRADE RECORD "DISAPPEARS." Keep student finals for one semester per University policy; it is recommended that you keep them for one year. If a student wants their final, keep a copy. Keep grade books indefinitely.

3. Office Hours

Give a written schedule of your office hours to your students and to the Department office. One hour for each two hours in class is a reasonable policy. It is wise to urge students to tell you in advance, (e.g. just after class) if they wish to see you outside of class.

4. Tutoring

Tutoring for freshman-level courses is available in Temple Court 101 & 109. The location and schedule of the department's tutoring lab will be posted outside Aconda 104. There is no fee to the student. If students ask about private tutoring, send them to the department office, Aconda 104, where there is a file of available tutors. Please note, you may tutor students in other classes, but not your own class.

5. Attendance

Students should be impressed with the fact that non-attendance will, at least indirectly, affect their grades, especially in elementary courses. Frequent quizzes will help motivate students to attend class. **YOU SHOULD CHECK ATTENDANCE DAILY AND KEEP A RECORD OF ATTENDANCE.**

6. Course Grades

Explain carefully how final course grades will be determined. Include the portion of the grade determined by hour-tests, quizzes, homework, the final, and/or other items. Try to use letter grades as much as possible. At the end of the semester, do not post grades. It is a violation of federal law to post grades by name or social security number. Give the students an opportunity to bring you stamped self-addressed postcards, or use the University sponsored Online@UT web site to post grades promptly. Online@UT offers a fully integrated course management tool that allows an instructor to create and deliver content, communicate with students, deliver surveys and exams, receive homework in digital form, maintain and distribute grades, and more, without having to know Web-design or Web-design tools. In addition, course materials and student information in a course are secure. Instructors have the ability to make their course widely available or only accessible to those enrolled in the course. Go to http://online.utk.edu for more information and to gain access to your course site.

7. Tests, and the Final Examination Period

Announce the exact date of each test well in advance (at least one week). Most course outlines suggest convenient times for scheduling tests. Consult the timetable for the official schedule of your final examination. All final exams must be given during the specified times. The following is quoted from the Undergraduate Catalog and represents university policy, which all teachers must follow.

"Any final exams must be given during the final exam period at the scheduled time, although alternative uses of the scheduled exam period may be designated by the instructor.

Students are not required to take more than two written exams on any day. The instructor(s) of the last non-departmental exam(s)

on that day must reschedule the student's exam during the exam period. It is the obligation of students with such conflicts to make appropriate arrangements with the instructor at least two weeks prior to the end of classes.

No in-class, written quizzes or tests counting more than 10% of the semester grade may be given the last five calendar days prior to the study period. Courses that are exempt from the policy are so indicated in the catalog course description."

Mathematics classes taught by GTA's are expected to have examinations during the examination period. If you think there is some reason to use this time for some other purpose, you should obtain written approval from Dr. Szczepanski before doing so. Students may be permitted (but not required) to take make-up exams during the study period.

You are encouraged to schedule a review session for your students during the study period. If you do, check with Jessica Daugherty, Aconda Court 105D, to be sure your classroom is available.

8. Makeup Exams

There are various methods for providing a fair way for students with legitimate reasons for missing an exam to make up the grade. The most important thing is for you to **determine your policy and explain it carefully to your class at the beginning of the semester**.

9. Quizzes and Homework

Give your students a clear statement about whether you will give quizzes and/or homework which will count in the final grade. Keep in mind that you must use your time carefully. Teaching assistants, in general, cannot obtain paper graders. Some combination of quizzes and homework seems desirable to encourage students to work regularly, but it can also lead to grading chores that deprive you of valuable study time. After teaching for a couple of semesters, you probably will find the procedures that work best for you. Don't hesitate to ask other graduate assistants or members of the faculty for their comments and suggestions.

10. Disability Services

It is recommended that your syllabus contain the disability clause: “If you need course adaptations or accommodations because of a documented disability or if you have emergency information to share, please contact the Office of Disability Services at 2227 Dunford Hall or 974-6087. This will ensure that you are properly registered for services.”

Students, who have a disability and want special consideration, must register with disability services at least two weeks before using the service. The student is required to bring you a letter from disability services explaining the services that they are entitled to receive. The student should then discuss with you which services he/she would like to use. The instructor is to comply with the requests, as stated in the letter. If a student needs extra time or a quiet place for exams, the instructor is to make the arrangements. If it is not possible to work out these arrangements with the student, disability services will administer the exam. In this case, the student is required to bring you a form arranging for disability services to pick up the exam. The instructor is to fill out the student information label on an envelope in the departmental office and sign across the seal. It will be placed in your mailbox when it is returned.

F. STUDENT/PARENT COMPLAINTS AND CLASSROOM BEHAVIOR PROBLEMS

Sometimes a student comes to the department office to complain about his/her instructor. The Service Course Coordinator or Associate Head for Undergraduates will talk with the student and attempt to identify the problem(s) and to remind the student of his/her own obligations in the course. This initial conversation is simply a "fact-finding session" after which the instructor may be asked to come in to discuss the situation and to give his/her side of the matter. The department's main concern is that good instruction is provided, fair grading policies are used, and a pleasant atmosphere conducive to teaching and learning is maintained. Because students are often hesitant to discuss their concerns directly with the instructor, working through the departmental office is sometimes the only way for an instructor to learn that his/her student is troubled. The Service Course Coordinator and Associate Head for Undergraduates are always willing to work with instructors to resolve problems.

Do not talk with parents about a student’s progress or grade in class. Advise parents that you are not legally permitted to share this information with them. All information about their child’s progress must come from the student. Explain to the parent that if the student has questions about their progress or grade for the course that you would be happy to meet with the student during office hours to discuss this. If this does not satisfy the student or parent, advise them to call the Mathematics Undergraduate Program office, Aconda Court 105D, at 974-1478.

If you have behavioral problems with a student in your classroom, please seek the advice of the Associate Head for Undergraduates or Service Course Coordinator. They will attempt to help you solve classroom difficulties. Some additional resources:

Reed, R. (1997). Strategies for Dealing with Troublesome Behaviors in the Classroom [Electronic version]. *The National Teaching & Learning Forum*, 6(6). Retrieved March 19, 2004, from http://www.ntlf.com/html/pi/9710/strat.htm

Texas Tech University. (2002). *Faculty Guide — Civility in the Classroom: Tips for Dealing with Troublesome Behavior 2002–2003*. Retrieved March 19, 2004, from http://www.studentaffairs.ttu.edu/publications/civility2002.pdf

VII. MISCELLANEOUS INFORMATION

A. TELEPHONE

Telephones are provided for local use only, and they may not be used for long distance calls. The office will not give your number to students, but will take messages and put them in your mailbox.

B. MAINTENANCE PROBLEMS

Any maintenance problems that you have (e.g., heating, lighting) should be reported to the office as soon as you are aware of them.

C. COMMON ROOM

The Common Room, Aconda Court basement, is available to all faculty and graduate students in the Mathematics Department for relaxation and informal discussion. Many graduate students find the Common Room an ideal place to meet fellow students and faculty. A microwave, refrigerator, and sink are available in the Common Room, and many who bring their own lunches eat there. Coffee is available throughout the day. To maintain the room for the purposes intended, teaching assistants should not consult with their students in the Common Room.

D. COLLOQUIA

The Mathematics Department regards the colloquium lectures as a part of a student's graduate education, and graduate students are expected to attend these lectures. Speakers at the Mathematics Colloquia include mathematicians from outside the university, our own faculty, and other members of the university community. Most talks are based on the speaker's current research interests, or are expository talks on advanced topics. They are general in nature, with technical details left to special seminars.

E. GRADUATE STUDENT TRAVEL GRANTS

The Graduate Student Senate in cooperation with the Dean of Students and the Dean of the Graduate School awards funding for graduate and professional students to travel, present work, and participate at scholarly conferences and events.

Three travel award announcements are made throughout the year, designed to roughly coinciding with the academic term periods. These awards are based on merit and are given to provide partial reimbursement of certain allowable expenses such as transportation, lodging and registration expenses. Applications are considered by a committee composed of graduate students, faculty members, and university administrators.

Applications must be submitted to and received by the Office of the Dean of Students by specified deadlines which will be posted when available. Only applications submitted on the official form will be considered for awards.

F. THE SCIENCE ALLIANCE

The Science Alliance is a partnership between UT and Oak Ridge National Laboratory with joint funding from the state of Tennessee and DOE and additional funding from industry. It provides an unusual concentration of people, facilities, and funds to support scientific research, technological development, and educational excellence. It also provides financial awards for mathematics graduate students.

G. GRADUATE MATH CLUB / GRADUATE MATH FORUM

All graduate students in the Mathematics Department are members of the Graduate Math Club. The Graduate Math Club is in charge of coffee in the Common Room and also plans parties for the Department during the Fall and Spring semesters. The officers of the Graduate Math Club are referred to as The Graduate Student Executive Committee (GSEC). GSEC organizes meetings for

all graduate students in the Mathematics Department called the Graduate Math Forums. Talks at Graduate Math Forums are given, by invitation from the GSEC, by students on their own work or experience (e.g., research, job hunting and interviewing, interesting travel, etc.), and also by faculty members or outside speakers.

H. THE SIAM STUDENT CHAPTER

The Society for Industrial and Applied Mathematics is a leading international organization for the promotion of applied mathematics and its many varied disciplines. One way that the society seeks to foster the continued development of applied mathematics is through the information generated by student chapters. UT is one of the first institutions to have organized such a chapter. Most members are graduate students from the Mathematics Department, although other students are welcome. A nominal annual fee obtains this membership and the privilege to participate in election of chapter officers. Activities of the chapter include the sponsorship of lectures of particular interest to the membership, participation in national and regional SIAM meetings (including presentation of research papers by students in competitions in which UT students have been particularly successful) and, of course, social gatherings. All interested students are invited to attend meetings of the chapter.

I. POLICY ON DEPARTMENTAL PROPERTY

Before leaving the department you will be asked to turn in to the department your grade records, textbooks, office keys, equipment that has been checked out to you, and in some instances copies of examinations. A GTA's final paycheck may be withheld until any missing item is supplied. Often the department must handle questions concerning grades--sometimes several years after the grade has been assigned. It is impossible to do so without adequate records. The need to return keys, books, and equipment is obvious. Although the department must pay for all key replacements, our real concern is for loss of security when keys are not adequately controlled. Cooperation of graduate assistants in these matters is appreciated.

J. ASSISTANTSHIP APPLICATIONS

Each completed assistantship application with its related material (such as transcripts and reference letters) is filed in the department. During the selection process, only those faculty involved in deciding who should receive support have access to the file. Files of applicants who do not receive support are maintained by the department in accordance with federal law. The file of each applicant who receives support becomes part of the individual's departmental employee personnel file.

K. INCLEMENT WEATHER POLICY: The University of Tennessee will remain open except in the most severe weather conditions. The Provost may officially close or suspend selected activities of the University because of extreme weather conditions. When a decision to close is reached, campus and local radio and TV stations will be notified so that appropriate announcements may be made. In the event of inclement weather when the University remains open, all faculty, administrators, and staff will be expected to make every reasonable effort to maintain their regular work schedules, but are advised to avoid undue risks in traveling. Employees who anticipate arriving late or not arriving at all should notify their immediate supervisors. Students will be responsible for any academic work that they miss due to absences caused by severe weather conditions. It is the individual student's responsibility to take the initiative to make up any missed class work, and it is the instructor's responsibility to provide a reasonable opportunity for students to complete assignments or examinations missed due to such absences.

VIII. DISTRIBUTION OF PREVIOUSLY-PUBLISHED MATERIAL

Do not copy previously published material for distribution to your class. A memo from the College dated March 23, 1993, reminded faculty that "... providing copies of published material to students for class use with or without costs to them and/or without permission of the original publisher is illegal. Copyright laws in general apply to all such material." It also noted that "[f]aculty members who choose to make such copies of published information available for public use, especially when it involves University owned equipment invite legal action toward themselves and the institution as a whole."

IX. SEXUAL HARASSMENT

The following information on sexual harassment is from the publication *Sexual Harassment: A Guide for Faculty, Staff and Students* distributed by the Office of Affirmative Action.

The University of Tennessee, Knoxville is committed to providing an environment free from sexual harassment. Sexual harassment by any member of the University community is a violation of both the law and University policy and will not be tolerated. Both males and females can be victims of sexual harassment, and both males and females can be perpetrators of sexual harassment. Sexual harassment is an issue which may affect any member of the University community and will be dealt with promptly by the University administration.

Definitions of Sexual Harassment

FOR EMPLOYEES, harassment on the basis of sex is a violation of Section 703 of Title VII of the Civil Rights Act of 1964. The Equal Employment Opportunity Commission (EEOC) guidelines define sexual harassment as follows:

Unwelcome sexual advances, requests for sexual favors, and other verbal or physical conduct of a sexual nature constitute sexual harassment when 1. submission to such conduct is made either explicitly or implicitly a term or condition of an individual's employment; 2. submission to or rejection of such conduct by an individual is used as a basis for employment decisions affecting such individual; or 3. such conduct has the purpose or effect of substantially interfering with an individual's work performance or creating an intimidating, hostile, or offensive work environment.

FOR STUDENTS, harassment on the basis of sex is a violation of Title IX of the Education Amendments of 1972, which prohibits sex discrimination in educational programs and activities.

Unwelcome sexual advances, requests for sexual favors, and other verbal or physical conduct of a sexual nature constitute sexual harassment when 1. submission to such conduct is made either explicitly or implicitly a term of condition of an individual's status in a course, program, or activity; 2. submission to such conduct is used as the basis for academic decisions affecting the individual, including, but not limited to, grades or academic progress; or 3. when the conduct has the purpose or effect of interfering with the individual's academic performance, or of creating an intimidating, hostile, or offensive educational environment.

The basic point to remember is that sexual harassment is unwanted, unsolicited, or undesired attention of a sexual nature. Sexual harassment is a breach of the trusting relationship that normally exists between the employer-employee and/or the professor-student. Boundaries between the professional role and the personal relationship blur because the harasser introduces the personal element into what should be a sex-neutral situation.

Sexual harassment can be exhibited verbally or physically. Examples of sexual harassment include: unwelcome sexual innuendos, suggestive or insulting sounds, whistling in a suggestive manner, or humor and jokes about sex or (wo)men in general, implied or overt threats, and unwelcome patting, pinching, or touching.

X. POLICY ON CONSENSUAL ROMANTIC OR SEXUAL RELATIONSHIPS

UT's educational mission requires an atmosphere of professional behavior based upon mutual trust and respect between faculty and students. Relationships between students and their teachers, advisors, and others holding positions of authority over them should be conducted in a manner that avoids potential conflicts of interest or exploitation. Given the inherent differences in power between faculty and students, all members of the university community should recognize the possibility of intentional or unintentional abuse of that power.

Commonly accepted standards of professional behavior and ethics require that faculty members not hold evaluative power over any student with whom they have a romantic or sexual relationship.

Faculty members who engage in these relationships leave themselves vulnerable to charges of sexual harassment or conflict of interests. Even when both parties initially have consented, such a relationship renders both the faculty member and the institution vulnerable to possible later allegations of sexual harassment in the light of the significant power differential that exists between faculty and students. Thus, faculty members should not initiate or accept such a relationship with a student over whom they have an evaluative role.

Should such a relationship develop between a faculty member and a student, the faculty member shall remove him/herself from the evaluation of the student's work.

Faculty members are therefore obliged to be aware of these problems and of their individual responsibility to protect themselves, their students, and the institution from harmful effects of such relationships.

XI. COMPUTER ETHICS

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1. UTCC'S CODE OF COMPUTING PRACTICE

UTCC has the responsibility for securing its computing system to a reasonable and economically feasible degree against unauthorized access, while making it accessible for legitimate and innovative uses. This responsibility includes informing persons who use the UTCC computer system of expected standards of conduct and encouraging their application. It is important for you to practice ethical behavior in computing activities because you have access to many valuable and sensitive resources and your computing practices can adversely affect the work of other people. Although most people act responsibly, the few who do not, either through ignorance or by intent, have the potential for disrupting everyone's work. The list below constitutes a code of computing practice for all persons using the UTCC system. Disciplinary action for violating the code shall be governed by the applicable provisions of student handbooks, faculty and staff handbooks, personnel policy manuals for The University of Tennessee, and the Computer Crimes Act of The State of Tennessee.

1. You are responsible for being aware of and following the published procedures for accessing the UTCC computing system.

2. You must use only the computer accounts which have been authorized for your use. You are required to identify all of your computing work with your name and assigned account codes so that responsibility for the work can be determined and you can be contacted in unusual situations, such as the return of misplaced output.

3. You are responsible for the use of your computer accounts. You should make appropriate use of system-provided protection features such as pass words, and you should take precautions against others obtaining access to your computer resources. Do not make your account available to others for any purpose. If you require assistance in using your accounts, you should contact UTCC User Services at 974-6831.

4. You must use your computer accounts only for the purpose for which they are authorized. For example, unsponsored research codes must not be used for sponsored research work or private consulting.

5. Do not access or copy the programs, files or data belonging to other persons or to UTCC without prior authorization to do so. Do not attempt to access files for which you do not have authorization. Programs, subroutines, and data provided by UTCC are not to be taken to other computer sites without permission. You may use software on UTCC computers only if it has been legally obtained and its use does not violate any license or copyright restriction. Do not use programs at UTCC that were obtained from other computer sites unless they are in the public domain or authority to use them at UTCC has been obtained.

6. To minimize the impact of your work on the work of other persons, you must not attempt to encroach on others' use of the facilities or deprive them of resources.

7. Do not attempt to modify system facilities.

8. Do not attempt to subvert the restrictions associated with your computer accounts. The code is intended to work to the benefit of all who use the UTCC systems by encouraging responsible use of scarce computer resources. So that UTCC can better serve you, comments on the code are welcome.

2. USING SOFTWARE

A guide to the ethical and legal use of software for members of the academic community. This is an authorized reprint of a brochure produced as a service to the academic community by EDUCOM, a nonprofit consortium of over 450 colleges and universities committed to the use and management of information technology in higher education, and ADAPSO, the computer software and services industry association. Although this brochure is copyrighted, you are authorized and encouraged to make and distribute copies of it, in whole or in part, providing the source is acknowledged. For copies of the brochure, contact either source listed at the end of the text.

Software enables us to accomplish many different tasks with computers. Unfortunately, in order to get their work done quickly and conveniently, some people justify making and using unauthorized copies of software. They may not understand the

implications of their actions or the restrictions of the U.S. copyright law. Here are some relevant facts:

- Unauthorized copying of software is illegal. Copyright law protects software authors and publishers, just as patent law protects inventors.

- Unauthorized copying of software by individuals can harm the entire academic community. If unauthorized copying proliferates on a campus, the institution may incur a legal liability. Also, the institution may find it more difficult to negotiate agreements that would make software more widely and less expensively available to members of the academic community.

- Unauthorized copying of software can deprive developers of a fair return for their work, increase prices, reduce the level of future support and enhancement, and inhibit the development of new software products.

RESPECT

Respect for the intellectual work and property of others has traditionally been essential to the mission of colleges and universities. As members of the academic community, we value the free exchange of ideas. Just as we do not tolerate plagiarism, we do not condone the unauthorized copying of software, including programs, applications, data bases and code. Therefore, we offer the following statement of principle about intellectual property and the legal and ethical use of software (see "Software and Intellectual Rights" on next page). This "code"--intended for adaptation and use by individual colleges and universities--was developed by the EDUCOM Software Initiative.

QUESTIONS YOU MAY HAVE ABOUT USING SOFTWARE

a. What do I need to know about software and the U.S. Copyright Act?

Unless it has been placed in the public domain, software is protected by copyright law. The owner of a copyright holds exclusive right to the reproduction and distribution of his or her work. Therefore, it is illegal to duplicate or distribute software or its documentation without the permission of the copyright owner. If you have purchased your copy, however, you may make a backup for your own use in case the original is destroyed or fails to work.

b. Can I loan software I have purchased myself?

If your software came with a clearly visible license agreement, or if you signed a registration card, READ THE LICENSE CAREFULLY before you use the software. Some licenses may restrict use to a specific computer. Copyright law does not permit you to run your software on two or more computers simultaneously unless the license agreement specifically allows it. It may, however, be legal to loan your software to a friend temporarily as long as you do not keep a copy.

c. If software is not copy-protected, do I have the right to copy it?

Lack of copy-protection does NOT constitute permission to copy software in order to share or sell it. "Non-copy-protected" software enables you to protect your investment by making a backup copy. In offering non-copy-protected software to you, the developer or publisher has demonstrated significant trust in your integrity.

d. May I copy software that is available through facilities on my campus, so that I can use it more conveniently in my own room?

Software acquired by colleges and universities is usually licensed. The licenses restrict how and where the software may be legally used by members of the community. This applies to software installed on hard disks in microcomputer clusters, software distributed on disks by a campus lending library, and software available on a campus mainframe or network. Some institutional licenses permit copying for certain purposes. Consult your campus authorities if you are unsure about the use of a particular software product.

e. Isn't it legally "fair use" to copy software if the purpose in sharing it is purely educational?

No. It is illegal for a faculty member or student to copy software for distribution among the members of a class, without permission of the author or publisher.

Alternatives to explore Software can be expensive. You may think that you cannot afford to purchase certain programs that you need. But there are legal alternatives to unauthorized copying. Site licensed and bulk-purchased software. Your institution may have negotiated agreements that make software available either to use or to purchase at special prices. Consult your campus

computing office for information. Software available through institutional site licenses or bulk purchases is subject to copyright and license restrictions, and you may not make or distribute copies without authorization.

SHAREWARE

Shareware, or "user-supported" software, is copyrighted software that the developer encourages you to copy and distribute to others. This permission is explicitly stated in the documentation or displayed on the computer screen. The developer of shareware generally asks for a small donation or registration fee if you like the software and plan to use it. By registering, you may receive further documentation, updates and enhancements. You are also supporting future software development. Public domain software. Sometimes authors dedicate their software to the public domain, which means that the software is not subject to any copyright restrictions. It can be copied and shared freely. Software without copyright notice is often, but not necessarily, in the public domain. Before you copy or distribute software that is not explicitly in the public domain, check with your campus computing office.

A FINAL NOTE

Restrictions on the use of software are far from uniform. You should check carefully each piece of software and the accompanying documentation yourself. In general, you do not have the right to:

1. receive and use unauthorized copies of software, or
2. make unauthorized copies of software for others.

If you have questions not answered by this brochure about the proper use and distribution of a software product, seek help from your computing office, from the software developer or publisher. For brochure copies, contact:

EDUCOM, Software Initiative
P. O. Box 364
Princeton, NJ 08540

ADAPSO
1300 North 17th Street, Suite 300
Arlington, VA 22209

SOFTWARE AND INTELLECTUAL RIGHTS

Respect for intellectual labor and creativity is vital to academic discourse and enterprise. This principle applies to works of all authors and publishers in all media. In encompasses respect for the right to acknowledgment, right to privacy, and right to determine the form, manner, and terms of publication and distribution. Because electronic information is volatile and easily reproduced, respect for the work and personal expression of others is especially critical in computer environments. Violations of authorial integrity, including plagiarism, invasion of privacy, unauthorized access, and trade secret and copyright violations, may be grounds for sanctions against members of the academic community.

3. TENNESSEE COMPUTER CRIMES ACT

Tennessee law provides that certain computer offenses are criminal acts and prescribes penalties for unlawful activities related to computer usage. UTCC believes it is important for the university community to be aware of the law and its provisions, shown below, which are found in Tennessee Code Annotated, Sections 39-14-601, et seq.

COMPUTER OFFENSES

39-14-601. Definitions. -- The following definitions apply in this part, unless the context otherwise requires:

1) "Access" means to approach, instruct, communicate with, store data in, retrieve or intercept data from, or otherwise make use of any resources of, a computer, computer system, or computer network;

2) "Computer" means a device that can perform substantial computation, including numerous arithmetic or logic operations, without intervention by a human operator during the processing of a job;

3) "Computer network" means a set of two (2) or more computer systems that transmit data over communication circuits connecting them;

4) "Computer program" means an ordered set of data that are coded instructions or statements that, when executed by a computer, cause the computer to process data;

5) "Computer software" means a set of computer programs, procedures, and associated documentation concerned with the operation of a computer, computer system, or computer network;

6) "Computer system" means a set of connected devices including a computer and other devices including, but not limited to, one (1) or more of the following: data input, output, or storage devices, data communication circuits, and operating system computer programs that make the system capable of performing data processing tasks;

7) "Data" is a representation of information, knowledge, facts, concepts, or instructions which is being prepared or has been prepared in a formalized manner, and is intended to be stored or processed, or is being stored or processed, or has been stored or processed, in a computer, computer system or computer network;

8) "Financial instruments" includes, but is not limited to, any check, cashier's check, draft, warrant, money order, certificate of deposit, negotiable instrument, letter of credit, bill of exchange, credit card, debit card, marketable security, or any computer system representation thereof;

9) "Intellectual property" includes data, which may be in any form including, but not limited to, computer printouts, magnetic storage media, punched cards, or may be stored internally in the memory of a computer;

10) "To process" is to use a computer to put data through a systematic sequence of operations for the purpose of producing a specified result;

11) "Property" includes, but is not limited to, intellectual property, financial instruments, data, computer programs, documentation associated with data, computers, computer systems and computer programs, all in machine-readable or human-readable form, and any tangible or intangible item of value; and

12) "Services" includes, but is not limited to, the use of a computer, a computer system, a computer network, computer software, computer program, or data to perform tasks.

39-14-602. Violations -- Penalties. --

(a) Whoever knowingly, directly or indirectly, accesses, causes to be accessed, or attempts to access any computer software, computer program, data, computer, computer system, computer network, or any part thereof, for the purpose of obtaining money, property, or services for himself or another by means of false or fraudulent pretenses, representations, or promises violates this subsection and is subject to the penalties of Section 39-14-105.

(b) Whoever intentionally and without authorization, directly or indirectly: (1) accesses; or (2) alters, damages, destroys, or attempts to damage or destroy, any computer, computer system, computer network, computer software, program or data; violates this subsection.

(c) A violation of subdivision (b)(1) is a Class C misdemeanor.

(d) A violation of subdivision (b)(2) is punished as in Section 39-14-105.

(e) Whoever receives, conceals, uses, or aids another in receiving, concealing or using any proceeds resulting from a violation of either subsection (a) or subdivision (b)(2), knowing the same to be proceeds of such violation, or whoever receives, conceals, uses, or aids another in receiving, concealing or using, any books, records, documents, property, financial instrument, computer software, program, or other material, property, or objects, knowing the same to have been used in violating either subsection (a) or subdivision (b)(2) violates this subsection and is subject to the penalties of Section 39-14-105.

39-14-603. Venue. --

For the purposes of venue under the provisions of this part, any violation of this part shall be considered to have been committed:

(1) In any county in which any act was performed in furtherance of any transaction violating this part;

(2) In any county in which any violator had control or possession of any proceeds of the violation or of any books, records, documents, property, financial instrument, computer software, computer program or other material, objects or items which were used in furtherance of the violation; and

(3) In any county from which, to which or through which any access to a computer, computer system, or computer network was made, whether by wire, electromagnetic waves, microwaves or any other means of communication.

XII. EMERGENCY SITUATIONS

REACTING TO AN EMERGENCY SITUATION

The following procedures should be followed in the event of an emergency situation:

1. **Notify other building occupants of the existence of an emergency.** The best way to alert others is by **activating the building's emergency alarm system as you leave the building**. The alarm system will sound when the activation handle is pulled out or down.

2. **Notify 911 of the emergency from a safe location.** This may be an office or a room down the hall, your own office/room or a nearby building. When the 911 operator answers, describe the type of emergency, its exact location and the severity of the problem. Stay on the line, if you can safely do so, until you are sure the operator has all the information you can provide.

3. **If it is not safe to use a building telephone, use the nearest "blue light" emergency telephone.** The "blue light" telephones are connected directly to the University Police Department dispatcher who will relay the request for assistance to the appropriate response agency. Stay on the line until you are sure the dispatcher has all the information you can provide.

4. Procedures for evacuation: One of the most important responsibilities of each individual is to evacuate the building promptly and safely. In response to the sounding of an emergency alarm (or other notification) leave the building immediately. As you leave the area, close the door behind you to retard the spread of flames and smoke. Proceed along your previously determined escape route to the building's exit. (If an exit is blocked, use an alternate path.) After you have entered a stairwell, be sure that the door closes and latches behind you. **DO NOT USE THE ELEVATORS. The elevator may fail as a result of damage or it may move to the location of the emergency and the doors may open.**

5. Once outside the building, move away to a safe location. Do not return to the building until instructed to do so by authorized personnel (Fire or Police Officer). If there are no authorized personnel on the scene, go to a nearby building or to a "blue light" emergency telephone and call for instructions.

If You Realize a Fire Has Occurred While You Are Inside a Room

1. Feel the door to see whether it is hot. If the door is hot, the area on the other side is probably involved in the fire. If the door is cool, kneel down and check the air coming into the room from under the door. If the air is cool, it should be safe to open the door.

2. Kneel behind the door and open it a crack, being sure to keep your face turned away from the opening. Listen and smell for smoke and fire. If the area on the other side of the door is on fire, very hot air and gases may rush into the room when you open the door. If this occurs, close the door immediately.

3. If you determine that it is safe to leave the room, close all the windows and then the door as you exit. When leaving a smoke-filled area, move quickly, crawling on your hands and knees. (Hot air and poisonous gases rise; fresh air will be nearer the floor.)

4. If you must stay in the room and wait rescue, place a wet towel or other material along the bottom of the door to impede the entry of smoke and gases. Check all windows for an escape route. If no unaided safe escape from a window is possible, attempt to open a window slightly and hang something out to show rescuers that you are there. The small opening will also provide fresh air.

Handicapped Individuals

Special arrangements must be made for individuals who have a handicap which would hinder their evacuation from the building. The head of a unit in which a handicapped individual is employed is responsible for making arrangements for provision of necessary assistance in the event of an emergency. The person or persons designated to assist the handicapped person should go to the handicapped person when the alarm sounds. The University Police Department should be informed of persons for whom special arrangements have been made.

XIII. IMPORTANT RESOURCES:

1. Graduate and Undergraduate Catalogs: http://diglib.lib.utk.edu/dlc/catalog/index.html

2. ***Hilltopics*** Student Handbook: http://web.utk.edu/~homepage/hilltopics/default.html

3. Faculty Handbook: http://chancellor.tennessee.edu/facultyhandbook/

4. Final Exam Schedule: http://registrar.tennessee.edu/timetable/finalexam.html

5. Academic Calendar: http://registrar.tennessee.edu/academic_calendar/

6. Key dates: http://registrar.tennessee.edu/

IX. CURRENT MATHEMATICS CATALOG COURSES:

MATH 400 - History of Mathematics
3 Credit Hours Development of major ideas in mathematics from ancient to modern times and the influence of these ideas in science, technology, philosophy, art, and other areas. Includes at least one in-class essay examination and 3,000 words of writing outside classroom.
(DE) Prerequisite(s): 251 or 257 and 300.

MATH 403 - Mathematical Methods for Engineers and Scientists
3 Credit Hours Matrix computations, numerical methods, partial differential equations, Sturm-Liouville Theory and special functions as used in engineering and science.
Credit Restriction: Does not satisfy major requirements for the mathematics major (Bachelor of Science or Master of Science).
(DE) Prerequisite(s): 231, 241, and familiarity with operating system and programming language.

MATH 404 - Applied Vector Calculus
3 Credit Hours Topics from multivariable and vector calculus; line and surface integrals, divergence theorem and the theorems of Gauss and Stokes.
(DE) Prerequisite(s): 241 or 247.

MATH 405 - Models in Biology
3 Credit Hours Difference and differential equation models of biological systems.
Credit Restriction: May not be applied toward graduate degree.
(DE) Prerequisite(s): 142 or 148 or 152.

MATH 411 - Mathematical Modeling
3 Credit Hours Construction and analysis of mathematical models used in science and industry. Projects emphasized.
Recommended Background: Courses in differential equations and linear algebra.

MATH 421 - Combinatorics
3 Credit Hours Introduction to problems of construction and enumeration for discrete structures such as sequences, partitions, graphs, finite fields and geometries, and experimental designs.
(DE) Prerequisite(s): 323.

MATH 423 - Probability
3 Credit Hours Axiomatic probability, univariate and multivariate distributions, conditional distributions and expectations, moment generating functions, laws of large numbers and central limit theorem.
(DE) Prerequisite(s): 241 and 323.

MATH 424 - Stochastic Processes
3 Credit Hours Markov chains, Poisson processes and Brownian motion. Other topics as selected by instructor.
(DE) Prerequisite(s): 423.

MATH 425 - Statistics
3 Credit Hours Standard statistical distributions, independence of mean and variance for a Gaussian sample, basic limit theorems; point and interval estimation, tests of statistical hypotheses, Neyman-Pearson theorem; likelihood ratio and other parametric and nonparametric tests.
(DE) Prerequisite(s): 423.

MATH 431 - Differential Equations II
3 Credit Hours A second course in ordinary differential equations. Linear systems of differential equations, Frobenius method, Sturm-Liouville eigenvalue problems, phase plane analysis.
(DE) Prerequisite(s): 200 or 251 or 257 or 231.

MATH 435 - Partial Differential Equations
3 Credit Hours Separation of variables, Fourier series, solution of Laplace, wave, and heat equations.
(DE) Prerequisite(s): 231 and 241 or 247.

MATH 443 - Complex Variables
3 Credit Hours Introduction to the theory of functions of a complex variable, including residue theory and contour integrals.
(DE) Prerequisite(s): 241 or 247.

MATH 445 - Advanced Calculus I
3 Credit Hours Introduction to the theory of sequences, series, differentiation, and Riemann integration of functions of one or more variables.
(DE) Prerequisite(s): 241 or 247 and 300.

MATH 446 - Advanced Calculus II
3 Credit Hours Continuation of 445.
(DE) Prerequisite(s): 445.

MATH 447 - Honors: Advanced Calculus I
3 Credit Hours Honors version of 445.
(DE) Prerequisite(s): 341.

MATH 448 - Honors: Advanced Calculus II
3 Credit Hours Continuation of 447.
(DE) Prerequisite(s): 447.

MATH 453 - Matrix Algebra II
3 Credit Hours Advanced topics in matrix theory including Jordan canonical form.
(DE) Prerequisite(s): 251 or 257.

MATH 455 - Abstract Algebra I
3 Credit Hours Introduction to algebraic structures such as groups, rings, fields, vector spaces, and linear transformations.
(DE) Prerequisite(s): 251 or 257 and 300.

MATH 456 - Abstract Algebra II
3 Credit Hours Continuation of 455.
(DE) Prerequisite(s): 455.

MATH 457 - Honors: Abstract Algebra I
3 Credit Hours Honors version of 455.
(DE) Prerequisite(s): 351.

MATH 458 - Honors: Abstract Algebra II
3 Credit Hours Continuation of 457.
(DE) Prerequisite(s): 457.

MATH 460 - Geometry
3 Credit Hours Axiomatic and historical development of neutral, Euclidean, and hyperbolic geometry stressing proof technique and critical reasoning. Models of Non-Euclidean geometries.
(DE) Prerequisite(s): 300.

MATH 462 - Differential Geometry
3 Credit Hours Classical differential geometry of curves and surfaces: Frenet frames, first and second fundamental forms, Gauss curvature and mean curvature, geodesics and parallel transport, the Gauss-Bonet theorem, geometry of the hyperbolic plane.
Recommended Background: Multivariable calculus (241 or 247).

MATH 467 - Honors: Topology
3 Credit Hours Includes topology of line and plane, separation properties, compactness, connectedness, continuous functions, homeomorphisms, continua, and topological invariants.
(DE) Prerequisite(s): 300 and 241 or 247.

MATH 471 - Numerical Analysis
3 Credit Hours Introduction to computation, instabilities, and rounding. Interpolation and approximation by polynomials and piecewise polynomials. Quadrature and numerical solution of initial and boundary value problems of ordinary differential equations, stiff systems.
Cross-listed: (Same as Computer Science 471.)
Recommended Background: Course in basic numerical methods.

MATH 472 - Numerical Algebra
3 Credit Hours Direct and iterative methods for systems of linear equations. Solution of single nonlinear equation and nonlinear systems. Orthogonal decomposition, least squares and algebraic eigenvalue problem.
Cross-listed: (Same as Computer Science 472.)
Recommended Background: Course in basic numerical methods and linear algebra.

MATH 475 - Industrial Mathematics
3 Credit Hours Modeling, analysis, and computation applied to scientific/technical/industrial problems.
Recommended Background: Course in differential equations and familiarity with an operating system and a programming language.

MATH 490 - Readings in Mathematics
1-3 Credit Hours Open to superior students. Independent study with faculty guidance.
Repeatability: May be repeated. Maximum 9 hours.
Comment(s): Consent of faculty mentor to supervise independent work required.
Registration Permission: Consent of department head.

MATH 499 - Seminar in Mathematics
1-3 Credit Hours Topics vary. Requires out-of-class projects and in-class presentations by students. Students must register for the number of credit hours announced for a particular seminar.
Repeatability: May be repeated. Maximum 9 hours.
Registration Permission: Consent of instructor.

MATH 500 - Thesis
1-15 Credit Hours *Grading Restriction: P/NP only.*
Repeatability: May be repeated.

MATH 502 - Registration for Use of Facilities
1-15 Credit Hours Required for the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree is completed.
Grading Restriction: Satisfactory/No Credit grading only.
Repeatability: May be repeated.
Credit Restriction: May not be used toward degree requirements.

MATH 504 - Discrete Mathematics for Teachers
3 Credit Hours Mathematical logic and methods of argument, sets, functions and relations, combinatorics. Normally, the first graduate course for students seeking Master of Mathematics degree.
Credit Restriction: May not apply toward mathematics major (Master of Science).
Recommended Background: 1 year of calculus or equivalent.
Comment(s): For students in Master of Mathematics program and for students in graduate programs in the College of Education, Health, and Human Sciences.

MATH 505 - Analysis for Teachers
3 Credit Hours Development of differential and integral calculus, proofs of basic theorems.
Credit Restriction: May not apply toward mathematics major (Master of Science).
Recommended Background: 1 year of calculus or equivalent.
Comment(s): For students in Master of Mathematics program and for students in graduate programs in the College of Education, Health, and Human Sciences.

MATH 506 - Algebra for Teachers
3 Credit Hours Algebraic structures: integral domains and fields and their applications to algebra of integers and polynomials.
Credit Restriction: May not apply toward mathematics major (Master of Science).
Recommended Background: 1 year of calculus or equivalent.
Comment(s): For students in Master of Mathematics program and for students in graduate programs in the College of Education, Health, and Human Sciences.

MATH 507 - Probability and Statistics for Teachers
3 Credit Hours Probability models. Discrete random variables. Binomial, hypergeometric, and Poisson distributions.
Credit Restriction: May not apply toward mathematics major (Master of Science).
Recommended Background: 1 year of calculus or equivalent.
Comment(s): For Students in Master of Mathematics program and for students in graduate programs in the College of Education, Health, and Human Sciences.

MATH 509 - Seminar for Teachers
3 Credit Hours *Repeatability: May be repeated. Maximum 12 hours.*
Credit Restriction: May not apply toward mathematics major (Master of Science).
Comment(s): For Students in Master of Mathematics program and for students in graduate programs in the College of Education, Health, and Human Sciences.
Registration Permission: Consent of instructor.

MATH 510 - Applied Mathematics Laboratory
1 Credit Hours Computer applications in applied mathematics: software packages for matrix analysis, symbolic algebra, and differential equations.
Repeatability: May be repeated. Maximum 2 hours.
(DE) Corequisite(s): 511.

MATH 511 - Methods in Applied Mathematics I
3 Credit Hours Fundamentals and techniques associated with discrete models of physical, engineering and biological systems: difference equations, networks and graphs, optimization, and other topics.
Recommended Background: Courses in advanced calculus and linear algebra.

MATH 512 - Methods in Applied Mathematics II
3 Credit Hours Fundamentals and techniques associated with continuous models of physical, engineering, and biological systems: development, solution and qualitative analysis of ordinary and partial differential equations, and calculus of variations.
(DE) Prerequisite(s): 511.

MATH 513 - Mathematical Principles of Fluid Mechanics I
3 Credit Hours Equations of motion, incompressible and compressible potential flow, shock waves, viscous flows. Navier-Stokes equations.
Recommended Background: Advanced courses in ordinary and partial differential equations and advanced calculus.

MATH 514 - Mathematical Principles of Fluid Mechanics II
3 Credit Hours Continuation of 513.
(DE) Prerequisite(s): 513.

MATH 515 - Analytical Applied Mathematics I
3 Credit Hours Analysis of advanced techniques in modern context for applied problems: dimensional analysis and scaling, perturbation theory, variational approaches, transform theory, wave phenomena and conservation laws, stability and bifurcation, distributions, integral equations.
Recommended Background: Courses in advanced calculus, linear algebra, and either advanced differential equations or 512.

MATH 516 - Analytical Applied Mathematics II
3 Credit Hours Continuation of 515.
(DE) Prerequisite(s): 515.

MATH 517 - Mathematical Methods in Physics I
3 Credit Hours *Cross-listed: (See Physics 571.)*

MATH 518 - Mathematical Methods in Physics II
3 Credit Hours *Cross-listed: (See Physics 572.)*

MATH 519 - Seminar in Applied Mathematics
1-3 Credit Hours *Repeatability: May be repeated. Maximum 12 hours.*

MATH 521 - Enumerative Combinatorics I
3 Credit Hours Sieve methods, recursion, generating functions, and permutation groups applied to enumeration of discrete structures. Incidence algebras and combinatorics of partially ordered sets.

MATH 522 - Enumerative Combinatorics II
3 Credit Hours Continuation of 521.
(DE) Prerequisite(s): 521.

MATH 523 - Probability I
3 Credit Hours Probability spaces and random variables, expectation, characteristic functions, convergence of random variables.
Recommended Background: One year of advanced calculus and 323.

MATH 524 - Probability II
3 Credit Hours Continuation of 523. Law of large numbers, central limit theorem, conditional expectation, martingales. Other topics as selected by instructor.
(DE) Prerequisite(s): 523.

MATH 525 - Statistics I
3 Credit Hours Formulation of statistical models, sufficiency; methods of estimation and optimal theory, asymptotic efficiency; the confidence procedures and hypothesis testing, uniformly most powerful tests; Bayesian statistics.
Recommended Background: One year of advanced calculus and 425.

MATH 526 - Statistics II
3 Credit Hours Continuation of 525. Estimation and tests in general linear models; non-parametric models, rank methods for comparison, robust tests. Other topics as selected by instructor.
(DE) Prerequisite(s): 525.

MATH 527 - Stochastic Modeling
3 Credit Hours Variable topics in probability applied to real world situations. Topics may include queuing theory, branching processes, Monte Carlo simulation, stochastic finance and other topics as selected by instructor.
Recommended Background: One year of advanced calculus and one year of undergraduate probability or mathematical statistics.

MATH 529 - Seminar in Stochastics
1-3 Credit Hours *Repeatability: May be repeated. Maximum 12 hours.*

MATH 531 - Ordinary Differential Equations I
3 Credit Hours Existence, uniqueness, extendibility, and dependence on parameters for solutions of differential equations. The theory of linear systems of differential equations including boundary value problems and series methods.
Recommended Background: One year of advanced calculus and undergraduate differential equations.

MATH 532 - Ordinary Differential Equations II
3 Credit Hours Continuation of 531. The nonlinear theory of differential equations including Liapunov stability, critical point analysis, and Poincare-Bendixson theory.
(DE) Prerequisite(s): 531.

MATH 534 - Calculus of Variations
3 Credit Hours Necessary and sufficient conditions for weak and strong extrema in one-dimensional variation problems; Lagrangian mechanics. Multiple integrals. Basic elements of direct methods.
Recommended Background: At least one senior-level course in differential equations or advanced calculus. Mathematical maturity.

MATH 535 - Partial Differential Equations I
3 Credit Hours First order partial differential equations, classification of second order partial differential equations, properties of elliptic, parabolic and hyperbolic partial differential equations.
Recommended Background: One year of advanced calculus.

MATH 536 - Partial Differential Equations II
3 Credit Hours Continuation of 535. Properties and representation formulas for elliptic, parabolic and hyperbolic partial differential equations.
(DE) Prerequisite(s): 535.

MATH 537 - Mathematical Principles of Continuum Mechanics I
3 Credit Hours Conservation principles, equations of equilibrium and motion for fluids and elastic solids, constitutive relations and stress, convexity properties, bifurcation phenomena, existence theory.
Recommended Background: Courses in advanced calculus and advanced differential equations.

MATH 538 - Mathematical Principles of Continuum Mechanics II
3 Credit Hours Continuation of 537.
(DE) Prerequisite(s): 537.

MATH 539 - Seminar in Differential Equations

1-3 Credit Hours *Repeatability: May be repeated. Maximum 12 hours.*

MATH 545 - Real Analysis
3 Credit Hours Measure theory, Lebesgue integration, Holder and Minkowski inequalities, Radon-Nikodym theorem, Fubini's theorem.
Recommended Background: One year of advanced calculus.

MATH 546 - Complex Analysis
3 Credit Hours Holomorphic functions, Cauchy's theorem, Maximum Modulus theorem, Schwarz's lemma, normal families, Riemann mapping theorem.
(DE) Prerequisite(s): 545.

MATH 547 - Applied Linear Analysis
3 Credit Hours Banach and Hilbert spaces, linear operators and spectral theory, Sobolev spaces, applications.
(DE) Prerequisite(s): 545.

MATH 549 - Seminar in Analysis
1-3 Credit Hours *Repeatability: May be repeated. Maximum 12 hours.*

MATH 551 - Modern Algebra I
3 Credit Hours Groups and rings.
Recommended Background: One year of undergraduate abstract algebra.

MATH 552 - Modern Algebra II
3 Credit Hours Continuation of 551; modules, fields and Galois theory.
(DE) Prerequisite(s): 551.

MATH 555 - Number Theory I
3 Credit Hours Introduction to algebraic number theory.
Recommended Background: One year of undergraduate abstract algebra.

MATH 556 - Number Theory II
3 Credit Hours Continuation of 555.
(DE) Prerequisite(s): 555.

MATH 559 - Seminar in Algebra
1-3 Credit Hours *Repeatability: May be repeated. Maximum 12 hours.*

MATH 561 - Topology I
3 Credit Hours Topological spaces and continuous functions, separation axioms, product and quotient topologies, connectedness, compactness, complete metric spaces.
Recommended Background: One year of advanced calculus.

MATH 562 - Topology II
3 Credit Hours Continuation of 561. Fundamental group and covering spaces.
(DE) Prerequisite(s): 561.

MATH 567 - Riemannian Geometry I
3 Credit Hours Riemannian and Lorentzian manifolds. Variations of arc length, Jacobi fields, comparison theorems. Constant curvature spaces. Curvature and topology of manifolds.
Recommended Background: One year of advanced calculus.

MATH 568 - Riemannian Geometry II
3 Credit Hours Continuation of 567.
(DE) Prerequisite(s): 567.

MATH 569 - Seminar in Topology and Geometry
1-3 Credit Hours *Repeatability: May be repeated. Maximum 12 hours.*

MATH 571 - Numerical Mathematics I
3 Credit Hours Direct and iterative methods for linear systems. The algebraic eigenvalue problem and the singular decomposition theorem. Newton and quasi-Newton methods for systems of nonlinear equations.
Cross-listed: (Same as Computer Science 571.)
Recommended Background: Courses in advanced calculus and basic numerical analysis.

MATH 572 - Numerical Mathematics II
3 Credit Hours Numerical techniques for initial value problems of ordinary differential equations. Two-point boundary value problems. Finite difference and finite element methods for selected partial differential equations. Fast Poisson solvers.
Cross-listed: (Same as Computer Science 572.)
(DE) Prerequisite(s): 571.

MATH 574 - Finite Element Methods
3 Credit Hours Finite element techniques for solution of boundary and initial-boundary value problems. Variational formulation. Finite dimensional subspaces and their approximating properties; rates of convergence. Computer implementation.
Cross-listed: (Same as Computer Science 574.)
Recommended Background: Courses in partial differential equations, linear algebra and numerical analysis.

MATH 576 - Linear and Nonlinear Programming
3 Credit Hours Linear programming, the simplex and interior methods. Integer, convex, stochastic and other topics in nonlinear programming. Applications to real world problems.
Recommended Background: Courses in numerical algorithms, linear algebra and advanced calculus.

MATH 577 - Optimization
3 Credit Hours Mathematical foundations of constrained and unconstrained optimization. Lagrange multipliers, the Farkas lemma, the Kuhn-Tucker-Karush theorem. Analysis of major algorithms and applications to real world problems.
Recommended Background: Courses in numerical algorithms, linear algebra and advanced calculus.

MATH 578 - Numerical Methods for Partial Differential Equations
3 Credit Hours Numerical approximation of solutions of partial differential equations including conservation laws and hyperbolic, parabolic, and elliptic problems. Derivation, physical meaning, and implementation of schemes.
Recommended Background: A course in partial differential equations or 512 or 515, and familiarity with an operating system and a programming language.

MATH 579 - Seminar in Numerical Mathematics
1-3 Credit Hours *Repeatability: May be repeated. Maximum 12 hours.*

MATH 581 - Mathematical Ecology I
3 Credit Hours Deterministic and stochastic models of populations, communities, and ecosystems.
Cross-listed: (Same as Ecology and Evolutionary Biology 581.)
(DE) Prerequisite(s): 431 and 453.

MATH 582 - Mathematical Ecology II
3 Credit Hours Continuation of 581.
Cross-listed: (Same as Ecology and Evolutionary Biology 582.)
(DE) Prerequisite(s): 581.

MATH 583 - Mathematical Evolutionary Theory
3 Credit Hours Population genetics and evolutionary ecology.
Cross-listed: (Same as Ecology and Evolutionary Biology 585.)
(DE) Prerequisite(s): 431 and 453.

MATH 585 - Optimal Control Theory
3 Credit Hours Deterministic optimal control. Examples involving calculus of variations, optimal trajectories, and engineering control problems. Introduction to stochastic control.
Recommended Background: One year of advanced calculus and undergraduate differential equations.

MATH 589 - Seminar in Mathematical Ecology
1-3 Credit Hours *Repeatability: May be repeated. Maximum 12 hours.*

MATH 590 - Seminar in Teaching College Mathematics
1-3 Credit Hours Selected topics in research, theory, and techniques for teaching collegiate mathematics.
Repeatability: May be repeated. Maximum 12 hours.
Credit Restriction: May not be applied toward mathematics major (Master of Science).
Registration Permission: Consent of department head.

MATH 593 - Independent Study
1-12 Credit Hours *Repeatability: May be repeated. Maximum 12 hours.*

MATH 598 - Graduate Reading in Mathematics
1-3 Credit Hours Independent study with faculty guidance.
Repeatability: May be repeated. Maximum 6 hours.
Comment(s): Graduate standing required.
Registration Permission: Consent of instructor.

MATH 599 - Seminar in Mathematical Presentations
1 Credit Hours

MATH 600 - Doctoral Research and Dissertation
3-15 Credit Hours *Grading Restriction: P/NP only.*
Repeatability: May be repeated.

MATH 617 - Geometry of Groups
3 Credit Hours Geometry of Lie groups, symmetric spaces and discrete groups. Topics vary.
Repeatability: May be repeated. Maximum 12 hours.
(DE) Prerequisite(s): 561 and 562 or 567 and 568.

MATH 619 - Seminar in Applied Mathematics
1-3 Credit Hours *Repeatability: May be repeated. Maximum 12 hours.*

MATH 623 - Advanced Probability I
3 Credit Hours Selected topics in modern theory of probability and stochastic processes.
Repeatability: May be repeated. Maximum 12 hours.
(DE) Prerequisite(s): 523 and 524.

MATH 624 - Advanced Probability II
3 Credit Hours Continuation of 623.
Repeatability: May be repeated. Maximum 12 hours.
(DE) Prerequisite(s): 623.

MATH 629 - Seminar in Combinatorics
1-3 Credit Hours *Repeatability: May be repeated. Maximum 12 hours.*

MATH 635 - Advanced Partial Differential Equations I
3 Credit Hours Selected topics in classical and modern theoretical partial differential equations.
Repeatability: May be repeated. Maximum 12 hours.
(DE) Prerequisite(s): 535 and 536.

MATH 636 - Advanced Partial Differential Equations II
3 Credit Hours Continuation of 635.
Repeatability: May be repeated. Maximum 12 hours.
(DE) Prerequisite(s): 635.

MATH 641 - Functional Analysis I
3 Credit Hours Topological vector spaces, distributions, and Banach algebras with applications to Fourier analysis and differential equations: theorems of Krein-Milman, Paley-Wiener, Lax, Malgrange-Ehrenpreis, Gelfand-Naimark, and spectral theory of normal operators.
Repeatability: May be repeated. Maximum 6 hours.
(DE) Prerequisite(s): 545.
(DE) Corequisite(s): 546 or 443.

MATH 642 - Functional Analysis II
3 Credit Hours Continuation of 641.
Repeatability: May be repeated. Maximum 6 hours.
(DE) Prerequisite(s): 641.

MATH 645 - Advanced Analysis I
3 Credit Hours Selected topics in real, complex, or discrete analysis.
Repeatability: May be repeated. Maximum 12 hours.
(DE) Prerequisite(s): 545 and 546.

MATH 646 - Advanced Analysis II
3 Credit Hours Continuation of 645.
Repeatability: May be repeated. Maximum 12 hours.
(DE) Prerequisite(s): 645.

MATH 649 - Seminar in Analysis
1-3 Credit Hours *Repeatability: May be repeated. Maximum 12 hours.*

MATH 651 - Advanced Modern Algebra I
3 Credit Hours Selected topics in algebra, algebraic geometry, or number theory.
Repeatability: May be repeated. Maximum 12 hours.
(DE) Prerequisite(s): 551 and 552.

MATH 652 - Advanced Modern Algebra II
3 Credit Hours Continuation of 651.
Repeatability: May be repeated. Maximum 12 hours.
(DE) Prerequisite(s): 651.

MATH 659 - Seminar in Algebra
1-3 Credit Hours *Repeatability: May be repeated. Maximum 12 hours.*

MATH 661 - Modern Topology I
3 Credit Hours Selected topics in topology.
Repeatability: May be repeated. Maximum 12 hours.
(DE) Prerequisite(s): 561 and 562.

MATH 662 - Modern Topology II
3 Credit Hours Continuation of 661.
Repeatability: May be repeated. Maximum 12 hours.
(DE) Prerequisite(s): 661.

MATH 663 - Algebraic Topology I
3 Credit Hours Homology, cohomology and homotopy theories: duality theorems and Hurewicz isomorphism theorem.
Repeatability: May be repeated. Maximum 9 hours.
(DE) Prerequisite(s): 561 and 562.
Recommended Background: One year of abstract algebra.

MATH 664 - Algebraic Topology II
3 Credit Hours Continuation of 663.
Repeatability: May be repeated. Maximum 9 hours.
(DE) Prerequisite(s): 663.

MATH 667 - Modern Geometry I
3 Credit Hours Selected topics in Riemannian geometry and geometric analysis.
Repeatability: May be repeated. Maximum 12 hours.
(DE) Prerequisite(s): 561 and 562 or 567 and 568.

MATH 668 - Modern Geometry II
3 Credit Hours Continuation of 667.
Repeatability: May be repeated. Maximum 12 hours.
(DE) Prerequisite(s): 667.

MATH 669 - Seminar in Topology and Geometry
1-3 Credit Hours *Repeatability: May be repeated. Maximum 12 hours.*

MATH 673 - Advanced Topics in Numerical Partial Differential Equations I
3 Credit Hours Theoretical aspects of finite difference and finite element methods for initial and boundary value problems.
Repeatability: May be repeated. Maximum 12 hours.
(DE) Prerequisite(s): 571 and 572.

MATH 674 - Advanced Topics in Numerical Partial Differential Equations II

3 Credit Hours Continuation of 673.
Repeatability: May be repeated. Maximum 12 hours.
(DE) Prerequisite(s): 673.

MATH 679 - NUMERICAL MATHEMATICS
1-3 Credit Hours *Repeatability: May be repeated. Maximum 12 hours.*

MATH 681 - Advanced Mathematical Ecology I
3 Credit Hours Selected topics in theoretical and applied mathematical ecology: population, community, ecosystem ecology and applied topics such as demography, ecotoxicology, epidemiology, environmental change, and resource management.
Cross-listed: (Same as Ecology and Evolutionary Biology 681.)
Repeatability: May be repeated. Maximum 6 hours.
(DE) Prerequisite(s): 581 and 582.

MATH 682 - Advanced Mathematical Ecology II
3 Credit Hours Continuation of 681.
Cross-listed: (Same as Ecology and Evolutionary Biology 682.)
Repeatability: May be repeated. Maximum 6 hours.
(DE) Prerequisite(s): 681.