2022–2023 Graduate Student Handbook

UNCG Department of Mathematics and Statistics

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UNC
GREENSBORO
Department *of*
Mathematics & Statistics

Introduction

The Department of Mathematics and Statistics at the University of North Carolina at Greensboro offers a Ph.D. in Computational Mathematics (§10); an M.A. in Mathematics with Doctoral Track (M.A./Ph.D.) (§11), an M.A. in Mathematics (§12) with concentrations in Actuarial Mathematics, Data Analytics, Mathematics, Mathematical Foundations of Data Science, Mathematical Statistics, or Teaching College Mathematics; an M.S. in Applied Statistics (both on-site and online) (§13), a Post-Baccalaureate Certificate in Statistics (§14), and a Doctoral Minor in Statistics (§15). This Handbook serves as a resource for students enrolled in these programs. The *UNC Greensboro University Catalog* contains general policies, calendars and deadlines, course descriptions, and a listing of faculty members.

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Guidelines and Expectations

1 Advising and Registration

Entering students must consult with the Graduate Program Director (GPD) prior to registering for classes in their first term. This typically occurs via email or in person once the student is admitted to the program. Until the student chooses a master's thesis or doctoral dissertation advisor, the GPD serves as the advisor and the Graduate Studies Committee serves as the student's advisory committee. Once a student selects a thesis/dissertation advisor, typically by February of the first year for M.A. students and by February of the second year for Ph.D. students, together they select the committee. The thesis/dissertation advisor becomes the student's advisor, and the thesis/dissertation committee becomes the student's advisory committee.

The committee helps the student select appropriate coursework, and the advisor provides the code to register for classes. Students must register prior to the deadline to avoid late registration fees. Students who receive a Graduate Teaching Assistantship may be eligible to receive a tuition scholarship or reduction. All students are responsible for paying all student fees. All questions regarding assistantships, tuition, and fees can be addressed to the GPD.

All Ph.D. students will be assigned a professional mentor from among the faculty for each semester. Professional mentors can help students with aspects of the profession not directly related to their research program.

2 Annual Progress Reports

The student's advisor provides an *Annual Progress Report* to the GPD each February. A sample of the report form is given in §19. This annual report is used to evaluate the student's progress in the program. A copy of the student's current CV must accompany the report.

> **Failure to meet the expectations and standards set out in this Handbook may result in loss of assistantship or dismissal from the program.**

The report addresses enrollment (§4), attendance in seminars and colloquia (§5), teaching and tutoring (§6), GPA (§7), as well as specific milestones in each program. For the Ph.D. in Computational Mathematics, this includes progress in the Plan of Study (§10.4), the preliminary examination (§10.7), choosing a dissertation advisor and committee (§10.8.1),

the dissertation topic proposal (§10.8.2), admission to candidacy (§10.8.3), and dissertation defense (§10.8.4). For the M.A. in Mathematics and M.S. in Applied Statistics, the form assesses progress in the Plan of Study (§12.4) and progress in the capstone experience (§12.5). This annual report, together with the criteria for evaluating students to receive continued funding (§17), is used by the Graduate Studies Committee to make funding decisions.

3 Assistantships and Tuition Scholarships

Students on graduate assistantships who are making good progress as outlined in this Handbook can expect priority for continued funding for up to five years for Ph.D. students and up to two years for M.A. students; the department will make every effort to continue its support, subject to budget constraints. Student progress is assessed in the Annual Progress Report (§2). This annual report, together with the criteria for evaluating students to receive continued funding (§17), is used by the Graduate Studies Committee to make funding decisions.

The Department has a limited number of tuition scholarships to offer to Graduate Assistants. Tuition scholarships will cover the tuition for up to 12 semester hours each semester, but they do not cover any student fees. All students are responsible for paying student fees. Not all students on assistantships will be awarded tuition scholarships; however, tuition scholarships can only be awarded to students who are Graduate Assistants.

Students seeking funding beyond the fifth year of enrollment in the program must have their dissertation supervisor submit an application to extend funding to the GPD. Funding beyond the fifth year will be granted only in cases when the dissertation is nearing completion and sufficient funding is available.

4 Enrollment Guidelines

Regarding enrollment guidelines, course registration, continuous enrollment, students should refer to the Graduate Policies in the *UNC Greensboro University Catalog* for more details.

All eligible Graduate Teaching Assistants should apply for in-state residency as soon as possible. Students should apply to change their drivers' license and car registration as soon as possible upon entering the state. Students may apply for residency no sooner than one year after beginning employment/school in the state. Instructions for applying for North Carolina residency for tuition purposes is available at the North Carolina Residency Determination Service homepage.

5 Colloquia, Lecture Series, and Seminars

All graduate students are expected to attend colloquia and lecture series talks. Students should also attend seminars in their discipline. Students should also take every available opportunity to give talks, both at UNCG and at regional conferences. There is some funding

to support graduate student attendance at many conferences. Consult with GPD regarding funding at the departmental level. Additionally, students should seek for the potential funding support up to $500 from the Graduate Student Association (GSA) for professional development each semester. Additional information can be found on the Graduate Student Association GSA funding page. Consult with your faculty advisor for participating at a conference or workshop before requesting for funds from GPD and GSA.

6 Teaching and Tutoring Evaluations

Each Graduate Teaching Associate is evaluated twice each semester by a committee led by a member of the Graduate Studies Committee. Each Graduate Instructional Assistant or Graduate Research Associate is evaluated by the Math Help Center Coordinator, the Director of Statistical Consulting Center or the Faculty Mentor. Satisfactory evaluations are necessary for reappointment.

7 GPA Requirements

Students are expected to maintain the Academic Good Standing as specified by the Graduate Policies in the *UNC Greensboro University Catalog*. Funded students are expected to maintain a cumulative GPA of at least 3.5 in all graduate coursework at UNCG.

8 Graduation and Commencement

Students should refer to the Graduate Policies in the *UNC Greensboro University Catalog* for more details about UNCG Graduation and Commencement.

Every graduating student must fill out a Departmental exit survey evaluating the program and giving any post-graduation plans.

Additionally, Ph.D. students must complete the following.

- AMS Doctorates Granted Annual Survey form
- Math Geneology Submission Form

9 Graduate School Time Limits

Regarding the Graduate School Time Limits, students should refer to the Graduate Policies in the *UNC Greensboro University Catalog* for more details.

Programs

The Department of Mathematics and Statistics at the University of North Carolina at Greensboro offers a Ph.D. in Computational Mathematics (§10); an M.A. in Mathematics with Doctoral Track (M.A./Ph.D.) (§11), an M.A. in Mathematics (§12) with concentrations in Actuarial Mathematics, Data Analytics, Mathematics, Mathematical Foundations of Data Science, Mathematical Statistics, or Teaching College Mathematics, an M.S. in Applied Statistics (both onsite and online programs) (§13); a Post-Baccalaureate Certificate in Statistics (§14), and a Doctoral Minor in Statistics (§15).

10 Ph.D. in Computational Mathematics

The mission of the Doctoral Program in Computational Mathematics is to provide students with a solid foundation in the major areas of mathematical sciences, an understanding for the structures, theories, and computational aspects of advanced mathematical sciences and a demonstrated ability to do original research.

10.1 General Description and Student Learning Outcomes (SLOs)

The Doctor of Philosophy in Computational Mathematics is a 48-54 semester-hour program designed for students who hold a Bachelor's or Master's Degree in mathematics or a closely related area. These hours include two computing courses as well as 18–21 hours of dissertation (MAT 799). Our challenging and rigorous program culminates in the defense of an original dissertation that is of sufficient quality that is suitable for publication in a quality refereed journal. Upon completion of this degree the successful student will be capable of producing new results in their chosen area of research.

SLO 1: Broad Understanding Students demonstrate broad understanding by reproducing results and definitions at the introductory Ph.D. level.

SLO 2: In Depth Study Students discover new results and defend these results in a specific area of computational mathematics that goes beyond the introductory Ph.D. level.

SLO 3: Synthesis and Written Communication Students combine their knowledge from graduate course work, individual readings, and their own original research and communicate this research and its significance in writing.

SLO 4: Oral Communication Students defend their research findings orally.

10.2 Typical 5-Year Timeline for Ph.D. Students

Summer 0: Meet with GPD (§1), and select appropriate coursework (§10.4). Students with strong preparation in Mathematical Analysis, Linear Algebra, Linear Models, or Mathematical Statistics may opt to take an area exam (§10.6) in August prior to the start of classes.

Year 1: Focus on coursework (§10.4) and preparing for qualifying examinations (§10.6). Attend colloquia and research seminars (§5). Talk to faculty, and narrow down research area. Work with GPD and advisory committee (§1) to submit the initial Doctoral Plan of Study (§10.4) by the end of February.

Summer 1: Take the two qualifying exams (§10.6) in May. Retake in August, if necessary.

Year 2: Continue to attend colloquia and research seminars (§5). Continue coursework. Retake remaining qualifying exams (§10.6) in January. Choose a dissertation advisor and committee (§10.8.1), and revise Doctoral Plan of Study (§10.4). Students without an M.A. in Mathematics should speak with GPD to be awarded the M.A.

Summer 2: Work with advisor and committee.

Year 3: Continue to attend colloquia and research seminars (§5). Coursework transitions to include more specialized research courses such as

- Graduate Seminar in Computational Mathematics (MAT 701), Seminar in Computational Statistics (STA 701)
- Topics in Computational Mathematics (MAT 709), Topics in Computational Statistics (STA 709)
- Directed Doctoral Research (MAT 790)

Complete the preliminary examination (§10.7). Prepare the written dissertation outline. Prepare and defend the dissertation topic proposal (§10.8.2).

Summer 3: Work with advisor and committee.

Year 4: Continue to attend colloquia and research seminars (§5). Continue specialized research coursework and begin completing dissertation hours. Apply for admission to candidacy (§10.8.3) and submit the final Doctoral Plan of Study (§10.4).

Summer 4: Work with advisor and committee.

Year 5: Continue to attend colloquia and research seminars (§5). Apply for jobs. Finish dissertation research and defense (§10.8.4). Apply to graduate, and complete exit forms (§8).

10.3 Summary of Requirements

Students should refer to the Summary of Requirements for Research Doctoral Degrees in the *UNC Greensboro University Catalog*. Additionally, here is the Doctoral Timeline and Checklist from the Graduate School.

10.4 Plan of Study

Each student, together with their advisor, must submit an initial *Doctoral Plan of Study* to The Graduate School by the end of second semester. A sample of the form is given in §19. The plan must include specific courses the student is expected to complete as a minimum

requirement and all specific core, seminar, language, and research requirements of the major department. This Plan of Study can be revised at a later date once the student is ready to apply to The Graduate School for formal admission to candidacy for the doctoral degree (§10.8.3).

The following restrictions on credits are placed on all Ph.D. degrees by The Graduate School:

- Students may take no more than 15 hours of independent study, exclusive of the dissertation.
- No credit evaluated as B- (2.7) or lower can be counted towards the degree.
- All courses that appear on the student's Plan of Study must have been completed within seven years of the granting of the degree. For students admitted to the Ph.D. program directly from a baccalaureate program, the limit is ten years (§9).

The coursework for first year funded students is essentially fixed. Supported students and students that have interest in undergraduate teaching must take MAT 601 Seminar in the Teaching of Mathematics I, typically offered in Fall. All students must satisfy the requirement of computational components by taking two courses out of the following list.

- MAT 630 Computational Discrete Mathematics (3)
- MAT 627 Numerical Methods (3)
- STA 642 Statistical Computing (3)

Both MAT 630 and STA 642 are typically offed in Fall while MAT 627 is offered in Spring. In addition, all PhD students must take two written qualifying exams based on year long sequences. They can choose two out of four areas offered in the department — Linear Algebra, Linear Models, Mathematical Analysis or Mathematical Statistics. These sequences of courses are MAT 695–696 Mathematical Analysis I/II, MAT 727–728 Linear Algebra and Numerical Linear Algebra, STA 635 –673 Theory of Linear Regression and Statistical Linear Models I, and STA 651–652 Mathematical Statistics I/II. Students must take two of the four sequences unless they intend to take a qualifying exam (§10.6) in August or January before the start of their second semester. For example, they must take the MAT 695–696 Mathematical Analysis sequence, unless they intend to take the Mathematical Analysis qualifying exams (§10.6) in August or January before the start of their second semester.

After the first year, the required coursework is given on the Plan of Study, and the timing is more flexible. For students on tuition scholarships, courses that are not approved by the GPD may not be covered by the scholarship.

The Plan of Study must be submitted to the Dean of The Graduate School for approval. Copies of the approved Plan of Study must be filed in the student's permanent folder in The Graduate School, in the department's files, with the chair and each member of the advisory/dissertation committee, and with the student. Any subsequent changes in the Plan of Study or in the subject of the dissertation must be submitted to The Graduate School for approval.

10.5 Computing Course Requirement

All students must satisfy the requirement of computational components by taking two courses that are chosen from the list.

- MAT 630 Computational Discrete Mathematics (3)
- MAT 627 Numerical Methods (3)
- STA 642 Statistical Computing (3)

This requirement must be completed by the end of the third year, with a grade of B or above for each course. Students with sufficient computing background/courses may apply for an exemption from taking the computing courses. To obtain the exemption, students should submit a written request with supporting documents to the GPD.

10.6 Qualifying (Area) Exams

Each Ph.D. student must pass qualifying exams, which consist of two area exams, chosen from Mathematical Analysis, Linear Algebra and Matrix Theory, Linear Models, and Mathematical Statistics. Each area exam is a three hour written exam, created and graded by a committee of three faculty members appointed by the GPD. Three possible scores are available on each area exam: Ph.D. Pass, M.A. Pass, and Fail. The committee must submit a Preliminary Exam Evaluation Form (§19) after each area exam attempt. A score of Ph.D. Pass is required on both area exams in order to pass the written component of the preliminary exam at the Ph.D. level. Each area exam committee is responsible for establishing the format and grading criteria that are appropriate for the exam. Students with solid background from their prior program are encouraged to take these exams as early as possible. Old area exams and topic lists are available in the Department Library in Petty 116.

The qualifying exams are typically taken in May after the completion of the first year of study. Students with strong backgrounds should take the qualifying exam in August prior to the start of their first year or in January after their first semester. These exams are typically administered in January, May, and August, based on demand.

For satisfactory progress in the program, students must complete both qualifying exams with a score of Ph.D. Pass prior to the start of their 4th semester. All students must pass both qualifying exams with a score of Ph.D. Pass prior to the start of the fifth semester to stay in the program.

10.7 Doctoral Preliminary Examination

Each Ph.D. student must pass the doctoral preliminary exam, which consists of both a written and oral component. Both written and oral parts are prepared and conducted by the dissertation committee appointed by the GPD.

Unanimous approval is required for passing the preliminary examination. Students must pass both the written and oral parts to pass the preliminary exam. The specific requirements are described below.

10.7.1 Written Component

In the written component of the preliminary exam, each Ph.D. student is required to prepare a research-oriented written document in consultation with the dissertation committee. The written document should describe the current research status in a targeted topic. It should include but not limited to the following items:

1. appropriate literature search and overview/review;
2. potential research problems, and
3. possible approaches to take.

The document should be written clearly, using the correct mathematical notation, style, and format.

10.7.2 Oral Component

Upon passing the written component of the preliminary exam, each Ph.D. student should prepare for the oral component of the preliminary exam, which is administered by the dissertation committee, The oral part of the preliminary exam should be conducted within one month of passing the written component. In the oral component of the preliminary exam, the student is required to present and defend the written document. The committee must evaluate the oral exam and decide on one of three options.

1. The committee unanimously agrees that the work was satisfactory. This constitutes a score of Pass on the oral component of the preliminary exam.
2. The committee unanimously agrees that the work was unsatisfactory. This constitutes a score of Fail on the oral component of the preliminary exam.
3. The committee decides to require the student to complete additional work before assigning a score to the exam. This may occur if the student has demonstrated mostly satisfactory work but shows deficiency in some component. Upon completion of the additional work, the committee decide on one of these three options.

Once the committee unanimously agrees upon a score of Pass or Fail on the oral component, they must give their decision on the Preliminary Exam Evaluation Form (§19).

A score of Fail on the oral component constitutes failure of the preliminary exam. In this case, the dissertation committee may choose to allow at most one re-examination. The re-examination will not be permitted during the semester in which the preliminary examination was failed. If the student fails to pass the re-examination, The Graduate School will send the student a letter of dismissal from the program.

Each Ph.D. student is required to pass the preliminary exam by the beginning of the 7th semester. Failure to do so will be dismissed from the program.

10.8 Dissertation Research

Each student must write a dissertation, which will be reviewed by the student's dissertation committee. The dissertation is the product of a thorough investigation of a basic and significant problem or question within the chosen area of study. This dissertation will be defended in a public oral exam.

Writing the dissertation requires a broad understanding of mathematical sciences to give the topic some context. This context is carefully explained through careful written communication. Depth of knowledge in one particular area is demonstrated by the focus of the dissertation and the new results therein. The public oral presentation gives the student the opportunity to effectively communicate their knowledge orally.

10.8.1 Choosing a Dissertation Advisor and Committee

The student must find a dissertation advisor. This typically occurs in the third semester of study. The dissertation advisor must be a member of the graduate faculty in the Department of Mathematics and Statistics. When the student and advisor have agreed to work together, with the approval of the GPD, they form the dissertation committee. At this time the dissertation advisor assumes the role of the student's academic advisor, and the dissertation committee becomes the student's advisory committee.

10.8.2 Dissertation Topic

The student works with their dissertation advisor to prepare a dissertation topic proposal. The student must propose a dissertation topic in a public oral presentation and defend the topic to their dissertation committee. The student must also submit a written dissertation research outline to their dissertation committee. Each dissertation must include a significant computational component, so students must work with their advisor, committee members, or other experts to ensure this aspect is properly reflected in the research outline. The topic proposal is typically completed during the third year of study. Students often take Directed Doctoral Research (MAT 790) to review the current literature leading to a dissertation proposal. The approved dissertation topic must be filed in The Graduate School.

10.8.3 Admission to Candidacy

Upon successful completion of the preliminary exam (§10.7) and the dissertation topic proposal (§10.8.2), including the written dissertation research outline, the student should re-submit their Plan of Study (§10.4), if any changes have been made. Once this is approved, the student may apply to The Graduate School for formal admission to candidacy (§18) for the doctoral degree. This allows the student to work exclusively on the dissertation.

10.8.4 Dissertation and Oral Defense

Each dissertation is reviewed by the student's dissertation committee. The dissertation must be original work and of sufficient quality to be suitable for publication in a quality refereed journal. In addition, there must be an external component to each dissertation. This

can be satisfied by meeting at least one of the three criteria — external (to department) committee member, publication of part of dissertation in a quality journal, or external report on the dissertation before defense. The dissertation must conform to rules established by the UNCG Graduate Studies Council. Detailed information is available at the Graduate School's webpage on Electronic Thesis or Dissertation (ETD). Additionally, each student must present their completed dissertation research in a public oral presentation and defend the research to their dissertation committee. The dissertation, presentation, and oral defense must be deemed satisfactory by each member of the student's dissertation committee and The Graduate School. The dissertation defense can occur at most twice.

Students must apply to defend their dissertation by filling out the appropriate forms (§18) with The Graduate School **two weeks** prior to the scheduled defense. The final date for defense of dissertations varies each semester, and is typically mid-March for the May graduation. See the UNCG Academic Calendar for the precise date each year. Allow at least two hours for the defense.

11 Master of Arts (M.A.) in Mathematics with Doctoral Track (M.A./Ph.D. Program)

The M.A. in Mathematics with Doctoral Track provides an opportunity for outstanding students who have joined the program with a Bachelor degree to pursue the Ph.D. while also completing the requirements for the M.A. degree. For further details about the program requirements and course selection, contact the GPD.

12 Master of Arts (M.A.) in Mathematics

The mission of the Master's Program in Mathematics is to provide students with a solid foundation in the major areas of mathematical sciences, an appreciation for the structures and theories of advanced mathematics or statistics, and a deep understanding of the role of mathematical sciences in applications.

12.1 General Description and Student Learning Outcomes (SLOs)

The Master's in Mathematics is a 30 semester-hour program this is offered in six areas of concentration: Actuarial Mathematics (§12.6.1), Data Analytics (§12.6.2), Mathematics (§12.6.3), Mathematical Foundations of Data Science (§12.6.4), Mathematical Statistics (§12.6.5), and Teaching College Mathematics (§12.6.6). Each concentration has specific course requirements, and all course work must be approved by the GPD. At least half of the work credited towards the degree must be in 600-level or above. Students who plan to continue to the Ph.D. program in Computational Mathematics are urged to select the exam option as their capstone experience (§12.5).

SLO 1: Communication and Synthesis Students combine their knowledge from graduate course work and individual readings and demonstrate this knowledge through

effective communication.

SLO 2: In-Depth Study Students apply knowledge of an area of mathematics or statistics that goes beyond the introductory graduate level.

SLO 3: Broad Understanding Students demonstrate broad understanding by reproducing results and definitions at the introductory graduate level.

12.2 Typical 2-Year Timeline for MA/MS Students

Summer 0: Meet with GPD (§1) and select coursework.

Year 1: Focus on coursework. Attend colloquia and research seminars (§5). Talk to faculty, and narrow down research area. Work with GPD to choose advisory committee (§1) by the end of February. Choose capstone experience (§12.5), and submit Master's Plan of Study (§12.4).

Summer 1: Work with advisor and committee.

Year 2: Apply for jobs or Ph.D. programs. Finish capstone experience (§12.5). Apply to graduate, and complete exit forms (§8).

12.3 Summary of Requirements

Students should refer to the Summary of Requirements for Research Doctoral Degrees in the *UNC Greensboro University Catalog*.

12.4 Plan of Study

Each student, together with their advisor, must submit a *Master's Plan of Study* to The Graduate School by the end of second semester. The plan must include all courses the student is expected to complete as a minimum requirement, including courses required for the major, supporting courses, number of elective hours, and capstone experience (§12.5), as well as all courses required by the department but not counted toward the degree, including prerequisite courses. The following restrictions on credits are placed on all M.A. degrees by The Graduate School, and can be found from Summary of Requirements for Master's Degrees in the *UNC Greensboro University Catalog*.

Copies of the approved Plan of Study must be filed in the student's permanent folder in The Graduate School, in the department's files, and with the student. If changes have been made to the Plan of Study, a revised Plan of Study must be submitted to The Graduate School by the end of the third week of classes of the semester in which the student applies for graduation.

The master's curriculum, including the thesis, must be completed within five academic years, from the date the first courses carrying graduate degree credit applicable to the student's program are begun. However, if study for the program extends beyond three years, the student may need to meet new requirements.

12.5 Capstone Experience

Students must choose a capstone experience before submitting their Plan of Study (§12.4). Students may choose the thesis, project, or comprehensive exam option. Not every capstone experience is allowed with every concentration.

12.5.1 Thesis Option

The thesis option is available for concentrations in Mathematics (§12.6.3), Mathematical Foundations of Data Science (§12.6.4), Mathematical Statistics (§12.6.5), or Data Analytics (§12.6.2). Students selecting this option must find a thesis advisor and a thesis committee from the graduate faculty prior to completing the Master's Plan of Study (§12.4). The thesis committee, chaired by the thesis advisor, consists of two other members of the graduate faculty. The student must include either 6 hours of MAT 699, 6 hours of STA 699, or 3 hours each of STA 698 and STA 699 in the required hours and as indicated the Master's Plan of Study (§12.4) and completes a thesis based on investigation of a topic in their chosen concentration.

Writing the thesis requires a broad understanding of mathematics or statistics to give the topic some context. Depth of knowledge in one particular area is demonstrated by the focus of the thesis and the public oral presentation gives the student the opportunity to effectively communicate their knowledge.

Each thesis is reviewed by the thesis committee. The thesis must conform to rules established by the UNCG Graduate Studies Council. Detailed information is available at the Graduate School's webpage on Electronic Thesis or Dissertation (ETD). Additionally, the student must present their completed thesis research in a public oral presentation and defend the research to their thesis committee.

The thesis must be acceptable to each member of the student's thesis committee and The Graduate School. The committee evaluates the thesis with the following rubric.

0: Unacceptable Thesis Thesis committee does not unanimously accept thesis. Thesis is poorly written. Thesis lacks focus or level of exposition in focus area does not exceed the introductory graduate level. Thesis does not demonstrate broad understanding; no context is given for the results; may contain errors in results and definitions at the introductory graduate level.

1: Acceptable Thesis Thesis is a well-written summary of known results in mathematics or statistics. Thesis demonstrates depth of knowledge beyond the introductory graduate level in a particular area of focus. May contain some original ideas. Thesis demonstrates broad understanding; work is placed in the proper context; introduction, definitions and known results demonstrate student's breadth of knowledge at or above the introductory graduate level.

2: Very Good Thesis Clear exposition. Depth of knowledge is demonstrated by original mathematics or statistics, new theorems, or new methods of proof. Context and previous results are clearly indicated and demonstrate the student's broad understanding beyond

the introductory graduate level.

3: Exemplary Thesis Clear exposition. Depth of knowledge is demonstrated by significant amount of original mathematics or statistics. Results contained in the thesis are worthy of publication in a refereed mathematics or statistics research journal. Context and previous results are clearly indicated and demonstrate student's understanding of mathematics at level expected of a research mathematician or statistician.

The oral presentation and defense is assessed separately from the thesis. A score of Satisfactory on the oral presentation and defense and a score of 1 or higher is required for completion of this capstone.

12.5.2 Project Option

The project option is available for concentrations in Actuarial Mathematics (§12.6.1), Data Analytics (§12.6.2), Mathematics (§12.6.3), Mathematical Foundations of Data Science (§12.6.4), Mathematical Statistics (§12.6.5), and Teaching College Mathematics (§12.6.6). Students selecting this option must find a project supervisor prior to completing the Master's Plan of Study (§12.4). The student must include 3 hours of MAT 687 or STA 698 (Project) in the required hours as indicated in the Master's Plan of Study (§12.4) and prepares a project based on in-depth investigation of a topic in their chosen concentration.

Writing the project requires a broad understanding of mathematics or statistics to give the topic some context. This requires the student to apply their basic knowledge and to read about topics that were not covered in their coursework. When the project is complete, the results are carefully written in a report, which is approved by the project supervisor and delivered in an oral presentation which is open to the public. The project supervisor evaluates the project with the following rubric.

0: Unacceptable Project Project supervisor does not approve the project. Presentation of project poorly organized. Methods not explained well. Methods are incorrectly applied or do not exceed the introductory graduate level. No context given or poor understanding of the context within the broad context of the discipline.

1: Acceptable Project Presentation and written components of the project are organized and well presented. Focus of project exceeds introductory graduate level. Context of project and applications within discipline are explained.

2: Exemplary Project Presentation and written components of the project serve as models of organization and clear exposition. Focus of the project far exceeds level expected in the M.A. program. Context and applications of the project are well explained.

A score of 1 or higher is required for successful completion of this capstone.

12.5.3 Comprehensive Exam Option

The exam option is available for concentrations in Mathematics (§12.6.3), Mathematical Statistics (§12.6.5), Data Analytics (§12.6.2), and Teaching College Mathematics (§12.6.6).

Students selecting this option must select one of the following exam types prior to completing the Plan of Study (§12.4).

Area exams Take two area exams in the written component of the doctoral preliminary examination. See §10.6. Students must earn scores of M.A. Pass or Ph.D. Pass on both area exams for completion of this capstone. Students who continue in the Ph.D. program in Computational Mathematics after completing their M.A. degree may apply any scores of Ph.D. pass on these exams towards the written component of the preliminary exam requirement.

Program exam Take an exam based on 18–21 hours of coursework in the student's program of study selected by the GPD, in consultation with the Graduate Studies Committee. The exam consists of two parts. Each part is a three hour written exam covering 9–12 hours of coursework, created and graded by a committee of three faculty members appointed by the GPD. Two possible scores are available on each part: Pass and Fail. Students must earn scores of Pass on both parts for successful completion of this capstone.

The student selecting Comprehensive Exam Option cannot include any hours of Project (MAT 687 or STA 698) or Thesis (MAT 699 or STA 699) in the required hours.

12.6 Concentrations

The M.A. in Mathematics is offered in six areas of concentration: Actuarial Mathematics (§12.6.1), Data Analytics (§12.6.2), Mathematics (§12.6.3), Mathematical Foundations of Data Science (§12.6.4), Mathematical Statistics (§12.6.5), and Teaching College Mathematics (§12.6.6).

12.6.1 Concentration in Actuarial Mathematics

The M.A. in Mathematics with concentration in Actuarial Mathematics provides students wishing to pursue a career in actuarial science a solid foundation in Applied Probability and Statistical Models and their applications in the area of actuarial science. It is designed to help students pass the preliminary actuarial exams while providing educational experiences related to the actuarial field. Students select the capstone experience (§12.5) of project.

Refer to the Mathematics, M.A. Requirements in the *UNC Greensboro University Catalog* for additional details concerning required courses. The coursework consists of foundation courses, core courses, statistics electives, and interdisciplinary electives.

- STA 631 Introduction to Probability
- STA 632 Introduction to Mathematical Statistics
- STA 655 Applied Probability Models
- MAT 686 Financial Mathematics for Actuaries
- Select at least 9 credits of Actuarial Exam and Applied Statistics models:

  - STA 642 Statistical Computing
  - STA 665 Analysis of Survival Data
  - STA 635 Theory of Linear Regression
  - STA 691 Actuarial Exam Preparation Seminar
  - STA 670 Categorical Data Analysis
  - STA 671 Multivariate Analysis
  - STA 682 Theory of Time Series
  - STA 686 Actuarial Models I
  - STA 687 Actuarial Models II
- Select at most 6 credits from other Applied Statistics courses: any other STA 600-level courses, excluding STA 651, STA 652, STA 667, STA 668, and STA 699.
- Select at most 6 credits for actuarial educational experiences courses:
  - ECO 641 Microeconomics
  - ECO 646 Macroeconomics
  - ISM 671 Organizing Data for Analytics
  - ISM 645 Principles of Predictive Analytics
  - MBA 702 Financial and Managerial Accounting
  - MBA 707 Financial Management

12.6.2 Concentration in Data Analytics

The M.A. in Mathematics with concentration in Data Analytics provides students with advanced analytical training to develop their ability to draw insights from big data including data collection, preparation and integration, statistical methods and modeling, and other techniques. The program is highly applied in nature, integrating project-based learning, simulations, case studies, and specific electives addressing the analytical needs of various industry sectors. Students select a capstone experience (§12.5) of thesis, project, or comprehensive exam.

Refer to the Mathematics, M.A. Requirements in the *UNC Greensboro University Catalog* for additional details concerning required courses. The coursework consists of an approved curriculum of foundation courses, core courses, statistics electives, and interdisciplinary electives.

- STA 631 Introduction to Probability
- STA 632 Introduction to Mathematical Statistics
- STA 642 Statistical Computing

- STA 673 Statistical Linear Models I
- STA 703 Topics in High Dimensional Data Analysis
- Select at least two of the Analytics Applications:
  - STA 645 Nonparametric Statistics
  - STA 661 Advanced Statistics in the Behavioral and Biological Sciences I
  - STA 662 Advanced Statistics in the Behavioral and Biological Sciences II
  - STA 665 Analysis of Survival Data
  - STA 670 Categorical Data Analysis
  - STA 671 Multivariate Analysis
  - STA 674 Statistical Linear Models II
  - STA 677 Advanced Topics in Data Analysis and Quantitative Methods
- Select at most two of the following:
  - ECO 663 Predictive Data Mining
  - ECO 664 Time Series and Forecasting
  - ECO 725 Data Methods in Economics
  - CSC 605 Data Science
  - CSC 610 Big Data and Machine Learning
  - CSC 625 Bioinformatics
  - ISM 645 Principles of Predictive Analytics
  - ISM 646 Visualizing Data to Design Strategy
  - ISM 671 Organizing Data for Analytics

12.6.3 Concentration in Mathematics

The M.A. in Mathematics with concentration in Mathematics provides students with training in a range of pure and applied mathematics. This program is designed to prepare students with background necessary to succeed in a rigorous doctoral program, in industry or to teach at a community college. Students select a capstone experience (§12.5) of thesis, project, or comprehensive exam.

Refer to the Mathematics, M.A. Requirements in the *UNC Greensboro University Catalog* for additional details concerning required courses. The coursework consists of an approved curriculum of foundation courses, core courses, and electives:

- Select two courses from the following foundation courses, include a year-long sequence

  - MAT 727 Linear Algebra
  - MAT 728 Numerical Linear Algebra
  - MAT 695 Mathematical Analysis
  - MAT 696 Mathematical Analysis
- The remaining elective credits consist of 600-, or 700-level mathematical sciences courses with prior approval of the GPD. At most 6 credits of courses from STA or CSC may be counted.

12.6.4 Concentration in Mathematical Foundations of Data Science

The M.A. concentration in Mathematical Foundations of Data Science will provide students with fundamental knowledge in the rapidly growing area of data science, data analytics and machine learning, with a particular emphasis on understanding the core mathematics, optimization and probability, that underlies many of the central techniques of these fields.

The concentration is designed so that graduates

1. will be equipped with the solid mathematical knowledge needed in order to understand core concepts of data science, data analytics, and machine learning.
2. will be able to adopt this fast growing field with their solid mathematics background.
3. will be able to apply the knowledge and techniques they have learned to the real world problems.
4. will be able to serve as a liason between theoretical and applied data scientists.

The program requires 30 credit hours at the 600-level or above. Students select a capstone experience (§12.5) of thesis or project.

Refer to the Mathematics, M.A. Requirements in the *UNC Greensboro University Catalog* for additional details concerning required courses. The coursework consists of an approved curriculum of foundation courses, core courses, and interdisciplinary electives:

- MAT 651 Topological Data Analysis
- MAT 653 Mathematical Data Science I: Foundations
- MAT 654 Mathematical Data Science II: Machine Learning
- STA 622 Complex Data Analysis
- Select 12-15 credits of elective courses with prior approval of the GPD.
  - suggested MAT or STA elective courses
    * MAT 628 Linear Programming and Optimization
    * MAT 632 Introduction to Graph Theory

    - MAT 751 Topological Data Analysis
    - MAT 749 The Mathematics of Machine Learning
    - STA 642/IAA 621 Statistical Computing
    - STA 670/ IAA 623 Categorical Data Analysis
    - STA 703 Topics in High Dimensional Data Analysis
  - Up to 6 credits from any of the following departments
    - Computer Science
    - Economics
    - Educational Research Methodology
    - Informatics and Analytics
    - Computational Analytics
    - Cultural Analytics
    - Information Systems and Supply Chain Management

    Refer to *Concentration in Mathematical Foundations of Data Science* for additional details concerning interdisciplinary elective courses.

12.6.5 Concentration in Mathematical Statistics

The M.A. in Mathematics with concentration on Mathematical Statistics is designed to provide students an opportunity to apply both mathematics and statistics theories and methods in solving problems arisen from the real world. In addition, the concentration will also provide an opportunity for the MA/PhD students who are interested in a PhD that focuses on computational statistics to obtain an MA degree while pursuing their PhD in the department. The program requires 30 credit hours at the 600-level or above. Students select a capstone experience (§12.5) of thesis, project, or comprehensive exam.

Refer to the Mathematics, M.A. Requirements in the *UNC Greensboro University Catalog* for additional details concerning required courses. The coursework consists of an approved curriculum of core courses, mathematics and statistics electives:

- STA 631 Introduction to Probability or STA 651 Mathematical Statistics I
- STA 632 Introduction to Mathematical Statistics or STA 652 Mathematical Statistics II
- STA 635 Theory of Linear Regression
- STA 673 Statistical Linear Models I
- Select 12 - 18 credit hours of MAT or STA 600 level or higher courses with prior approval of the GPD.

12.6.6 Concentration in Teaching College Mathematics

The M.A. in Mathematics with concentration in Teaching College Mathematics is intended for students wishing to pursue a career in teaching at the community college level. The concentration has three components: The Mathematics and Statistics core courses; Pedagogy, Educational Research, and Higher Education. Students select a capstone experience (§12.5) of project or comprehensive examination.

Refer to the Mathematics, M.A. Requirements in the *UNC Greensboro University Catalog* for additional details concerning required courses.

- Select 18 credits of approved MAT or STA courses, including at least one two-semester sequence: MAT 591–592, MAT 695–696, MAT 727–728, or STA 631–632.
- MAT 601 Seminar in the Teaching of Mathematics I
- MAT 603 Practicum in the Teaching of Mathematics
- Select 6–9 additional credits in the following courses:
  - MAT 503 Problem Solving in Mathematics
  - MAT 513 Historical Development of Mathematics
  - STA 661 Advanced Statistics in the Behavioral and Biological Sciences I
  - STA 662 Advanced Statistics in the Behavioral and Biological Sciences II
  - ERM 605 Educational Measurement and Evaluation
  - ERM 667 Foundations of Educational Measurement Theory
  - HED 602 Student Development Theory in Higher Education

13 Master of Science (M.S.) in Applied Statistics

The MS in Applied Statistics is designed to provide students with excellent data analytics training and problem solving skills for employment in various settings such as health and insurance sectors, government agencies, and business entities. This degree program is available to students under both onsite and online settings.

13.1 General Description and Student Learning Outcomes (SLOs)

The MS in Applied Statistics requires 30 credit hours of course work at 600 – level or above, including a final capstone project. (§13.5).

SLO 1: Basic Understanding Students demonstrate mastery of fundamental statistical methods.

SLO 2: Synthesis and In-Depth Understanding with Applications Students demonstrate the ability to apply statistical methods and appropriate statistical software tools to manipulate and analyze complex data sets.

SLO 3: Communication Effectiveness Students demonstrate the ability to communicate findings and results effectively, both orally and in writing.

13.2 Typical 2-Year Timeline for M.S. Students

Summer 0: Meet with GPD (§1) and select coursework.

Year 1: Focus on coursework. Work with GPD to submit Master's plan of study (§1) by the end of February. (§13.4).

Summer 1: Seek for a summer internship.

Year 2: Talk to faculty, and narrow down project area. Finish capstone experience (§13.5). Apply to graduate, and complete exit forms (§8).

13.3 Summary of Requirements

Students should refer to the Summary of Requirements for Research Doctoral Degrees in the *UNC Greensboro University Catalog*.

13.4 Plan of Study

Each student, together with their advisor, must submit a *Master's Plan of Study* to The Graduate School by the end of second semester. The plan must include all courses the student is expected to complete as a minimum requirement, including courses required for the major, supporting courses, number of elective hours, and capstone experience (§13.5), as well as all courses required by the department but not counted toward the degree, including prerequisite courses. The following restrictions on credits are placed on all Master's degrees by The Graduate School, and can be found from Summary of Requirements for Master's Degrees in the *UNC Greensboro University Catalog*.

Copies of the approved Plan of Study must be filed in the student's permanent folder in The Graduate School, in the department's files, and with the student. If changes have been made to the Plan of Study, a revised Plan of Study must be submitted to The Graduate School by the end of the third week of classes of the semester in which the student applies for graduation.

13.5 Capstone Experience

Students must choose a capstone experience before submitting their Plan of Study (§13.4). Students must find a project supervisor prior to completing the Master's Plan of Study (§13.4). The student must include 3 hours of STA 698 (Project) in the required hours as indicated in the Master's Plan of Study (§13.4) and prepares a project based on in-depth investigation of a topic in their chosen concentration.

Writing the project requires a broad understanding of statistics to give the topic some context. This requires the student to apply their basic knowledge and to read about topics that were

not covered in their coursework. When the project is complete, the results are carefully written in a report, which is approved by the project supervisor and delivered in an oral presentation which is open to the public. The project supervisor evaluates the project with the following rubric.

0: Unacceptable Project Project supervisor does not approve the project. Presentation of project poorly organized. Methods not explained well. Methods are incorrectly applied or do not exceed the introductory graduate level. No context given or poor understanding of the context within the broad context of the discipline.

1: Acceptable Project Presentation and written components of the project are organized and well presented. Focus of project exceeds introductory graduate level. Context of project and applications within discipline are explained.

2: Exemplary Project Presentation and written components of the project serve as models of organization and clear exposition. Focus of the project far exceeds level expected in the M.A. program. Context and applications of the project are well explained.

A score of 1 or higher is required for successful completion of this capstone.

13.6 Program Requirements

Refer to the Applied Statistics, M.S. Requirements in the *UNC Greensboro University Catalog* for additional details concerning required courses. The coursework consists of an approved curriculum of foundation courses, core courses, statistics electives, and interdisciplinary electives:

- Required Courses
  - STA 631 Introduction to Probability
  - STA 632 Introduction to Mathematical Statistics
  - STA 640 SAS System for Statistical Analysis
  - STA 602 Statistical Methods for Data Analytics
  - STA 606 Problem Solving with Data Analytics
  - STA 668 Consulting Experience (2 credits)
  - STA 698 Project in Statistics
- Select at least two of the following:
  - STA 622 Complex Data Analysis
  - STA 635 Theory of Linear Regression
  - STA 642 Statistical Computing
  - STA 645 Nonparametric Statistics
  - STA 655 Applied Probability Models

  - STA 665 Analysis of Survival Data
  - STA 670 Categorical Data Analysis
  - STA 671 Multivariate Analysis
  - STA 673 Statistical Linear Models I
  - STA 674 Statistical Linear Models II
  - STA 675 Advanced Experimental Design
  - STA 676 Sample Survey Methods
  - STA 682 Theory of Time Series
  - STA 703 Topics in High Dimensional Data Analysis
  - STA 709 Topics in Computational Statistics
- Select 0–6 elective credits:
  - any STA course at the 600-level or above
  - from any of the following departments
    * Mathematics
    * Computer Science
    * Economics
    * Educational Research Methodology
    * Informatics and Analytics
    * Information Systems and Supply Chain Management

14 Post-Baccalaureate Certificate in Statistics

The purpose of the 12-hour Post-Baccalaureate Certificate in Statistics is to provide statistical training to individuals who wish to enhance their knowledge of statistics but do not wish to pursue a formal degree and for professionals whose interests require a knowledge of statistics beyond the undergraduate level. The objective of the certificate is to offer a structured introduction to the basic ideas of graduate-level statistical analysis.

Students should refer to the Summary of Requirements for Research Doctoral Degrees in the *UNC Greensboro University Catalog*.

Refer to the Statistics, Post-Baccalaureate Certificate Requirements in the *UNC Greensboro University Catalog* for additional details concerning required courses.

- STA 602 Statistical Methods for Data Analytics
- Select three additional three-credit hour STA courses at the 600-level or above.

15 Doctoral Minor in Statistics

The Doctoral Minor in Statistics is designed for PhD students from a wide range of backgrounds to add a minor in statistics to their transcript. In today's world of data analytics and big data, being able to collect and analyze data is even more critical than ever before. Our department offers courses in both theory and application of statistical ideas and techniques to help students gain an edge in the workplace. We are confident that adding the Doctoral Minor in Statistics to your transcript will enhance your resume, your job options, and the depth and breadth of your future research projects.

The program is best suited for those UNCG PhD students who wish to enhance their data analysis skills. They can obtain a doctoral minor in statistics by completing 18 semester hours of graduate statistics courses at 600 level or above.

Students should refer to the Summary of Requirements for Research Doctoral Degrees in the *UNC Greensboro University Catalog*.

Refer to the Statistics, Doctoral Minor Requirements in the *UNC Greensboro University Catalog* for additional details concerning required courses.

- STA 602 Statistical Methods for Data Analytics
- Select five additional three-credit hour STA courses at the 600-level or above.

Appendix

16 Awards and Scholarships

The Graduate School's webpage on Awards, Nominations, Scholarships & Fellowships gives details on several Graduate School awards. All Graduate School awards are by departmental nomination/endorsement only; students may not apply directly for these awards.

The Department of Mathematics and Statistics has a number of scholarships available to graduate students. Please see the Department of Mathematics and Statistics Scholarship home page for details and application materials. Typically, applications are received from January to April for awards for the following academic year.

Eligibility Requirements:

- M.A. student applicants must have a thesis/project advisor.
- First year Ph.D. student applicants must have passed at least one Area exam.
- Second year Ph.D. student applicants must have passed both Area exams.
- Third year Ph.D. student applicants must have passed the preliminary exam and selected a dissertation advisor.

- Fourth year Ph.D. student applicants must demonstrate a high level of research activity.
- All graduate student applicants must have their advisor submit a letter of reference addressing the selection criteria listed above and discussing the likelihood of graduation in 5 years for Ph.D. and 2 years for M.A. degrees.

The Department grants *Excellence in Teaching* and *Excellence in Research* awards to qualified Ph.D. students. These awards are normally given every year. At most one teaching and one research award is given each year. The *Excellence in Teaching* award is given to a Ph.D student that has demonstrated a history of exceptional teaching for the Department. The *Excellence in Research* award is given to a graduating Ph.D student that has demonstrated exceptional research.

17 Criteria for evaluating students to receive continued funding

All advisors must submit the Annual Progress Report (§2) for their student by the end of February. These reports will be used to evaluate the student's progress in the program. Students that are not making satisfactory progress as outlined below are in jeopardy of losing their funding.

17.1 Master's Students

Master's students on assistantships are funded for a maximum of two years, contingent upon satisfactory progress in the program. By March 1, funded first year M.A. students must meet the following criteria to qualify for satisfactory progress in the program.

M.A. Year 1

- ☐ Student's advisor has submitted the Annual Progress Report with student's current CV (§2) and initial Master's Plan of Study (§12.4) to the GPD.
- ☐ Student has chosen a capstone experience (§12.5).

  Thesis The student must have a thesis advisor and approved thesis committee.

  Project The student must have a project supervisor.

  Exam The student must select the area exams or program exam.
- ☐ Student has maintained 3.5 GPA in graduate coursework (§7).
- ☐ Student is maintaining full-time status and continuous enrollment. Student is NC resident, or is taking steps to apply for residency, if applicable (§4).
- ☐ Student has received positive evaluations on TA assignments (§6).
- ☐ Student has excellent attendance record for colloquia and participated in relevant seminars (§5).

M.A. Year 2

- [ ] Student's advisor has submitted the Annual Progress Report with student's current CV (§2) and final Master's Plan of Study (§12.4) to the GPD.
- [ ] Student has made significant progress on the capstone experience (§12.5).
- [ ] Student has maintained 3.5 GPA in graduate coursework (§7).
- [ ] Student has received positive evaluations on TA assignments (§6).
- [ ] Student is maintaining full-time status and continuous enrollment. Student is NC resident, or has applied for residency (§4).
- [ ] Student has excellent attendance record for colloquia and participated in relevant seminars (§5).
- [ ] Student has applied for graduation (§8).

17.2 Doctoral Students

Doctoral students on assistantships are funded for a maximum of five years, contingent upon satisfactory progress in the program. By March 1, funded Ph.D. students must meet the criteria for their year to qualify for satisfactory progress in the program.

Ph.D. Year 1

- [ ] Student's advisor has submitted the Annual Progress Report with current CV (§2) and initial Doctoral Plan of Study (§10.4) to the GPD.
- [ ] Student has chosen an advisory committee (§1).
- [ ] Student has maintained 3.5 GPA in graduate coursework (§7).
- [ ] Student has selected the area exams and plans to attempt both in May or August (§10.6).
- [ ] Student has received positive evaluations on TA assignments (§6).
- [ ] Student is maintaining full-time status and continuous enrollment. Student is NC resident, or is taking steps to apply for residency, if applicable (§4).
- [ ] Student has excellent attendance record for colloquia and participated in relevant seminars (§5).

Ph.D. Year 2

- [ ] Student's advisor has submitted the Annual Progress Report with current CV (§2) and current Doctoral Plan of Study (§10.4) to the GPD.
- [ ] Student has chosen a dissertation advisor and committee (§10.8.1).
- [ ] Student has maintained 3.5 GPA in graduate coursework (§7).
- [ ] Student has passed both area exams prior to the start of the fourth semester (§10.6).

- [ ] Student is working with the dissertation committee to prepare the preliminary exam (§10.7).
- [ ] Student has received positive evaluations on TA assignments (§6).
- [ ] Student is maintaining full-time status and continuous enrollment. Student is NC resident, or has applied for residency (§4).
- [ ] Student has excellent attendance record for colloquia and participated in relevant seminars (§5).

Ph.D. Year 3

- [ ] Student's advisor has submitted the Annual Progress Report with current CV (§2) and current Doctoral Plan of Study (§10.4) to the GPD.
- [ ] Student has maintained 3.5 GPA in graduate coursework (§7).
- [ ] Student has completed the preliminary exam.
- [ ] Student has completed, or plans to complete prior to the start of the seventh semester, the presentation and defense of the dissertation topic (§10.8.2).
- [ ] Student has received positive evaluations on TA assignments (§6).
- [ ] Student is maintaining full-time status and continuous enrollment. Student is NC resident, or has applied for residency (§4).
- [ ] Student has excellent attendance record for colloquia and participated in relevant seminars (§5).

Ph.D. Year 4

- [ ] Student's advisor has submitted the Annual Progress Report with current CV (§2) and final Doctoral Plan of Study (§10.4) to the GPD.
- [ ] Student has maintained 3.5 GPA in graduate coursework (§7).
- [ ] Student has completed the presentation and defense of the dissertation topic and written dissertation research outline (§10.8.2).
- [ ] Student has made significant progress in the dissertation research (§10.8).
- [ ] Student has applied for candidacy (§10.8.3).
- [ ] Student has received positive evaluations on TA assignments (§6).
- [ ] Student is maintaining full-time status and continuous enrollment. Student is NC resident, or has applied for residency (§4).
- [ ] Student has excellent attendance record for colloquia and participated in relevant seminars (§5).

Ph.D. Year 5

- ☐ Student's advisor has submitted the Annual Progress Report with current CV (§2) to the GPD.
- ☐ Student has maintained 3.5 GPA in graduate coursework (§7).
- ☐ Student has completed, or plans to complete prior to the end of March, the oral presentation and defense of the dissertation (§10.8.4).
- ☐ Student has received positive evaluations on TA assignments (§6).
- ☐ Student has excellent attendance record for colloquia and participated in relevant seminars (§5).
- ☐ Student is maintaining full-time status and continuous enrollment. Student is NC resident, or has applied for residency (§4).
- ☐ Student has applied for graduation (§8).

18 Graduate School Forms

The Graduate School's webpage on Documents & Forms houses several important forms. Forms are required to do the following:

- apply for graduation;
- take a leave of absence;
- declare or change a concentration (M.A. students);
- request permission to take an independent study course;
- submit a passing score on preliminary exam or thesis/dissertation defense;
- form the thesis/dissertation committee;
- revise the Plan of Study;
- seek dissertation topic approval;
- apply to doctoral candidacy (required in order to register for dissertation hours);
- deliver results of your dissertation defense.

19 Departmental Forms

In this section, we give samples of the required forms.

1. Annual Progress Report (§2): To be completed each February by advisor and student. This report is used by the Department to evaluate student progress in their program.
2. Doctoral Plan of Study (§10.4): To be completed by the advisor and student. The student should choose the one based on their year of enrollment. The first plan must

be submitted to The Graduate School by the end of the first year of study (prior to completing 18 hours of graduate work). Any revisions must be submitted to the GPD with the Annual Progress Report.

3. MA in Mathematics Plan of Study (§12.4): To be completed by the advisor and student. The first plan must be submitted to The Graduate School by the end of the first year of study (prior to the end of the second semester). Any revisions must be submitted to the GPD with the Annual Progress Report. There is a different plan of study form for each of the concentrations: Actuarial Mathematics, Data Analytics, Mathematics, Mathematical Foundations of Data Science, Mathematical Statistics, and Teaching College Mathematics.

4. MS in Applied Statistics Plan of Study (§13.4): To be completed by the advisor and student. The first plan must be submitted to The Graduate School by the end of the first year of study (prior to the end of the second semester). Any revisions must be submitted to the GPD with the Annual Progress Report.

5. Post-Baccalaureate Certificate Plan of Study (§14): To be completed by the advisor and student. The plan must be submitted to The Graduate School when the student applies for graduation.

6. Doctoral Minor Plan of Study (§15): To be completed by the advisor and student. The plan must be submitted to The Graduate School when the student applies for doctoral minor.

7. Doctoral Evaluation Forms: These forms are used in the Department to evaluate certain milestones in the Ph.D. program.

   (a) Qualifying Exam (§10.6) Evaluation Form: To be completed by the exam committee. A form must be submitted to the GPD after each area exam.

   (b) Preliminary Exam (§10.7) Evaluation Form: To be completed by the dissertation committee. A form must be submitted to the GPD after both written and oral components of the preliminary exam.

   (c) Dissertation Topic (§10.8.2) Evaluation Form: To be completed by the dissertation committee upon the completion of the oral dissertation topic proposal; oral defense of the topic; and the written dissertation research outline.

   (d) Dissertation (§10.8.4) Evaluation Form: To be completed by the dissertation committee upon the completion of the dissertation and oral presentation and defense of the dissertation.

8. Master's Evaluation Forms: These forms are used in the Department to evaluate the capstone experience (§12.5) in the M.A. program.

   (a) Comprehensive Exam Evaluation Form: To be completed by the relevant exam committee. A form must be submitted to the GPD after each area exam and after each part of comprehensive exam.

(b) Project Evaluation Form: To be completed by the project supervisor upon completion of the written report and oral presentation of the project.

(c) Thesis Evaluation Form: To be completed by the thesis committee upon completion of the thesis and oral presentation and defense of the thesis.

Department of Mathematics and Statistics: Annual Progress Report

Student: _____ Date: _____

Advisor: _____ Program: ☐ MA/MS ☐ Ph.D.

Years in Program: ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7+

Attach your student's current CV to this report. The CV must include all conferences and workshops attended, research presentations, and papers submitted/accepted.

Choose the response that best describes your student's Plan of Study.

- ☐ The Plan of Study on file with the DGS is up-to-date.
- ☐ The Plan of Study on file with the DGS needs revision. The revised Plan of Study is attached for DGS approval.

Choose the response that best describes your student's progress towards timely graduation.

- ☐ I expect on-time graduation. (May of year 2 for MA/MS or May of year 5 for Ph.D.)
- ☐ I expect delayed graduation in
  ☐ August ☐ January ☐ May of year ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7+
- ☐ I do not expect my student to graduate.

Choose all relevant program specific milestones that your student has completed. For a student in year n, enter comments at the end to address all relevant unchecked lines for years less than or equal to n.

All programs every year:

- ☐ Maintained full-time enrollment status this year.
- ☐ Enrolled in courses this year as described in Plan of Study.
- ☐ Registered for courses for next year as described in Plan of Study.
- ☐ Attended seminars and colloquia. (Checked by DGS.)
- ☐ GPA of at least 3.5 in graduate courses.

MA/MS Year 1:

- ☐ Chose a concentration.
- ☐ Chose a capstone experience. (Note: The thesis option requires choosing a thesis advisor. The project option requires choosing a project supervisor. The exam option requires choosing between the area exams and the program exam.)

MA/MS Year 2:

- ☐ Applied for graduation.
- ☐ Informed of exit forms.

Capstone experience: ☐ Completed. ☐ Expected to finish this semester.

Ph.D. Year 1:

Qualifying exam 1: ☐ Passed. ☐ Planned for May. ☐ Planned for August.

Qualifying exam 2: ☐ Passed. ☐ Planned for May. ☐ Planned for August.

Ph.D. Year 2:

- ☐ Chose dissertation advisor.
- ☐ Chose dissertation committee.

Ph.D. Year 3:

- ☐ Passed preliminary examination.
- ☐ Prepared dissertation topic proposal.
- ☐ Defended dissertation topic proposal.
- ☐ Prepared written dissertation research outline.

Ph.D. Year 4:

- ☐ Applied for admission to candidacy.
- ☐ Continued progress on dissertation research.

Ph.D. Year 5:

- ☐ Continued progress on dissertation research.
- ☐ Applied for graduation.
- ☐ Defended dissertation.
- ☐ Completed exit forms.

Enter comments below. Attach additional sheets if necessary.

Department of Mathematics and Statistics: Doctoral Plan Of Study (Fall 2022)

Student: _____ Program: Ph.D. in Computational Mathematics

ID #: _____ Advisor: _____

Coursework (minimum 48 - 54 credit hours)

Semester & Year

Choose at least two courses from the following list.

- ☐ MAT 630 Computational Discrete Mathematics (3) _____
- ☐ MAT 627 Numerical Methods (3) _____
- ☐ STA 642 Statistical Computing (3) _____

Choose at least 48 credit hours of approved coursework.

- ☐ STA 622 Complex Data Analysis (3) _____
- ☐ STA 635 Theory of Linear Regression (3) _____
- ☐ STA 642 Statistical Computing (3) _____
- ☐ STA 651 Mathematical Statistics (3) _____
- ☐ STA 652 Mathematical Statistics (3) _____
- ☐ STA 661 Advanced Statistics in the Behavioral and Biological Sciences I (3) _____
- ☐ STA 662 Advanced Statistics in the Behavioral and Biological Sciences II (3) _____
- ☐ STA 665 Analysis of Survival Data (3) _____
- ☐ STA 670 Categorical Data Analysis (3) _____
- ☐ STA 671 Multivariate Analysis (3) _____
- ☐ STA 673 Statistical Linear Models I (3) _____
- ☐ STA 674 Statistical Linear Models II (3) _____
- ☐ STA 675 Advanced Experimental Design (3) _____
- ☐ STA 676 Sample Survey Methods (3) _____
- ☐ STA 682 Theory of Time Series (3) _____
- ☐ STA 703 Topics in High Dimensional Data Analysis (3) _____
- ☐ MAT 701 Graduate Seminar in Computational Mathematics (____ credit hours) _____
- ☐ STA 701 Seminar in Computational Statistics (____ credit hours) _____
- ☐ MAT 709 Topics in Computational Mathematics (____ credit hours) _____

- ☐ STA 709 Topics in Computational Statistics (____ credit hours) _____
- ☐ MAT 721 Mathematical Cryptography (3) _____
- ☐ MAT 723 Numerical Mathematics (3) _____
- ☐ MAT 726 Finite Element Methods (3) _____
- ☐ MAT 727 Linear Algebra (3) _____
- ☐ MAT 728 Numerical Linear Algebra (3) _____
- ☐ MAT 735 Ordinary Differential Equations (3) _____
- ☐ MAT 736 Partial Differential Equations (3) _____
- ☐ MAT 737 General Topology (3) _____
- ☐ MAT 740 Algebra I: Groups and Rings (3) _____
- ☐ MAT 741 Algebra II: Modules and Fields (3) _____
- ☐ MAT 742 Computational Algebraic Number Theory (3) _____
- ☐ MAT 743 Complex Analysis (3) _____
- ☐ MAT 745 Measure Theory (3) _____
- ☐ MAT 746 Real Analysis (3) _____
- ☐ MAT 747 Computational Topology (3) _____
- ☐ MAT 748 Computational Algebra (3) _____
- ☐ MAT 749 The Mathematics of Machine Learning (3) _____
- ☐ MAT 751 Advanced Topological Data Analysis (3) _____
- ☐ MAT 790 Directed Doctoral Research (____ credit hours) _____
- ☐ MAT 799 Dissertation (____ credit hours) _____

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

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Choose additional electives that do not count toward the required 48 hours.

- ☐ MAT 695 Mathematical Analysis (3) _____
- ☐ MAT 696 Mathematical Analysis (3) _____
- ☐ MAT 601 Seminar in the Teaching of Mathematics I (1) _____
- ☐ MAT 602 Seminar in Mathematical Software (3) _____
- ☐ MAT 603 Practicum in the Teaching of Mathematics (2) _____

Qualifying Exams

Chose two areas.

- ☐ Mathematical Analysis _____
- ☐ Linear Algebra and Matrix Theory _____
- ☐ Linear Models _____
- ☐ Mathematical Statistics _____

Preliminary Examination

- ☐ Written component _____
- ☐ Oral component _____

Dissertation Research

Include 18–21 credit hours of MAT 799 Dissertation in required 48 hours.

Dissertation committee: _____(Chair)

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- Oral topic proposal and defense _____
- Written dissertation research outline _____
- Oral dissertation presentation and defense _____

Signatures

Sign and print below.

Student: _____ Date: _____

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DGS: _____ Date: _____

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Department of Mathematics and Statistics: Doctoral Plan Of Study (Fall 2021)

Student: _____ Program: Ph.D. in Computational Mathematics

ID #: _____ Advisor: _____

Coursework (minimum 48 - 54 credit hours)

Semester & Year

Complete the following two courses.

- ☐ MAT 602 Seminar in Mathematical Software (3) _____
  or MAT 630 Computational Discrete Mathematics (3) _____
  or STA 642 Statistical Computing (3) _____
- ☐ MAT 627 Numerical Methods (3) _____

Choose at least 48 credit hours of approved coursework.

- ☐ STA 622 Complex Data Analysis (3) _____
- ☐ STA 635 Theory of Linear Regression (3) _____
- ☐ STA 642 Statistical Computing (3) _____
- ☐ STA 651 Mathematical Statistics (3) _____
- ☐ STA 652 Mathematical Statistics (3) _____
- ☐ STA 661 Advanced Statistics in the Behavioral and Biological Sciences I (3) _____
- ☐ STA 662 Advanced Statistics in the Behavioral and Biological Sciences II (3) _____
- ☐ STA 665 Analysis of Survival Data (3) _____
- ☐ STA 670 Categorical Data Analysis (3) _____
- ☐ STA 671 Multivariate Analysis (3) _____
- ☐ STA 673 Statistical Linear Models I (3) _____
- ☐ STA 674 Statistical Linear Models II (3) _____
- ☐ STA 675 Advanced Experimental Design (3) _____
- ☐ STA 676 Sample Survey Methods (3) _____
- ☐ STA 682 Theory of Time Series (3) _____
- ☐ STA 703 Topics in High Dimensional Data Analysis (3) _____
- ☐ MAT 701 Graduate Seminar in Computational Mathematics
  (____ credit hours) _____
- ☐ STA 701 Seminar in Computational Statistics
  (____ credit hours) _____
- ☐ MAT 709 Topics in Computational Mathematics
  (____ credit hours) _____

- ☐ STA 709 Topics in Computational Statistics (____ credit hours) _____
- ☐ MAT 721 Mathematical Cryptography (3) _____
- ☐ MAT 723 Numerical Mathematics (3) _____
- ☐ MAT 726 Finite Element Methods (3) _____
- ☐ MAT 727 Linear Algebra (3) _____
- ☐ MAT 728 Numerical Linear Algebra (3) _____
- ☐ MAT 735 Ordinary Differential Equations (3) _____
- ☐ MAT 736 Partial Differential Equations (3) _____
- ☐ MAT 737 General Topology (3) _____
- ☐ MAT 740 Algebra I: Groups and Rings (3) _____
- ☐ MAT 741 Algebra II: Modules and Fields (3) _____
- ☐ MAT 742 Computational Algebraic Number Theory (3) _____
- ☐ MAT 743 Complex Analysis (3) _____
- ☐ MAT 745 Measure Theory (3) _____
- ☐ MAT 746 Real Analysis (3) _____
- ☐ MAT 747 Computational Topology (3) _____
- ☐ MAT 748 Computational Algebra (3) _____
- ☐ MAT 749 The Mathematics of Machine Learning (3) _____
- ☐ MAT 751 Advanced Topological Data Analysis (3) _____
- ☐ MAT 790 Directed Doctoral Research (____ credit hours) _____
- ☐ MAT 799 Dissertation (____ credit hours) _____

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Choose additional electives that do not count toward the required 48 hours.

- ☐ MAT 695 Mathematical Analysis (3) _____
- ☐ MAT 696 Mathematical Analysis (3) _____
- ☐ MAT 601 Seminar in the Teaching of Mathematics I (1) _____
- ☐ MAT 603 Practicum in the Teaching of Mathematics (2) _____

Qualifying Exams

Chose two areas.

- ☐ Mathematical Analysis _____
- ☐ Linear Algebra and Matrix Theory _____
- ☐ Linear Models _____
- ☐ Mathematical Statistics _____

Preliminary Examination

- ☐ Written component _____
- ☐ Oral component _____

Dissertation Research

Include 18–21 credit hours of MAT 799 Dissertation in required 48 hours.

Dissertation committee: _____(Chair)

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- Oral topic proposal and defense _____
- Written dissertation research outline _____
- Oral dissertation presentation and defense _____

Signatures

Sign and print below.

Student: _____ Date: _____

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DGS: _____ Date: _____

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Department of Mathematics and Statistics: Doctoral Plan Of Study (Fall 2020 or Prior)

Student: _____ Program: Ph.D. in Computational Mathematics

ID #: _____ Advisor: _____

Coursework (minimum 48 credit hours)

Semester & Year

Choose at least 48 credit hours of approved coursework.

- ☐ STA 622 Complex Data Analysis (3) _____
- ☐ STA 635 Theory of Linear Regression (3) _____
- ☐ STA 642 Statistical Computing (3) _____
- ☐ STA 651 Mathematical Statistics (3) _____
- ☐ STA 652 Mathematical Statistics (3) _____
- ☐ STA 661 Advanced Statistics in the Behavioral and Biological Sciences I (3) _____
- ☐ STA 662 Advanced Statistics in the Behavioral and Biological Sciences II (3) _____
- ☐ STA 665 Analysis of Survival Data (3) _____
- ☐ STA 670 Categorical Data Analysis (3) _____
- ☐ STA 671 Multivariate Analysis (3) _____
- ☐ STA 673 Statistical Linear Models I (3) _____
- ☐ STA 674 Statistical Linear Models II (3) _____
- ☐ STA 675 Advanced Experimental Design (3) _____
- ☐ STA 676 Sample Survey Methods (3) _____
- ☐ STA 682 Theory of Time Series (3) _____
- ☐ STA 703 Topics in High Dimensional Data Analysis (3) _____
- ☐ MAT 701 Graduate Seminar in Computational Mathematics (____ credit hours) _____
- ☐ STA 701 Seminar in Computational Statistics (____ credit hours) _____
- ☐ MAT 709 Topics in Computational Mathematics (____ credit hours) _____
- ☐ STA 709 Topics in Computational Statistics (____ credit hours) _____
- ☐ MAT 721 Mathematical Cryptography (3) _____
- ☐ MAT 723 Numerical Mathematics (3) _____
- ☐ MAT 726 Finite Element Methods (3) _____

- ☐ MAT 727 Linear Algebra (3) _____
- ☐ MAT 728 Numerical Linear Algebra (3) _____
- ☐ MAT 735 Ordinary Differential Equations (3) _____
- ☐ MAT 736 Partial Differential Equations (3) _____
- ☐ MAT 737 General Topology (3) _____
- ☐ MAT 740 Algebra I: Groups and Rings (3) _____
- ☐ MAT 741 Algebra II: Modules and Fields (3) _____
- ☐ MAT 742 Computational Algebraic Number Theory (3) _____
- ☐ MAT 743 Complex Analysis (3) _____
- ☐ MAT 745 Measure Theory (3) _____
- ☐ MAT 746 Real Analysis (3) _____
- ☐ MAT 747 Computational Topology (3) _____
- ☐ MAT 748 Computational Algebra (3) _____
- ☐ MAT 749 The Mathematics of Machine Learning (3) _____
- ☐ MAT 751 Advanced Topological Data Analysis (3) _____
- ☐ MAT 790 Directed Doctoral Research (____ credit hours) _____
- ☐ MAT 799 Dissertation (____ credit hours) _____

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Choose additional electives that do not count toward the required 48 hours.

- ☐ MAT 695 Mathematical Analysis (3) _____
- ☐ MAT 696 Mathematical Analysis (3) _____
- ☐ MAT 601 Seminar in the Teaching of Mathematics I (1) _____
- ☐ MAT 602 Seminar in Mathematical Software (3) _____
- ☐ MAT 603 Practicum in the Teaching of Mathematics (2) _____

Preliminary Examination

Month & Year

Written component Chose two areas.

- ☐ Mathematical Analysis _____
- ☐ Linear Algebra and Matrix Theory _____
- ☐ Linear Models _____
- ☐ Mathematical Statistics _____

Oral component

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Dissertation Research

Include 18–21 credit hours of MAT 799 Dissertation in required 48 hours.

Dissertation committee: _____(Chair)

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Oral topic proposal and defense _____

Written dissertation research outline _____

Oral dissertation presentation and defense _____

Signatures

Sign and print below.

Student: _____ Date: _____

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DGS: _____ Date: _____

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Department of Mathematics and Statistics: Master's Plan Of Study

Student: _____ Program: M.A. in Mathematics

ID #: _____ Concentration: Mathematics

Advisor: _____

Coursework (minimum 30 credit hours)

Semester & Year

Choose at least two, including a year-long sequence.

- ☐ MAT 727 Linear Algebra (3) _____
- ☐ MAT 728 Numerical Linear Algebra (3) _____
- ☐ MAT 695 Mathematical Analysis (3) _____
- ☐ MAT 696 Mathematical Analysis (3) _____

Choose remaining elective credits approved by the DGS that may count toward the minimum of 30 credit hours required. At most 6 credits from STA or CSC may be counted.

- ☐ MAT 687 Project in Mathematics (3) _____
- ☐ MAT 699 Thesis (____ credit hours) _____

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Choose additional electives that do not count toward the required 30 hours.

- ☐ MAT 601 Seminar in the Teaching of Mathematics I (1) _____
- ☐ MAT 603 Practicum in the Teaching of Mathematics (2) _____

Capstone Experience

Month & Year

Choose one.

☐ Thesis _____ _____
Include 6 credit hours of MAT 699 Thesis in required hours.

Thesis committee: _____(Chair)
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☐ Project _____ _____
Include 3 credit hours of MAT 687 Project in Mathematics in required hours.

Project supervisor: _____

☐ Comprehensive Exam _____
Do not include any hours of MAT 687, MAT 699, STA 698, or STA 699 in required hours.

Choose one type.

☐ Area exams: Choose two areas.

☐ Mathematical Analysis _____

☐ Linear Algebra and Matrix Theory _____

☐ Linear Models _____

☐ Mathematical Statistics _____

☐ Program exam:

Part 1 _____

Part 2 _____

List 18–21 credit hours from the program for the exam.

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Signatures

Sign and print below.

Student: _____ Date: _____

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DGS: _____ Date: _____

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Department of Mathematics and Statistics: Master's Plan Of Study

Student: _____ Program: M.A. in Mathematics

ID #: _____ Concentration: Data Analytics

Advisor: _____

Coursework (minimum 30 credit hours)

Semester & Year

Choose all or list replacement courses in elective hours.

- ☐ STA 631 Introduction to Probability (3) _____
- ☐ STA 632 Introduction to Mathematical Statistics (3) _____
- ☐ STA 642 Statistical Computing (3) _____
- ☐ STA 673 Statistical Linear Models I (3) _____
- ☐ STA 703 Topics in High Dimensional Data Analysis (3) _____

Choose at least two.

- ☐ STA 645 Nonparametric Statistics (3) _____
- ☐ STA 661 Advanced Statistics in the Behavioral and Biological Sciences I (3) _____
- ☐ STA 662 Advanced Statistics in the Behavioral and Biological Sciences II (3) _____
- ☐ STA 665 Analysis of Survival Data (3) _____
- ☐ STA 670 Categorical Data Analysis (3) _____
- ☐ STA 671 Multivariate Analysis (3) _____
- ☐ STA 674 Statistical Linear Models II (3) _____
- ☐ STA 677 Advanced Topics in Data Analysis and Quantitative Methods (3) _____

Choose at most two.

- ☐ ECO 663 Predictive Data Mining (3) _____
- ☐ ECO 664 Time Series and Forecasting (3) _____
- ☐ ECO 725 Data Methods in Economics (3) _____
- ☐ CSC 605 Data Science (3) _____
- ☐ CSC 610 Big Data and Machine Learning (3) _____
- ☐ CSC 625 Bioinformatics (3) _____
- ☐ ISM 645 Principles of Predictive Analytics (3) _____
- ☐ ISM 646 Visualizing Data to Design Strategy (3) _____
- ☐ ISM 671 Organizing Data for Analytics (3) _____

Choose remaining elective credits that may count toward the minimum 30 credit hours required.

- ☐ MAT 602 Seminar in Mathematical Software (3) _____
- ☐ STA 698 Project in Statistics (3) _____
- ☐ STA 699 Thesis (____ credit hours) _____
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Choose additional electives that do not count toward the required 30 hours.

- ☐ MAT 601 Seminar in the Teaching of Mathematics I (1) _____
- ☐ MAT 603 Practicum in the Teaching of Mathematics (2) _____
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Capstone Experience

Month & Year

Choose one.

☐ Thesis _____ _____
Include 6 credit hours of STA 699 Thesis or 3 credit hours each of STA 698 Project in Statistics and STA 699 Thesis in required hours.

Thesis committee: _____(Chair)
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☐ Project _____ _____
Include 3 credit hours of STA 698 Project in Statistics in required hours.

Project supervisor: _____

☐ Comprehensive Exam _____
Do not include any hours of MAT 687, MAT 699, STA 698, or STA 699 in required hours.

Choose one type.

☐ Area exams: Choose two areas.

☐ Mathematical Analysis _____

☐ Linear Algebra and Matrix Theory _____

☐ Linear Models _____

☐ Mathematical Statistics _____

☐ Program exam:

Part 1 _____

Part 2 _____

List 18–21 credit hours from the program for the exam.

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Signatures

Sign and print below.

Student: _____ Date: _____

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DGS: _____ Date: _____

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Department of Mathematics and Statistics: Master's Plan Of Study

Student: _____ Program: M.A. in Mathematics

ID #: _____ Concentration: Actuarial Mathematics

Advisor: _____

Coursework (minimum 30 credit hours)

Semester & Year

Choose all or list replacement courses in elective hours.

- ☐ STA 631 Introduction to Probability (3) _____
- ☐ STA 632 Introduction to Mathematical Statistics (3) _____
- ☐ STA 655 Applied Probability Models (3) _____
- ☐ MAT 686 Financial Mathematics for Actuaries (3) _____

Choose at least three.

- ☐ STA 642 Statistical Computing (3) _____
- ☐ STA 665 Analysis of Survival Data (3) _____
- ☐ STA 635 Theory of Linear Regression (3) _____
- ☐ STA 691 Actuarial Exam Preparation Seminar (1) _____
- ☐ STA 670 Categorical Data Analysis (3) _____
- ☐ STA 671 Multivariate Analysis (3) _____
- ☐ STA 682 Theory of Time Series (3) _____
- ☐ STA 686 Actuarial Models I (3) _____
- ☐ STA 687 Actuarial Models II (3) _____

Choose at most two additional STA course at the 600-level or above, excluding STA 667 and STA 699.

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Choose at most two.

- ☐ ECO 641 Microeconomics (3) _____
- ☐ ECO 646 Macroeconomics (3) _____
- ☐ ISM 645 Principles of Predictive Analytics (3) _____
- ☐ ISM 671 Organizing Data for Analytics (3) _____
- ☐ MBA 702 Financial and Managerial Accounting (3) _____
- ☐ MBA 707 Financial Management (3) _____

Choose remaining elective credits that may count toward the minimum 30 credit hours required.

- ☐ MAT 602 Seminar in Mathematical Software (3) _____
- ☐ STA 698 Project in Statistics (3) _____

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Choose additional electives that do not count toward the required 30 hours.

- ☐ MAT 601 Seminar in the Teaching of Mathematics I (1) _____
- ☐ MAT 603 Practicum in the Teaching of Mathematics (2) _____

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Capstone Experience

Semester & Year

This concentration required the project capstone.

- ☐ Project _____ _____
  Include 3 credit hours of STA 698 Project in Statistics in required hours.

Project supervisor: _____

Signatures

Sign and print below.

Student: _____ Date: _____

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DGS: _____ Date: _____

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Department of Mathematics and Statistics: Master's Plan Of Study

Student: _____ Program: M.A. in Mathematics

ID #: _____ Concentration: Mathematical Foundations of Data Science

Advisor: _____

Coursework (minimum 30 credit hours)

Semester & Year

Choose all or list replacement courses in elective hours.

- ☐ MAT 651 Topology Data Analysis (3) _____
- ☐ MAT 653 Mathematical Data Science I - Foundations (3) _____
- ☐ MAT 654 Mathematical Data Science II - Machine Learning (3) _____
- ☐ STA 622 Complex Data Analysis (3) _____

Choose remaining elective credits that may count toward the minimum 30 credit hours required.

- ☐ STA 698 Project in Statistics (3) _____
  or MAT 687 Project in Mathematics (3) _____
- ☐ STA 699 Thesis (____ credit hours) _____
  or MAT 699 Thesis (____ credit hours) _____
- ☐ any MAT or STA course at the 600-level or above

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- ☐ Up to 6 credits of graduate level courses from any of the following department (with DGS approval)
  - ☐ Computer Science _____
  - ☐ Economics _____
  - ☐ Educational Research Methodology _____
  - ☐ Informatics and Analytics _____
  - ☐ Computational Analytics _____

- ☐ Cultural Analytics _____
- ☐ Information Systems and Supply Chain Management _____
- _____ _____
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Choose additional electives that do not count toward the required 30 hours.

- ☐ MAT 601 Seminar in the Teaching of Mathematics I (1) _____
- ☐ MAT 603 Practicum in the Teaching of Mathematics (2) _____
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Capstone Experience

Month & Year

Choose one.

☐ Thesis _____ _____
Include 6 credit hours of MAT 699 Thesis or STA 699 Thesis in required hours.

Thesis committee: _____(Chair)
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☐ Project _____ _____
Include 3 credit hours of STA 698 Project in Statistics or MAT 687 Project in Mathematics in required hours.

Project supervisor: _____

Signatures

Sign and print below.

Student: _____ Date: _____
_____

DGS: _____ Date: _____
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Department of Mathematics and Statistics: Master's Plan Of Study

Student: _____ Program: M.A. in Mathematics

ID #: _____ Concentration: Mathematical Statistics

Advisor: _____

Coursework (minimum 30 credit hours)

Semester & Year

Choose all or list replacement courses in elective hours.

- ☐ STA 631 Introduction to Probability (3) _____
  or STA 651 Mathematical Statistics I (3) _____
- ☐ STA 632 Introduction to Mathematical Statistics (3) _____
  or STA 652 Mathematical Statistics II (3) _____
- ☐ STA 635 Theory of Linear Regression (3) _____
- ☐ STA 673 Statistical Linear Models I (3) _____

Choose remaining elective credits that may count toward the minimum 30 credit hours required.

- ☐ MAT 602 Seminar in Mathematical Software (3) _____
- ☐ STA 698 Project in Statistics (3) _____
- ☐ STA 699 Thesis (____ credit hours) _____
- ☐ Any MAT or STA 600 level or above courses

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Capstone Experience

Month & Year

Choose one.

☐ Thesis _____ _____
Include 6 credit hours of MAT 699 Thesis or STA 699 Thesis in required hours.

Thesis committee: _____(Chair)
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☐ Project _____ _____
Include 3 credit hours of STA 698 Project in Statistics in required hours.

Project supervisor: _____

☐ Comprehensive Exam _____
Do not include any hours of MAT 687, MAT 699, STA 698, or STA 699 in required hours.

Choose one type.

☐ Area exams: Choose two areas.

☐ Mathematical Analysis _____

☐ Linear Algebra and Matrix Theory _____

☐ Linear Models _____

☐ Mathematical Statistics _____

☐ Program exam:

Part 1 _____

Part 2 _____

List 18–21 credit hours from the program for the exam.

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Signatures

Sign and print below.

Student: _____ Date: _____

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DGS: _____ Date: _____

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Department of Mathematics and Statistics: Master's Plan Of Study

Student: _____ Program: M.A. in Mathematics

ID #: _____ Concentration: Teaching College Mathematics

Advisor: _____

Coursework (minimum 30 credit hours)

Semester & Year

Choose at least six, including at least one two-semester sequence MAT 691–692, MAT 695–696, MAT 727–728, or STA 631–632).

- ☐ MAT 691 Advanced Abstract Algebra (3) _____
- ☐ MAT 692 Advanced Abstract Algebra (3) _____
- ☐ MAT 695 Mathematical Analysis (3) _____
- ☐ MAT 696 Mathematical Analysis (3) _____
- ☐ MAT 727 Linear Algebra (3) _____
- ☐ MAT 728 Numerical Linear Algebra (3) _____
- ☐ STA 631 Introduction to Probability (3) _____
- ☐ STA 632 Introduction to Mathematical Statistics (3) _____
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Choose all or list approved replacement courses in elective hours.

- ☐ MAT 601 Seminar in the Teaching of Mathematics I (1) _____
- ☐ MAT 603 Practicum in the Teaching of Mathematics (2) _____

Choose at least two.

- ☐ MAT 503 Problem Solving in Mathematics (3) _____
- ☐ MAT 513 Historical Development of Mathematics (3) _____
- ☐ STA 661 Advanced Statistics in the Behavioral and Biological Sciences I (3) _____
- ☐ STA 662 Advanced Statistics in the Behavioral and Biological Sciences II (3) _____
- ☐ ERM 605 Educational Measurement and Evaluation (3) _____
- ☐ ERM 667 Foundations of Educational Measurement Theory (3) _____
- ☐ HED 602 Student Development Theory in Higher Education (3) _____

Choose remaining elective credits approved by the DGS that may count toward the minimum of 30 credit hours required.

- ☐ MAT 602 Seminar in Mathematical Software (3) _____
- ☐ MAT 687 Project in Mathematics (3) _____
- ☐ STA 698 Project in Statistics (3) _____

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Choose additional electives that do not count toward the required 30 hours.

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Capstone Experience

Month & Year

Choose one.

☐ Project _____ _____
Include 3 credit hours of MAT 687 Project in Mathematics or STA 698 Project in Statistics in required hours.

Project supervisor: _____

☐ Comprehensive Exam _____
Do not include any hours of MAT 687, MAT 699, STA 698, or STA 699 in required hours.

Choose one type.

☐ Area exams: Choose two areas.

- ☐ Mathematical Analysis _____
- ☐ Linear Algebra and Matrix Theory _____
- ☐ Linear Models _____
- ☐ Mathematical Statistics _____

☐ Program exam:

Part 1 _____

Part 2 _____

List 18–21 credit hours from the program for the exam.

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Signatures

Sign and print below.

Student: _____ Date: _____

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DGS: _____ Date: _____

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Department of Mathematics and Statistics: Master's Plan Of Study

Student: _____ Program: M.S. in Applied Statistics

ID #: _____ Advisor: _____

Coursework (minimum 30 credit hours)

Semester & Year

Choose all or list replacement courses in elective hours.

- ☐ STA 631 Introduction to Probability (3) _____
- ☐ STA 632 Introduction to Mathematical Statistics (3) _____
- ☐ STA 640 SAS System for Statistical Analysis (1) _____
- ☐ STA 602 Statistical Methods for Data Analytics (3) _____
- ☐ STA 606 Solving Problems with Data Analytics (3) _____
- ☐ STA 668 Consulting Experience (2) _____

Choose at least two.

- ☐ STA 622 Complex Data Analysis (3) _____
- ☐ STA 635 Theory of Linear Regression (3) _____
- ☐ STA 642 Statistical Computing (3) _____
- ☐ STA 645 Nonparametric Statistics (3) _____
- ☐ STA 655 Applied Probability Models (3) _____
- ☐ STA 665 Analysis of Survival Data (3) _____
- ☐ STA 670 Categorical Data Analysis (3) _____
- ☐ STA 671 Multivariate Analysis (3) _____
- ☐ STA 673 Statistical Linear Models I (3) _____
- ☐ STA 674 Statistical Linear Models II (3) _____
- ☐ STA 675 Advanced Experimental Design (3) _____
- ☐ STA 676 Sample Survey Methods (3) _____
- ☐ STA 682 Theory of Time Series (3) _____
- ☐ STA 703 Topics in High Dimensional Data Analysis (3) _____
- ☐ STA 709 Topics in Computational Statistics (3) _____

Choose remaining elective credits that may count toward the minimum 30 credit hours required.

- ☐ STA 698 Project in Statistics (3) _____
- ☐ any STA course at the 600-level or above

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☐ Up to 6 credits of graduate level courses from any of the following department (with DGS approval)

- ☐ Mathematics _____
- ☐ Computer Science _____
- ☐ Economics _____
- ☐ Educational Research Methodology _____
- ☐ Informatics and Analytics _____
- ☐ Information Systems and Supply Chain Management _____

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Choose additional electives that do not count toward the required 30 hours.

- ☐ MAT 601 Seminar in the Teaching of Mathematics I (1) _____
- ☐ MAT 603 Practicum in the Teaching of Mathematics (2) _____

Capstone Experience

Month & Year

Choose one.

☐ Project _____ _____
Include 3 credit hours of STA 698 Project in Statistics in required hours.

Project supervisor: _____

Signatures

Sign and print below.

Student: _____ Date: _____

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DGS: _____ Date: _____

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Department of Mathematics and Statistics: PBC Plan Of Study

Student: _____ Program: PBC in Statistics

ID #: _____ Advisor: _____

Coursework (minimum 12 credit hours)

Semester & Year

Choose all or list replacement courses in elective hours.

☐ STA 602 Statistical Methods for Data Analytics (3) _____

Choose at least three additional STA courses at the 600-level or above, excluding STA 667 and STA 699.

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Signatures

Sign and print below.

Student: _____ Date: _____

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DGS: _____ Date: _____

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Department of Mathematics and Statistics: Doctoral Minor Plan of Study

Student: _____ Program: Doctoral Minor in Statistics

ID #: _____ Advisor: _____

Coursework (minimum 18 credit hours)

Semester & Year

Choose all or list replacement courses in elective hours.

☐ STA 602 Statistical Methods for Data Analytivs (3) _____

Complete at least five three-credit STA courses at the 600-level or above.

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Signatures

Sign and print below.

Student: _____ Date: _____

_____

DGS: _____ Date: _____

_____

Department of Mathematics and Statistics: Preliminary Exam Evaluation Form

Student: _____ Program: Ph.D. in Computational Mathematics

Advisor: _____

Date: _____

This form only evaluates one portion of the preliminary examination. The preliminary examination consists of a two written area exams and one oral exam. Completion of the preliminary examination requires Ph.D. Pass on both area exams and Pass on the oral exam. The written portion is administered and assessed by a committee of three faculty members appointed by the DGS. The oral portion is administered and assessed by the dissertation committee.

Choose the exam and evaluation.

- ☐ Area exam: Mathematical Analysis
- ☐ Area exam: Linear Algebra and Matrix Theory
- ☐ Area exam: Linear Models
- ☐ Area exam: Mathematical Statistics

Evaluation of area exam: ☐ **Fail** ☐ **M.A. Pass** ☐ **Ph.D. Pass**

☐ Oral exam: (Optional) List topic areas for the oral exam.

_____

_____

_____

_____

Evaluation of oral exam: ☐ **Fail** ☐ **Pass**

	Name	Signature	
Committee:	_____	_____	(Chair)
	_____	_____	
	_____	_____	
	_____	_____	
	_____	_____	

Department of Mathematics and Statistics: Preliminary Exam Evaluation Form

Student: _____ Program: Ph.D. in Computational Mathematics

Advisor: _____

Date: _____

This form is used to evaluate the preliminary examination. The preliminary examination consists of a written component and an oral component. Both components are administered and assessed by the dissertation committee.

☐ Written exam:
Evaluation of written component: ☐ **Fail** ☐ **Pass**

☐ Oral exam:
Evaluation of oral exam: ☐ **Fail** ☐ **Pass**

	Name	Signature
Committee:	_____	_____(Chair)
	_____	_____
	_____	_____
	_____	_____
	_____	_____
	_____	_____

Department of Mathematics and Statistics: Dissertation Topic Evaluation Form

Student: _____ Program: Ph.D. in Computational Mathematics

Advisor: _____

Topic: _____

Date: _____

The dissertation topic requirement includes an oral presentation of the dissertation topic, an oral defense of the topic, and a written dissertation research outline. A score of Satisfactory on all three portions is required for completion of this requirement. The dissertation topic is assessed by the dissertation committee.

Evaluation of oral dissertation topic proposal:	☐ **Unsatisfactory**	☐ **Satisfactory**
Evaluation of oral defense of topic:	☐ **Unsatisfactory**	☐ **Satisfactory**
Evaluation of written dissertation research outline:	☐ **Unsatisfactory**	☐ **Satisfactory**

	Name	Signature
Committee:	_____	_____(Chair)
	_____	_____
	_____	_____
	_____	_____
	_____	_____

Department of Mathematics and Statistics: Dissertation Evaluation Form

Student: _____ Program: Ph.D. in Computational Mathematics

Advisor: _____

Title: _____

Date: _____

The dissertation must conform to rules established by the UNCG Graduate Studies Committee. The dissertation, presentation, and oral defense must be acceptable to each member of the dissertation committee.

Evaluation of oral dissertation presentation:	☐ **Unsatisfactory**	☐ **Satisfactory**
Evaluation of oral defense of dissertation:	☐ **Unsatisfactory**	☐ **Satisfactory**
Evaluation of dissertation:	☐ **Unsatisfactory**	☐ **Satisfactory**

	Name	Signature
Committee:	_____	_____(Chair)
	_____	_____
	_____	_____
	_____	_____
	_____	_____

Department of Mathematics and Statistics: Comprehensive Exam Evaluation Form

Student: _____ Program: M.A. in Mathematics

Advisor: _____ Concentration: _____

Date: _____

This form only evaluates one exam. Completion of the comprehensive examination capstone requires completion of two. A score of M.A. Pass or Ph.D. Pass on two area exams or score of Pass on two parts of a program exam are required to complete the exam capstone. The comprehensive exam is administered and assessed by a committee of three faculty members appointed by the DGS.

Choose the exam and evaluation.

- ☐ Area exam: Mathematical Analysis
- ☐ Area exam: Linear Algebra and Matrix Theory
- ☐ Area exam: Linear Models
- ☐ Area exam: Mathematical Statistics

Evaluation of area exam: ☐ **Fail** ☐ **M.A. Pass** ☐ **Ph.D. Pass**

☐ Program exam: List 9–12 credit hours from the program for this part of the program exam.

_____

_____

_____

_____

Evaluation of program exam: ☐ **Fail** ☐ **Pass**

	Name	Signature
Committee:	_____	_____(Chair)
	_____	_____
	_____	_____
	_____	_____
	_____	_____

Department of Mathematics and Statistics: Project Evaluation Form

Student: _____ Program: M.A. in Mathematics

Advisor: _____ Concentration: _____

Title: _____

Date: _____

Completion of the project capstone requires a score of 1 or higher on the oral presentation and written report. The written report and oral presentation is assessed by the project supervisor.

Evaluation of written report and oral presentation:

- ☐ **0: Unacceptable project:** Project supervisor does not approve the project. Presentation of project poorly organized. Methods not explained well. Methods are incorrectly applied or do not exceed the introductory graduate level. No context given or poor understanding of the context within the broad context of the discipline.
- ☐ **1: Acceptable project:** Presentation and written components of the project are organized and well presented. Focus of project exceeds introductory graduate level. Context of project and applications within discipline are explained.
- ☐ **2: Exemplary project:** Presentation and written components of the project serve as models of organization and clear exposition. Focus of the project far exceeds level expected in the M.A. program. Context and applications of the project are well explained.

	Name	Signature
Supervisor :	_____	_____

Department of Mathematics and Statistics: Thesis Evaluation Form

Student: _____ Program: M.A. in Mathematics

Advisor: _____ Concentration: _____

Title: _____

Date: _____

Completion of the thesis capstone requires a score of Satisfactory on the oral presentation and defense of thesis and a score of 1 or higher on the thesis. The thesis, oral presentation, and defense is assessed by the thesis committee.

Evaluation of oral presentation and defense of the thesis: ☐ **Unsatisfactory** ☐ **Satisfactory**

Evaluation of thesis:

☐ **0: Unacceptable thesis:** Thesis committee does not unanimously accept thesis. Thesis is poorly written. Thesis lacks focus or level of exposition in focus area does not exceed the introductory graduate level. Thesis does not demonstrate broad understanding; no context is given for the results; may contain errors in results and definitions at the introductory graduate level.

☐ **1: Acceptable Thesis:** Thesis is a well-written summary of known results in mathematics or statistics. Thesis demonstrates depth of knowledge beyond the introductory graduate level in a particular area of focus. May contain some original ideas. Thesis demonstrates broad understanding; work is placed in the proper context; introduction, definitions and known results demonstrate student's breadth of knowledge at or above the introductory graduate level.

☐ **2: Very Good Thesis:** Clear exposition. Depth of knowledge is demonstrated by original mathematics or statistics, new theorems, or new methods of proof. Context and previous results are clearly indicated and demonstrate the student's broad understanding beyond the introductory graduate level.

☐ **3: Exemplary Thesis:** Clear exposition. Depth of knowledge is demonstrated by significant amount of original mathematics or statistics. Results contained in the thesis are worthy of publication in a mathematics or statistics research journal. Context and previous results are clearly indicated and demonstrate student's understanding of mathematics at level expected of a research mathematician or statistician.

	Name	Signature
Committee:	_____	_____(Chair)
	_____	_____
	_____	_____
	_____	_____