



Graduate Curriculum Approval Form Changes to Graduate Majors

Degree Program CIP Code	27.0101
Degree (i.e. M.A., Ph.D., etc.):	Ph.D.
Name of Major (e.g. Biology)	Mathematics
Name of affected Concentration(s) (e.g. Botany)	Pure and Applied Mathematics, Statistics
Proposed Effective Term (e.g. Fall 2017)	Fall 2018
Faculty Contact	Brian Curtin
Email	bcurtin@usf.edu

APPROVALS	Name	Signature	Action	Date
Dept. Chair	Leslaw Skrzypek		<input checked="" type="checkbox"/> Approve <input type="checkbox"/> Not approved <input type="checkbox"/> Comments attached	1-12-18
School Committee Chair (if applicable)	Jennifer Lewis		<input checked="" type="checkbox"/> Approve <input type="checkbox"/> Not approved <input type="checkbox"/> Comments attached	2/27/18
College Committee Chair	Kathleen McCook		<input checked="" type="checkbox"/> Approve <input type="checkbox"/> Not approved <input type="checkbox"/> Comments attached	3/2/18
College Dean/ Associate Dean	Robert Potter		<input checked="" type="checkbox"/> Approve <input type="checkbox"/> Not approved <input type="checkbox"/> Comments attached	3/2/18
Concurrence <input checked="" type="checkbox"/> N/A <input type="checkbox"/> Needed	Dept: Chair:		<input type="checkbox"/> Concur <input type="checkbox"/> Doesn't concur <input type="checkbox"/> Comments attached	
Grad Council	<input type="checkbox"/> Approve <input type="checkbox"/> Not approved <input type="checkbox"/> Tabled <input type="checkbox"/> Comments	Graduate Studies	<input type="checkbox"/> Approve <input type="checkbox"/> Disapprove	

Summary of Changes – Select all that apply:

Admissions Section:

- X Change Priority Admission Deadlines
 - Fall: _____
 - X Spring: _October 1_
 - Summer: _____
 - To "fall admissions only"
- From Regular to Direct Receipt Admissions
- From Direct Receipt to Regular Admission
- X Admission Requirements

Curriculum Requirements

- X Current Curriculum Requirements
 - X Core
 - Add New Concentration, Specialization, or Track*
 - Delete Concentration, Specialization, or Track
 - Thesis/Dissertation
 - Comprehensive/Qualifying Exam
 - Other: _____

*Requires submission to APAC for comment/clearance

Why are these changes necessary?

SACS compliance, match current practices, update courses mentioned

Attach the current Catalog Copy, with the requested revisions shown using Track Changes. Catalog copy is not required for changes to the Admission Deadline. All other changes require Catalog Copy. To obtain the most current catalog, email cdh@usf.edu.

Once College has approved, scan and email this Approval Form, and the revised Catalog Copy in Word to Graduate Studies by the deadline posted online <http://www.grad.usf.edu/graduate-council.php>. For questions, contact cdh@usf.edu

MATHEMATICS

Doctor of Philosophy (Ph.D.) Degree

DEGREE INFORMATION

Priority Program Admission Deadlines:
 Fall: February 1
 Spring: ~~August~~ ~~October~~ 1

International applicant deadlines:
<http://www.grad.usf.edu/majors>

Minimum Total Hours: 90 ~~post-baccalaureate~~
 60 ~~post-masters~~

Level: Doctoral
 CIP Code: 27.0101
 Dept. Code: MTH
 (Major/College Codes): MTH AS
 Approved: 1971

Concentrations:
 Pure and Applied (PAA)
 Statistics (STT)

CONTACT INFORMATION

College: Arts and Sciences
 Department: Mathematics and Statistics

Contact Information: www.grad.usf.edu

Commented [Office1]: This deadline reflects actual practice.

Commented [Office2]: This was the solution recommended to address changes in the way SACS asks us to give credit for Master's work. Hopefully, it will relieve us from transferring credits.

MAJOR INFORMATION

The Department of Mathematics and Statistics offers a Ph.D. in mathematics with concentrations in ~~P~~ure and ~~A~~ppplied mathematics and in ~~S~~tatistics. The ~~major program~~ provides the experience and knowledge to understand and appreciate prior accomplishments in the discipline and develops the skills necessary for a meaningful contribution to the intellectual advancement and applications of the discipline. It prepares its graduates to pursue long-term careers in their field by providing solid and cutting-edge knowledge. Graduates receive training that enables them to conduct independent research and write research papers publishable in peer-reviewed journals of their discipline, as well as a technical education enabling them to take on leading positions in a modern economy.

The Department of Mathematics at the University of South Florida, Tampa Campus, is composed of approximately thirty faculty who do research in a variety of fields, and teach courses ranging from the freshman to the doctoral level. The Department serves as the editorial base for the international journals: *Abstract and Applied Analysis* and *Journal of Theoretical Probability*. The Center for Mathematical Services within the department provides lectures, special programs for secondary students, and in-service training programs in mathematics.

Major Research Areas: [Approximation Theory](#), [Complex & Harmonic Analysis](#), [Functional Analysis](#), [Mathematical Physics](#), [Partial Differential Equations](#), [Dynamical Systems](#), [Mathematical Biology](#), [Probability](#), [Statistics](#), [Stochastic Modeling and Analysis](#), [Combinatorial Algebra](#), [Knot Theory](#), [Cybersecurity & Cryptography](#), [Theoretical Computer Science](#), [Biomolecular Computation](#), and [Extremal Combinatorics](#)

Algebra, Analysis, Discrete Mathematics, Partial-Differential Equations, Probability, Statistics, and Topology, including the following fields: Applied Mathematics, Approximation Theory, Combinatorics, Computational Statistics, Control Theory, DNA computing, Dynamical Systems, Graph Theory, Knot Theory, Nonlinear Analysis, Number Theory, Special Functions, Theoretical Computer Science, and other areas.

Commented [Office3]: The most significant change to this document is that it now includes the requirements for the statistics concentration. Around 2005, the plan was to create an independent statistics program. References to the statistics concentration were prematurely removed. When Renu Khator left and our colleague, A.N.V. Rao, passed away, no one was left to support and lead the effort. Since this time, the statistics concentration requirements have been described in a student handbook. The current effort to integrate them into the document is largely a matter of bringing in long-followed practices codified in the statistics handbook and smoothing out a few minor differences between the concentrations that have developed over the last decade.

Commented [Office4]: This description focuses more on the goals of the program rather than the particulars of the department. While it may be buzz-word heavy, it is less likely to become outdated like the old one had.

Commented [HC5]: Can you list a few research areas? This is used to help drive students to your major on the Catalog website

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ADMISSION INFORMATION

Must meet University requirements (see Graduate Admissions), as well as requirements for admission to the major, listed below.

- A degree from a regionally accredited institution relevant to the prospective concentration. Either
 - o a Master's degree or equivalent in mathematical sciences/statistics or a related area; or
 - o a Bachelor's degree or equivalent in mathematical sciences/statistics or related area with a strong record of undergraduate/graduate courses related to prospective concentration.
- At least a at least a 155th percentile Quantitative score on the GRE score on the GRE. Verbal and Analytic Writing scores on the GRE are also considered.
- At least a 3.50 GPA in graduate and/or upper undergraduate mathematics/statistics courses at least a 3.50 GPA in graduate and/or upper-level undergraduate mathematics/statistics courses.
- Three letters of recommendation (two of which should be from college level three letters of recommendation (two of which should be from college level mathematics/statistics professors)
- a completed departmental application form, including a statement of goals.
- a completed departmental graduate teaching assistantship application form (if such a position is desired).

Commented [Office6]: The previous statement was ambiguous about expectations for previous degree.

Commented [Office7]: We've finally updated the GRE score to the new scale and made a statement to reflect current practices.

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Commented [HC8]: GRE Scores should include the percentiles.

Applicants to the Ph.D. program may be offered admission to the MA program and move to the Ph.D. program after establishing a record of success in graduate courses. Graduate Teaching and Research Assistantships are available on a competitive basis. Contact the Department for recommended prerequisites for each concentration.

Commented [HC9]: are these just recommended or required pre-reqs? If required, they should be listed...

- a Bachelor's degree or equivalent in mathematical sciences or related area
- at least a 650 quantitative preferred score on the GRE
- at least a 3.5 GPA in graduate and/or upper undergraduate mathematics/statistics courses
- three letters of recommendation (two of which should be from college level math professors)
- a completed math department application form
- a statement of goals

In addition to the M.A. requirements, entrants to the Ph.D. must have a Master's degree in Mathematics or a strong enough background as determined by the Graduate Admissions Committee, three letters of recommendation, at least two of which from mathematicians indicating an aptitude for doctoral study. See list below.

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CURRICULUM REQUIREMENTS

Total Minimum Hours: 90 hours post-baccalaureate
60 hours post-masters

Total Minimum Hours: 90 hours

In addition to the University and College requirements, the students must fulfill the following requirements. Some graduate courses are organized into Core and Elective Sequences as follows:

- Core courses – 9 hours
- Concentration – 9-18 hours minimum
- Sequence Courses – 24 hours minimum
- Electives – 2 hours minimum
- Dissertation – 16 hours minimum

Commented [HC10]: make sure these add up to the minimum hours - 60

Core Courses: 9 hours

All students in the Mathematics Ph.D. program must take the following core courses:

MAA 5307	3	Real Analysis I	3 hours
MAS 5145	3	Advanced Linear Algebra	3 hours

Commented [Office11]: We will be submitting the course change to make the name "Real Analysis I" rather than "Real Analysis II" as it is currently in the catalog.

~~MAE 5177T-6932 3 Special Topics (Teaching College Mathematics) (Proposed course)~~
~~3 hours~~

Commented [HC12]: Can't use Special Topics for the Core

Commented [Office13]: This course has been submitted to the state. We hope for it to receive the number MAE 5177

Required Courses Concentrations

Students select from one of the concentrations below. Each concentration requires a number of courses to ensure breadth of disciplinary knowledge. Substitutions may be allowed with prior approval of both the Concentration Program Director and Concentration Graduate Committee.

Required Courses for the Pure and Applied Concentration -- 9 hours

The student must complete at least one course from each of the following groups: ~~12 hours~~

Group 1 – Algebra: MAS 5311 Algebra I
 MAS 6312 Algebra II

Commented [Office14]: These requirements for the Pure and Applied concentration are not changed from the current catalog.

~~Group 2 – Real Analysis: MAA 5307 Real Analysis I
 MAA 6616 Real Analysis II~~

Commented [Office15]: We have submitted a course change to renumber this from 5312 to 6312.

Commented [Office16]: We will be submitted a course change to rename this Real Analysis I

Group 23 – Complex Analysis: MAA 6406 Complex Analysis I
 MAA 6407 Complex Analysis II

Commented [Office17]: We will be submitting a course change to rename this Real Analysis II, rather than abstract integration.

Group 34 – Topology: MTG 5316 Topology I
 MTG 6317 Topology II

Commented [Office18]: We have submitted a course change to renumber this from 5317 to 6317

Required Courses for the Statistics Concentration – 18 hours

The student must complete the following courses: ~~18 hours~~

- STA 5446 Probability Theory I
- STA 6447 Probability Theory II
- STA 5526 Nonparametric Statistics
- STA 6746 Multivariate Analysis
- STA 6876 Time Series Analysis
- MAT 5932 Special Topics (Survival Analysis)

Commented [Office19]: These are the requirements currently listed in the statistics handbook, so they have been used for many years despite not being recorded in the catalog.

~~The student must complete~~ Choose three of the following seven courses: ~~12 hours~~

- STA 6206 Stochastic Processes
- ~~STAMAT 6932 Special Topics (Stochastic Dynamic Modeling)~~
- ~~STAMAT 5932 Special Topics (Time Series Analysis II)~~
- ~~STAMAT 5932 Special Topics (Nonlinear Time Series Analysis)~~
- ~~STAMAT 5932 Special Topics (Multivariate Iterative Processes with Applications)~~
- ~~STAMAT 6908 Independent Study (preapproval required)~~
- ~~STAMAT 5932 Special Topics Courses (preapproval required)~~

Commented [HC20]: are these for the statistics concentration or for all students?

Commented [CB21]: The department is working toward creating these courses for statistics that are currently offered as special topics.

Commented [CB22]: The department plans on creating an STA 6908, but it is still in progress.

Sequences of Courses 24 hours minimum

~~27 to 33 hours~~

Each concentration offers coherent pairs/triples of courses, referred to as sequences, to ensure a certain depth of disciplinary knowledge. The student must complete two Fundamental sequences and a total of four sequences from among the Fundamental and Elective Sequences with at least a 3.00 average in each sequence. Fundamental Sequences prepare students for Fundamental Qualifying Examinations, of which students must pass two. A student who passes a Fundamental Qualifying Examination at Ph.D. level will be considered to have completed the corresponding Fundamental Sequence. Prior to offering, the Mathematics Graduate Committee may approve a pair of courses to be an elective sequence. Each course may count towards only one sequence.

Commented [Office23]: These are the same sequences (previously called core) listed in the previous catalog entry, with a minor tweak to the Algebra sequence.

Fundamental Sequences for the Pure and Applied Mathematics concentration

Algebra: MAS 5311 Algebra I
 MAS 6312 Algebra II

Commented [Office24]: We have submitted a course change to renumber from 5312 to 6312

Real Analysis: MAA 5306 Introduction to Real Analysis

Commented [Office25]: We will be submitting course changes to rename the courses in the real analysis sequence to be as shown here.

[1-9-18 p drive; OGS suggested edits from meeting 1/11/18](#)

MAA 5307 Real Analysis I (taken as a core requirement)
 MAA 6616 Real Analysis II

Topology: MTG 5316 Topology I
 MTG 6317 Topology II

Elective Sequences for the Pure and Applied Mathematics concentration

Applied Mathematics one of MAP 5407 Methods of Applied Mathematics
 MAP 5345 Applied Partial Differential Equations
 one of MAA 5405 Applied Complex Variables
 MAT 5932 Special Topics (Numerical Analysis)
 and one of MAP 6205 Control Theory and Optimization
 MAT 6932 Special Topics (Dynamical Systems II)

Combinatorics MAD 6206 Combinatorics I
 MAD 6207 Combinatorics II

Complex Analysis MAA 6406 Complex Analysis I
 MAA 6407 Complex Analysis II

Differential Geometry MTG 6256 Differential Geometry I
 MTG 6257 Differential Geometry II (Proposed course)

Dynamical Systems MAT 5932 Special Topics (Dynamical Systems I)
 MAT 6932 Special Topics (Dynamical Systems II)

Functional Analysis MAA 6506 Functional Analysis I
 MAA 6507 Functional Analysis II

Harmonic Analysis MAT 6932 Special Topics (Harmonic Analysis)
 MAP 6356 Partial Differential Equations

Nonlinear Analysis MAP 5316 Ordinary Differential Equations I
 MAP 5317 Ordinary Differential Equations II

Partial Differential Equations MAP 5345 Applied Partial Differential Equations
 MAP 6356 Partial Differential Equations

Theory of Computing MAD 6616 Theory of Computing
 MAD 6510 Analysis of Algorithms

All sequences for the Statistics Concentration are Elective Sequences for the Pure and Applied Concentration.

Fundamental Sequences for the Statistics Concentration

Statistical Methods: STA 5166 Statistical Methods I
 STA 6167 Statistical Methods II
 STA 6208 Linear Statistical Models

Mathematical Statistics: STA 5326 Mathematical Statistics I
 STA 6326 Mathematical Statistics II

Elective Sequences for the Statistics Concentration

Linear Models and Multivariate Analysis: STA 6208 Linear Models
 STA 6746 Multivariate Analysis

Probability: STA 5446 Probability I
 STA 6447 Probability II

Commented [Office26]: We have submitted a course change to renumber from MTG 5317 to MTG 6317

Commented [Office27]: While a few minor adjustments have been made, these are largely the same sequences in the previous catalog. We have added Functional Analysis and Harmonic Analysis and deleted foundations of Mathematics

Commented [Office28]: One of our faculty has promised to submit paperwork to create these courses.

Commented [Office29]: We will be submitting paperwork to create this course

Commented [Office30]: One of our faculty has said he hopes to file paperwork to create courses that will replace these two. I'm not sure if it will happen soon enough to show in the catalog.

[1-9-18 p drive: OGS suggested edits from meeting 1/11/18](#)

Stochastic Processes and Time Series Analysis: STA 6876 Time Series Analysis
STA 6206 Stochastic Processes

Core Sequences:

Algebra: MAS 5107, 5311, 5312

Analysis: MAA 5306, 5307, 6616

Topology: _____ MTG 5316, 5317

Elective Sequences:

Applied Mathematics: three courses, one from each group listed below.

(Group A) _____ MAP 5407, 5345

(Group B) _____ MAA 5405, MAT 5932 (MAD 4401)

(Group C) _____ MAP 6205, MAT 6932 (Dynamical Sys II)

Combinatorics: _____ MAD 6206, 6207

Complex Analysis: _____ MAA 6406, 6407

Statistical Methods: _____ STA 5166, 6167

Dynamical Systems: _____ MAT 5932, 6932

Foundations: _____ MHF 5306, 6307

Linear Models and Multivariate Analysis: _____ STA 6208, 6356

Mathematical Statistics: _____ STA 5326, 6326

Nonlinear Analysis: _____ MAP 5316, 5317

Ordinary Differential Equations: _____ MAP 6336, MAT 5932 (Dynamical Systems I)

Partial Differential Equations: _____ MAP 5345, 6356

Probability: _____ STA 5446, 6447

Stochastic Processes and Time Series Analysis: _____ STA 6206, 6876

Theory of Computing: _____ MHF 5306, MAD 6616

For degree requirements, each course from the Elective Sequence list above counts towards only one Elective Sequence.

Electives – 2 hours minimum

Students select a graduate course electives in consultation with their advisor.

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Independent Study, Graduate Seminar, and Directed Research

Prior to passing two Fundamental Qualifying Examinations at Ph.D. level, students may not earn credit toward the MA or Ph.D. degrees for MAT 6908 Independent Study, MAT 6939 Graduate Seminar, and MAT 6911 / 7912 Directed Research, although they may take these courses with the approval of the Concentration Graduate Director. Students must obtain the approval of the Seminar Organizer to take credit hours of MAT 6939 Graduate Seminar.

Commented [Office31]: This is a current requirement.

External Coursework

Graduate coursework taken from other departments may be accepted toward the minimum number of credits with prior approval from the Concentration Graduate Director.

Commented [Office32]: This is not currently listed in the catalog. This codifies current practices.

Qualifying Examinations

A Qualifying Examination based on a Fundamental Sequence is called a Fundamental Qualifying Examination. The student is required to pass two Fundamental Qualifying Examinations at the Ph.D. Level. The student is expected to complete both within 17 months after entering the Ph.D. unless an extension is granted by the Concentration Graduate Committee. Students may repeat an examination only once unless additional attempts are granted by the Concentration Graduate Committee. The syllabus for each examination is available from the Department. Fundamental Qualifying Examinations are offered in January, May and August.

Commented [Office33]: This section describes current departmental practices.

After passing two Fundamental Qualifying Examinations, the student will select a Dissertation Advisor, who will convene a Specialty Examination Committee. The Specialty Examination Committee will prepare a syllabus for the student's Specialty Examination on background material for the student's intended research. The syllabus for the Specialty Examination and the names of two examiners from the Faculty, must be approved by the Concentration Graduate Director at least one semester before the examination is to take place. The student is expected to complete the Specialty Examination within 25 months after entering the Ph.D. unless an extension is granted by the Concentration Graduate Committee.

[1-9-18-p drive; OGS suggested edits from meeting 1/11/18](#)

Passing two Fundamental Qualifying Examinations and the Specialty Examination at the Ph.D. level is considered passing the Doctoral Qualifying Examination. After passing the Doctoral Qualifying Examination, the student should form their Doctoral Dissertation Committee and apply for Doctoral Candidacy. Once admitted to Doctoral Candidacy, the student may enroll in Doctoral Dissertation hours.

Each Spring semester after admission to doctoral candidacy, the candidate shall give an oral presentation to the Doctoral Committee of the problem(s) under investigation. The presentation may also include a discussion of partial results. The Dissertation Advisor shall submit to the Department Chairperson a written report of the presentation.

Dissertation - 16 credit hours minimum

MAT 7980 16 Doctoral Dissertation

Students admitted to doctoral candidacy are required to take at least 16 hours in MAT 7980 Doctoral Dissertation, with a minimum of 6 credits of dissertation hours accumulated during each previous 12-month period (previous 3 terms, e.g. Fall, Spring, Summer) until the degree is granted.

The candidate will conduct original and significant research which is worthy of publication. The research will be described in the doctoral dissertation. Research towards the dissertation typically forms the major part of the work required for the Ph.D. in Mathematics. The Doctoral Dissertation Defense shall consist of an oral presentation of the research in the dissertation to the supervisory committee.

Handbook

The student is responsible for familiarizing themselves with the additional program requirements and expectations listed in the program handbook, particularly those concerning timely progress.

Qualifying Exam

A qualifying examination based on a Core Sequence is called a Core Qualifying Examination. The syllabus for each examination is available from the Department. Core Qualifying Examinations are offered in January, May and September. A student who passes a Core Qualifying Examination at Ph.D. level will be considered to have completed the corresponding Core Sequence. Credit hours of MAT 6908 Independent Study, MAT 6939 Graduate Seminar, and MAT 6911 / 7912 Directed Research, earned before passing two Core Qualifying Examinations at Ph.D. level, do not count towards M.A. or Ph.D. degree. These courses, MAT 6908, 6911, 6939 and 7912, however, can be taken by a student before passing two Core Qualifying Examinations at Ph.D. level, with an approval from the Graduate Director, and also from the Seminar Organizer for MAT 6939. The course work for more than one credit hour for MAT 6939 needs an approval from the Graduate Committee.

1. Core Qualifying Examinations: The student is required to pass two of the Core Qualifying Examinations at Ph.D. Level. A student is expected to complete both within 13 months after entering the Ph.D. unless an extension is granted by the Mathematics Graduate committee. A student may repeat each examination once.
2. Elective Qualifying Examination: After passing two Core Qualifying Examinations, the student will select a Dissertation Advisor and a Doctoral Committee will be appointed by the Department Chairperson. The Committee will determine a course of study leading to the written Elective Qualifying Examination, which may be based on one of the Elective Sequences above, possibly supplemented by other material. The syllabus for this examination, and the names of two examiners from the Faculty, must be approved by the Mathematics Graduate Director at least one semester before the examination is to take place. A student is expected to complete all three examinations within 25 months after entering the Ph.D. unless an extension is granted by the Mathematics Graduate Committee. A student may repeat each examination once. The student will be admitted to candidacy after completion of the above two requirements.
3. Completion of Four Sequences: The student must complete four sequences from among Core and Elective Sequences with at least a 3.0 average in each sequence.
4. Additional Course Requirement: The student must complete at least one course from each of the following groups:

Group 1—Algebra: MAS 5311, 5312

Group 2—Real Analysis: MAA 5307, 6616

Commented [Office34]: As per graduate school recommendations, we will be developing an academic handbook to elaborate on the requirements and expectations of our program.

USF Graduate Catalog 2017-2018

[1-9-18 p drive; OGS suggested edits from meeting 1/11/18](#)

Mathematics (Ph.D.)

Group 3—Complex Analysis: MAA-6406, 6407

Group 4: Topology: MTG-5316, 5317

5. *Progress Evaluation:* Each Spring semester after admission to doctoral candidacy, the candidate shall give an oral presentation to the Doctoral Committee of the problem(s) under investigation. The presentation may also include a discussion of partial results. The Dissertation Advisor shall submit to the Department Chairperson a written report of the presentation.
6. *Dissertation:* Students admitted to doctoral candidacy are required to take at least 16 hours in MAT-7980 Doctoral Dissertation, with a minimum of 6 credits of dissertation hours accumulated during each previous 12-month period (previous 3 terms, e.g. Fall, Spring, Summer) until the degree is granted. The dissertation is expected to contain new mathematical results which are worthy of publication. Research towards the dissertation typically forms the major part of the work required for the Ph.D. in Mathematics.
7. *The Final Oral Examination:* The Final Oral Examination is also called the Dissertation Defense. The department defers to the university requirements.

COURSES

See <http://www.ugs.usf.edu/course-inventory/>

