M.S. in Mathematics

CALIFORNIA STATE UNIVERSITY SAN MARCOS

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PROGRAM CHANGE PROPOSAL - Form P-2

COLLEGE ☐ CHABSS ☐ CoBA ☐ CoEHHS ☒ CSM

TITLE OF PROGRAM Master of Science in Mathematics Discipline Math

Check one: ☒ Change to Program ☐ Program Deletion

TITLE OF DEGREE PROGRAM: Master of Science in Mathematics

This form is the signature sheet for a change to, or deletion of, an existing program.
Note that the addition of a new option/concentration/emphasis/track is a new "program," and requires the use of Form P.

For a change to a program,

1. Attach a page (or pages) giving a brief summary of the purpose of this proposal, and its connection to the mission and student learning outcomes of the program.
2. Attach catalog copy showing exactly how the program should appear in the catalog if the changes are approved.

For a program deletion, attach a statement explaining the impact on students: how will the program be "taught-out" for declared majors?

Does this proposal impact other disciplines or units? _____Yes ____x__No If yes, obtain signature(s).
Any objections or concerns should be stated in writing and attached to this form. Please check the box to indicate whether a memo has been attached.

____ Discipline/Unit	_____ Signature	☐	_____ Date	_____Support _____Oppose
____ Discipline/Unit	_____ Signature	☐	_____ Date	_____Support _____Oppose
____ Discipline/Unit	_____ Signature	☐	_____ Date	_____Support _____Oppose
____ Discipline/Unit	_____ Signature	☐	_____ Date	_____Support _____Oppose

1. Prof. Amber Puha — Originator (Please Print) — 12/20/16 — Date
2. Prof. Wayne Aitken — Program/ Department - Director/Chair — 12/20/16 — Date

APPROVAL PROCESS

3. _____ College Curriculum Committee^ ☐ 2/23/17 Date
4. _____ College Dean (or Designee)* ☐ 2/23/17 Date

5a. _____ University Curriculum Committee^ ☐ _____ Date

5b. _____ Budget and Long-Range Planning Committee (if applicable)^ ☐ _____ Date

6. _____ Academic Senate _____ Date

7. _____ Provost (or Designee) _____ Date

8. _____ President _____ Date

9. _____ Date to Chancellor's Office (if applicable)

* Where appropriate, attach a memo on program impact on the unit and the ability of the unit to support it. Check the box next to the signature line to indicate whether a memo has been attached.
^ Where appropriate, attach a memo summarizing the curricular and/or resource deliberations. Check the box next to the signature line to indicate whether a memo has been attached.

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California State University
SAN MARCOS

College of Science
& Mathematics

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MEMORANDUM

DATE: December 20, 2016

TO: CSM Curriculum Committee and UCC

FROM: Prof. Amber Puha
Graduate Coordinator
Department of Mathematics

SUBJECT: Master of Science in Mathematics P-2 Form

The Department of Mathematics is making some curriculum changes to its Master of Science in Mathematics degree requirements in response to a self-review and an external program review. The major focus is that our current 36 unit requirements is inconsistent with other programs in the CSU. All other Master of Science in Mathematics programs in the CSU require between 30 and 33 units, with only two programs exceeding 30 units. Therefore, to be more competitive in attracting students, we wish to reduce the total units required for our degree from 36 to 30.

Our 36 unit requirement has benefited the many students that we accept to our program with undergraduates degrees in disciplines other than mathematics. With the higher than average unit count, they gain the mathematical breadth expected for a Master of Science in Mathematics. Moreover, to assist students in broadening their mathematics training, we currently allow students to take up to 9 units of approved 400-level coursework toward the degree. This higher unit count with the option of up to 9 units at the 400-level is perhaps not necessary, and maybe even burdensome, for those with an undergraduate degree in mathematics. For those that do not possess an undergraduate degree in mathematics, the needed breadth can be handled with an additional prerequisite and conditional admission requirements. This alleviates a perhaps excessive total unit count for fully prepared students.

As we make this change, we are also introducing MATH 698, which is much like SPAN 698. In recent semesters, the Comprehensive Exam Option is a becoming a popular choice for culminating experience. We have been graduating students from our MS program since 1995. Yet, no one requested the exam until 2009. Since 2009, nine students have completed their degree via the Exam Option. This exam is rigorous. Students spend an entire semester researching and preparing. To assist students in accurately documenting their academic efforts, maintaining continuous enrollment, and receiving financial aid while they study and prepare, we are creating MATH 698. This will function as MATH 699 does for mathematics graduate students working on a thesis project and as SPAN 698 does for Spanish graduate students preparing for their comprehensive examination.

Since the Comprehensive Exam Option is functioning well and very time efficient, we expect it to continue to increase in popularity. The Thesis Option will remain available to more ambitious students. This is an especially good choice for students preparing for a PhD, or wishing to delve deeper into topic than standard coursework permits. However, we have found that writing a successful thesis requires a higher level of motivation and academic self-discipline than successfully passing the comprehensive exam. Therefore, to indicate readiness to undertake such a project, students will be required to have a program GPA of 3.2 or higher for Advancement to Candidacy under the Thesis Option. This is slightly higher than the 3.0 or higher currently required for Advancement to Candidacy under either option. Students will continue to require a program GPA of 3.0 or higher for Advancement to Candidacy under the Comprehensive Exam Option.

Summary of Proposed Curriculum Changes

Thesis Option

- 30 units of graduate math coursework reduced to 24 units of graduate math coursework
- 6 units of Math 699, Thesis, remains in place for thesis work

Comprehensive Exam Option

- 36 units of graduate math coursework reduced to 27 units of graduate math coursework
- Add 3 units of Math 698, Preparation for Graduate Examinations.

400 level courses

- Reduce the up to 9 units of approved 400 coursework to up to 3 units

Additional Program Prerequisite

- Any senior level proof-based mathematics course

Units Needed to Advance to Candidacy

- Reduced from 18 to 15 for students advancing under the thesis option, allowing fulltime students to complete one of the two Math 699 courses in semester 2 and advance to candidacy in semester 3
- Reduced from 27 to 18 for students advancing under the comprehensive exam option, allowing fulltime students to take Math 698 and the comprehensive exam in their 3rd semester

Program GPA Requirement to Advance to Candidacy

- Raised to 3.2 or higher (from 3.0 or higher) for students advancing under thesis option.
- Maintained at 3.0 or higher for students advancing under the comprehensive exam option.

Enclosures (5): P-2 form, Catalogue Copy, C Form & Explanatory Memo, Sample Exam Subject Content, Sample Course Study Guide, Course Outline

MINOR IN MATHEMATICS

Lower-Division (9 units)

	Units
MATH 160	5
MATH 162	4

5 elective courses chosen from the following (at least 15 units):

MATH 260	4
MATH 270^ or 350	3
MATH 330	3
MATH 346	3
MATH 362	3
MATH 374	3
MATH 378	3
MATH 464 or CS 464	3
MATH 480 or CS 480	3

Any other mathematics courses numbered 410 through 599 approved for the mathematics major.

Total Units ***24-26***

^with grade of B (3.0) or higher

MASTER OF SCIENCE IN MATHEMATICS

Graduate Program Coordinator:

Amber Puha, Ph.D.

The Master of Science Program in Mathematics at California State University San Marcos is designed to provide breadth of exposure to mathematics and enhance the intellectual attitudes and the analytic skills needed for the comprehension, appreciation, creation, and application of mathematics. There are also opportunities for students to pursue applications of mathematics, computational aspects of mathematics, and fertile connections between branches of mathematics both in coursework and in thesis work.

Graduates will be prepared for a wide range of career opportunities as the skills and attitudes fostered in the program are in demand in academe, business, government, and industry. In particular, graduates will be well-prepared to teach in ~~secondary schools~~, community colleges, and some four-year colleges. They will be prepared to enter a doctoral program in mathematics or mathematical education. The computational and applicable mathematics mastered by students will offer graduates training for careers as mathematical scientists in business, government, and industry. There are some opportunities for students to teach undergraduates and assist faculty in their scholarly activity.

The curriculum is also designed for secondary teachers seeking professional growth and improved content knowledge.

Student Learning Outcomes

Students who graduate with a Master of Science in Mathematics will be able to:

1. Apply advanced concepts of algebra.
2. Apply advanced concepts of analysis.
3. Compose and present extended passages of mathematical prose following modern conventions.
4. Develop and write mathematical proofs in advanced areas of mathematics.
5. Develop and analyze mathematical models and algorithms, utilizing appropriate software and drawing from different fields of mathematics when necessary.

Admission Requirements and Application

Admission to the program requires an undergraduate major in mathematics or related field (such as computer science) which includes the equivalent of the following four key courses with a grade of B or higher: (1) MATH 374 (Linear Algebra), (2) MATH 430 (Foundations of Analysis), [redacted] (3) MATH 470 (Introduction to Abstract Algebra), and (4) an additional senior level proof-based mathematics course. Admission also requires a 2.5 grade point average in the last sixty (60) units attempted at the undergraduate level, and a 3.0 grade point average in the last thirty (30) units of the undergraduate major. Students who have deficiencies in admission requirements that can be removed by specified additional preparation may be admitted with conditionally classified graduate status, but the units earned to remove these deficiencies may not be used toward the [redacted] State San Marcos Master of Science in Mathematics. California University

All applicants, regardless of citizenship, who do not possess a Bachelor's Degree from a post-secondary institution or a country where English is the principal language, must take the combined Test of English as a Foreign Language (TOEFL) and receive a minimum score of 550 on the TOEFL and a minimum of 4.5 on the Test of Written English (TWE) portion of the paper-based TOEFL or on the writing portion of the computer-based TOEFL.

A complete application consists of:

Application Materials sent directly to the Admissions Office of California State University San Marcos:

- A completed university application form for admission to California State University San Marcos (available on-line through CSUMentor);
- One set of official transcripts from all colleges and universities attended, with indication of graduation.

Application Materials sent directly to the Mathematics Department (see address below):

- A letter of intent requesting entry to the M.S. program, which also includes an expository description of the student's educational preparation and career aspirations;
- One set of official transcripts from all colleges and universities attended and official indication of graduation (if not in English, certified English translations must be included); and
- At least two letters of recommendation accompanied by waiver forms (available on department webpage) from individuals who can comment on the mathematical capabilities of the applicant.

Application materials sent directly to the Mathematics Department Administrative Coordinator at: California State University San Marcos, San Marcos, CA 92096-0001.

Application Deadlines:

Applications, including verification of English proficiency, should be received by the department by:

March

- ~~April~~ 15th

However applications will be accepted from domestic students until June 30th and international students until May 1, provided that space is available in the program.

Degree Requirements

The Master of Science in Mathematics requires thirty-~~six~~ (30) units of coursework with an overall of at least a 3.0 grade point average. At least twenty-seven (27) of these units must be at the 500-level or above, and any 400-level courses must be approved by the Graduate Coordinator. At least ~~thirty~~ (30) units towards the degree must be earned at Cal State San Marcos; any units not earned in residence at Cal State San Marcos must be approved by the Graduate Coordinator. All requirements must be satisfied within five years of initial acceptance into the program.

Two options are available:

- ~~Thirty~~ (30) units of non-thesis coursework, six (6) units of MATH 699, and a Master's Thesis, or
- ~~Thirty-six (36)~~ units of non-thesis coursework, and a comprehensive examination.

Students must satisfy the following breadth requirements by passing (with a C or higher) at least one course in each of the following broad areas: (1) Algebra, Number Theory, and Geometry (courses whose numbers fall in the range 520-529. MATH 550 is also approved for this area). (2) Analysis and Topology (courses whose numbers fall in the range 530-539, or the range 552-555). (3) Discrete, Numerical, Probabilistic and Applied Mathematics (courses whose numbers fall in the range 540-549, or 560-579. The courses 505, 620, 621 have variable content, and may be approved for one of these areas by the Graduate Coordinator.

Continuation

Students must complete all conditional admission requirements within the timeframe specified at the time of admission. Failure to do so may result in the student being dropped from the program.

Students must maintain a cumulative grade point average (GPA) of 3.0 or higher. A student whose GPA falls below 3.0 may be placed on academic probation by the department. Failure to raise the GPA to 3.0 or higher within one semester may result in the student being placed on administrative probation by the Dean of Graduate Studies, which can lead to academic disqualification. A student whose GPA remains below a 3.0 for two or more consecutive semesters may be dropped from the program.

Students are limited to a total of three (3) grades of C or lower (2.0 or less) in their master's coursework. Any student earning four (4) or more grades of C or lower (2.0 or less) in mathematics courses may be dropped from the program.

Master's Student Graduate Writing Assessment Requirement

Students need to fulfill the Master's Student Graduate Writing Assessment Requirement concurrent with advancing to candidacy. Please refer to page 118 for more information regarding this requirement.

~~*See the department webpage for more information on this requirement.~~

Math 490 may be counted as part of the twenty-seven (27) 500-level units, with the approval of the Graduate Coordinator.

Advancement to Candidacy

In addition to fulfilling the Master's Student Graduate Writing Assessment, in order to advance to candidacy a student must ~~have a GPA of 3.0 in the Master's program~~, be classified (that is, have all terms of conditional acceptance satisfied), and be in good standing (not on probation). A student must also complete the departmental advancement to candidacy form with attached study plan listing the courses and culminating experience option (thesis or comprehensive exam) he/ she will complete to finish the degree, and the courses that he/ she has completed to date. The study plan must include the proposed date of graduation.

have completed at least fifteen (15) nonthesis units toward the degree with a program grade point average of 52 or higher. The student must

A student pursuing the thesis option must find a thesis advisor and two other faculty members for the thesis committee. He/ she must give an oral presentation to the thesis committee describing progress to date and proposing a thesis topic, and attach a short description of the thesis proposal to the advancement to candidacy form (1-3 pages). The student must obtain the signatures of the thesis committee and the department Graduate Coordinator on the advancement to candidacy form. A thesis committee member's signature indicates that the proposed work, if completed properly, is sufficient for a Master's thesis. The Graduate Coordinator's signature indicates that (i) the student has met the requirements for advancement to candidacy, (ii) the student's study plan will, if completed properly, satisfy the requirements for the Master's degree, and (iii) the composition of the thesis committee is consistent with departmental and university policy. Any departures from, or changes to, the study plan must be approved by the student's thesis advisor and the Graduate Coordinator. A student pursuing the thesis option must advance to candidacy by the last day of classes of the semester preceding the semester in which he/ she plans to graduate. Only students pursuing the thesis option may graduate in the summer semester, and they must get permission from all members of the thesis committee.

must have completed eighteen (18) nonthesis units toward the degree with a program grade point average of 3.0 or higher the student

A student pursuing the comprehensive exam option may include with the study plan short lists of courses on which they would and would not like to be tested. The graduate coordinator will appoint a comprehensive exam committee, who will determine the exam content. The student must obtain the signature of the departmental graduate coordinator on the advancement to candidacy form. The graduate coordinator's signature indicates that (i) the student has met the requirements for advancement to candidacy, and (ii) the student's study plan will, if completed properly, satisfy the requirements for the Master's degree. Any departures from, or changes to, the study plan must be approved by the graduate coordinator. A student pursuing the comprehensive exam option must advance to candidacy by the end of Week 11 of the semester preceding the semester in which he/she plans to take the exam.

Thesis Requirements

A thesis is the written result of a systematic study of a significant mathematical problem. It defines, develops, and executes an investigation into a chosen problem area. The motivation, approach, and results of the investigation are communicated in a clear and logical fashion; it is grammatically correct, logically organized, and mathematically sound. The finished product evidences originality, critical and independent thinking, and thorough documentation. The thesis must be planned, organized, executed, and completed while enrolled in the masters program. It must be a coherent, substantial document, appropriate for six (6) units of graduate coursework.

Guidelines for preparing and officially submitting the thesis are posted on the CSUSM Library webpage. The final copies of the thesis are to be in the hands of the members of the thesis committee at least three weeks prior to a required oral, public defense of the thesis, which must be held at least one week prior to the end of a regular semester. Both the thesis and the project must demonstrate mathematical skills and general scholarship at a level expected of a professional mathematician. Mathematical skills can be demonstrated by the development of new mathematics, critical evaluation of existing mathematics, application of existing mathematics to non-mathematical contexts, or development of mathematical models. General scholarship refers to understanding, organizing, and communicating knowledge relevant to the undertaking in a conventionally acceptable format.

Comprehensive Exam

A comprehensive examination is a written examination administered during the student's final semester. It is intended as a culminating experience for the master's degree, and it is used to assess the student's ability to integrate his or her knowledge of mathematics, to think critically and independently, and to demonstrate mastery of the coursework. The problems will reflect the student's coursework, and the student's responses will be evaluated both on the basis of logical correctness as well as on written presentation. The examination will be offered as needed at most once each regular semester. In order to take the comprehensive exam, students must choose this option when advancing to candidacy. More detailed information is available on the department webpage.