Applied Mathematics Major, BS

zz-New Major, Minor, Specialization, or Certificate for Undergraduate and Graduate Programs-3/23/16

General Catalog Information

READ BEFORE YOU BEGIN

1. You may turn on the help text before starting this proposal by clicking on the icon in the top right corner of the heading.

2. All fields with an asterisk (*) are required fields. You will not be able to launch (submit) the proposal without completing the required fields.

If you have any questions, please email curriculog@cwu.edu.

Type of Proposal *

- Major
- Specialization
- Minor
- Certificate
- Graduate Major
- Graduate Specialization
- Graduate Certificate

Majors

Major means that a student concentrates on one subject or group of subjects and which comprises the largest number of units in any given discipline. Its contents are usually defined by one academic department but also may be defined jointly by two or more departments, as in the case of an interdisciplinary major.

Specializations

A specialization is a coherent, focused subfield within a degree program. A specialization can be distinguished from a new degree in that the full designation of the degree title - including level, type and major - does not change when a new specialization is added. Specializations in an undergraduate major must share a core, defined as a group of courses shared by all specializations within a major, which consists of no fewer than 25 credits for an undergraduate program or 15 credits for a graduate program. The courses constituting the specialization must consist of no fewer than 20 credits for an undergraduate program or 15 credits for graduate program.

Minors

A minor is defined as a program consisting generally of less than one-half of the total credits

needed for a major.

Certificates

Certificate programs are programs of study that normally require less than 25% of the credits required for a degree program at a similar level. Successful completion of the program results in a certificate. Certificate programs may also be noncredit.

Graduate Certificates

Graduate certificate programs are courses of study that require equal to half or less than half of the credits required during a degree program at a similar level. They are usually limited in scope relative to a graduate degree program but provide an opportunity for advanced study with a particular focus. Subject to the regulations that govern a specific program, a graduate certificate can often serve as an intermediate accomplishment for a student whose ultimate goal is a graduate degree.

College or Academic Group * **College of The Sciences**

Department or Program **Mathematics Department**

Title of Program Applied Mathematics Major, BS

Select one: *

- Undergraduate
- Undergraduate and part of Teacher Preparation Program
- Graduate
- Graduate and part of Teacher Preparation Program

Program Type

- Program
- Shared Core

Program Description The applied mathematics major is intended primarily for students interested in applications of mathematics to other disciplines.

Admission Requirements for Mathematics Major and Minor

Admission to any major in the mathematics department will be considered after the first two quarters of calculus are taken (MATH 172 and MATH 173). Transfer students with the calculus background will generally take and successfully complete (2.0 or higher) 10 hours of math beyond calculus to be admitted to a major. Application forms are available from the mathematics department office. Students must meet with an advisor in the mathematics department before being considered for major or minor. In addition, students must earn a minimum grade of C in any course that fulfills a major or minor requirement.

Degree Type * **Bachelor of Science (B.S.)**

Prospective Curriculum

Applied Mathematics Major Required Courses, Credits: 70

Courses required for the Applied Mathematics Major

MATH 172 Calculus I
MATH 173 Calculus II
MATH 260 Sets and Logic
MATH 265 Linear Algebra I
MATH 272 Multivariable Calculus I
MATH 273 Multivariable Calculus II
MATH 299S Seminar - Math Major Orientation
MATH 314 Probability and Statistics
MATH 365 Linear Algebra II
MATH 371 Advanced Calculus
MATH 376 Differential Equations I
MATH 377 Differential Equations II
MATH 475 Mathematical Modeling
MATH 476 Numerical Analysis I
MATH 477 Numerical Analysis II
MATH 499S Senior Seminar
Choose one of the following two options:
MATH 335 Combinatorics and Graph Theory
MATH 351 Point Set Topology

Applied Mathematics Major Electives, Credits: 6

Mathematics department approved electives numbered 300 or higher including courses from departments that apply mathematics (such as Biology, Chemistry, Computer Science, Economics, Engineering, Finance, Geological Science, Mathematics or Physics). No more than 2 credits in Math 407 may be applied.

Total credits: 76

First Term To Be Offered

Term * Fall **Year *** 2016

Definitions of Certificate Types

Type A - College Sponsored Certificate Programs: Programs that admit only matriculating students and offer a set of courses approved through the CWU academic governance procedures are classified as "College Sponsored Certificate Programs." These programs are developed, taught, and offered by academic departments housed in colleges at CWU.

Type B - Collaborative Certificate Programs: Programs that admit both matriculating students and non-matriculating students and offer a set of courses that includes regular course offerings appearing in the CWU catalog and administered by CWU Colleges are classified as "Collaborative Certificate Programs." These programs are developed, taught, and offered by academic departments housed in colleges in cooperation with the office of continuing education.

Type C - Continuing Education Certificate Programs: Programs that target primarily non-matriculating students and offer a set of instructional experiences developed independent of CWU's colleges but with input as appropriate from faculty are classified as "continuing education certificate programs." These programs are developed, delivered, and administered by the office of continuing education in consultation with faculty, academic departments, and/or college dean, as appropriate.

Type D - Graduate School Certificate Program.

If this is a Certificate, which type? A B C D

Percentage of Online Instruction Definitions

Online (WW): Where most or all of the regularly scheduled courses contact hours take place online. If the courses require face-to-face meetings (for example, proctored exams) or regularly scheduled synchronous online meetings, these meetings must be identified for the courses in the details notes in Safari. (*75% to 100% scheduled contact hours online*).

Hybrid (WE): Blend online and face-to-face delivery. Proportion of the contact hours take place online to deliver content and facilitate interaction, with corresponding reduction in face-to-face meetings. (*1% to 74% scheduled contact hours online*).

Web Presence (WP): Web-based technology is used to supplement what is essentially a face-to-face course. This designation is required for courses using the learning management system (LMS) and other university-sponsored instructional technologies (e.g., streaming audio/video, class capture, student-response, web-conferencing) to deliver content and facilitate interaction. (*0% scheduled contact hours online*).

Is all or part of this program offered on-line?* Yes No

If yes, what percentage? Online (WW)
Hybrid (WE)
Web Presence (WP)

Required Summary Information

Provide a justification for the creation of this program. Please address all questions below. If this section is not complete, the proposal will be returned to the originator.

In the box below, please address how this new program will enhance the curriculum of your department, your college, and the university.

How will new program enhance your department? *

The purpose of this major is for students interested in applications of mathematics to STEM disciplines. This applied mathematics major will give them a foundation in proof-based mathematics while emphasizing mathematical modeling and computation. This will fill a hole for students that are currently interested in mathematics and another STEM field and prepare them for employment in STEM fields or graduate programs in both applied mathematics or another STEM discipline. The resulting degree will allow for further collaboration between mathematics and other STEM fields.

In the boxes below, please specify the demand for this program, and the specific needs that this program addresses that are not being met in other programs currently offered?

Demand *

Some students want to major in mathematics, but are more interested in the applications of advanced mathematics as opposed to the abstract and theoretical aspects of the field. The proposed major will give students the ability to major in mathematics with more focus on computation and applications. Students will still take key proof courses, but will culminate their program with a senior sequence in modeling and computation. Students in this major are encouraged to double major and electives are expected, though not required, to come from a related field.

Specific needs

This will provide more emphasis on modeling and computation for students

program will meet. *

whose interest in mathematics is primarily for its applications.

Please indicate how this new program will impact existing programs in your department/college and the university.

Is this new program replacing a deleted program?*

Yes No

If it is an additional program, how will the program be staffed?

Existing faculty have the expertise to teach the senior sequence required.

How will FTEs be affected in existing programs?*

A small amount of FTE time will be reassigned to teach the senior sequence required.

What is the long-term support for the program in terms of staffing and funding?*

The department recently hired two applied mathematicians who will be staffing and advising in the program.

Will faculty be reassigned from existing course offerings?* Yes No

Will this new program impact student enrollment in other departments, graduate programs, colleges, etc.? * Yes No

If yes, please explain

IMPORTANT: If you intend to use course(s) from outside your department or area within your new program, a CUSTOM ROUTE will need to be created prior to approval by the Originator, Department Chair, Program Director, OR Dean. For assistance with CUSTOM ROUTES, please email curriculog@cwu.edu.

Will this new program include courses from outside the originating department?* Yes No

List below the Enrollment and Graduation Targets for the first five years.

Headcount Year 1 5

Headcount Year 2 7

Headcount Year 3 9

Headcount Year 4 11

Headcount Year 5 13

FTE Year 1 * 0.1

FTE Year 2 * 0.2

FTE Year 3 * 0.3

FTE Year 4 * 0.3

FTE Year 5 * 0.3

For Graduate programs only

Please indicate in the fields below the estimated number of projected enrollments in thesis, project or exam options, and estimated number of graduate assistantships.

Graduates Year 1 0

Graduates Year 2 0

Graduates Year 3 0

Graduates Year 4 0

Graduates Year 5 0

Please explain the basis for these projections. * not applicable

Graduate Assistantships

Please indicate in the field below your faculty's ability to oversee thesis, project, or exam options as Regular, Associate, or Affiliate Graduate Faculty or qualifications to obtain Graduate Faculty status.

List the Program Personnel, Administration and Staff * not applicable

Graduate Qualifications

Program Expenses and Revenues

Program Expenses, Administrative Salaries, and (#FTE) Benefits.

Year 1 * 0.02

Year 2 * 0.03

Year 3 * 0.04

Year 4 * 0.04

Year n (full enrollment) * 0.04

Faculty Salaries (#FTE) / Benefits

Year 1 * .1

Year 2 * .2

Year 3 * .3

Year 4 * .3

Year n (full enrollment) * .3

TA/RA Salaries (#FTE) / Benefits

Year 1 * 0

Year 2 * 0

Year 3 * 0

Year 4 * 0

Year n (full enrollment) * 0

Other Salaries (#FTE) / Benefits

Year 1 * 0

Year 2 * 0

Year 3 * 0

Year 4 * 0

Year n (full enrollment) * 0

Clerical Salaries (#FTE) / Benefits

Year 1 * 0

Year 2 * 0

Year 3 * 0

Year 4 * 0

Year n (full enrollment) * 0

Contract Services

Year 1 * 0

Year 2 * 0

Year 3 * 0

Year 4 * 0

Year n (full enrollment) * 0

Goods and Services

Year 1 * 0

Year 2 * 0

Year 3 * 0

Year 4 * 0

Year n (full enrollment) * 0

Travel

Year 1 * 0

Year 2 * 0

Year 3 * 0

Year 4 * 0

Year n (full enrollment) * 0

Equipment * not applicable

Year 1 * 0

Year 2 * 0

Year 3 * 0

Year 4 * 0

Year n (full enrollment) * 0

Lease or Acquisition

Year 1 * 0

Year 2 * 0

Year 3 *	0	**Year 4 ***	0
Year n (full enrollment) *	0		
Other (Itemize)			

Year 1 *	0	**Year 2 ***	0
Year 3 *	0	**Year 4 ***	0
Year n (full enrollment) *	0		

Indirect (if applied to the program)

Year 1	0	**Year 2**	0
Year 3	0	**Year 4**	0
Year n (full enrollment)	0		

Total Costs

Year 1 *	7000+30% benefits	**Year 2 ***	13500 + 30% benefits
Year 3 *	20000 + 30% benefits	**Year 4 ***	20000 + 30% benefits
Year n (full enrollment) *	20000 + 30% benefits		

Program Revenues

General Fund: State Support

Year 1 * 0

Year 2 * 0

Year 3 * 0

Year 4 * 0

Year n (full enrollment) * 0

Tuition and Fees (total)

Year 1 * 13000

Year 2 * 18000

Year 3 * 23000

Year 4 * 23000

Year n (full enrollment) * 23000

Corporate Grants / Donations

Year 1 * 0

Year 2 * 0

Year 3 * 0

Year 4 * 0

Year n (full enrollment) * 0

Internal Reallocation

If revenues are projected through internal reallocation, please attach a detailed explanation of the costs and impact the reallocation would have on other departments or programs. (Source of funds and percentage of budget)

Year 1

Year 2

Year 3

Year 4

Year n (full enrollment)

Other Funding Source (specify)

Year 1

Year 2

Year 3

Year n (full enrollment)

Year 4

Total Revenue

Year 1 * 13000

Year 2 * 18000

Year 3 * 23000

Year 4 * 23000

Year n (full enrollment) * 23000

BS Applied Mathematics Student Learning Outcomes Assessment

Student Learning Outcomes:

1. Graduates will be able to use differential and integral calculus as well as sequences and series to solve problems.

2. Graduates will be able to use concepts of vector subspaces of R^n and $R^{n'm}$ to solve problems.

3. Graduates will be to write proofs using contrapositive, contradiction, cases, and mathematical induction.

4. Graduates will know standard applications of calculus, linear algebra, and statistics.

5. Graduates will be able to apply their understanding of mathematics to fields outside of mathematics.

6. Graduates will be able to describe the differences between the following types of mathematics: discrete/continuous, algebraic/geometric, pure/applied, deterministic/stochastic.

7. Graduates will be able to communicate mathematical ideas through writing.

8. Graduates will be able to communicate mathematical ideas orally.

Methods of Assessment:

1. Standardized questions
2. Standardized questions
3. 499S Portfolio
4. 499S Portfolio
5. Math 477 Final Project
6. 499S Portfolio
7. 475 & 477 Final Projects
8. 475 & 477 Final Projects

Who Assessed:

1. Math 376 or 377
2. Math 376 or 377
3. Students in MATH 499S
4. Students in MATH 499S
5. Students in MATH 499s and MATH 477

6. Students in MATH 499S
7. Students in MATH 475/ MATH 499S/ MATH 477
8. Students in MATH 475/ MATH 499S/ MATH 477

When Assessed:

1. Winter/Spring
2. Winter/Spring
3. Winter
4. Winter
5. Winter/ Spring
6. Winter
7. Fall, Winter and Spring
8. Fall, Winter and Spring

Standard of Mastery, Criterion of Achievement:

1. Yes/No
2. Yes/No
3. Portfolio Criterion
4. Portfolio Criterion
5. Portfolio Criterion and Paper Criterion.
6. Portfolio Criterion
7. Portfolio Criterion and Paper Criterion.
8. Portfolio Criterion and Paper Criterion.