MATHEMATICAL PROBLEM SOLVING, MINOR - LIBERAL ARTS:

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Approval Path
1. Fri, 07 Oct 2022 20:26:27 GMT
   Abra Brisbin (brisbia): Approved for MATH Chair
2. Wed, 09 Nov 2022 22:37:39 GMT
   Margaret Cassidy (cassidml): Rollback to Initiator
3. Tue, 29 Nov 2022 22:45:09 GMT
   Abra Brisbin (brisbia): Approved for MATH Chair
4. Thu, 08 Dec 2022 22:15:19 GMT
   Margaret Cassidy (cassidml): Approved for AS Dean PreCurrComm (PIM)
5. Wed, 08 Feb 2023 01:10:44 GMT
   Margaret Cassidy (cassidml): Approved for AS Dean (PIM)

New Program Proposal
Date Submitted: Tue, 29 Nov 2022 22:18:22 GMT

Viewing: : Mathematical Problem Solving, Minor - Liberal Arts
Last edit: Fri, 02 Dec 2022 17:15:37 GMT
Changes proposed by: Melissa Troudt (troudtml)

Preparer(s)

Preparer Name:
Melissa Troudt

Program Level
Undergraduate

Program Type
Minor

Name of Program
Mathematical Problem Solving, Minor - Liberal Arts

Administrative Department
Mathematics

College
Arts and Sciences

Effective Catalog Year
2023-2024

Is this content intended to be shared across multiple programs/catalog pages?
No

Catalog Placement Notes
Place under the Mathematics Department.

Program Requirements (Includes Course Lists):

A minimum of 24 credits from mathematics courses must be earned as described below.

Code	Title	Credits
Core Requirements:		
MATH 114	Calculus I	4
MATH 365	Patterns of Problem Solving	4
At least one of:		
MATH 314	Discrete Mathematics	
MATH 322	Abstract Algebra for Elementary Teachers	
Additional courses may be chosen from:		
MATH 201	Number and Operations I	
MATH 202	Number and Operations II	
MATH 246	Elementary Statistics	
MATH 297	Developmental Tutoring Techniques (At most two credits count for minor)	
MATH 302	Algebraic Thinking	
MATH 303	Probability and Statistical Thinking	
MATH 304	Geometric Thinking	
MATH 307	Mathematics and Music	
MATH 330	Modern Geometry	
MATH 341	Classical Number Theory	
MATH 441	Linear Regression Analysis, with Time Series	
MATH 451	Teaching Mathematics with Technology	
MATH 462	History of Mathematics	
Or other mathematics courses numbered above 305		

Note: Students cannot pursue a major in Mathematics and this minor to meet graduation requirements for completing a first and second degree program.

Additional Program Requirements (If Applicable)

Additional Admission Requirements Unique to Program (If Applicable)

Other Catalog Notes/Restrictions (If Applicable)

Learning Outcomes

Please state the Learning Outcomes for this New Program:

	Description
Outcome 1	Make sense of problems and persevere in solving them.
Outcome 2	Construct viable arguments and critique the reasoning of others utilizing precise language and multiple representations.
Outcome 3	Use appropriate tools strategically.
Outcome 4	Look for and make use of structure.

Summary and Rationale

Target Audience(s)

The target audience for this minor is students who are interested in pursuing further education and credentials in the field of mathematics but are perhaps enrolled in majors which do not require the full calculus sequence. We provide options for courses to fulfill the major based on interest.

Note some example pathways for various majors:

An English major could complete the minor by taking Math 114, Math 365, Math 246, Math 314 plus 9 credits of their choosing.

An Elementary Teaching Comprehensive major could complete the minor by taking their required courses of Math 201, Math 202, at least two of the courses Math 302, Math 303, and Math 304. The student would also need Math 114, Math 365, Math 322, and 4 additional credits of their choosing.

A Computer Science Comprehensive major could complete the minor by adding Math 365 and 9 additional math credits beyond their major requirements.

Evidence of long-term need

The study of mathematics relates to the development of the capacity for logical and creative thinking as well as the ability to communicate logical arguments. The Department of Mathematics currently has three minors: Liberal Arts, Teaching, and Actuarial, all of which require 12 credits of calculus (Math 114, 215, and 216). Opportunities to learn varied ways of problem solving reside within but also beyond the study of calculus.

We see a need for a minor, therefore, that allows mathematically-inclined students to continue mathematical studies without taking the full calculus sequence. This minor still requires Calculus I (Math 114) as the basic background knowledge for other mathematical classes. Next we require the course of Mathematical Problem Solving (Math 365) and an option for other classes that also develop skills in mathematical problem solving and communication of solutions (Math 314 or 322). Finally, we allow students to choose electives such as Math 246 or Math 201 that require problem solving from different points of view like probability and statistics or fundamental mathematics. We hope this minor gives students additional options to graduate in a timely manner and will encourage mathematically-inclined students to finish their studies by offering them classes of interest.

Anticipated Enrollment

We anticipate enrollment of at least 15 students per academic year as evidenced by the average number of students enrolled in Math 322 each academic year over the past four years when Math 322 was only offered to students in the now discontinued MCEA elementary education major with its associated minor in mathematics. Additional students may choose to opt into this major even without taking Math 322.

Alignment with university mission

UWEC includes in its mission to provide a transformative, liberal education. Key outcomes of the minor are for students to develop problem solving strategies and communicate effectively. Developing mathematics problem solving relates to a development of logical, critical, and creative thinking. Because mathematical content occurs in a wide variety of fields, from the sciences to government policy, being able to communicate, read, and listen to mathematics will better enable students to critically assess arguments in any of these fields. Additionally, the minor provides a liberal education in the field of mathematics by providing opportunities for students to take courses in a diversity of mathematical fields such as statistics, fundamental mathematics, and algebra.

Statement of benefits to students

Students will be able to continue their mathematics education in a diverse selection of courses specifically targeted at developing mathematical problem solving. They will develop their capacities to think creatively and critically and to communicate and interpret arguments. This option provides students a way to add a mathematics minor and also graduate in a timely manner by offering classes of interest.

Department(s), program(s), college(s), and university predecessor programs

N/A

Relationship to existing programs

The Department of Mathematics currently has three minors: Liberal Arts, Teaching, and Actuarial, all of which require 8 or more credits of calculus (Math 114, 215, and 216). The new proposed Minor in Mathematical Problem Solving requires only 4 credits of calculus (Math 114), courses that focus on problem solving, and electives that require problem solving from other points of view.

Resources

Does the department have the necessary staffing to offer this program?

Yes

Explain need for student support, library resources, etc.:

No additional support needed as all required and elective courses are already offered.

Describe funding needs to initiate and maintain the program, including source(s) of funding and any needed resource reallocation:

No additional funding is needed. Courses required for the minor are courses which are already offered. We do not anticipate such a great enrollment in the minor to lead to significant increases in students enrolling into the already offered mathematics courses.

Proposed frequency of offering for courses included in the program:

The required course, Math 114, is offered every semester in multiple sections. Math 365 is offered each spring. Math 314 is offered every semester. Math 322 is offered each spring. We do not anticipate changes to this frequency of offerings. The listed "additional courses" vary in frequency of offerings. Many of the listed courses are offered every year.

Proposed arrangements for ongoing faculty advising for students in the program

Mathematics faculty will advise students in this minor.

Provide justification that this program is not a duplication of another program that is currently being offered

See above comments in "Relationships to Existing Programs" to see how the proposed minor in Mathematical Problem Solving relates to other programs in Mathematics.

Reviewer Comments

Margaret Cassidy (cassidml) (Wed, 09 Nov 2022 22:37:39 GMT): Rollback: Per request.

Key: 406