Program Change Request

Date Submitted: 02/20/25 8:24 pm

Viewing: BS-AMAT-2 : Bachelor of Science in Applied Mathematics

Last approved: 10/23/20 11:31 am

Last edit: 02/20/25 8:24 pm

Changes proposed by: kong2

Catalog Pages
Using this Program
[Bachelor of Science in Applied Mathematics](#)

Program Status	Active
Requestor	Name ~~Kiah Ong~~ ~~Holli Pryor-Harris~~ E-mail ~~kong2@iit.edu~~ ~~pryor@iit.edu~~
Origination Date	~~2025-2-20~~ ~~2020-10-23~~
Is this an interdisciplinary program?	No
Academic Unit College	Applied Mathematics College of Computing
Program Title	Bachelor of Science in Applied Mathematics
Effective Academic Year	~~2025~~ ~~2020~~ - ~~2026~~ ~~2021~~ Effective Term Fall 2025
Academic Level	Undergraduate

If all courses in a subject in your department are required, please enter each subject followed by the number ranges in the "Quick Add" field in the pop up box when you click the green plus button below. For example: ARCH 100-499.

What courses will factor the major GPA?

In Workflow

1. **AMAT Chair**
2. **Academic Affairs**
3. Undergraduate Academic Affairs
4. CC Dean
5. Undergraduate Studies Committee Chair
6. Faculty Council Chair
7. Academic Affairs

Approval Path

1. 02/20/25 9:36 pm Chun Liu (cliu124): Approved for AMAT Chair

History

1. Oct 25, 2017 by clmig-jwehrheim
2. Nov 3, 2017 by Sarah Pariseau (sparisea)
3. Apr 2, 2018 by Sarah Pariseau (sparisea)
4. Oct 23, 2020 by Holli Pryor-Harris (pryor)

Program Type   Degree

Degree Type   Bachelor of Science (BS)

CIP Code
  27.0301 - Applied Mathematics, General.

Is there more than one Academic Unit proposer?

  No

Program Code   BS-AMAT-2

Program Attribute

Total Program   120 ~~128~~
Credit Hours

Rationale for
change in program
credit hours.
  The university has moved to minimum of 120 credit hours for BS programs, and we are
  reducing the number of free elective credits and science credit in this program to have this
  degree's minimum requirements be in line with the new university policy.

Please provide a
summary and
rationale for the
requested program
revision.
  Proposed Changes:

  (1) Reduced the science elective from 9 credits to 6 credits.

  (2) Reduced the free electives as follows:

  Students who complete CS 115 & 116 to fulfill their CS requirement will need to take 4 credits
  of free electives, bringing their total to 120 credits.

  Students who take CS 104 & 201 or CS 105 & 201 will be required to take 2 credits of free
  electives to reach the total of 120 credits.

  So the free elective will be set as (2-4 credits).

  Rationale:
  We have already fulfilled the core science credit requirement, and students interested in
  further exploration can pursue a minor in a related scientific discipline. The reduction in free
  electives is due to the same rationale. ~~10/23/2020 Updated program iteration code and~~
  ~~effective CAT year/term for College Reorg.HPH~~

Program Narrative and Justification

Narrative description of how the institution determined the need for the program. For example, describe what need this program will address and how the institution became aware of that need. If the program is replacing a current program(s), identify the current program(s) that is being replaced by the new program(s) and provide details describing the benefits of the new program(s). If the program will be offered in connection with, or in response to, an initative by a governmental entity, provide details of that initiative.

Narrative description of how the program was designed to meet local market needs, or for an online program, regional or national market needs. For example, indicate if Bureau of Labor Statistics data or State labor data systems information was used, and/or if State, regional, or local workforce agencies were consulted. Include how the course content, program length, academic level, admission requirements, and prerequisites were decided; including information received from potential employers about course content; and information regarding the target students and employers.

Narrative description of any wage analysis the institution may have performed, including any consideration of Bureau of Labor Statistics wage data related to the new program.

Narrative description of how the program was reviewed or approved by, or developed in conjunction with, one or more of the following: a) business advisory committees; b) program integrity boards; c) public or private oversight or regulatory agencies (not including the state licensing/authorization agency and accrediting agency); and d) businesses that would likely employ graduates of the program. For example, describe the steps taken to develop the program, identify when and with whom discussions were held, provide relevant details of any proposals or correspondence generated, and/or describe any process used to evaluate the program.

Admission Entry Details

What are the enrollment estimates?

Year 1   Year 2   Year 3

Attach Additional
Program
Justification
Document(s)

Academic Information

Advising

Since quality advising is a key component of good retention, graduation, and career placement, how will students be mentored? What student professional organizations will be formed? How will the department work with the Career Services office to develop industry connections?

Program Resources

Which program resources are necessary to offer this program?

Proposed Catalog Entry

Admission Requirements

Course Requirements

Required Courses

Applied Mathematics Requirements		(42)
MATH 100	Introduction to the Profession	3
MATH 151	Calculus I	5
MATH 152	Calculus II	5
MATH 230	Introduction to Discrete Math	3
MATH 251	Multivariate and Vector Calculus	4
MATH 252	Introduction to Differential Equations	4
MATH 332	Elementary Linear Algebra	3
MATH 350	Introduction to Computational Mathematics	3
MATH 380	Introduction to Mathematical Modeling	3
MATH 400	Real Analysis	3
Select one of the following:		3
MATH 410	Number Theory	3
MATH 430	Applied Algebra	3

MATH 431	Computational Algebraic Geometry	3
MATH 454	Graph Theory and Applications	3
MATH 475	Probability	3
Applied Mathematics Electives		**(18)**
Select 18 credit hours [1]		18
Minor Requirement		**(15)**
Select five related courses from an area outside of applied mathematics		15
Computer Science Requirements		**(4-6)**
Select one of the following sequences:		4-6
CS 115 & CS 116	Object-Oriented Programming I and Object-Oriented Programming II	4
CS 104 & CS 201	Introduction to Computer Programming for Engineers and Accelerated Introduction to Computer Science	6
CS 105 & CS 201	Introduction to Computer Programming and Accelerated Introduction to Computer Science	6
Science Requirement		**(4)**
PHYS 123	General Physics I: Mechanics	4
Science Electives		**(6)**
~~Select nine credit hours~~		~~9~~
Select six credit hours		6
Humanities and Social Science Requirements		**(21)**
See Illinois Tech Core Curriculum, sections B and C		21
Interprofessional Projects (IPRO)		**(6)**
See Illinois Tech Core Curriculum, section E		6
Free Electives		**(2-4)**
~~Select nine credit hours~~		~~9~~
Select 2-4 credits [2]		2-4
	Minimum degree credits required:	120

[1]
Applied mathematics electives are to be chosen after consultation with an academic adviser. Student goals, interests, and course availability should be determining factors in this selection process. The optional specializations on the Specializations tab may also serve as a guide to applied mathematics elective selection.

[2]
Students who completed CS 115 and CS 116 to fulfill their CS requirement will need to take 4 credits of free electives. Students who completed either CS 104 & CS 201 or CS 105 & CS 201 will need to take 2 credits of free elective to meet the minimum credit of 120.

~~128~~

Sample Curriculum/Program Requirements

Bachelor of Science in Applied Mathematics Curriculum

				Year 1
Semester 1	Credit Hours	Semester 2		Credit Hours
MATH 100	3	MATH 152		5
MATH 151	5	MATH 230		3
Computer Science Course[1]	2	Computer Science Course[1]		2
Science Elective	3	PHYS 123		4
Humanities 200-level Course	3	~~Social Sciences Elective~~		~~3~~
	16			14

				Year 2
Semester 1	Credit Hours	Semester 2		Credit Hours
MATH 251	4	MATH 252		4
MATH 332	3	MATH 380		3
Minor Elective	3	Minor Elective		3
Social Science Elective	3	Science Elective		3
Humanities or Social Sciences Elective	3	Social Sciences Elective (300+)		3
	16			16

				Year 3
Semester 1	Credit Hours	Semester 2		Credit Hours
MATH 430 or 431[2]	3	MATH 350		3
MATH 475	3	MATH 410 or 454[2]		3
Applied Mathematics Elective[3]	3	Applied Mathematics Elective[3]		3
Minor Elective	3	IPRO Elective I		3
Humanities Elective (300+)	3	Minor Elective		3
~~Free Elective~~	~~3~~			
	15			15

				Year 4
Semester 1	Credit Hours	Semester 2		Credit Hours
MATH 400	3	IPRO Elective II		3
Minor Elective	3	Applied Mathematics Elective[3]		3
Applied Mathematics Elective[3]	3	Applied Mathematics Elective[3]		3
Social Sciences Elective (300+)	3	Humanities Elective (300+)		3
~~Free Elective~~	~~3~~	Free Elective		4
	12			16

Total Credit Hours: 120

[1]

Students must complete one of the following computer science sequences: CS 115 and CS 116, CS 104 and CS 201, or CS 105 and CS 201.

2

Applied mathematics majors are required to take one of the following: MATH 410, MATH 430, MATH 431, or MATH 454. MATH 430 and MATH 431 are offered only during fall semesters; MATH 410 and MATH 454 are offered only during spring semesters. If a student chooses to take only one of these courses, then the other slot is to be interpreted as an applied mathematics elective.

3

Applied mathematics electives are to be chosen after consultation with an academic adviser. Student goals, interests, and course availability should be determining factors in this selection process. The optional specializations on the Specializations tab may also serve as a guide to applied mathematics elective selection.

Specialization
Requirements

Specialization in Applied Analysis

Program adviser: J. Duan

Applied analysis is one of the foundations for interdisciplinary applied mathematics. The principles of analysis are applied to such areas as partial differential equations, dynamical systems, and numerical analysis. The basic framework, concepts, and techniques of modern mathematical analysis are essential for modeling, analysis, and simulation of complicated phenomena in engineering and science.

Required Courses

MATH 380	Introduction to Mathematical Modeling	3
MATH 400	Real Analysis	3
MATH 461	Fourier Series and Boundary-Value Problems	3
MATH 488	Ordinary Differential Equations and Dynamical Systems	3
MATH 489	Partial Differential Equations	3
Closely related courses which are recommended as additional electives include:		
MATH 402	Complex Analysis	3
MATH 478	Numerical Methods for Differential Equations	3
MATH 486	Mathematical Modeling I	3

MATH 380 and MATH 400 are required for all applied mathematics majors. The other three courses count toward MATH electives.

Recommended minors include: Physics or an engineering minor.

Specialization in Computational Mathematics

Program adviser: X. Li

The use of computation/simulation as a third alternative to theory and experimentation is now common practice in many branches of science and engineering. Many scientific problems that were previously inaccessible have seen tremendous progress from the use of computation (e.g., many-body simulations in physics and chemistry, simulation of semi-conductors, etc.). Researchers and scientists in these areas must have a sound training in the fundamentals of computational mathematics and become proficient in the use and development of new algorithms and analytical techniques as they apply to modern computational environments.

Required Courses

MATH 350	Introduction to Computational Mathematics	3
MATH 435	Linear Optimization	3
or MATH 461	Fourier Series and Boundary-Value Problems	
MATH 476	Statistics	3
MATH 477	Numerical Linear Algebra	3
MATH 478	Numerical Methods for Differential Equations	3
Closely related courses which are recommended as additional electives include:		
MATH 431	Computational Algebraic Geometry	3
MATH 435	Linear Optimization [1]	3
MATH 461	Fourier Series and Boundary-Value Problems [1]	3
MATH 484	Regression	3
MATH 486	Mathematical Modeling I	3
MATH 488	Ordinary Differential Equations and Dynamical Systems	3
MATH 489	Partial Differential Equations	3

[1]
Only if not already counted as a required course.

MATH 350 is required for all applied mathematics majors. The other four courses count toward MATH electives.

Recommended minors include: Artificial Intelligence, Computational Structures, or Software Engineering.

Specialization in Discrete Applied Mathematics

Program adviser: M. Pelsmajer

Discrete applied mathematics is a fairly young branch of mathematics and is concerned with using combinatorics, graph theory, optimization, and portions of theoretical computer science to attack problems in engineering as well as the hard and soft sciences.

Required Courses

MATH 332	Elementary Linear Algebra	3
MATH 430	Applied Algebra	3
MATH 435	Linear Optimization	3
MATH 453	Combinatorics	3
MATH 454	Graph Theory and Applications	3
Closely related courses which are recommended as additional electives include:		
MATH 410	Number Theory	3
MATH 431	Computational Algebraic Geometry	3

MATH 332 is required for all applied mathematics majors, and MATH 430 or MATH 454 satisfies the discrete mathematics core requirement. The other three courses count toward MATH electives.

Recommended minors include: Artificial Intelligence, Computational Structures, or Computer Networking.

Specialization in Mathematical Finance

Program adviser: T. Bielecki

Students who choose this specialization may qualify for admission to the [Master of Mathematical Finance program](#)—a collaborative program between the Stuart School of Business and the Department of Applied Mathematics. The objective of the MMF program is to provide individuals interested in pursuing careers in the finance industry with advanced education in theoretical, computational, and business aspects of relevant quantitative methodologies. A business or entrepreneurship minor is required. See the [Minors section](#) for more details.

Required Courses

MATH 475	Probability	3
MATH 476	Statistics	3
MATH 478	Numerical Methods for Differential Equations	3
MATH 481	Introduction to Stochastic Processes	3
MATH 485	Introduction to Mathematical Finance	3
Closely related courses which are recommended as additional electives include:		
MATH 461	Fourier Series and Boundary-Value Problems	3
MATH 477	Numerical Linear Algebra	3
MATH 483	Design and Analysis of Experiments	3
MATH 484	Regression	3
MATH 486	Mathematical Modeling I	3
MATH 489	Partial Differential Equations	3

MATH 475 is required for all applied mathematics majors. The other four courses count toward MATH electives.

Specialization in Stochastics

Program Adviser: I. Cialenco

Stochastics includes traditional statistics (the methods of data analysis and inference) and probability (the modeling of uncertainty and randomness). However, also included are other areas where stochastic methods have been becoming more important in recent years such as stochastic processes, stochastic integration, stochastic dynamics, stochastic partial differential equations, probabilistic methods for analysis, mathematical finance, discrete mathematics, and computational methods for stochastic systems.

Required Courses

MATH 475	Probability	3
MATH 476	Statistics	3
MATH 481	Introduction to Stochastic Processes	3
MATH 485	Introduction to Mathematical Finance	3
MATH 488	Ordinary Differential Equations and Dynamical Systems	3
Closely related courses which are recommended as additional electives include:		

MATH 453	Combinatorics	3
MATH 483	Design and Analysis of Experiments	3
MATH 484	Regression	3
MATH 486	Mathematical Modeling I	3

MATH 475 is required for all applied mathematics majors. The other four courses count toward MATH electives.

Program Outcomes and Assessment Process

What are your learning objectives in this program? Please list each learning objective in the boxes below:

Note: These should be the same as described in your assessment plan at the bottom of this form.

Use a variety of techniques to manually solve mathematical problems.

Use appropriate software tools to solve mathematical problems.

Formulate basic mathematical and statistical models, apply them to solving real problems, and interpret the solution.

Construct a mathematical proof using fundamental mathematical concepts, logic, and arguments.

Communicate clearly and precisely, orally and in writing, their understanding of mathematical concepts.

Describe the broader and dynamic societal context in which mathematics plays a role and has an impact.

Upload your assessment plan here:

NEW BS AMAT Program Accessment.xlsx

Undergraduate Program Requirements

What courses will factor the major GPA?

Undergraduate Degree Requirements

Minimum credit
hours

120 ~~128~~

Specialization
required?
  Optional

Notes about
specialization
requirement

Minor required?
  Yes

How many credit
hours are required
for the minor?

15

Details about the
minor requirement

Proposed General Curriculum

Degree credit hours
required

120 ~~128~~

Specialization
credit hour
requirement

15

List Major Course
Requirements

List Mathematics
Requirements

List Science
Requirements

List Computer
Science
Requirements

List Humanities and
Social Sciences
Requirements

List
Interprofessional
Project (IPRO)
Requirements

List Technical
Elective Course
Options

List Free Elective   9
Credit Hours (if
applicable)

Semester-by-
semester plan of
study for the
degree program

Specialization

Reviewer
Comments

Key: 32