APPLIED MATHEMATICS

Home Department: Mathematics (https://my.kettering.edu/academics/departments/mathematics)

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Program Overview

Mathematics is the universal language of engineering, science, and management. Students majoring in Applied Mathematics (https://www.kettering.edu/programs-and-degrees/applied-math) at Kettering University select a concentration in Actuarial Science, Applied and Computational Mathematics, Applied Statistics or Mathematical Biology. The degree is very flexible in serving the interests of business and industry, preparing the student for a wide variety of careers. The degree also provides a sound preparation for graduate study. Kettering graduates in Applied Mathematics appreciate their broad-based education because it enables them to work easily with engineers, managers, and scientists. They can contribute to team approaches to problem solving.

Students with concentrations in Actuarial Science will study mathematical and statistical methods of certain actuarial models and the application of those models to insurance and other financial risks. Courses include the early stage of the actuarial exams (P, FM and MLC). The actuarial science concentration provides excellent preparation for the student interested in starting a career in the actuarial profession. It is a leading undergraduate level actuarial program by the standards of the Society of Actuaries. Actuaries are professionals who use mathematics, statistics and financial theory to analyze financial consequences of risk.

Students with concentrations in Applied and Computational Mathematics will study classical and modern mathematical topics related to scientific and engineering disciplines. Courses are included that emphasize the modeling of physical systems from theoretical and practical perspectives as well as practical scientific computations. The student will also complete an application sequence of engineering, science, or computer science courses related to the special interests of the student.

Students with concentrations in Applied Statistics will study modern statistical methods related to the acquisition, organization, analysis, and interpretation of data. Courses are included that emphasize theory and application of probability, statistics, and mathematical modeling.

Students with concentrations in Mathematical Biology will study mathematical and statistical methods related to the modeling of complex biological systems. Theoretical and numerical methods of solution will be applied to ordinary and partial differential equations and systems of equations arising in General and Human Biology, Anatomy and Physiology, and Ecology.

The curriculum for Applied Mathematics includes core mathematics courses that are common to all concentrations. These courses make up about one quarter of the total credits in the program. Considerable emphasis is placed on additional core courses in science, management and humanities.

Applied Mathematics students interact regularly with engineering and science departments through core and other required courses appropriate to the concentrations in applied and computational mathematics, applied statistics and mathematical biology. A substantial number of electives provides flexibility for greater breadth or depth of study in mathematics or its applications.

In addition to the major in Applied Mathematics, there are available minors in Applied and Computational Mathematics and Applied Statistics. Because of the strong mathematical content of Kettering's other degree programs, it is possible for many students to complete one of these minors with a modest amount of additional course work.

Program Educational Objectives

The Mathematics Program Faculty (https://my.kettering.edu/math/faculty-and-staff) have established the following Program Educational Objectives:

- Provide its students with a broad, fundamental understanding of foundational, mathematical and computational concepts.
- Provide the skills to use mathematics in modeling and solving real problems of mathematics, science, engineering, commerce and industry.
- Provide productive employees to science, engineering, commerce, and industry and ensure the relevance of the Applied Mathematics program through interaction with employers.

Applied Mathematics Program Curriculum Requirements

First Year Experience

FYE-101	First Year Foundations	1
	Credit Hours Subtotal:	*1*

General Education

COMM-101	Written & Oral Communication I	4
COMM-301	Written & Oral Communication II	4
ECON-201	Economic Principles	4
HUMN-201	Introduction to Humanities	4
LS-489	Senior Seminar: Leadership, Ethics, and Contemporary Issues	4
SSCI-201	Introduction to the Social Sciences	4
Advanced Humanities Elective		4
Advanced Social Science Elective		4
	Credit Hours Subtotal:	*32*

Computer Programming

Select one of the following:		4
CS-101	Computing & Algorithms I	
ECE-101	MATLAB and C Programming	
IME-211	Algorithms and Computer Programming	
	Credit Hours Subtotal:	*4*

Basic Science

CHEM-135 & CHEM-136	Principles of Chemistry and Principles of Chemistry Lab	4
PHYS-114 & PHYS-115	Newtonian Mechanics and Newtonian Mechanics Laboratory	4
PHYS-224 & PHYS-225	Electricity and Magnetism and Electricity and Magnetism Laboratory	4
	Credit Hours Subtotal:	*12*

Mathematics

MATH-101	Calculus I	4
or MATH-101X	Calculus I	
MATH-102	Calculus II	4
or MATH-102X	Calculus II	
MATH-203	Multivariate Calculus	4
MATH-204	Differential Equations & Laplace Transforms	4
MATH-305	Numerical Methods and Matrices	4
MATH-307	Matrix Algebra	4
MATH-308	Abstract Algebra	4
MATH-313	Boundary Value Problems	4
MATH-321	Real Analysis I	4
MATH-327	Mathematical Statistics I	4
MATH-412	Complex Variables	4
MATH-416	Vector Analysis	4
	Credit Hours Subtotal:	*48*

Concentration

Select one of the following concentrations:		28-36
(Courses for each concentration are listed in the Plan of Study Tab)		
Actuarial Science		
Applied and Computational Mathematics		
Applied Statistics		
Mathematical Biology		
	Credit Hours Subtotal:	*28-36*

Electives

Science Electives	8
Free Electives	16-24
Credit Hours Subtotal:	*24-32*

Culminating Undergraduate Experience

CUE-495	Culminating Undergraduate Experience Introductory Course (No Credit, Pass/Fail)	
Select one of the following:		4
CUE-495C	Co-op Thesis	
CUE-495E	Intra/Entre/Social E-ship Thesis	
CUE-495P	Professional Practice Thesis	
CUE-495R	Research Thesis	
	Credit Hours Subtotal:	*4*

Total Credit Hours	153-169

(Minimum) Total Credits Required for Program: 161

Representative Program

Course	Title	Credit Hours
Freshman I		
FYE-101	First Year Foundations	1
CHEM-135	Principles of Chemistry	3
CHEM-136	Principles of Chemistry Lab	1
COMM-101	Written & Oral Communication I	4
MATH-101	Calculus I	4
Select one of the following:		4
CS-101	Computing & Algorithms I	
IME-211	Algorithms and Computer Programming	
ECE-101	MATLAB and C Programming	
	Credit Hours	17
Freshman II		
ECON-201	Economic Principles	4
MATH-102	Calculus II	4
MATH-307	Matrix Algebra	4
PHYS-114	Newtonian Mechanics	3
PHYS-115	Newtonian Mechanics Laboratory	1
	Credit Hours	16
Sophomore I		
HUMN-201	Introduction to Humanities	4
MATH-203	Multivariate Calculus	4
MATH-308	Abstract Algebra	4
SSCI-201	Introduction to the Social Sciences	4
	Credit Hours	16
Sophomore II		
MATH-204	Differential Equations & Laplace Transforms	4
PHYS-224	Electricity and Magnetism	3
PHYS-225	Electricity and Magnetism Laboratory	1
MATH-327	Mathematical Statistics I	4
Science Elective		4
	Credit Hours	16
	Total Credit Hours	65

Actuarial Science Concentration

Course	Title	Credit Hours
Junior I		
COMM-301	Written & Oral Communication II	4
ECON-342	Intermediate Microeconomics: Managerial Economics	4
BUSN-331	Financial Management	4
MATH-313	Boundary Value Problems	4
MATH-408	Probability and Statistics	4
	Credit Hours	20
Junior II		
MATH-305	Numerical Methods and Matrices	4
MATH-350	Financial Mathematics	4
ECON-344	Intermediate Macroeconomics: Economic Growth and Fluctuation	4
Advanced Humanities or Advanced Social Science Elective		4
	Credit Hours	16
Senior I		
MATH-427	Mathematical Statistics II	4
MATH-360	Life Contingencies I	4
MATH-416	Vector Analysis	4
Advanced Humanities or Advanced Social Science Elective		4
Science Elective		4
	Credit Hours	20

Senior II

Course	Title	Credit Hours
MATH-321	Real Analysis I	4
MATH-361	Life Contingencies II	4
MATH-448	Time Series	4
Free Electives		8
	Credit Hours	20

Senior III

Course	Title	Credit Hours
LS-489	Senior Seminar: Leadership, Ethics, and Contemporary Issues	4
MATH-412	Complex Variables	4
Free Electives		8
	Credit Hours	16

Any Term

Course	Title	Credit Hours
CUE -495/C/E/P/R	Culminating Undergraduate Experience	4
	Credit Hours	4
	Total Credit Hours	96

(Minimum) Total Credits Required for Program: 161

Applied and Computational Mathematics Concentration

Course	Title	Credit Hours
Junior I		
COMM-301	Written & Oral Communication II	4
MATH-305	Numerical Methods and Matrices	4
MATH-313	Boundary Value Problems	4
Free Elective		4
	Credit Hours	16
Junior II		
MATH-328	Methods of Applied Mathematics	4
MATH-418	Intermediate Differential Equations	4
Advanced Humanities or Advanced Social Science Elective		4
Free Elective		4
	Credit Hours	16
Senior I		
MATH-416	Vector Analysis	4
Advanced Humanities or Advanced Social Science Elective		4
Engineering Applications/CS Sequence		4
Free Electives		8
	Credit Hours	20
Senior II		
MATH-321	Real Analysis I	4
MATH-423	Partial Differential Equations	4
Engineering Applications/CS Sequence		4
Free Elective		4
Science Elective		4
	Credit Hours	20
Senior III		
LS-489	Senior Seminar: Leadership, Ethics, and Contemporary Issues	4
MATH-412	Complex Variables	4
Engineering Applications/CS Sequence		8

Free Elective — 4

	Credit Hours	20

Any Term

Course	Title	Credit Hours
CUE -495/C/E/P/R	Culminating Undergraduate Experience	4
	Credit Hours	4
	Total Credit Hours	96

(Minimum) Total Credits Required for Program: 161

The student will develop an engineering applications or computer science sequence with the assistance of an academic advisor. The following are examples of a possible CS-sequence, EE-sequence, IME-sequence, MECH-sequence, and PHYS sequence.

Course	Title	Credit Hours
CS-Sequence		
CS-102	Computing & Algorithms II	4
CS-203	Computing & Algorithms III	4
CS-312	Theory of Computation	4
CS-415	Cryptography	4
EE-Sequence		
EE-210	Circuits I	3
EE-240	Electromagnetic Fields and Applications	4
EE-340	Electromagnetic Wave Propagation	4
EE-348	Electromagnetic Compatibility	4
IME-Sequence		
IME-351	Engineering Economics	4
IME-321	Operations Research I - Deterministic Models	4
IME-423	Operations Research II - Stochastic Models	4
IME-453	Tools for Managing the Supply Chain	4
MECH-Sequence		
MECH-210	Statics	4
MECH-212	Mechanics of Materials	4
MECH-310	Dynamics	4
MECH-320	Thermodynamics	4
PHYS-Sequence		
PHYS-302	Vibration, Sound and Light	4
PHYS-362	Modern Physics and Lab	4
PHYS-412	Theoretical Mechanics	4
PHYS-462	Quantum Mechanics	4

Applied Statistics Concentration

Course	Title	Credit Hours
Junior I		
COMM-301	Written & Oral Communication II	4
MATH-313	Boundary Value Problems	4
MATH-408	Probability and Statistics	4
MATH-412	Complex Variables	4
	Credit Hours	16
Junior II		
MATH-305	Numerical Methods and Matrices	4
MATH-448	Time Series	4

Course	Title	Credit Hours
Free Elective		4
Industrial/MATH Elective [1]		4
	Credit Hours	16
Senior I		
MATH-350	Financial Mathematics	4
MATH-416	Vector Analysis	4
MATH-427	Mathematical Statistics II	4
Advanced Humanities or Advanced Social Science Elective		4
Free Elective		4
	Credit Hours	20
Senior II		
IME-333	Engineering Statistics II - Design of Experiments	4
IME-471	Quality Assurance	4
MATH-321	Real Analysis I	4
Free Elective		4
Science Elective		4
	Credit Hours	20
Senior III		
LS-489	Senior Seminar: Leadership, Ethics, and Contemporary Issues	4
Advanced Humanities or Advanced Social Science Elective		4
Free Electives		8
Industrial/Math Elective [1]		4
	Credit Hours	20
Any Term		
CUE -495/C/E/P/R Culminating Undergraduate Experience		4
	Credit Hours	4
	Total Credit Hours	96

(Minimum) Total Credits Required for Program: 161

[1] The student should select at least two IME/MATH electives from the following courses: IME-321, IME-422, IME-423, and MATH-428.

Mathematical Biology Concentration

Course	Title	Credit Hours
Junior I		
COMM-301	Written & Oral Communication II	4
MATH-313	Boundary Value Problems	4
BIOL-241	Human Biology	3
BIOL-242	Human Biology Lab	1
CHEM-245 or CHEM-247	Appl Chem for Engineers or Survey of Organic Chemistry	4
Free Elective		4
	Credit Hours	20
Junior II		
MATH-328	Methods of Applied Mathematics	4
MATH-418	Intermediate Differential Equations	4
Advanced Humanities or Advanced Social Science Elective		4
Free Elective		4
	Credit Hours	16

Course	Title	Credit Hours
Senior I		
MATH-416	Vector Analysis	4
MATH-310	Biostatistics I	4
BIOL-341	Anatomy and Physiology	4
Advanced Humanities or Advanced Social Science Elective		4
Science Elective		4
	Credit Hours	20
Senior II		
MATH-321	Real Analysis I	4
MATH-410	Biostatistics II	4
BIOL-441	Cellular Biology	4
BIOL-442	Cellular Biology Lab	2
Free Elective		4
	Credit Hours	18
Senior III		
LS-489	Senior Seminar: Leadership, Ethics, and Contemporary Issues	4
MATH-412	Complex Variables	4
BIOL-481	Genetics	4
Free Electives		8
	Credit Hours	20
Any Term		
CUE -495/C/E/P/R Culminating Undergraduate Experience		4
	Credit Hours	4
	Total Credit Hours	98

(Minimum) Total Credits Required for Program: 161