Undergraduate Catalog 2017–18

Department of Mathematics

College of Natural Sciences and Mathematics

www.iup.edu/math

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Indiana University of Pennsylvania

Department of Mathematics

Website: *www.iup.edu/math*
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The Department of Mathematics prepares students for work in industry, graduate school mathematics, and teaching. Degree programs offered by the department are the bachelor of science degree program in mathematics and the bachelor of science in education degree program in mathematics education. The first degree program is offered within the College of Natural Sciences and Mathematics and the second is in conjunction with the College of Education and Communications. The department also offers a Mathematics minor, Applied Statistics minor, and Elementary and Middle-Level Mathematics minor.

Bachelor of Science

The program for a mathematics major in the College of Natural Sciences and Mathematics has three options. A student may pursue a degree with a major in mathematics or a degree with a major in mathematics with a concentration in either applied mathematics or actuarial science. Those completing a degree with a major in mathematics will be prepared to continue their studies in mathematics in graduate school, though some may enter business, industry, or government service. Students receiving a mathematics degree with a concentration in applied mathematics will be primarily prepared to enter business, industry, or government service in an area where mathematics or computer science is used, or to continue their studies in applied mathematics or computer science in graduate school. Students in the actuarial science concentration take additional course work in finance and economics, preparing them to complete the first two professional actuarial exams and to pursue employment in the areas of insurance and investment.

Bachelor of Science in Education

The program leading to the BSEd degree with a major in mathematics education prepares the student for teaching mathematics in grades 7-12. Many graduates, however, continue their formal education in mathematics at the graduate level or work in government or industry.

Students interested in the BSEd—Middle-Level Education 4-8/Mathematics specialization should refer to the College of Education and Communica-

tions, Department of Professional Studies in Education, section of the catalog.

Minor in Mathematics

The minor consists of a minimum of 18 credits in mathematics including at least 6 credits from 300-level or higher courses. The minor prepares students for advanced study in areas such as economics, computer science, physics, and other natural sciences. Anyone required to take a year of calculus should consider the Mathematics minor.

A cumulative GPA of at least 2.0 in MATH courses is required for the Mathematics or Applied Statistics minor. No more than 6 credits of overlap can be used for the Mathematics and Applied Statistics minors. Transfer students must take at least three courses from IUP with at least two courses from the IUP Mathematics Department in order to complete a minor.

Minor in Applied Statistics

The Applied Statistics minor consists of 18 credits in mathematics and statistics. It is designed for students who want to apply statistical methodology to investigate real-world problems. The use of statistical software and interpretation of results is heavily emphasized. The minor is created for students from a variety of majors, including those in the natural sciences, social sciences, and business.

Minor in Elementary and Middle-Level Mathematics

The minor consists of 18 credits in Elementary and Middle-Level Mathematics Education. The minor may offer additional preparation for the teaching of elementary and middle mathematics. This minor does not lead to certification and is not open to students majoring in middle-level education 4-8/mathematics.

Bachelor of Science—Mathematics

Liberal Studies: As outlined in Liberal Studies section with the following specifications: 49-50
Mathematics: MATH 125
Liberal Studies Electives: 9cr, no courses with MATH prefix, includes intermediate-level foreign language

Major: 39-40
Required Courses:

MATH 126	Calculus II for Physics, Chemistry, Mathematics	3cr
MATH 171	Introduction to Linear Algebra	3cr
MATH 216	Probability and Statistics for Natural Sciences	3cr
MATH 225	Calculus III for Physics, Chemistry, Mathematics	3cr
MATH 271	Introduction to Mathematical Proofs I	3cr
MATH 272	Introduction to Mathematical Proofs II	3cr
MATH 341	Differential Equations	3cr
MATH 480	Senior Seminar	3cr

Controlled Electives:
Four courses from the following: 12cr
MATH 371, 421, 422, 423, 427, 476, 477
A minimum of 3 additional cr from the list above or the following: 3-4cr
MATH 342, 350, 353, 355, 363, 364, 445, 446, 447, 465, 481

Other Requirements: 3
Computer Science:
COSC 110 Problem Solving and Structured Programming 3cr
Foreign Language Intermediate Level (1)

Free Electives: 27-29

Total Degree Requirements: 120

(1) Intermediate-level foreign language may be included in Liberal Studies electives.

Bachelor of Science—Mathematics/Actuarial Track (1, 2)

Liberal Studies: As outlined in Liberal Studies section with the following specifications: 49-50
Mathematics: MATH 125
Social Science: ECON 121
Liberal Studies Elective: ECON 122

Major: 33
Required Courses:

MATH 126	Calculus II for Physics, Chemistry, Mathematics	3cr
MATH 171	Introduction to Linear Algebra	3cr
MATH 216	Probability and Statistics for Natural Sciences	3cr
MATH 225	Calculus III for Physics, Chemistry, Mathematics	3cr
MATH 271	Introduction to Mathematical Proofs I	3cr
MATH 272	Introduction to Mathematical Proofs II	3cr
MATH 341	Differential Equations	3cr
MATH 363	Mathematical Statistics I	3cr
MATH 364	Mathematical Statistics II	3cr
MATH 448	Introduction to Financial Mathematics	3cr
MATH 450	Topics in Applied Computational Mathematics	3cr

Controlled Electives: 15

MATH 416	Time Series Analysis	3cr
One course from the following: MATH 371, 421, 423		3cr
One course from the following: MATH 445 or 446		3cr
One course from the following: MATH 480 or 493		3cr

Computer Science:
COSC/MATH 250 Introduction to Numerical Methods 3cr

Other Requirements: 6-10
Foreign Language Intermediate Level
ECON 356, FIN 320 (3)

Free Electives: 12-17

Total Degree Requirements: 120

(1) Pass SOA Exam P or Exam FM.
(2) "B" or higher grades in course work that carries Validation by Educational Experience (VEE) from the Society of Actuaries (required for SOA credential).
(3) FIN 320 and ECON 356 must be passed with grade of "B" or better.

Bachelor of Science—Mathematics/Applied Mathematics Track

Liberal Studies: As outlined in Liberal Studies section with the following specifications: 49-50
Mathematics: MATH 125
Liberal Studies Electives: 9cr, no courses with MATH prefix, includes intermediate-level foreign language

Major: 42
Required Courses:

MATH 126	Calculus II for Physics, Chemistry, Mathematics	3cr
MATH 171	Introduction to Linear Algebra	3cr
MATH 216	Probability and Statistics for Natural Sciences	3cr
MATH 225	Calculus III for Physics, Chemistry, Mathematics	3cr
MATH 271	Introduction to Mathematical Proofs I	3cr
MATH 272	Introduction to Mathematical Proofs II	3cr
MATH 341	Differential Equations	3cr
MATH 363	Mathematical Statistics I	3cr
MATH 447	Modeling and Simulation	3cr
MATH 450	Topics in Applied Computational Mathematics	3cr

Controlled Electives: (1)

One course from the following: MATH 371, 421, 423, 427, 476		3cr
One course from the following: MATH 445 or 446		3cr
One course from the following: MATH 480 or 493 (2)		3cr
One course from the following: MATH 342, 364, 445, 446		3cr

Other Requirements: 18
Computer Science:
COSC 110 Problem Solving and Structured Programming 3cr
COSC/MATH 250 Introduction to Numerical Methods 3cr
Foreign Language Intermediate Level (3)
Planned program in complementary field (or minor, requires advisor approval) with at least 6cr in 300/400-level courses 12cr

Free Electives: 10-11

Total Degree Requirements: 120

(1) A student may select courses for a specialized area.
Statistics/Actuarial Science: MATH 363, 364, 371, 446
Additionally, a student should minor in applied statistics.
Math Analysis/Engineering: MATH 342/447, 371, 423
Operations Research: MATH 371, 421, 445/446, 447
(2) Three credits of internship will be applied to the major. Additional credits may count as free electives.
(3) Intermediate-level foreign language may be included in Liberal Studies electives.

Bachelor of Science in Education—Mathematics Education (*)

Liberal Studies: As outlined in Liberal Studies section with the following specifications: 43-44
Mathematics: MATH 125
Social Science: PSYC 101
Liberal Studies Elective: 3cr, no courses with MATH prefix

College: 31
Preprofessional Education Sequence:
ACE 103 Digital Instructional Technology 3cr
EDSP 102 Educational Psychology 3cr
Professional Education Sequence:
EDEX 301 Education of Students with Disabilities in Inclusive Secondary Settings 2cr
EDEX 323 Instruction of English Language Learners with Special Needs 2cr
EDSP 477 Assessment of Student Learning: Design and Interpretation of Educational Measures 3cr
EDUC 242 Pre-student Teaching Clinical Experience I 1cr
EDUC 342 Pre-student Teaching Clinical Experience II 1cr
EDUC 441 Student Teaching 12cr
EDUC 442 School Law 1cr
EDUC 456 Teaching Math in the Secondary Schools 3cr

Major: 36
Required Courses:
MATH 126 Calculus II/Physics, Chemistry, Mathematics 3cr
MATH 171 Introduction to Linear Algebra 3cr
MATH 216 Probability and Statistics for Natural Sciences 3cr
MATH 225 Calculus III/Physics, Chemistry, Mathematics 3cr
MATH 271 Introduction to Mathematical Proofs I 3cr
MATH 272 Introduction to Mathematical Proofs II 3cr
MATH 340 Principles of Secondary School Mathematics 3cr
MATH 350 History of Mathematics 3cr
MATH 353 Theory of Numbers 3cr
MATH 355 Foundations of Geometry I 3cr
MATH 430 Seminar in Teaching Secondary School Mathematics 3cr
MATH 460 Technology in Mathematics Instruction 3cr

Other Requirements: 3
COSC 110 Problem Solving and Structured Programming 3cr

Free Electives: 6-7

Total Degree Requirements: 120

(*) See requirements leading to teacher certification, titled "3-Step Process for Teacher Education," in the College of Education and Communications section of this catalog.

Minor—Applied Statistics 18

Required Courses: 9cr
MATH 214 or 216 or 217
MATH 411 Univariate Data Analysis
MATH 412 Multivariate Statistics
Controlled Electives: 9cr
Select at least 9cr from the following:
MATH 115 or 121 or 125, 363, 364,
CRIM 306, QBUS 215, ECON 356, PSYC 290, 291, or any statistics or quantitative methods course approved by the Applied Statistics advisor. Students majoring in mathematics cannot select MATH 115, 121, or 125 as a controlled elective

Minor—Mathematics 18

Required Courses: 6-8cr
MATH 121 or 125 and MATH 122 or 126
Controlled Electives: (1, 2) 10-12cr
Select the additional 10-12 credits from MATH 250, 309, or any required courses for mathematics majors. One of MATH 411 or 412 is permitted but not both. Must include 6 credits from courses at the 300 level or higher

(1) The following courses are excluded: MATH 100, 101, 105, 110, 115, 214, 217, 417, 418, 480 and courses for the Middle-Level Education 4-8/Mathematics specialization.
(2) No more than 6cr of overlap with the minor in Applied Statistics is permitted.

Minor—Elementary and Middle-Level Mathematics 18

Required Courses: 12cr
MATH 151 Elements of Mathematics I
MATH 152 Elements of Mathematics II
MATH 456 Geometry for Elementary/Middle-Level Teachers
MATH 471 Algebra for Elementary/Middle-Level Teachers
Controlled Electives: (1) 6cr
Select 6cr from the following:
MATH 153, 317, 420, 457, 458, 459, 461 (1)

(1) Other MATH content courses with the approval of the minor advisor.