ACTUARIAL MATHEMATICS - B.S.

College of Arts and Sciences
Department of Mathematical Sciences
www.kent.edu/math

Contact Information
• Program Coordinator: Xiaoyu Zheng | xzheng3@kent.edu | 330-672-9089
• Speak with an Advisor
• Chat with an Admissions Counselor

Fully Offered
• Kent Campus

Examples of Possible Careers*

Actuaries
• 17.6% much faster than the average
• 27,700 number of jobs
• $111,030 potential earnings

Economists
• 14.1% much faster than the average
• 20,500 number of jobs
• $108,350 potential earnings

Financial and investment analysts, financial risk specialists, and financial specialists, all other
• 5.5% faster than the average
• 487,800 number of jobs
• $83,660 potential earnings

Mathematical science teachers, postsecondary
• 1.3% slower than the average
• 60,100 number of jobs
• $73,650 potential earnings

Insurance underwriters
• -6.2% decline
• 114,700 number of jobs
• $71,790 potential earnings

*Note
Source of occupation titles and labor data is from the U.S. Bureau of Labor Statistics’ Occupational Outlook Handbook. Data comprises projected percent change in employment over the next 10 years; nation-wide employment numbers; and the yearly median wage at which half of the workers in the occupation earned more than that amount and half earned less.

Description
The Bachelor of Science degree in Actuarial Mathematics prepares students for the actuarial profession. Actuaries are professionals who manage risk. They predict the likelihood of future events and model the financial impact of future scenarios. They find creative ways to mitigate the undesirable effects of future events. Although most actuaries are employed in the insurance and financial industries, many others work in the transportation, environmental, medical and manufacturing industries, as well as in government.

The Actuarial Mathematics major is highly interdisciplinary, integrating substantial coursework in business, computing and communications with a solid core of mathematics and statistics. Kent State University is one of only four institutions in Ohio to receive the Universities and Colleges with Actuarial Programs-Advanced Curriculum designation from the Society of Actuaries. The Kent State program prepares students for the first four of a series of examinations to receive professional certification as an actuary.

Admission Requirements
The university affirmatively strives to provide educational opportunities and access to students with varied backgrounds, those with special talents and adult students who graduated from high school three or more years ago.

Freshman Students on the Kent Campus: The freshman admission policy on the Kent Campus is selective. Admission decisions are based upon the following: cumulative grade point average, ACT and/or SAT scores, strength of high school college preparatory curriculum and grade trends. The Admissions Office at the Kent Campus may defer the admission of students who do not meet admissions criteria but who demonstrate areas of promise for successful college study. Deferred applicants may begin their college coursework at one of seven regional campuses of Kent State University. For more information on admissions, including additional requirements for some academic programs, visit the admissions website for first-year students.

Freshman Students on the Regional Campuses: Kent State campuses at Ashtabula, East Liverpool, Geauga, Salem, Stark, Trumbull and Tuscarawas, as well as the Twinsburg Academic Center, have open enrollment admission for students who hold a high school diploma, GED or equivalent.

English Language Proficiency Requirements for International Students: All international students must provide proof of English language proficiency (unless they meet specific exceptions) by earning a minimum 525 TOEFL score (71 on the Internet-based version), minimum 75 MELAB score, minimum 6.0 IELTS score, minimum 48 PTE score or minimum 100 DET score; or by completing the ESL level 112 Intensive Program. For more information on international admission, visit the Office of Global Education's admission website.

Transfer, Transitioning and Former Students: For more information about admission criteria for transfer, transitioning and former students, please visit the admissions website.

Program Learning Outcomes
Graduates of this program will be able to:

1. Reason mathematically by using precise definitions, articulating assumptions and reasoning logically to conclusions.
2. Engage effectively in problem solving by exploring examples, assessing the correctness of solutions and interpreting solutions in an actuarial context.
3. Define, interpret and apply standard actuarial notation, terminology and formulas.
4. Analyze various streams of cash flows, both certain and contingent.
5. Apply methods from probability, statistics and stochastic processes to the solution of problems in actuarial science, finance and economics.
6. Communicate solutions of mathematical problems clearly, both orally and in writing.
7. Employ commonly used computer programming languages and software packages to solve problems in actuarial science, finance and economics.
8. Demonstrate fundamental knowledge of finance, economics and accounting.

University Requirements

All students in a bachelor’s degree program at Kent State University must complete the following university requirements for graduation.

**NOTE:** University requirements may be fulfilled in this program by specific course requirements. Please see Program Requirements for details.

**Destination Kent State: First Year Experience**

<table>
<thead>
<tr>
<th>Course is required for students with 25 transfer credits, excluding College Credit Plus, or age 21+ at time of admission.</th>
</tr>
</thead>
</table>

**Diversity Domestic/Global (DIVD/DIVG)**

- Students must successfully complete one domestic and one global course, of which one must be from the Kent Core.

**Experiential Learning Requirement (ELR)**

- Students must successfully complete one course or approved experience.

**Kent Core (see table below)**

<table>
<thead>
<tr>
<th>Writing-Intensive Course (WIC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students must earn a minimum C grade in the course.</td>
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</tbody>
</table>

**Upper-Division Requirement**

- Must successfully complete 39 upper-division (numbered 30000 to 49999) credit hours to graduate. Students in a B.A. and/or B.S. degree in the College of Arts and Sciences must complete 42 upper-division credit hours.

**Total Credit Hour Requirement**

- Some bachelor’s degrees require students to complete more than 120 credit hours.

**Kent Core Requirements**

<table>
<thead>
<tr>
<th>Kent Core Composition (KCMP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kent Core Mathematics and Critical Reasoning (KMCR)</td>
</tr>
<tr>
<td>Kent Core Humanities and Fine Arts (KHUM/KFA)</td>
</tr>
<tr>
<td>Kent Core Social Sciences (KSS)</td>
</tr>
<tr>
<td>Kent Core Basic Sciences (KBS/KLAB)</td>
</tr>
<tr>
<td>Kent Core Additional (KADL)</td>
</tr>
</tbody>
</table>

**Total Credit Hours:**

| 36-37 |

**Program Requirements**

**Major Requirements**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACCT 23020</td>
<td>INTRODUCTION TO FINANCIAL ACCOUNTING</td>
</tr>
<tr>
<td>ECON 22060</td>
<td>PRINCIPLES OF MICROECONOMICS</td>
</tr>
<tr>
<td>ECON 22061</td>
<td>PRINCIPLES OF MACROECONOMICS</td>
</tr>
<tr>
<td>ECON 32050</td>
<td>APPLIED ECONOMETRICS I</td>
</tr>
<tr>
<td>FIN 36053</td>
<td>BUSINESS FINANCE</td>
</tr>
<tr>
<td>MATH 12002</td>
<td>ANALYTIC GEOMETRY AND CALCULUS I</td>
</tr>
<tr>
<td>MATH 12003</td>
<td>ANALYTIC GEOMETRY AND CALCULUS II</td>
</tr>
<tr>
<td>MATH 20011</td>
<td>DECISION-MAKING UNDER UNCERTAINTY</td>
</tr>
<tr>
<td>MATH 21001</td>
<td>LINEAR ALGEBRA</td>
</tr>
<tr>
<td>MATH 22005</td>
<td>ANALYTIC GEOMETRY AND CALCULUS III</td>
</tr>
<tr>
<td>MATH 30055</td>
<td>MATHEMATICAL THEORY OF INTEREST</td>
</tr>
<tr>
<td>MATH 31011</td>
<td>PROOFS IN DISCRETE MATHEMATICS</td>
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<tr>
<td>MATH 32044</td>
<td>ORDINARY DIFFERENTIAL EQUATIONS</td>
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<td>MATH 40011</td>
<td>PROBABILITY THEORY AND APPLICATIONS</td>
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<td>MATH 40012</td>
<td>THEORY OF STATISTICS</td>
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<tr>
<td>MATH 40055</td>
<td>ACTUARIAL MATHEMATICS I (ELR)</td>
</tr>
<tr>
<td>MATH 40056</td>
<td>ACTUARIAL MATHEMATICS II</td>
</tr>
<tr>
<td>MATH 40059</td>
<td>STOCHASTIC ACTUARIAL MODELS</td>
</tr>
</tbody>
</table>

**Computer Science Elective, choose from the following:**

| CS 10062 | PROGRAMMING FOR PROBLEM SOLVING IN SCIENCES |
| CS 13001 | COMPUTER SCIENCE I: PROGRAMMING AND PROBLEM SOLVING |
| CS 13011 & CS 13012 | COMPUTER SCIENCE IA: PROCEDURAL PROGRAMMING and COMPUTER SCIENCE IB: OBJECT ORIENTED PROGRAMMING |

**Mathematics Electives, choose from the following:**

| MATH 40015 | APPLIED STATISTICS |
| MATH 40024 | COMPUTATIONAL STATISTICS |
| MATH 40028 | STATISTICAL LEARNING |
| MATH 40051 | TOPICS IN PROBABILITY THEORY AND STOCHASTIC PROCESSES |
| MATH 41021 | THEORY OF MATRICES |
| MATH 42001 | ANALYSIS I (ELR) |
| MATH 42002 | ANALYSIS II (ELR) |
| MATH 42011 | MATHEMATICAL OPTIMIZATION |
| MATH 42021 | GRAPH THEORY AND COMBINATORICS |
| MATH 42031 | MATHEMATICAL MODELS AND DYNAMICAL SYSTEMS |
| MATH 42039 | MODELING PROJECTS (ELR) |
| MATH 42041 | ADVANCED CALCULUS |
| MATH 42045 | PARTIAL DIFFERENTIAL EQUATIONS |
| MATH 42048 | COMPLEX VARIABLES |
| MATH 42201 | NUMERICAL COMPUTING I |
| MATH 42202 | NUMERICAL COMPUTING II |
| MATH 45011 | DIFFERENTIAL GEOMETRY |

**Total Credit Hours:**

| 36-37 |
Allied Area Elective, choose from the following:

ACCT 33001 INTERMEDIATE FINANCIAL ACCOUNTING I
ACCT 33004 INTRODUCTION TO ACCOUNTING SYSTEMS
ACCT 33010 COST ACCOUNTING
ACCT 33012 INTERMEDIATE FINANCIAL ACCOUNTING II
ACCT 43020 ADVANCED FINANCIAL ACCOUNTING
ACCT 43089 INTERNATIONAL ACCOUNTING EXPERIENCE (ELR)
BSCI 30050 HUMAN GENETICS
BSCI 40020 BIOLOGY OF AGING
BUS 30189 INTERNATIONAL BUSINESS EXPERIENCE (ELR)
BUS 30234 INTERNATIONAL BUSINESS
CHEM 30050 INTRODUCTION TO MATERIALS CHEMISTRY
CHEM 30105 HUMAN GENETICS
CHEM 30106 INORGANIC CHEMISTRY I
CHEM 30301 INORGANIC CHEMISTRY II
CHEM 40302 INORGANIC CHEMISTRY III
CHEM 40555 PHYSICAL CHEMISTRY I
CHEM 40556 PHYSICAL CHEMISTRY II
CHEM 40559 NAMATERIALS
CIS 34032 DATA AND FILE TECHNOLOGY
CIS 34068 SYSTEMS ANALYSIS AND DESIGN
CIS 34070 PROGRAMMING THEORY AND APPLICATIONS
CIS 44033 ADVANCED COMPUTER PROGRAMMING FOR BUSINESS
CIS 44043 DATA MANAGEMENT AND BUSINESS INTELLIGENCE I
CIS 44045 INFORMATION SYSTEMS MANAGEMENT
CIS 44048 CLOUD SYSTEMS INTEGRATION (ELR) (WIC)
CS 33007 INTRODUCTION TO DATABASE SYSTEM DESIGN
CS 33101 STRUCTURE OF PROGRAMMING LANGUAGES
CS 33211 OPERATING SYSTEMS
CS 33901 SOFTWARE ENGINEERING
CS 35101 COMPUTER ORGANIZATION
CS 35201 COMPUTER COMMUNICATION NETWORKS
CS 38101 INTRODUCTION TO GAME PROGRAMMING
CS 43006 THEORY OF OBJECT-ORIENTED PROGRAMMING
CS 43111 STRUCTURE OF COMPILERS
CS 43202 SYSTEMS ADMINISTRATION
CS 43203 SYSTEMS PROGRAMMING
CS 43301 SOFTWARE DEVELOPMENT FOR ROBOTICS
CS 43305 ADVANCED DIGITAL DESIGN
CS 43401 SECURE PROGRAMMING
CS 44001 COMPUTER SCIENCE III-PROGRAMMING PATTERNS
CS 44003 MOBILE APPS IN IOS PROGRAMMING
CS 44105 WEB PROGRAMMING I
CS 44106 WEB PROGRAMMING II
CS 44201 ARTIFICIAL INTELLIGENCE
CS 45203 COMPUTER NETWORK SECURITY
CS 45231 INTERNET ENGINEERING
CS 46101 DESIGN AND ANALYSIS OF ALGORITHMS
CS 47101 COMPUTER GRAPHICS
CS 47205 INFORMATION SECURITY
CS 47206 DATA SECURITY AND PRIVACY
MATH 42031  MATHEMATICAL MODELS AND DYNAMICAL SYSTEMS
MATH 42039  MODELING PROJECTS (ELR) (WIC)
MATH 42041  ADVANCED CALCULUS
MATH 42045  PARTIAL DIFFERENTIAL EQUATIONS
MATH 42048  COMPLEX VARIABLES
MATH 42201  NUMERICAL COMPUTING I
MATH 42202  NUMERICAL COMPUTING II
MATH 45011  DIFFERENTIAL GEOMETRY
MATH 45021  EUCLIDEAN GEOMETRY
MATH 45022  LINEAR GEOMETRY
MATH 46001  ELEMENTARY TOPOLOGY
MATH 47011  THEORY OF NUMBERS
MATH 47021  HISTORY OF MATHEMATICS
MATH 49992  INTERNSHIP IN MATHEMATICS (ELR)
MGMT 34060  OPERATIONS MANAGEMENT
PHIL 41035  PHILOSOPHY OF SCIENCE
PHIL 41038  INTERMEDIATE LOGIC
PHIL 41045  METALOGIC
PHY 34000  COSMOLOGY
PHY 35101  CLASSICAL MECHANICS
PHY 36001  INTRODUCTORY MODERN PHYSICS
PHY 36002  APPLICATIONS OF MODERN PHYSICS
PHY 44802  ASTROPHYSICS
PHY 45201  ELECTROMAGNETIC THEORY
PHY 45301  THERMAL PHYSICS
PHY 45401  MATHEMATICAL METHODS IN PHYSICS
PHY 45403  DATA ANALYSIS AND COMPUTATIONAL PHYSICS TECHNIQUES
PHY 45501  ELECTROMAGNETIC WAVES AND MODERN OPTICS
PHY 46101  QUANTUM MECHANICS
PHY 46301  INTRODUCTION TO NUCLEAR AND PARTICLE PHYSICS
PHY 46401  INTRODUCTION TO SOLID STATE PHYSICS

Additional Requirements (courses do not count in major GPA)
COMM 15000  INTRODUCTION TO HUMAN COMMUNICATION (KADL)
UC 10097  DESTINATION KENT STATE: FIRST YEAR EXPERIENCE

Foreign Language Requirement (see Foreign Language College Requirement)
Kent Core Composition
Kent Core Humanities and Fine Arts (minimum one course from each)
Kent Core Social Sciences (must be from two disciplines)
Kent Core Basic Sciences (must include one laboratory)
General Electives (total credit hours depends on earning 120 credit hours, including 42 upper-division credit hours)

Minimum Total Credit Hours: 120

1 These courses with a minimum B- or higher fulfill the Validation by Educational Experience (VEE) requirements jointly sponsored by the Society of Actuaries, Casualty Actuarial Society, and Canadian Institute of Actuaries.
2 A minimum C grade must be earned to fulfill the writing-intensive course requirement.
3 A course may only count for one requirement even though it may appear in more than one course list.

Graduation Requirements
Minimum Major GPA  Minimum Overall GPA
2.000  2.000

Foreign Language College Requirement, B.S.
- Students pursuing the Bachelor of Science degree in the College of Arts and Sciences must complete 8 credit hours of foreign language.
- Minimum Elementary I and II of the same language

Roadmap
This roadmap is a recommended semester-by-semester plan of study for this major. However, courses designated as critical (†) must be completed in the semester listed to ensure a timely graduation.

Semester One
COMM 15000  INTRODUCTION TO HUMAN COMMUNICATION (KADL)  3
MATH 12002  ANALYTIC GEOMETRY AND CALCULUS I (KMCR)  5
UC 10097  DESTINATION KENT STATE: FIRST YEAR EXPERIENCE  1

Computer Science Elective  4
Kent Core Requirement  3
Credit Hours  16

Semester Two
MATH 12003  ANALYTIC GEOMETRY AND CALCULUS II  4
MATH 20011  DECISION-MAKING UNDER UNCERTAINTY  3
MATH 21001  LINEAR ALGEBRA  3
Kent Core Requirement  3
Kent Core Requirement  3

Credit Hours  17

Semester Three
ECON 22060  PRINCIPLES OF MICROECONOMICS (KSS)  3
MATH 22005  ANALYTIC GEOMETRY AND CALCULUS III  4
MATH 30055  MATHEMATICAL THEORY OF INTEREST  3
MATH 31011  PROOFS IN DISCRETE MATHEMATICS  3
Foreign Language  4

Credit Hours  17

Semester Four
ECON 22061  PRINCIPLES OF MACROECONOMICS (KSS)  3
MATH 32044  ORDINARY DIFFERENTIAL EQUATIONS  3
MATH 40011  PROBABILITY THEORY AND APPLICATIONS  3
Kent Core Requirement  3
Foreign Language  4

Credit Hours  16

Semester Five
ACCT 23020  INTRODUCTION TO FINANCIAL ACCOUNTING  3
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tr>
<td>MATH 40055</td>
<td>ACTUARIAL MATHEMATICS I (ELR) (WIC)</td>
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<tr>
<td></td>
<td>Mathematics Elective</td>
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<td></td>
<td>Kent Core Requirement</td>
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<tr>
<td></td>
<td><strong>Credit Hours</strong></td>
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<td>Semester Six</td>
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<td>FIN 36053</td>
<td>BUSINESS FINANCE</td>
<td>3</td>
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<td>MATH 40012</td>
<td>THEORY OF STATISTICS</td>
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</tr>
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<td>MATH 40056</td>
<td>ACTUARIAL MATHEMATICS II</td>
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<td></td>
<td>Kent Core Requirement</td>
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<td></td>
<td>Kent Core Requirement</td>
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<td></td>
<td><strong>Credit Hours</strong></td>
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<td>Semester Seven</td>
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<td></td>
<td>Mathematics Elective</td>
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<td><strong>Credit Hours</strong></td>
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<td>Semester Eight</td>
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<td>ECON 32050</td>
<td>APPLIED ECONOMETRICS I (ELR)</td>
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<td>MATH 40059</td>
<td>STOCHASTIC ACTUARIAL MODELS</td>
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<td></td>
<td>General Electives</td>
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<td><strong>Credit Hours</strong></td>
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<td><strong>Minimum Total Credit Hours:</strong></td>
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*Actuarial Mathematics - B.S.*