

ACTUARIAL MATHEMATICS - B.S.

College of Arts and Sciences

Department of Mathematical Sciences
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Kent Campus
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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.

Fully Offered At:

- Kent Campus

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 new freshmen.

Freshman Students on the Regional Campuses: Kent State campuses at Ashtabula, East Liverpool, Geauga, Salem, Stark, Trumbull and Tuscarawas, as well as the Regional Academic Center in Twinsburg, 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 or minimum 48 PTE 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	1
Course is not required for students with 25 transfer credits, excluding College Credit Plus, or age 21+ at time of admission.	
Diversity Domestic/Global (DIVD/DIVG)	2 courses
Students must successfully complete one domestic and one global course, of which one must be from the Kent Core.	
Experiential Learning Requirement (ELR)	varies
Students must successfully complete one course or approved experience.	
Kent Core (see table below)	36-37
Writing-Intensive Course (WIC)	1 course
Students must earn a minimum C grade in the course.	
Upper-Division Requirement	39 (or 42)
Students 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	120
Some bachelor's degrees require students to complete more than 120 credit hours.	

Kent Core Requirements

Kent Core Composition (KCMP)	6
Kent Core Mathematics and Critical Reasoning (KMCR)	3
Kent Core Humanities and Fine Arts (KHUM/KFA) (min one course each)	9
Kent Core Social Sciences (KSS) (must be from two disciplines)	6
Kent Core Basic Sciences (KBS/KLAB) (must include one laboratory)	6-7
Kent Core Additional (KADL)	6
Total Credit Hours:	36-37

Program Requirements

Major Requirements

Code	Title	Credit Hours
Major Requirements (courses count in major GPA)		
ACCT 23020	INTRODUCTION TO FINANCIAL ACCOUNTING ¹	3
ECON 22060	PRINCIPLES OF MICROECONOMICS (KSS) ¹	3
ECON 22061	PRINCIPLES OF MACROECONOMICS (KSS) ¹	3
ECON 32050	APPLIED ECONOMETRICS I (ELR)	3
FIN 36053	BUSINESS FINANCE ¹	3
MATH 12002	ANALYTIC GEOMETRY AND CALCULUS I (KMCR) (min C grade)	5
MATH 12003	ANALYTIC GEOMETRY AND CALCULUS II (min C grade)	5
MATH 20011	DECISION-MAKING UNDER UNCERTAINTY	3
MATH 21001	LINEAR ALGEBRA (min C grade)	3
MATH 22005	ANALYTIC GEOMETRY AND CALCULUS III (min C grade)	4
MATH 30055	MATHEMATICAL THEORY OF INTEREST (min C grade)	3
MATH 31011	PROOFS IN DISCRETE MATHEMATICS	3
MATH 32044	ORDINARY DIFFERENTIAL EQUATIONS	3
MATH 40011	PROBABILITY THEORY AND APPLICATIONS	3
MATH 40012	THEORY OF STATISTICS	3
MATH 40055	ACTUARIAL MATHEMATICS I (ELR) (WIC) ²	4
MATH 40056	ACTUARIAL MATHEMATICS II	4
MATH 40059	STOCHASTIC ACTUARIAL MODELS	3
Computer Science Elective, choose from the following: 4		
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: 6		
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) (WIC) ²	
MATH 42002	ANALYSIS II (ELR) (WIC) ²	
MATH 42021	GRAPH THEORY AND COMBINATORICS	
MATH 42031	MATHEMATICAL MODELS AND DYNAMICAL SYSTEMS	
MATH 42039	MODELING PROJECTS (ELR) (WIC) ²	
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	
Allied Area Elective, choose from the following: ³		3
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 43087	INTERNATIONAL ACCOUNTING EXPERIENCE	
BSCI 30050	HUMAN GENETICS	
BSCI 40020	BIOLOGY OF AGING	
BUS 30187	INTERNATIONAL BUSINESS EXPERIENCE	
BUS 30234	INTERNATIONAL BUSINESS	
CHEM 30050	INTRODUCTION TO MATERIALS CHEMISTRY	
CHEM 30105	ANALYTICAL CHEMISTRY I	
CHEM 30106	ANALYTICAL CHEMISTRY II	
CHEM 30301	INORGANIC CHEMISTRY I	
CHEM 40302	INORGANIC CHEMISTRY II	
CHEM 40303	INORGANIC CHEMISTRY III	
CHEM 40555	PHYSICAL CHEMISTRY I	
CHEM 40556	PHYSICAL CHEMISTRY II	
CHEM 40559	NANOMATERIALS	
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 MGMT AND BUS INTELL 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 ARCHITECTURE	
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	GEOL 42030	REMOTE SENSING	
CS 44003	MOBILE APPS IN IOS PROGRAMMING	GEOL 42035	SCIENTIFIC METHODS IN GEOLOGY	
CS 44105	WEB PROGRAMMING I	MATH 40015	APPLIED STATISTICS	
CS 44106	WEB PROGRAMMING II	MATH 40024	COMPUTATIONAL STATISTICS	
CS 44201	ARTIFICIAL INTELLIGENCE	MATH 40028	STATISTICAL LEARNING	
CS 45203	COMPUTER NETWORK SECURITY	MATH 40051	TOPICS IN PROBABILITY THEORY AND STOCHASTIC PROCESSES	
CS 45231	INTERNET ENGINEERING	MATH 41001	MODERN ALGEBRA I (ELR) (WIC)	
CS 46101	DESIGN AND ANALYSIS OF ALGORITHMS	MATH 41002	MODERN ALGEBRA II (ELR) (WIC)	
CS 47101	COMPUTER GRAPHICS	MATH 41021	THEORY OF MATRICES	
CS 47205	INFORMATION SECURITY	MATH 42001	ANALYSIS I (ELR) (WIC)	
CS 47206	DATA SECURITY AND PRIVACY	MATH 42002	ANALYSIS II (ELR) (WIC)	
CS 47207	DIGITAL FORENSICS	MATH 42021	GRAPH THEORY AND COMBINATORICS	
CS 47221	INTRODUCTION TO CRYPTOLOGY	MATH 42031	MATHEMATICAL MODELS AND DYNAMICAL SYSTEMS	
CS 48101	GAME ENGINE CONCEPTS	MATH 42039	MODELING PROJECTS (ELR) (WIC)	
ECON 32025	MONEY, CREDIT AND BANKING	MATH 42041	ADVANCED CALCULUS	
ECON 32040	INTERMEDIATE MICROECONOMIC THEORY AND APPLICATIONS	MATH 42045	PARTIAL DIFFERENTIAL EQUATIONS	
ECON 32041	INTERMEDIATE MACROECONOMIC THEORY AND POLICY	MATH 42048	COMPLEX VARIABLES	
ECON 32051	APPLIED ECONOMETRICS II	MATH 42201	NUMERICAL COMPUTING I	
ECON 42050	DATA ACQUISITION, PREPARATION AND VISUALIZATION	MATH 42202	NUMERICAL COMPUTING II	
ECON 42065	PROBLEMS OF MONETARY AND FISCAL POLICY	MATH 45011	DIFFERENTIAL GEOMETRY	
ECON 42070	GAME THEORY	MATH 45021	EUCLIDEAN GEOMETRY	
ECON 42085	PUBLIC ECONOMICS: GOVERNMENT AND POLICY	MATH 45022	LINEAR GEOMETRY	
ECON 42086	ECONOMICS OF HEALTH CARE	MATH 46001	ELEMENTARY TOPOLOGY	
FIN 36054	INTERMEDIATE CORPORATE FINANCE	MATH 47011	THEORY OF NUMBERS	
FIN 36059	INTERMEDIATE INVESTMENTS	MATH 47021	HISTORY OF MATHEMATICS	
FIN 36081	PRINCIPLES OF INSURANCE	MGMT 34060	OPERATIONS MANAGEMENT	
FIN 36085	ADVANCED FINANCIAL MODELING	PHIL 41035	PHILOSOPHY OF SCIENCE	
FIN 46054	FINANCIAL RISK MANAGEMENT	PHIL 41038	INTERMEDIATE LOGIC	
FIN 46055	ADVANCED DERIVATIVE SECURITIES	PHIL 41045	METALOGIC	
FIN 46064	INTERNATIONAL BUSINESS FINANCE	PHY 34000	COSMOLOGY	
FIN 46067	ADVANCED PORTFOLIO ANALYSIS	PHY 35101	CLASSICAL MECHANICS	
FIN 46087	INTERNATIONAL FINANCE EXPERIENCE	PHY 36001	INTRODUCTORY MODERN PHYSICS	
GEOG 31062	FUNDAMENTALS OF METEOROLOGY	PHY 36002	APPLICATIONS OF MODERN PHYSICS	
GEOG 31064	PRINCIPLES OF CLIMATOLOGY	PHY 44802	ASTROPHYSICS	
GEOG 35065	GEOGRAPHY OF TRANSPORTATION AND SPATIAL INTERACTION	PHY 45201	ELECTROMAGNETIC THEORY	
GEOG 39002	STATISTICAL METHODS IN GEOGRAPHY	PHY 45301	THERMAL PHYSICS	
GEOG 41065	APPLIED CLIMATOLOGY	PHY 45401	MATHEMATICAL METHODS IN PHYSICS	
GEOG 44070	SPATIAL ANALYSIS AND LOCATION THEORY	PHY 45403	DATA ANALYSIS AND COMPUTATIONAL PHYSICS TECHNIQUES	
GEOG 49070	GEOGRAPHIC INFORMATION SCIENCE	PHY 45501	ELECTROMAGNETIC WAVES AND MODERN OPTICS	
GEOG 49080	ADVANCED GEOGRAPHIC INFORMATION SCIENCE	PHY 46101	QUANTUM MECHANICS	
GEOG 49085	WEB AND MOBILE GEOGRAPHIC INFORMATION SCIENCE	PHY 46301	INTRODUCTION TO NUCLEAR AND PARTICLE PHYSICS	
GEOG 49162	CARTOGRAPHY AND GEOVISUALIZATION	PHY 46401	INTRODUCTION TO SOLID STATE PHYSICS	
GEOG 49163	CARTOGRAPHY AND GEOVISUALIZATION LABORATORY	Additional Requirements (courses do not count in major GPA)		
GEOG 49230	REMOTE SENSING	COMM 15000	INTRODUCTION TO HUMAN COMMUNICATION (KADL)	3
GEOL 31080	STRUCTURAL GEOLOGY	UC 10097	DESTINATION KENT STATE: FIRST YEAR EXPERIENCE	1
GEOL 32066	GEOMORPHOLOGY	Foreign Language Requirement (see Foreign Language College Requirement)		8
GEOL 41025	GENERAL GEOPHYSICS	Kent Core Composition		6
GEOL 41080	TECTONICS AND OROGENY	Kent Core Humanities and Fine Arts (minimum one course from each)		9
		Kent Core Social Sciences (must be from two disciplines)		3
		Kent Core Basic Sciences (must include one laboratory)		6-7

General Electives (total credit hours depends on earning 120 credit hours, including 42 upper-division credit hours)	10
Minimum Total Credit Hours:	120

- ¹ These courses with a minimum B- grade 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

- Students pursuing the Bachelor of Science degree in the College of Arts and Sciences must complete 8 credit hours of foreign language.¹
- Minimum Elementary I and II of the same language

- ¹ All students with prior foreign language experience should take the foreign language placement test to determine the appropriate level at which to start. Some students may begin their university foreign language experience beyond the Elementary I level and will complete the requirement with fewer credit hours and fewer courses. This may be accomplished by: (1) passing a course beyond the Elementary I through Intermediate II level or (2) receiving credit through Credit by Exam (CBE), the College Level Examination Program (CLEP), the Advanced Placement (AP) exam or credit through the International Baccalaureate (IB) program; or (3) being designated a "native speaker" of a non-English language (consult with the College of Arts and Sciences Advising Office for additional information). When students complete the requirement with fewer than 8 credit hours and two courses, they will complete the remaining hours with general electives.

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		Credits
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	5
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
MATH 40055	ACTUARIAL MATHEMATICS I (ELR) (WIC)	4
Mathematics Elective		3
Kent Core Requirement		3
Credit Hours		13

Semester Six		
FIN 36053	BUSINESS FINANCE	3
MATH 40012	THEORY OF STATISTICS	3
MATH 40056	ACTUARIAL MATHEMATICS II	4
Kent Core Requirement		3
Kent Core Requirement		3
Credit Hours		16

Semester Seven		
Allied Area Elective		3
Mathematics Elective		3
Kent Core Requirement		3
General Electives		6
Credit Hours		15

Semester Eight		
ECON 32050	APPLIED ECONOMETRICS I (ELR)	3
MATH 40059	STOCHASTIC ACTUARIAL MODELS	3
General Electives		4
Credit Hours		10
Minimum Total Credit Hours:		120