

Proposal for the Provisional Status of the BS ACTUARIAL SCIENCES MAJOR in the College of Arts and Sciences

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1. Description

This program is designed for students who have a goal of entering into the actuarial profession, risk management or financial sector in general. Actuaries are skilled professions who measure, assess, analyze and manage risk. The Society of Actuaries (SOA) and the Casualty Actuarial Society (CAS) administer their own battery of exams that guide actuaries along their career track into various specialties and sub-specialties. Our new Actuarial Sciences program provides a strong foundation in mathematics, statistics and finance. This program will prepare students to pass their initial professional actuarial exams and compete in the marketplace.

We will judge our success by how well our program prepares students for the actuarial profession. There is no accreditation process for actuarial sciences, but the actuarial exams provide a concrete measurement of student preparation. To be an Actuarial Associate, candidates must pass a battery of preliminary exams and receive Validation by Educational Experiences (VEE) in three areas:

- Applied Statistical Methods
- Corporate Finance
- Economics

Our new program will prepare students to pass the first two preliminary exams: P (probability) and FM (financial mathematics) and meet the requirements for all three VEE areas. Ideally, these students will be connected to an internship in the summer of their sophomore or junior year through the GET program. The internship would meet the DLE requirement.

2. Rationale and demand.

Academic Priorities: Delaware remains a hub of the banking and finance industry. During recruiting events, students regularly approach the math table to ask about preparation for actuarial careers, and this is not surprising. According to a 2010 Georgetown University study, the unemployment rate for actuaries was 0%! Whether UD provides a program in Actuarial Sciences or not, many of our math majors move into this field. When Prof. Rossi polled the 82 Mathematics and Economics majors in the Fall of 2011 and asked "Are you interested in pursuing a career in actuarial sciences?" 43 responded. Of the 43, 42 stated that they were planning to pursue a career in actuarial sciences.

Currently, students who are interested in actuarial sciences normally complete a

BS in Mathematics and Economics (MAEC). This is sub-optimal for several reasons:

- The actuarial profession relies on a combination of standardized examinations and specific completed coursework in hiring and promotion decisions. Hence a program tailored to those requirements will provide better preparation.
- The MAEC degree was designed for students wishing to attend graduate school in economics. Removing actuarial students from this major will benefit them as well as allowing the MAEC curriculum to be focused on the students for whom it was originally designed.
- Most of our comparator institutions have either a major or minor specifically designated as “actuarial science”. Potential students know it, and question the department about UD’s commitment to this area. Having a program specifically designated as “actuarial science” will allow UD to compete more strongly for the best students interested in this area.

Planning process: Prof. Rossi initiated the process in the Fall of 2011. To design the Actuarial Sciences program, he worked with his colleague Prof. David Edwards who has passed several actuarial exams as well as counterparts in the Departments of Accounting and Management Information Systems, Economics, Finance, and Applied Economics and Statistics (formerly Department of Food and Resource Economics). We also consulted with the SOA to make sure our new program would meet their VEE requirements. After consultations with all parties and a vetting by the Mathematical Sciences Undergraduate Studies Committee, we arrived at the version which we are submitting for approval.

Transferability: We expect roughly 30-40 students from our Mathematics and Economics program to change majors into the new program. The programs are flexible enough that we believe this will not require many accommodations. When these are required, they will be made on a case-by-case basis so as to minimize the amount of extra course work needed by transferring students, without compromising the principal goals of the major.

Demand and employment factors: This program is designed to prepare mathematics majors for a career in the actuarial sciences, and we anticipate the vast majority of students earning this degree will gain employment as actuaries. As stated earlier, this is a sector boasting 0% unemployment, and a large number of our mathematics majors and prospective students are excited about this degree program. We emphasize that it is a mathematics degree. Students completing this degree will be prepared for a career in any field requiring a deep knowledge of mathematics.

Regional, state and national factors: Actuarial sciences is a very common option offered by mathematics departments regionally and nationally. For example, programs exist regionally at Pennsylvania State, Temple (master's degree), University of Pittsburgh and University of Pennsylvania. There is no

accreditation required.

Strengths: The University of Delaware offers two unique advantages as a home for an actuarial sciences program. First, Delaware is a banking, finance and corporate hub so there are many employment opportunities for students who have a deep and broad knowledge of risk management. Second, the Management Information Systems program runs the Global Enterprise Technologies (GET) minor where students earn credit while completing internships with industrial partners. Two partners, JP Morgan and Nationwide Insurance, have already expressed an interest in our proposed program and would like to have these math majors involved in their internship program. More than ever, business decisions are being driven by analytics and big data which will place students like ours with knowledge of both computational mathematics and finance in high demand. At the same time, many math majors have expressed interest in participating in such a program.

Enrollment, admissions and financial aid: The admission and financial aid criteria are the same as for the BS in Mathematics.

Curriculum specifics:

DEGREE: BACHELOR OF SCIENCE

MAJOR: ACTUARIAL SCIENCES

CURRICULUM

CREDITS

UNIVERSITY REQUIREMENTS

[ENGL 110](#) Critical Reading and Writing
(minimum grade C-)

3

[First Year Experience](#) (FYE)

0-4

[University Breadth Requirement](#) (minimum grade C-)

12

[Discovery Learning Experience](#) (DLE)

3

[Multi-cultural Course](#)

3

COLLEGE REQUIREMENTS

Writing: (minimum grade C-)

3

A second writing course involving significant writing experience including two papers with a combined minimum of 3,000 words to be submitted for extended faculty critique of both composition and content. This course must be taken after completion of 60 credit hours.

[College of Arts and Sciences Breadth Requirements:](#) (minimum grade C-)

The College Breadth Requirements are in addition to the University Breadth Requirement. Up to 3 credits from each of the University Breadth Requirement categories may be used to simultaneously satisfy these College of Arts and Sciences Breadth Requirements.

A total of eighteen credits from Groups A, B and C is required with six credits 18 from each group. The six credits from each group could be from the same area.

Group A: Creative Arts and Humanities	6
Group B: History and Cultural Change	6
Group C: Social and Behavioral Sciences	6

MAJOR REQUIREMENTS

A grade of C- or better is required for major courses and related work. Students lacking adequate preparation for [MATH 242](#) should begin with [MATH 241](#).

Mathematics/Statistics Cluster

MATH 210	Discrete Mathematics I	3
MATH 242	Analytic Geometry and Calculus B	4
MATH 243	Analytic Geometry and Calculus C	4
MATH 302	Ordinary Differential Equations	3
MATH 349	Elementary Linear Algebra	3
MATH 426	Numerical Analysis and Algorithmic Computations	3
MATH 529	Fundamentals of Optimization	
MATH 530	Applications of Mathematics in Economics (capstone)	3
STAT 621	Survival Analysis	3
STAT 674	Applied Data Base Management	3

One of the following: 1

[MATH 268](#) Perspectives on Mathematics

or

[UNIV 101](#) First Year Experience I

One of the following sequences: 6

Option A

[MATH 350](#) Probability Theory and Simulation Methods

[MATH 450](#) Mathematical Statistics

Option B

[STAT 470](#) Introduction to Statistical Analysis I

[STAT 471](#) Introduction to Statistical Analysis II

Economics Cluster

[ECON 151](#) Introduction to Microeconomics: Prices and Markets 3

[ECON 152](#) Introduction to Macroeconomics: The National Economy 3

[ECON 301](#) Quantitative Microeconomic Theory 3

[ECON 303](#) Intermediate Macroeconomic Theory 3

[ECON 422](#) Econometric Methods and Models I 3

[ECON 423](#) Econometric Methods and Models II 3

Accounting/Finance Cluster

ACCT 207	Accounting I	3
FINC 311	Principles of Finance	3
FINC 312	Intermediate Financial Management	3

Computational Cluster

CISC 106	General Computer Science for Engineers	3
CISC 181	Introduction to Computer Science II	3
MISY 330	Database Design and Implementation	3

ELECTIVES

After the required courses are completed, sufficient elective credits must be taken to meet the minimum credit requirement for the degree. See the Department of Mathematical Sciences web site for suggestions on particular electives useful for actuaries.

Initially, we will recommend the following courses.

MATH 428, FINC 314, FINC 416, FINC 417, STAT 409, STAT 611, STAT 613, STAT 619, STAT 675, CISC 220.

Credits to total a minimum of 124.

Resources: The new Actuarial Sciences will not require any additional resources.

Implementation and evaluation: The program will be deployed in Fall of 2012. Initially, we expect many Mathematics and Economics students to change into the Actuarial Sciences program. The two programs are similar enough during the first years that this will go smoothly. To assess the program, we will track students as they take Exams P and FM, complete internships and find jobs in the industry.

Appendices:

Letters of support from Departments of Accounting and Management Information Systems, Economics, Finance, and Applied Economics and Statistics (formerly Department of Food and Resource Economics) are attached separately.