UNIVERSITY FACULTY SENATE FORMS

Academic Program Approval

This form is a routing document for the approval of new and revised academic programs. Proposing department should complete this form. For more information, call the Faculty Senate Office at 831-2921.

Submitted by: __Louis Rossi_____phone number_____x1880___

Department: ___Mathematical Sciences_email ___rossi@math.udel.edu

Date: _____October 10, 2012_____

Action: _____Add Major_____
<div style="text-align:center">(Example: add major/minor/concentration, delete major/minor/concentration, revise major/minor/concentration, academic unit name change, request for permanent status, policy change, etc.)</div>

Effective term_____13F_____
<div style="text-align:center">(use format 04F, 05W)</div>

Current degree_____n/a_____
<div style="text-align:center">(Example: BA, BACH, BACJ, HBA, EDD, MA, MBA, etc.)</div>

Proposed change leads to the degree of: _____BS_____
<div style="text-align:center">(Example: BA, BACH, BACJ, HBA, EDD, MA, MBA, etc.)</div>

Proposed name:_____Actuarial Sciences (MASC)_____
<div style="text-align:center">Proposed new name for revised or new major / minor / concentration / academic unit
(if applicable)</div>

Revising or Deleting:

Undergraduate major / Concentration:_____
<div style="text-align:center">(Example: Applied Music – Instrumental degree BMAS)</div>

Undergraduate minor:_____
<div style="text-align:center">(Example: African Studies, Business Administration, English, Leadership, etc.)</div>

Graduate Program Policy statement change:_____
<div style="text-align:center">(**Must attach** your Graduate Program Policy Statement)</div>

Graduate Program of Study:_____
<div style="text-align:center">(Example: Animal Science: MS Animal Science: PHD Economics: MA Economics: PHD)</div>

Graduate minor / concentration:_____

Note: all graduate studies proposals must include an electronic copy of the Graduate Program Policy Document, highlighting the changes made to the original policy document.

List new courses required for the new or revised curriculum. How do they support the overall program objectives of the major/minor/concentrations)?
 (Be aware that approval of the curriculum is dependent upon these courses successfully passing through

the Course Challenge list. If there are no new courses enter "None")

None

Explain, when appropriate, how this new/revised curriculum supports the 10 goals of undergraduate education: http://www.ugs.udel.edu/gened/

Goal 1: Students in the major will attain effective skills in quantitative reasoning and information technology skills through their normal coursework in MATH, STAT, CISC, and MISY.

Goal 3: Students will work and learn both independently and collaboratively as they complete the curriculum.

Goal 6: The actuarial profession requires lifelong learning through a series of examinations and research needed to progress professionally. By starting them on this process, this major will develop the necessary intellectual curiosity, confidence, and engagement.

Goal 7: Through internships in the GET program or with employers, students will develop the ability to integrate academic knowledge with experiences that extend the boundaries of the classroom, in particular the businesses that will soon employ them.

Identify other units affected by the proposed changes:
(Attach permission from the affected units. If no other unit is affected, enter "None")

ECON, FREC, FINC, MISY

Describe the rationale for the proposed program change(s):
(Explain your reasons for creating, revising, or deleting the curriculum or program.)

During recruiting events, students regularly approach the math table to ask about preparation for actuarial careers. And no wonder: according to a 2010 Georgetown University study, the unemployment rate for actuaries was 0%!

Currently, students who are interested in actuarial sciences normally complete a BS in Mathematics and Economics (MAEC). However, this is suboptimal 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.

Therefore, the Department is proposing a new Bachelor of Science in Actuarial Sciences (MASC). This program is recommended for

students whose goals are to enter into the actuarial profession, risk management, or the financial sector in general. This program provides a strong foundation in mathematics, statistics and finance, and will prepare students to pass their initial professional actuarial exams and to compete in the marketplace.

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.

Currently we have about 15 MAEC majors per class who are interested in actuarial sciences. We would expect those students to shift to the MASC degree. In addition, we would expect having a program specifically designated as ''actuarial sciences'' would help recruitment of additional majors.

Program Requirements:
(Show the new or revised curriculum as it should appear in the Course Catalog. If this is a revision, be sure to indicate the changes being made to the current curriculum and **include a side-by-side comparison** of the credit distribution before and after the proposed change.)

DEGREE: BACHELOR OF SCIENCE
MAJOR: ACTUARIAL SCIENCES

CURRICULUM   CREDITS

UNIVERSITY REQUIREMENTS
ENGL 110   Critical Reading and Writing   3
(minimum grade C-)

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.

: (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

Any substitutions must be approved by the department Undergraduate Studies Committee.

ELECTIVES

After required courses are completed, sufficient elective credits must be taken to meet the minimum credit requirement for the degree. See the department Web page for suggestions on particular electives useful for actuaries.

(Internal note: Currently this list would include 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**

ROUTING AND AUTHORIZATION: (Please do not remove supporting documentation.)

Department Chairperson _____Date_____

Dean of College_____Date_____

Chairperson, College Curriculum Committee_____Date_____

Chairperson, Senate Com. on UG or GR Studies_____Date_____

Chairperson, Senate Coordinating Com._____Date_____

Secretary, Faculty Senate_____Date_____

Date of Senate Resolution_____Date to be Effective_____

Registrar _____Program Code_____Date_____

Vice Provost for Academic Affairs & International Programs_____Date_____

Provost   _____Date_____

Board of Trustee Notification _____Date_____

Revised 02/09/2009   /khs

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

**Prepared by Professor Louis F Rossi
Undergraduate Director for the Department of Mathematical Sciences**

1. Description

This program is designed for students who have a goal of entering into the actuarial profession, risk management or the 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) administers its own batteries 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 no wonder: 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 responded 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 suboptimal 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 vetting by the Mathematical Sciences Undergraduate Studies Committee, we arrived at the version which have submitted 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 states 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   3
(minimum grade C-)

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
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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

Course	Title	Credits
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

Course	Title	Credits
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 required courses are completed, sufficient elective credits must be taken to meet the minimum credit requirement for the degree. See the department Web page 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.

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 program. The programs are similar enough during the first years that we expect this to 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.

UNIVERSITY FACULTY SENATE

Resolution

Whereas the actuarial sciences offers a rigorous and rewarding career in the application of mathematics to risk management, and

Whereas there is considerable interest among high quality prospective students and mathematics majors in our program in pursuing actuarial sciences as a career, and

Whereas the creation of this program will create new and exciting opportunities for collaboration between students, faculty and employers in the insurance and financial sectors, and

Whereas the Department of Mathematical Sciences, Accounting and Management Information Systems, Applied Economics and Statistics have collaborated in designing this program, and

Whereas, this program does not require major additional resources in order to run successfully, be it therefore

Resolved that the BS major in Actuarial Sciences be granted provisional status in the College of Arts and Sciences.

To: Louis F. Rossi, Director
              Undergraduate Studies

From: James L. Butkiewicz, Chairman
              Department of Economics

Subject: Actuarial Sciences Program

Date: October 8, 2012

        The faculty of the Department of Economics are supportive of the proposed major in Actuarial Sciences. The proposed major includes an economics cluster of six courses. Based on current enrollment projections, and also given that the major will draw students from the existing Mathematics and Economics major, students in the program can be accommodated through existing courses.

        The demand for actuaries is very strong, so this program will be a welcome addition for interested students. We are happy to support this proposed program.

cc: Dean Weber
              Deputy Dean Andrews

University of Delaware

Alfred Lerner College of Business & Economics

DEPARTMENT OF FINANCE

TO: Louis F. Rossi, Professor and Director of Undergraduate Studies
            Department of Mathematical Sciences

FROM: Helen Bowers, Associate Professor and Chair
            Department of Finance

DATE: September 18, 2012

RE: Letter of support for the proposed major in Actuarial Sciences (MASC)

The Department of Finance strongly supports the proposed major in Actuarial Sciences (MASC).

We understand that FINC311 Principles of Finance and FINC312 Intermediate Financial Management are required courses in this program. The Department of Finance agrees to make both of these courses available to students majoring in Actuarial Sciences who have met the prerequisites.

We also agree to make the following courses available, as elective courses, to students in the Actuarial Sciences major who have met the prerequisites: FINC314 Investments, FINC413 Advanced Corporate Finance, FINC416 Derivative Securities and Risk Management, and FINC419 Financial Modeling and Valuation.

We appreciate the opportunity to work with the Department of Mathematical Sciences on offering the Actuarial Sciences major.

October 10, 2012.

Professor Louis Rossi,
Department of Mathematical Sciences
University of Delaware
Newark, DE 19716

Dear Professor Rossi,

Re: Letter of Support for BS in Actuary Science Degree

The Department of Applied Economics and Statistics (APEC) is pleased to support the newly proposed BS in Actuary Science degree in the Department of Mathematical Sciences. We are in support of your plan to use four of our courses (STAT 470 / 471 / 621 / 674) as part of the required courses for the degree. My department is excited to be a part of this initiative and looks forward to having your students in the classroom. Please contact me if I can be of additional assistance in this process.

Sincerely,

Titus O. Awokuse
Professor and Chair

Subject:

Actuarial Sciences

From:

"Jones, Scott K." <sjones@UDel.Edu>

Date:

10/09/2012 02:13 PM

To:

"Rossi, Louis F" <lfrossi@UDel.Edu>

Dear Prof. Rossi,

The Department of Accounting and Management Information Systems enthusiastically supports the proposed major in Actuarial Sciences at UD. We believe it will attract excellent students to some of our courses and create an excellent program at UD. We understand that students, roughly a dozen per year, will be required to take ACCT 207 and MISY 330. We believe this will not have a major impact on the courses we offer, and we can accept these students into our classes. We also understand that some students may wish to enter the GET program and complete an MISY minor. We will make the required courses available to Actuarial Science students.

We look forward to working with the Department of Mathematical Sciences to make this program a success.

Sincerely,

Scott Jones, PhD

Professor & Chairperson

Department of Accounting & Management Information Systems

206 Purnell Hall

Universty of Delaware

Newark, DE 19716

302-831-8278

Checklist for Curriculum Proposals

__. 1. Are all **signatures on the hard copy of the proposal?**

_X_. 2. Is the **effective date** correct?

_X_. 3. Is the **rationale** for the proposal consistent with the changes proposed?

_X_. 4. Does the proposed **number of credits** match the stated
        number?

_X_. 5. Have affected units been identified and contacted? Are required **support letters** attached?

_X_. 6. Is a **resolution** necessary? If so, is it attached?

(Necessary for: establishing a major; disestablishing a major; a name change to any program with permanent status; a name change to a department or college; a transfer or creation of any department; request for permanent status).

_X_. 7. Are all **courses (required or referenced)** in the UDSIS Inventory or in the approval process?

_X_. 8. Are all **university requirements** correctly specified?

    _X_. A. Breadth requirements.

    _X_. B. Multicultural requirement.

    _X_. C. Writing requirement.

    _X_. D. DLE requirement.

_X_. 9. Are all **college requirements** correctly specified?

___. 9. Is a **side-by-side comparison** provided?