

1. Overview

A. Provide a brief description of the new certificate.

Actuarial Science is an area of mathematical and statistical sciences that requires expertise in specializations of probability and interest theory, together with working knowledge of accounting, finance and economics. This certificate will allow students to select classes to further their expertise in these areas.

B. This proposed certificate (check one):

- Is cross disciplinary; or
- Is certified by a professional or accredited organization/governmental agency; or,
- Clearly leads to advanced specialization in a field; or,
- Is granted to a program that does not currently have a major.

C. Why should this be a certificate rather than a concentration or a minor?

In addition to current students, industry is full of professionals who will value the opportunity to obtain actuarial expertise specific to the Society of Actuaries (SOA) and Casualty Actuarial Society (CAS) credentialing process. In order to make that program accessible to post-baccalaureate and graduate students it is important that this program stand alone.

D. Affiliation

If the certificate program is affiliated with a degree program, include a brief statement of how it will complement the program. If it is not affiliated with a degree program, incorporate a statement as to how it will provide an opportunity for a student to gain knowledge or skills not already available at ASU.

This certificate would be attractive to students in degrees related to actuarial science, such as, Mathematics, Applied Mathematics, Finance, Economics and Business. It would be appropriate for students seeking certification from the SOA and CAS and graduates will be well prepared for all the preliminary actuarial exams jointly administered by the two major North American Societies.

E. Demand

Explain the need for the new certificate (e.g., market demand, interdisciplinary considerations).

There is significant market demand for employees with actuarial expertise, particularly pertaining to the credentialing system of the SOA and CAS. For those who already hold a Bachelor's degree in a field related to Actuarial Sciences, such as Mathematics or Finance, this certificate will provide classes in actuarial science that will make them more marketable and desirable to employers in insurance, finance, and risk management.

F. Projected enrollment

What are enrollment projections for the first three years?

	1st Year	2nd Year (Yr. 1 continuing + new entering)	3rd Year (Yr. 1 & 2 continuing + new entering)
Number of Students (Headcount)	15	30	45

2. Support and Impact

A. Faculty governance

Provide a supporting letter from the chair of the academic unit verifying that the proposed certificate has received faculty approval through appropriate governance procedures in the unit and that the unit has the resources to support the certificate as presented in the proposal, without impacting core program resources.

see attached

B. Other related programs

Identify other related ASU programs and outline how the new certificate will complement these existing ASU programs. (If applicable, statements of support from potentially-affected academic unit administrators need to be included with this proposal submission.)

Actuaries come from an array of different undergraduate programs. Students completing degrees in Finance, Economics, Mathematics, and Business will be able to add this certificate ensuring that they have training in Actuary specific skills.

C. Letter(s) of support

Provide a supporting letter from each college/school dean from which individual courses are taken.

3. Academic Curriculum and Requirements

A. Knowledge, competencies, and skills

List the knowledge, competencies, and skills (learning outcomes) students should have when they complete this proposed certificate. Examples of program learning outcomes can be found at (<http://www.asu.edu/oue/assessment.html>).

Graduates of the Certificate in Actuarial Science will:

1. Analyze contingent cash flows with a combination of mathematical and statistical modeling techniques according to economic and financial principles.
2. Be well prepared for credentialing actuarial exams jointly administered by the Society of Actuaries (SOA) and the Casualty Actuarial Society (CAS).

B. Admissions criteria

List the admissions criteria for the proposed certificate. If they are identical to the admission criteria for the existing major and degree program under which this certificate will be established, please note that here.

Although no specific degree is required for admission to the actuarial science certificate, a strong mathematical background is essential (found in majors including mathematics, statistics, engineering, and natural sciences). Students with a major or degree other than those listed will require additional preparation beyond the certificate. Course prerequisites include: 3.00 GPA minimum, and B or better in Multivariate Calculus, Linear Algebra, Introductory Statistics, and Computer Programming coursework (completed at ASU or an equivalent institution).

Students admitted to study at Arizona State University are eligible to pursue the requirements of a certificate. In order to be admitted to the university, complete the Office of Admission online application. Please contact the unit for additional information.

C. Curricular structure

Provide the curricular structure for this certificate. Be specific in listing required courses and specify the total minimum number of hours required for the certificate.

Required certificate courses

Prefix	Number	Title	Is this a new Course?	Credit Hours
		Students must select a minimum of 15 credit hours from the approved course list of upper-division ACT courses See attached list of courses.	(Select one)	
			(Select one)	
			(Select one)	
			(Select one)	
<i>Section sub-total:</i>				0

Elective certificate courses

Prefix	Number	Title	Is this a new Course?	Credit Hours
		see attached	(Select one)	
			(Select one)	
			(Select one)	
<i>Section sub-total:</i>				15

Other certificate requirements

E.g. – Capstone experience, internship, clinical requirements, field studies, foreign language skills as applicable

Credit Hours

Section sub-total: 0

Total minimum credit hours required for certificate 15

D. Minimum residency requirement

How many hours of the certificate must be ASU credit?

15

E. New Courses

Provide a brief course description for each new course.

ACT 310 – Mathematics of Finance: The guiding principle for this course is that potential actuaries should master the Exam FM/2 syllabus. The goal of this course is to provide an understanding of the fundamental concepts of financial mathematics, and how those concepts are applied in calculating present and accumulated values for various streams of cash flows as a basis for future use in: reserving, valuation, pricing, asset/liability management, investment income, capital budgeting, and valuing contingent cash flows. Topics include: mathematics of compound interest, including annuities certain, amortization schedules, yields curves, sinking funds and bonds. The student will also be given an introduction to financial instruments, including derivatives, and the concept of no-arbitrage as it relates to financial mathematics.

ACT 415 – Probability for Risk Management: The guiding principle for this course is that potential actuaries should master the Exam P/1 syllabus. The purpose of this course is to develop knowledge of the fundamental probability tools for quantitatively assessing risk. Topics include: introduction to probability concepts, including definition of probability, independence, conditional probability, random variables, specific discrete and continuous probability distributions, multivariate random variables, moments and moment generating functions, functions of random variables, sampling distributions, and central limit theorem. The application of these tools to problems encountered in actuarial science is emphasized.

ACT 430 – Mathematics of Financial Derivatives: The guiding principle for this course is that potential actuaries should master the Exam MFE/3 syllabus. The purpose of this course is to develop knowledge of the theoretical basis of certain actuarial models and the application of those models to insurance and other financial risks. Topics include: option pricing, Black-Scholes formula, delta hedging, exotic options, Brownian motion, interest rate models and simulations.

ACT 440 – Life Contingencies I: The guiding principle for this course is that potential actuaries should master the first half of the Exam MLC/4 syllabus. The purpose of this course is to develop the student’s knowledge of the theoretical basis of life contingent actuarial models and the application of those models to insurance and other financial risks. Topics include: life tables, present value determination for life insurances and annuities, benefit premiums and reserves.

ACT 441 – Life Contingencies II: The guiding principle for this course is that potential actuaries should master the second half of the Exam MLC/4 syllabus. The purpose of this course is to develop the student’s knowledge of the theoretical basis of life contingent actuarial models and the application of those models to insurance and other financial risks. Topics include: multiple life functions, multiple decrement models and benefit reserves.

ACT 450 – Actuarial Models and Modeling I: The guiding principle for this course is that potential actuaries should master the first half of the Exam C/5 syllabus. The purpose of this course is to help the student understand the steps involved in the modeling process and how to carry out these steps in solving business problems. The student should be able to: analyze data from an application in a business context, determine a suitable model including parameter values and provide measures of confidence for decision making based upon the model. Topics include: survival, severity, frequency and aggregate models and their modifications.

ACT 451 – Actuarial Models and Modeling II: The guiding principle for this course is that potential actuaries should master the second half of the Exam C/5 syllabus. The purpose of this course is to help the student understand the steps involved in the modeling process and how to carry out these steps in solving business problems. The student should be able to: analyze data from an application in a business context, determine a suitable model including parameter values and provide measures of confidence for decision making based upon the model. Topics include: construction and selection of parametric models, Bayesian estimation, credibility, and simulation.

Note: All new required courses should be submitted in Curriculum Changemaker and ready for Provost’s Office approval before this certificate is put on Curriculum and Academic Programs Committee (CAPC) agenda.

PROPOSAL TO ESTABLISH A NEW UNDERGRADUATE CERTIFICATE: Actuarial Science

Students must complete 15 credit hours from the list of courses below.

Elective certificate courses:

ACT 310 Mathematics of Finance	Yes, new course	4 credits
ACT 415 Probability for Risk Management	Yes, new course	3 credits
ACT 430 Mathematics of financial Derivatives	Yes, new course	3 credits
ACT 440 Life Contingencies I	Yes, new course	3 credits
ACT 441 Life Contingencies II	Yes, new course	3 credits
ACT 450 Actuarial Models and Modeling I	Yes, new course	3 credits
ACT 451 Actuarial Models and Modeling II	Yes, new course	3 credits

4. Administration and Resources

A. Administration

How will the proposed certificate be administered (including admissions, student advisement, retention, etc.)?
 Certificate administration will be housed within the School of Mathematical and Statistical Sciences.

B. Resources

What are the resource implications for the proposed certificate, including any projected budget needs? Will new books, library holdings, equipment, laboratory space and/or personnel be required now or in the future? If multiple units/programs will collaborate in offering this certificate please discuss the resource contribution of each participating program. Letters of support must be included from all academic units that will commit resources to this certificate.

No new resources will be required.

C. Primary Faculty

List the primary faculty participants regarding this proposed certificate. For interdisciplinary certificates, please include the relevant names of faculty members from across the University.

Name	Title	Area(s) of Specialization as they relate to proposed certificate
May Boggess	Associate Professor	Phd, workplace pension actuary experience
Jelena Milovanovic	Lecturer	Phd, workplace actuary experience
Toni Garcia	Lecturer	MS, workplace casualty actuary experience

5. Additional Materials

- A. Complete and attach the Appendix document.
- B. Provide one or more model programs of study (if appropriate).
- C. Attach other information that will be useful to the review committees and the Office of the Provost.

APPENDIX

OPERATIONAL INFORMATION FOR UNDERGRADUATE CERTIFICATES

(This information is used to populate the Degree Search/catalog website.

Please consider the student audience in creating your text.)

A. Proposed Certificate Name:
Actuarial Science

B. Description (150 words maximum)

Actuarial science is an area of mathematical and statistical science that requires expertise in specializations of probability and interest theory, coupled with a strong foundation in accounting, finance and economics. This certificate provides students with preparation for professional actuarial credentialing exams offered by the Society of Actuaries and the Casualty Actuarial Society.

C. Contact and Support Information

Building Name, code and room number: (<i>Search ASU map</i>)	PSA 211
Program office telephone number: (<i>i.e. 480/965-2100</i>)	480/965-7195
Program Email Address:	math@asu.edu
Program Website Address:	http://math.asu.edu

D. Program Requirements: Provide applicable information regarding the program such as curricular restrictions or requirements, specific course lists, or academic retention requirements.

Students must complete a minimum of 15 credit hours of coursework from the ACT classes listed below. Course prerequisites include: 3.00 GPA minimum, and B or better in Multivariate Calculus, Linear Algebra, Introductory Statistics, and Computer Programming coursework (completed at ASU or an equivalent institution).

ACT 310 Mathematics of Finance (4)
ACT 415 Probability for Risk Management (3)
ACT 430 Mathematics of Financial Derivatives (3)
ACT 440 Life Contingencies I (3)
ACT 441 Life Contingencies II (3)
ACT 450 Actuarial Models and Modeling I (3)
ACT 451 Actuarial Models and Modeling II (3)

E. Additional Admission Requirements If applicable list any admission requirements (freshman and/or transfer) that are higher than and/or in addition to the university minimum undergraduate admission requirements.)
standard admission to ASU is all that is required.

Although no specific degree is required for admission to the actuarial science certificate, a strong mathematical background is essential (found in majors including mathematics, statistics, engineering, and natural sciences). Students with a major or degree other than those listed will require additional preparation beyond the certificate. Students are required to have a 3.00 cumulative GPA minimum and B or better in; Multivariate Calculus, Linear Algebra, and Introductory Statistics at ASU or an equivalent institution.

Students admitted to study at Arizona State University are eligible to pursue the requirements of a certificate. In order to be admitted to the university, complete the Office of Admission online application. Please contact the unit for additional information.

F. Delivery/Campus Information Delivery: On-campus only (ground courses and/or iCourses)

Note: Once students elect a campus or On-line option, students will not be able to move back and forth between the on-campus and the ASU Online options. Approval from the Office of the Provost and Philip Regier (Executive Vice Provost and Dean) is required to offer programs through ASU Online.

G. Campus/Locations:

Indicate **all** locations where this program will be offered.

Downtown Phoenix Polytechnic Tempe West Other:

From: Paul LePore
Sent: Wednesday, May 08, 2013 4:35 PM
To: curriculumplanning@asu.edu
Cc: Jenny Smith; Paul LePore
Subject: Proposals to establish a new undergraduate degree and a new certificate in Actuarial Science
Attachments: M Proposal_to_Establish_New_Undergrad_Degree_ACT.docx; Major Map - Actuarial Science_04.11.13.PDF; degree support letters.pdf; M Proposal_to_Establish_an_Undergrad_Certificate_ACT.docx; Actuarial Science Certificate elective courses.docx; certificate support_Boggess.pdf

Please accept the enclosed documents as a proposal to establish a new undergraduate degree and a new certificate in Actuarial Science.

PL

PAUL C. LEPORE, Ph.D.
Associate Dean
College of Liberal Arts and Sciences
Foundation Building, Suite 110
Arizona State University | P.O. Box 876605 | Tempe, Arizona 85287-6605
480.965.6506 | Fax: 480.965.2110 | e-mail: paul.lepore@asu.edu

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From: Jenny Smith
Sent: Wednesday, May 08, 2013 3:51 PM
To: Paul LePore
Subject: Proposals to establish a new undergraduate degree and a new certificate in Actuarial Science

Paul,

The CLAS Curriculum Committee and Senate have approved the attached proposals to establish a new BS degree and a new undergraduate certificate in Actuarial Science. Please forward these proposals with your approval to curriculumplanning@asu.edu

Thank you,
Jenny

April 3, 2013

To: Paul LePore, Associate Dean, College of Liberal Arts and Sciences
From: Al Boggess, Director, School of Mathematical and Statistical Sciences
Re: Proposed Actuarial Certificate Program



With this memorandum, I give my strong support for the proposed certificate program in Actuarial Science. There have been numerous surveys that support the notion that actuarial scientists are increasingly in demand and are paid lucrative salaries. For example, the PayScale College Salary Report 2012-13 places Actuarial Mathematics as one of the top ten majors in terms of starting salary and third in terms of mid-career median pay. In the Phoenix area, there are 20 insurance and financial analysis companies that employ actuaries. However, there are no undergraduate university degree programs in actuarial science within the state of Arizona (and indeed there are few such programs in any of the states west of the Rockies). To help meet the demand for actuarial scientists, the School of Mathematical and Statistical Sciences (SoMSS) is submitting a proposal during April, 2013 for a new B.S. Degree program in Actuarial Science which would admit students starting in fall, 2014. The proposed certificate program is a natural companion to the B.S. degree program. In particular, the certificate program will appeal to students whose majors are in other fields, such as economics or business, and who wish to obtain basic training in actuarial science.

Both the full degree program and the certificate program received approval by our undergraduate program committee. As per our by-laws, this is the committee charged with reviewing degree programs, new course proposals, and curriculum changes at the undergraduate level.

Our school has three current faculty members with actuarial experience. We have submitted a proposal to hire two additional faculty members – one to start in 2014 and one to start in 2015. The long-term plan is to fund the salaries for these new faculty members from the tuition and program fees collected by the students enrolled in the degree program and the certificate program. We anticipate no impact to any core programs with the school.