UC RIVERSIDE

Academic Senate

February 23, 2022

To: Michael Brown, UC Provost and Executive Vice President

From: Kim Wilcox, Riverside Chancellor

Jason Stajich, Riverside Senate Division Chair

Re: Bachelor of Science in Actuarial Science (Undergraduate Major in Actuarial Science)

Dear Colleagues,

Per the Compendium, we write to report that during the February 22, 2022 meeting of the Riverside Division of the Academic Senate the proposal to establish a *Bachelor of Science in Actuarial Science* was approved. Though all actions involving undergraduate degree programs are administered by individual campuses and do not undergo system-level review, this final campus action is to be reported to the University Provost.

Sincerely,

/s/Jason
Jason Stajich, Senate Division Chair

Kim A. Wilcox, Chancellor

Cc: Elizabeth Watkins, Riverside Provost & Executive Vice Chancellor
Michael Labriola, Analyst, Academic Council
Aimee Chang, Executive Assistant to the UC Provost and Executive Vice President

Attachments: Proposal documents

UC RIVERSIDE

Academic Senate

EXECUTIVE COUNCIL

January 13, 2022

To: Riverside Division

From: Jason Stajich, Division Chair

Re: Proposal for an Undergraduate Major in Actuarial Science

During their January 10, 2022 meeting Executive Council discussed the subject item and had no additional comments or objections.

UC RIVERSIDE Academic Senate

EXECUTIVE COUNCIL

January 13, 2022

To: Jean Helwege, Professor of Finance, Anderson Chair in Finance

From: Jason Stajich, Division Chair

Cc: Barry Mishra, Chair, School of Business Faculty Executive Committee

Re: Proposal for an Undergraduate Major in Actuarial Science

Dear Jean,

The *Proposal for an Undergraduate Major in Actuarial Science* will be included on the Winter 2022 Division meeting agenda for consideration and vote. As this is a proposed undergraduate program, it does not undergo system-level review.

Executive Council had no additional comments and advises that the attached consultative feedback provided by Senate committees is reviewed by the major's proponents.

Regards,
/s/Jason

UC RIVERSIDE

Academic Senate

COMMITTEE ON EDUCATIONAL POLICY

November 12, 2021

To: Jason Stajich, Chair
Riverside Division

From: Juliann Allison, Chair
Committee on Educational Policy

RE: Proposal for an Undergraduate Major in Actuarial Science

The Committee on Educational Policy reviewed and were supportive of the proposal for an undergraduate major in Actuarial Science at their November 5, 2021 meeting.

UC RIVERSIDE

College of Humanities, Arts, and Social Sciences
EXECUTIVE COMMITTEE

November 30, 2021

TO: Jason Stajich, Chair
Riverside Division of the Academic Senate

FROM: Peter Graham, Chair
CHASS Executive Committee

RE: Proposal: New Undergraduate Major: Proposal for an Undergraduate Major in Actuarial Science

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The CHASS Executive Committee reviewed the New Undergraduate Major: Proposal for an Undergraduate Major in Actuarial Science and has no further comments.

From: Theodore Garland <theodore.garland@ucr.edu>
Sent: Tuesday, December 21, 2021 9:49 AM
To: Cherysa P Cortez <cherysa.cortez@ucr.edu>
Cc: Denise Correll <denise.correll@ucr.edu>; Jason Stajich <jason.stajich@ucr.edu>
Subject: Re: [Follow up] FW: [Campus Review] (Proposal: New Undergraduate Major) Proposal for an Undergraduate Major in Actuarial Science

The CNAS Executive committee reviewed this proposal at our meeting of 5 October 2021. Overall, we had not major concerns. A few comments are as follows.

We wondered if this was just adequately integrated with other programs on campus, and particularly statistics. It seems to have a whole bunch of statistics involved on several courses in statistics.

One member found it fascinating and felt it was written by an actuary because it was very
detailed and very precise. They learned a lot about stuff she didn't know, and thought it just spelled things out really well in terms of justifying the new major, explaining why it wouldn't be a huge major, but that it was important for the state of California and the U.S. They felt it was well-justified that UCR is filling a niche that is needed.

What about adding a capstone experience?

Is there a mechanism to keep the major small because of its impact on other departments that are contributing to that major? Might Statistics be impacted?

UC RIVERSIDE

Academic Senate

COMMITTEE ON COURSES

October 18, 2021

To: Jason Stajich, Chair
Riverside Division

From: Stephanie Dingwall, Chair
Committee on Courses

Re: Proposal for an Undergraduate Major in Actuarial Science

The Committee on Courses reviewed the proposal for an undergraduate major in Actuarial Science at their October 15, 2021 meeting and had no concerns related to the Committee's charge of courses and instruction. The Committee does note that there is currently a proposal for consideration to renumber CS 009P to CS 009A and recommends that the course number be corrected in the proposal. Additionally, the Committee reminds the School of Business to consult with the Registrar's Office regarding the establishment of the proposed new subject code ACT to ensure that it is available and compatible with the Course Request System (CRS).

Received July 14, 2021
Academic Senate

Proposal for an Undergraduate major in Actuarial Science

1. *Name of the academic program and the department or unit that will administer the program.*

   Name: Actuarial Science Undergraduate Major

   Administration: The Actuarial Science major will be administered by the School of Business (which is one department)

2. *A thorough justification, including the motivation for the creation of the program in terms of student interest and professional or academic importance.*

   Actuarial science, which combines financial analysis with statistics, is a well-established field of study, with the profession having an organized presence that dates back to the 1800s. Actuarial science courses have been offered in universities in the U.S. since the early 1900s and at least one school (the University of Illinois at Urbana-Champaign) has offered a B.S. in actuarial science since 1959. Among the UCs, Santa Barbara has offered the B.S. in actuarial science since 2010 and UCLA established the major in 2013. Actuarial science is typically offered as a major in the business school, math department or statistics department. Some schools offer an actuarial track or concentration within those majors, rather than a separate major.

   There are two professional organizations, the Society of Actuaries (SOA) and the Casualty Actuary Society (CAS), that provide resources to aspiring actuaries and which conduct certification exams. The first four exams are the same for both societies and are the focus of university actuarial degree programs. University programs that have substantial training in actuarial science are given one of three designations: CAE, UCAP-AC and UCAP-IC. While there are thousands of business schools and math departments in American universities, only about 300 universities in the U.S. have one of the three designations. CAE universities have thriving programs that graduate many students and their students have typically passed at least two exams before graduation. This is a small group of colleges. UCAP-AC and UCAP-IC designations are used for universities that offer coursework related to the career but may not have many students in the program or many that pass the exams before graduation. The UCAP-IC designation is for schools that offer enough courses to pass two exams while the UCAP-AC designation is obtained if the courses cover four exams. UCR is currently a UCAP-IC university. In California there are no CAEs, four UCAP-ACs (including UCSB and UCLA) and two UCAP-ICs (including UCR). In addition to courses that prepare students for the actuarial exams, the SOA and CAS keep a list of courses at each school that satisfy the Validation by Educational Experience (VEE) element of actuarial science training.

   Despite the fact that actuarial careers are ranked very high in terms of annual income, the degree is not popular. A study by Georgetown University using 2009 data on incomes of people who have earned a bachelor's degree listed it as one of the highest paying careers among the least popular majors.[1] At $68,000,the median annual income of actuarial

[1] The Economic Value of College Majors available at https://cew.georgetown.edu/wp-

science majors was above that of business majors in general, which exceeds that of most of 171 possible majors. The Georgetown study shows that there were only about 9500 actuarial science majors among nearly 8.5 million business majors. The Bureau of Labor Statistics lists the 2019 median income at $108,350 and projects above average growth in this occupation (18%) over the next decade. While the high income associated with the career may increase the number of students drawn to the major, we do not expect more than a few dozen students to choose this major at UCR given the rigorous training involved and the fact that many of the students with the quantitative training required to do well in the field are less interested in business and finance. This is not a situation that is unique to UCR.

The main reason why the demand for the degree is limited is that the type of student attracted to the field must be extremely quantitatively oriented and also be interested in studying finance. We believe some of our current finance students may be attracted to the more quantitative nature of the degree while some of the current statistics students may learn that the business aspects of the degree are more quantitative than they expected (and therefore more appealing). The existence of a B.S. degree in actuarial science may attract high school students who otherwise might have attended UC Irvine or UC Davis or an out of state program.

3. *Relationship of the new program to existing programs.*

The courses for succeeding in the actuarial field are currently available to UCR undergraduates (hence our UCAP-IC designation). However, none of the current majors available to UCR undergraduates would easily allow students to take them and graduate on time. Indeed, students would likely need permission to go above the unit cap in order to use an existing major as the basis for an actuarial science education. Specifically, if a student majors in business with a concentration in finance, the required courses do not place enough emphasis on statistics and math, while at the same time using up room for those courses in the schedule by requiring students to take other business courses and breadth requirement courses. The breadth requirements for the finance concentration are suitable for humanities and social science majors rather than the quantitative nature of this STEM major. Likewise, if a student were to major in math or statistics they would not have room for the business courses that are necessary to succeed in the actuarial career. By putting the courses together in an organized method, it would be easy for students to gain the education required for success after graduation.

If students discovered that they do not have the quantitative training to succeed in the program, they would be advised to switch to the business major with a concentration in finance after their second year in the program. This would allow them time to replace the more rigorous math and statistics courses with the non-finance courses required of the business major (BUS 101-103 and BUS 107-109). They might also switch to Economics Administrative Studies with a concentration in finance.

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content/uploads/2014/11/whatsitworth-complete.pdf

4. *The proposed curriculum. Great care should be given in this area, correct rubrics should be listed for courses, all cross listings should be listed, unit total considerations should be taken into account and totals should be verified by program staff, faculty, and appropriate Executive Committee personnel. A copy of the proposed program change should be provided for inclusion in the Catalog.*

   The program requires 44 units from the School of Business, including 24 units from the finance area (BUS 131, BUS 133, BUS 134, BUS 136, BUS 137 and the new course, ACT 001); three 4-unit courses from the supply chain and operation management area (BUS 125, BUS 126 and BUS 181); one introductory business course (BUS 010); one introductory accounting course (BUS 020) and a business writing course (BUS 100W). The new course (ACT 001) covers insurance and would be useful to students in the Business major as well. The BUS 133 requirement could be satisfied by taking BUS 106 and BUS 132.

   These above courses have one prerequisite in Business (BUS 105) and two that are offered by the Economics Department (ECON 002, ECON 003). In addition, students are required to take ECON 104A and 104B. ECON 002, ECON 003 and ECON 104A are VEE courses.

   The degree requires 28 units from the Statistics Department, plus some pre-requisites. The most important set of courses in Statistics is the 160 A-C series, which prepares the students with a strong foundation in probability. STAT 160B in this series is a required course for the VEE element of the SOA certifications but not for CAS, which has one less requirement. In addition, students are required to take STAT 107 and STAT 146. Students also take two from the following list: STAT 161, STAT 167, STAT 170 and STAT 171. Some of these courses require STAT 010 and STAT 011 as prerequisites. STAT 010 substitutes for STAT 004 (previously STAT 048), which is a prerequisite to many of the Business courses.

   The program requires 28 units of Mathematics, including five quarters of calculus (MATH 009A-C and MATH 010A-B). Other required math courses are MATH 031 and MATH 046. Some of these courses are pre-requisites for the Statistics courses.

   The program requires two computing classes (CS 008 and CS 009P). CS 008, which focuses on spreadsheets, is a pre-requisite for some business courses.

   The breadth requirements for the new degree are similar to those of a CNAS degree, which is appropriate given that this degree is in a STEM discipline. The main difference between the breadth for this degree is that that economics is part of the major requirements and not a breadth requirement, so the social sciences breadth courses must come from a different discipline.

   The required courses are included in Appendix A. A sample program of study is included in Appendix B. Course descriptions are included in Appendix C. Catalog copy is included in Appendix D.

5. *A list of faculty who will be involved in the program, including those teaching, advising, and administering.*

   Below is the current list of faculty who would teach in the program.

   Professors:
   Peter Chung, Business (finance area)
   Xinping Cui, Statistics
   Mohsen El Hafsi, Business (supply chain and operations management area)
   Wee Gan, Mathematics
   Jean Helwege, Business (finance area)
   Yehua Li, Statistics
   Yat Sun Poon, Mathematics
   Richard Smith, Business (finance area)
   Fred Wilhelm, Mathematics
   Weixin Yao, Statistics

   Associate Professors:
   James Flegal, Statistics
   Long Gao, Business (supply chain and operations management area)
   Elodie Goodman, Business (supply chain and operations management area)
   Yawen Jiao, Business (finance area)
   Jun Li, Statistics
   Shujie Ma, Statistics
   Danko Turcic, Business (supply chain and operations management area)
   Weixin Yao, Statistics
   Ivy Zhang, Business (accounting area)
   Shuheng Zhou, Statistics

   Assistant Professors:
   Alexander Barinov, Business (finance area)
   Po-Ning Chen, Mathematics
   Yat Tin Chow, Mathematics
   Brian Collier, Mathematics
   Mike Dong, Business (finance area)
   Patricio Gallardo, Mathematics
   Esra Kurum, Statistics
   Wenxiu Ma, Statistics
   Adem Orsdemir, Business (supply chain and operations management area)
   Zhanghe Zhang, Mathematics

   LSOEs and LPSOEs:
   Greg Richey, Business (finance area)
   Joab Corey, Economics
   Bree Lang, Economics

6. *For interdisciplinary programs, the degree of participation and the role of each department must be explicitly described. The chairs of all participating departments must*

provide written approval for the creation of the program and indicate their commitment to provide necessary resources including faculty release.

The program is not an interdepartmental one, although it is interdisciplinary. The degree is offered through the School of Business, which teaches the majority of the courses in the program. The finance area within Business would staff and schedule the new course (ACT001), which would be part of the area coordinator's job (currently compensated via a cash payment, not a course release). Written approvals from the chair of the Business Department and the dean of the School of Business are included in Appendix E.

7. *Projected enrollment in the program*

   The projected enrollment at the start of the program is 10 students with perhaps another dozen once the program is fully established.

8. *Name of degree, if applicable, and the anticipated number of degrees to be granted when the program reaches steady state.*

   BS in Actuarial Science, 20 degrees awarded per year

9. *Potential impact of the new program on existing programs. If the proposed program includes required courses from a department other than the administering department, the proposal must include a statement from the department indicating that it has been consulted and that it will provide access to the required courses.*

   The new major uses existing courses that are offered by the School of Business, Statistics, Mathematics and Economics. Given that these courses are also been used by many other departments to satisfy college and major requirements, we do not expect a major impact in their offerings by the new program. Also, the number of additional students is likely to be fairly low as some of the students who might switch to this major are likely already in these classes.

   The design of the new major led to the creation of one new course (namely: ACT001). This course would be desirable to students majoring in business with a finance concentration so its enrollment is not dependent on the existence of this new major.

10. *A full listing of resources required for start-up and for operations. In cases where no additional resources will be needed, this must be explicitly stated. This listing may include: personnel (faculty FTE or temporary positions, Teaching Assistants or Readers, administrative staff, technical support); support services including computer facilities and library resources; space requirements. A plan indicating how the resources will be obtained would also be helpful to the committee in reviewing the proposal. A letter of support from the College Dean and/or Executive Vice Chancellor-Provost indicating endorsement as well as a promise of support for the proposal also would be extremely helpful.*

    - Faculty FTE: the program will use existing faculty given that the new major will only add a few dozen students to existing courses at the most.

- Teaching Assistants: no additional TAs would be required.
- Administrative Staff: the program will be administered by existing staff in the School of Business. An advisor who currently specializes in finance would be given the responsibility of advising these students as well.
- Computer facilities and library resources: no new facilities required
- Space requirements: no new space requirements.

11. *Both internal and external letters of support should be provided with the proposal. Internal letters of support are often from UCR department chairs and faculty of related programs. The external letters should be from other UC campuses or other peer institutions. Letters from off-campus help to establish the quality of the program and its fit within the context of related programs at other universities. Upon consultation with the CEP the demand for external letters may be waived.*

    Letters of support are included in Appendix F.

12. *Approvals from program faculty, College faculty (if the new proposal affects a college regulation), and the appropriate Executive Committee should be obtained before forwarding the new program to the attention of the Senate Analyst for CEP.*

    Approved by the Executive Committee of the School of Business: 5/7/2021
    Approved by the faculty of the School of Business: 5/24/2021

Appendix A: Requirements for the new B.S. in Actuarial Science degree

Finance (24 units)
BUS 133 – Intro and Foundations combined (can instead do both BUS 106 and BUS 132)
Requires BUS 020, ECON 003, STAT 004 or ECON 101 or equivalent
BUS 131 - Fixed Income
Requires BUS 133 or both BUS 106 and BUS 132
BUS 134 – Corporate Finance
Requires BUS 133 or both BUS 106 and BUS 132
BUS 136 – Investments and Portfolio Management
Requires BUS 133 or both BUS 106 and BUS 132
BUS 137 – Derivatives
Requires BUS 133 or both BUS 106 and BUS 132
ACT01 – Foundations of Insurance (offered by the finance area) NEW
Requires BUS 106 or BUS 133

Supply Chain and Operations Management (12 units)
BUS 125 Simulation for Business
Requires BUS 104/STAT 104 or STAT 004 or equivalent
BUS 126 Forecasting
Requires BUS 105
BUS 181 Business Modeling and Optimization
Requires BUS 105

Accounting (4 units)
BUS 020 – Accounting

General Business (8 units)
BUS 010 – Introduction to Business
BUS 100W – Management Writing and Communications

Statistics (32 units)
STAT 107 - Statistical Computing – intro
Requires STAT 10
STAT 146- Statistical Forecasting
Requires STAT 10
STAT 160A Probability Theory
Requires MATH 009C
STAT 160B Probability Theory
Requires STAT 160A
STAT 160C Probability Theory
Requires STAT 160BA
Choose two from these courses:
STAT 161 – Probability models
Requires STAT 160B
STAT 167 – Introduction to Data Science (uses R)
Requires STAT 011 and STAT 107
STAT 170 -Regression Analysis
Requires STAT 160C and STAT 107
STAT 171 – General Linear Models
Requires STAT 170

Math (28 units)
MATH 009A Calculus – Differentials
MATH 009B Calculus – Integration
Requires MATH 009A
MATH 009C Calculus – Additional topics
Requires MATH 009B
MATHC 010A – Calculus – Multivariate, matrices, determinants
Requires MATH 009B
MATHC 010B – Calculus – Multivariate, vectors, differentials
Requires MATH 010A
MATH 031 - Applied Linear Algebra
Requires MATH 009B and MATH 009C
MATH 046 – Intro to Differential Equations
Requires MATH 009B

Computing (4 units)
CS 008 – Introduction to computing
CS 009P – Introduction to computing (python)
Requires MATH 009B but can be taken concurrently

Economics (16 units)
ECON 002 – Introduction to Macroeconomics
ECON 003 – Introduction to Microeconomics
ECON 104A and 104B – Intermediate Microeconomics Sequence
Requires ECON 003 and MATH 009A

Appendix B. Sample Program of Study

Year 1	Fall	Winter	Spring	SOA exams
	MATH 009A	MATH 009B	MATH 009C	VEE accounting completed
	BUS 010	STAT 010	BUS 020	VEE economics completed
	ENGL 001A	ENGL 001B	CS 008	
	ECON 002	ECON 003	Ethnic Studies	
Year 2	**Fall**	**Winter**	**Spring**	
	MATH 010A	MATH 010B	MATH 031	VEE finance completed
	BUS 133	BUS 131	BUS 100W	Take Exam FM in Spring
	STAT 011	BUS 105	BUS 125	
	World History	CS 009P	STAT 107	
Year 3	**Fall**	**Winter**	**Spring**	
	STAT 160A	STAT 160B	STAT 160C	VEE statistics completed
	MATH 046	ACT 001	BUS 136	Take Exam P in Winter
	STAT 146	Elective	Biological Science	
	ECON 104A	ECON 104B	Humanities	
Year 4	**Fall**	**Winter**	**Spring**	
	STAT elective	BUS 134	STAT elective	Take Exam IFM in Spring
	BUS 181	Physical Science	BUS126	
	Social Science	BUS 137	Elective	
	Humanities	Social Science	Additional Science	

Appendix C. Course Descriptions

ACT 001 Foundations of Insurance (4) Lecture, 3 hours, extra reading, 1 hour. Prerequisite(s): BUS 106 or BUS 133. An introduction into the field of insurance from the perspective of financial analysis.- NEW

BUS 010 Introduction to Business (4) Lecture, 3 hours, discussion, 1 hour. Prerequisite(s): none. Provides an overview of the field of business administration. Explores business goals and strategies, functional areas of business and their integration in policy and decision making, social responsibility, computers in business, and business trends and challenges including the international dimension.

BUS 020 Financial Accounting and Reporting (4) Lecture, 3 hours, discussion, 1 hour. Prerequisite(s): none. A study of the concepts and techniques for measurement and communication of financial information. Includes interpretation of financial statements.

BUS 100W Management Writing and Communication (4) Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): ENGL 001B with a grade of C or better; BUS 020; ECON 003; STAT 048; or equivalent; or consent of instructor. Focuses on writing and communication methods in business environment. Topics include written and oral presentations, interpersonal skills, teamwork in multicultural setting, and effective use of communication technologies. Fulfills the third-quarter writing requirement for students who earn a grade of "C" or better for courses that the Academic Senate designates, and that the student's college permits, as alternatives to English 001C.

BUS 105 Production and Operations Management (4) Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): CS 008; STAT 048 or STAT 100A; or equivalent. Addresses the issues of design and control of production systems in manufacturing and service organizations. Covers product and process selection, capacity planning, location and layout design, project and job scheduling, inventory control, material planning, and quality control.

BUS 124 Business Analytics (4) Lecture, 3 hours; term paper, 1 hour; written work, 2 hours. Prerequisite(s): STAT 048 or consent of instructor. Provides fundamental concepts and tools needed to understand the emerging role of business analytics in organizations. Applies basic business analytics tools in a spreadsheet environment. Introduces market-leading techniques that help identify and manage key data from business processes. Provides the essential tools required for data mining and business process re-engineering.

BUS 125 Simulation for Business (4) Lecture, 3 hours; extra reading, 1.5 hours; outside projects, 1.5 hours. Prerequisite(s): BUS 104/STAT 104, STAT 048, or equivalents. Introduces simulation as a tool for analyzing complex systems. Analyzes and discusses the theory and practice of modeling through simulation. Topics include modeling uncertainty and collecting input data, Monte Carlo simulation techniques, model verification and validation, and sensitivity analysis. Examines applications in finance, marketing, operations, and supply chain management.

BUS 126 Practical Business Forecasting (4) Lecture, 3 hours; activity, 3 hours. Prerequisite(s): BUS 105; or consent of instructor. Teaches how forecasts are developed and utilized. Emphasizes common forecasting methods used in business and uses specific cases to illustrate these methods. Applications to business include forecasting sales, production, inventory, macroeconomic factors such as interest and exchange rates, and other aspects of both short- and long-term business planning.

BUS 131 Fixed Income Securities (4) Lecture, 3 hours; extra reading, 1 hour. Covers fixed income securities and basic analytical tools in fixed-income markets. Topics include relative pricing of fixed-income securities, yield-curve estimation, securities with embedded options, and trading strategies. Utilizes instruments such as interest rate swaps, mortgage-backed securities, and credit derivatives.

BUS 133 Accelerated Foundations of Finance (4) Lecture, 3 hours; extra reading, 1 hour. Covers materials from BUS 106/ECON 134 and ECON 132. Examines investment and operational decisions of individuals and companies. Covers the relationship between investment decisions, wealth, and risk tolerance. Operational decisions are from the perspective of an entrepreneur or manager. Pursues strategies that are personally appealing rather than investments that maximize shareholder value.

BUS 134 Corporate Finance (4) Lecture, 3 hours; term paper, 2 hours; extra reading, 1 hour. Prerequisite(s): BUS 106/ECON 134 and BUS 132 with grades of "C-" or better. Explores capital budgeting under uncertainty, cost of capital, capital structure, and basics of corporate governance. May cover other related topics. Provides an understanding of the theoretical issues related to these topics. Emphasizes formulating optimal financial decisions. May include case-method teaching and data analysis.

BUS 136 Investments: Security Analysis and Portfolio Management (4) Lecture, 3 hours; extra reading, 2 hours; projects, 1 hour. Prerequisite(s): BUS 106/ECON 134 and BUS 132 with grades of "C-" or better. Provides a thorough study of the investment process. Topics include portfolio selection, asset-pricing models, term structure, and portfolio performance valuation. Discusses empirical uses of securities data and empirical issues in testing asset pricing models.

BUS 137 Investments: Derivatives Markets (4) Lecture, 3 hours; extra reading, 2 hours; projects, 1 hour. Prerequisite(s): BUS 106/ECON 134 and BUS 132 with grades of "C-" or better. Covers option market characteristics, option pricing theories, and speculative strategies used in local, national, and international markets. Analyzes other derivatives instruments including futures, forwards, and swaps. Discusses empirical uses of securities data related to derivatives markets.

BUS 181 Business Modeling and Optimization (4) Lecture, 3 hours; homework problems and project 3 hours. Prerequisite(s): STAT 048, upper-division standing, or instructor's consent. The course teaches the analytical approach to business decision making and performance improvement. It focuses on how to structure and analyze business problems to arrive at optimal solutions and compelling insights. The course covers applications in marketing, operations, supply chain, and finance. The main techniques include probability, statistics, and optimization.

CS 008 Introduction to Computing (4) Lecture, 3 hours; laboratory, 3 hours. Includes operating system basics (Windows and Unix), word processing, spreadsheets, databases (e.g., Access), e-mail, the Internet, and the World Wide Web. Designed for students not majoring in computer science, engineering, mathematics, or science. CS 008 if it has already been awarded for CS 010A.

CS 009P Introduction to Python Programming with Applications (4) Lecture, 3 hours; laboratory, 3 hours. Prerequisite(s): a college mathematics course (may be taken concurrently) or credit for MATH 009A from the Advanced Placement Examination or the Mathematics Advisory Examination. Covers problem solving through structured programming of algorithms on computers using the Python language. Includes variables, expressions, input/output (I/O), branches, loops, functions, strings, lists, and use of common libraries. Also covers software design, testing, and debugging. Credit is awarded for one of the following CS 009P, CS 009M, or CS 010A.

ECON 002 Introduction to Macroeconomics (5) Lecture, 3 hours; discussion, 1 hour; written work, 3 hours. Prerequisite(s): none. An introduction to the study of the economic system from a macro, or aggregate, perspective. Includes analysis of business cycles, economic growth, unemployment, inflation, and the impact of government policies on the level of economic activity. Credit is awarded for only one of ECON 002 or ECON 002H.

ECON 003 Introduction to Microeconomics (5) Lecture, 3 hours; discussion, 1 hour; written work, 3 hours. Prerequisite(s): none. An introduction to the study of the economic system from the micro, or individual decision-maker's, perspective. Includes the study of opportunity cost, markets, consumption, production and competition. Credit is only awarded for one of ECON 003 or ECON 003H.

ECON 104A Intermediate Microeconomic Theory (5) Lecture, 3 hours; discussion, 1 hour; written work, 3 hours. Prerequisite(s): ECON 003 with a grade of C- or better or ECON 003H with 286 a grade of C- or better, MATH 007A or MATH 009A or MATH 09HA. A calculus-based course that develops theories of consumers and firms. Provides the foundation for partial equilibrium study of competitive markets. Explores welfare properties of competitive markets. Credit is awarded for one of the following ECON 104A or ECON 102.

ECON 104B Intermediate Microeconomic Theory (5) Lecture, 3 hours; discussion, 1 hour; written work, 3 hours. Prerequisite(s): ECON 102 with a grade of C or better or ECON 104A; MATH 007A or MATH 009A or MATH 09HA; or consent of instructor. A continuation of ECON 104A that covers monopoly, oligopoly, externalities, and public goods. Develops elementary concepts of game theory. May also cover information economics and economics of uncertainty.

ENGL 001A Beginning Composition (4) Lecture, 3 hours; written work, 3 hours. Prerequisite(s): ENGL 004 with a grade of C or better or ENGL 005 with a grade of C or better; fulfillment of the University of California Entry Level Writing Requirement. Introduces students to the strategies of personal writing in a multicultural context. Students must be formally

enrolled prior to the beginning of instruction and must attend the first day to avoid being dropped from the class. Credit is awarded for only one of ENGL 001A or ENGL 01PA.

ENGL 001B Intermediate Composition (4) Lecture, 3 hours; extra writing and rewriting, 3 hours. Prerequisite(s): ENGL 001A with a grade of "C" or better or ENGL 01PA with a grade of "C" or better. Emphasizes the transition from personal to public writing in a multicultural context. Students must be formally enrolled prior to the beginning of instruction and must attend the first day to avoid being dropped from the class**.**

MATH 009A First-Year Calculus (4) Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): MATH 005 with a grade of "C-" or better or MATH 006B with a grade of "C-" or better or equivalent. Introduction to the differential calculus of functions of one variable. Credit is awarded for only one of MATH 008B, MATH 009A, or MATH 09HA.

MATH 009B First-Year Calculus (4) Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): MATH 008B with a grade of "C-" or better or MATH 009A with a grade of "C-" or better or MATH 09HA with a grade of "C-" or better. Introduction to the integral calculus of functions of one variable. Credit is awarded for only one of MATH 009B or MATH 09HB.

MATH 009C First-Year Calculus (4) Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): MATH 009B with a grade of "C-" or better or MATH 09HB with a grade of "C-" or better. Further topics from integral calculus, improper integrals, infinite series, Taylor's series, and Taylor's theorem. Credit is awarded for only one of MATH 009C or MATH 09HC.

MATH 010A Calculus of Several Variables (4) Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): MATH 009B with a grade of "C-" or better or MATH 09HB with a "C-" or better or equivalent. Topics include Euclidean geometry, matrices and linear functions, determinants, partial derivatives, directional derivatives, Jacobians, gradients, chain rule, and Taylor's theorem for several variables.

MATH 010B Calculus of Several Variables (4) Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): MATH 010A with a grade of "C-" or better or equivalent. Covers vectors; differential calculus, including implicit differentiation and extreme values; multiple integration; line integrals; vector field theory; and theorems of Gauss, Green, and Stokes.

MATH 031 Applied Linear Algebra (5) Lecture, 3 hours; discussion, 2 hours. Prerequisite(s): MATH 009A (or MATH 09HA) with a grade "C-" or better and CS 010 or CS 010V or MATH 009B (or MATH 09HB) with a grade of "C-" or better. A study of matrices and systems of linear equations, determinants, Gaussian elimination, vector spaces, linear independence and linear transformation, orthogonality, eigenvalues, and eigenvectors. Also examines selected topics and applications.

MATH 046 Introduction to Ordinary Differential Equations (4) Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): MATH 007B or MATH 009B or MATH 09HB with a grade of "C-" or

better or equivalent. Introduction to first-order equations, linear second-order equations, and Laplace transforms, with applications to the physical and biological sciences.

STAT 010 Introduction to Statistics (5) Lecture, 3 hours; discussion, 1 hour; laboratory, 3 hours. Prerequisite(s): MATH 005 or MATH 006B or MATH 009A or MATH 09HA or equivalent. A general introduction to descriptive and inferential statistics. Topics include histograms; descriptive statistics; probability; normal, binomial, and Poisson distributions; sampling distributions; hypothesis testing; and confidence intervals. Credit is awarded for only one of STAT 004, STAT 048 or STAT 100A.

STAT 011 Introduction to Statistics (5) Lecture, 3 hours; discussion, 1 hour; laboratory, 3 hours. Prerequisite(s): STAT 100A "An introduction to statistics" with a grade of C- or better. Topics include linear regression, correlation, analysis of variance, and simple experimental designs.

STAT 107 Introduction to Statistical Computing (4) Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): STAT 100A or equivalent. Introduction to computer-assisted data analysis and statistical inference using both the R and SAS packages. Topics include input, output, and editing of data; graphical procedures; descriptive statistics; cross-tabulation; inferential statistical techniques including estimation and testing; and analysis of variance.

STAT 146 Statistical Forecasting Techniques (4) Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): STAT 100B or equivalent. Topics include exponential smoothing, simple and multiple regression analysis, time series, trend analysis, and seasonal analysis

STAT 160A Elements of Probability and Statistical Theory (4) Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): MATH 009C or MATH 09HC (may be taken concurrently). Topics include statistical regularity, probability spaces, fundamental theorems in discrete probability, Bayes' theorem, random variables, densities and distribution functions, and continuous distributions.

STAT 160B Elements of Probability and Statistical Theory (4) Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): STAT 160A with a grade of "C-" or better. Topics include transformations of random variables and central limit theorem, distributions of sample statistics, statistical inference, and estimation.

STAT 160C Elements of Probability and Statistical Theory (4) Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): STAT 160B with a grade of "C-" or better. Topics include hypothesis testing, chi-square tests, and nonparametric methods.

STAT 161 Introduction to Probability Models (4) Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): STAT 160B or equivalent with a grade of "C-" or better. Covers Compound distributions, branching processes. and random walk. Explores continuous time models such as Poisson process and queuing models. Examines the Markov property and introduces Markov chains. Also covers simple time series models.

STAT 167 Introduction to Data Science (4) Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): STAT 100B with a grade of C- or better or STAT 155 with a grade of C- or better; CS 010A, STAT 147; or consent of instructor. Introduction to data science using the R programming language. Topics include big data management, visualization and analytical skills, unsupervised and supervised statistical learning methods, and real-world data science application examples.

STAT 170 Regression Analysis (4) Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): STAT 157, STAT 160C, or equivalents. Topics include simple and multiple linear regression, scatter-plots, and point and interval estimation. Addresses prediction, testing, calibration, interpretation, and practical applications of multiple regression. Explores simple, partial, and multiple correlation; variable selection methods; diagnostic procedures; and regression for longitudinal data.

STAT 171 General Statistical Models (4) Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): STAT 170B. Generalized linear models and least squares. Analysis of covariance, nonlinear regression, nonlinear least squares. Regression methods for discrete data: loglinear models, logistic regression, discriminant analysis. Regression methods for life data. Cox survival model, Kaplan-Meier estimation, Mantel-Haenszel test.

Appendix D. Catalog Copy for the New B.S. in Actuarial Science

Actuarial Science
Subject Abbreviation: ACT
School of Business

Major

Actuarial science studies the probability and risk associated with financial payments, such as death benefits in the case of life insurance, accident reimbursements as in the case of fire or car crashes, pensions, and other contingencies. Students receive their degree from the School of Business and focus much of their studies in the area of finance, but a large amount of statistical and mathematical studies are also involved. Students are encouraged to visit the websites of the Society of Actuaries and Casualty Actuary Society to learn more about careers in actuarial science.

University Requirements

See Undergraduate Students section.

College Requirements

in Actuarial Science are the same as those for the B.S. in CNAS except that the requirement for Social Sciences is only two units and must not be a course in Economics. Note that college breadth requirements for the B.S. in Actuarial Science differ from those of CHASS, which are the requirements for the B.S. in Business

Major Requirements

1. Lower-division requirements (41 units):
   a) ACT 001
   b) BUS 010; BUS 020
   c) CS 008; CS 009P
   d) MATH 009A; MATH 009B; MATH 009C; MATH 010A;MATH 01B; MATH 031; MATH 046

   Upper-division requirements (80 units, minimum):
   a) BUS100W; BUS 125; BUS 126; BUS 131; BUS 133 (or BUS 106 and BUS 132); BUS 136; BUS 137
   b) STAT 107; STAT 146; STAT 160A; STAT 160B; STAT 160C
   c) Choose two from among STAT 161, STAT 167, STAT 170 and STAT 171

Appendix E. Written Approvals

This section contains letters from the following department chairs:

1. Yunzeng Wang, Dean, School of Business
2. John Haleblian, Chair, Business
3. Yehua Li, Chair, Statistics
4. Yat Sun Poon, Chair, Mathematics
5. Steven Halfend, Chair, Economics

UCR | School of Business Administration
HOME OF THE A. GARY ANDERSON GRADUATE SCHOOL OF MANAGEMENT

Office of the Dean

900 University Avenue, Anderson Hall, Riverside, CA, 92521
Tel: 951.827.4237 Fax: 951.827.3970 e-mail: yunzeng.wang@ucr.edu web-site: http://soba.ucr.edu

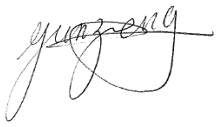
May 25, 2021

To Whom It May Concern:

I am writing to endorse the proposed Actuarial Science Undergraduate Major. This is a well thought-through to serve a niche market that offers opportunities to professionals with specialized educational training in actuarial science. In addition, the program creates great opportunities for the School of Business to collaborate with rest of the campus.

Like the faculty, I enthusiastically support the program, and the School is committed to support the program by offering the courses required by the proposal.

Sincerely



Yunzeng Wang
Dean

UNIVERSITY OF CALIFORNIA
UC RIVERSIDE | School of Business
A. GARY ANDERSON GRADUATE SCHOOL OF MANAGEMENT

May 25, 2021

To Whom it Concerns,

I approve the actuarial science major and allow the faculty in the School of Business to teach the required courses for students to complete this major.

The School of Business consists of one department with five areas of specialization: finance, marketing, operations, accounting and management. Many existing courses offered by the finance and marketing areas are relevant for the study of actuarial science. Accordingly, the vast majority of resources necessary to offer this new major are currently in place at the school of business. Given the program will likely have a small enrollment it is unlikely that additional sections of existing courses will be required. However, in the event additional sections are necessary, the department is prepared to support the program to ensure actuarial students are able to schedule their courses in a timely manner. The program proposal includes one new insurance course, which will also be of interest to finance and marketing students in addition to the students in the actuarial science program. Thus, the actuarial science major will only require limited additional resources not already allocated to existing students.

The actuarial science program has the potential to highlight the extensive mathematical studies students engage in at the School of Business. As a STEM degree, it will enhance UCR's reputation as an R1 university and signal to existing finance, marketing and operations students that additional statistical training has significant market value. Finally, we believe this major will appeal to underrepresented minorities in the Inland Empire who seek a career that takes advantage of their mathematical talents.

Sincerely,

Jerayr “John” Haleblian

Department Chair

School of Business

UC RIVERSIDE UNIVERSITY OF CALIFORNIA

COLLEGE OF NATURAL AND AGRICULTURAL SCIENCES
DEPARTMENT OF STATISTICS
900 UNIVERSITY AVENUE
RIVERSIDE, CALIFORNIA 92521

July 6, 2021

To Whom It May Concern,

As Chair of the Department of Statistics, I write to offer my support for the proposed major in Actuarial Science in the School of Business. The proposed program is expected to small and selective. It will provide UCR students, especially the underrepresented minority students, with quality trainings on some highly employable skills.

I approve the inclusion of STAT 107, 146, 160A, 160B, 160C as upper division major requirements in the proposed program. All, but STAT 146, are required courses for Statistics majors and hence offered regularly. Given the relatively small size of the proposed program, we will be able to provide additional seats for the Actuarial Science students. I also approve the inclusion of existing classes, such as STAT 161, 167, 170 and 171, as electives in the proposed program.

Please let me know if you need any additional information.

Sincerely yours.

Yehua Li

Yehua Li
Professor & Chair of Statistics,
University of California, Riverside
yehuali@ucr.edu
https://sites.google.com/a/ucr.edu/yehuali/

June 3, 2021

Dear Colleagues of the Academic Senate,

The Department of Mathematics acknowledges receiving a *Proposal for an Undergraduate Major in Actuarial Science.*

We observe that it proposes its students to take Math 009A, 009B, 009C, 010A, 031, and 046. Some students may also take Math 149A or Math 149B. The Department of Mathematics expects to offer these courses in the foreseeable future. We will be able to serve students of this program alongside with many other programs.

Yours sincerely

Yat-Sun Poon
Professor and Chair
Department of Mathematics
University of California, Riverside

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Dr. Steven M. Helfand
Professor & Chair
Department of Economics
UC Riverside
Riverside, CA 92521
steven.helfand@ucr.edu
(951) 827-1572

6/1/2021

To whom it may concern,

As Chair of the Department of Economics, I write to provide my support for the proposed major in Actuarial Science to be offered by the School of Business. I think this is an important addition to the majors offered on campus, and I think it would be attractive to a relatively small and select group of students.

I write, in addition, to provide my approval for the inclusion of ECON 2, 3, 104A and 104B in this proposed major. The Economics Department offers Introductory Macroeconomics (ECON 2) and Introductory Microeconomics (ECON 3) every quarter for at least 550 students each. Thus, it would not be a problem to accommodate students from the proposed major in these courses. Similarly, every year the Department offers the Intermediate Microeconomic Theory courses (ECON 104A and ECON 104B) 2-3 times each for a total of around 450 seats. Space in these courses would also not be an issue.

Please let me know if you need any additional information.

Sincerely,

Steven Helfand

Steven Helfand

Appendix F. Letters of Support

This section contains letters of support from the following individuals:

1. Ian Dunkin, UC Santa Barbara
2. Mikhael Chernov, UCLA
3. Steven Sault, Australian National University
4. Renee Henderson, Southern California Casualty Actuarial Club
5. Michael De Mattei, Milliman Consulting
6. Christopher Girod, Milliman Consulting
7. Fisher Li, United Health Group
8. Kenneth Hsu, Uber
9. Joshua Ng, California Department of Insurance and Chapman University
10. Jeremiah Gonzalez and other UCR students

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DEPARTMENT OF STATISTICS AND APPLIED PROBABILITY
SANTA BARBARA, CA 93106-3110
805-893-2129 • FAX 805-893-2334
www.pstat.ucsb.edu

June 3rd, 2021

UCR Actuarial Science Major

To whom it may concern:

This letter supports the proposed establishment of an Actuarial Science Major at UC Riverside.

My name is Ian Duncan. I am an adjunct professor in the Dept. of Statistics & Applied Probability at UC Santa Barbara, where I have taught actuarial courses and led actuarial research for 11 years. I have been an actuarial student and actuary for 47 years, practicing in 4 countries and founding and leading 5 companies (two sold previously). I was also the donor of the Janet and Ian Duncan chair in actuarial science within our department.

The actuarial profession is a small, although highly-respected one. Actuaries serve clients by managing financial risks in numerous ways: retirement, health, life and property-casualty. Actuaries are required to pass rigorous examinations and the failure and withdrawal rates along the pathway to fellowship are relatively high. The rigorous training that even those not completing the examinations undergo, however, fits them for leadership roles in finance industries served by the profession.

When I entered the profession there were very few actuarial programs and my own undergraduate degree was in economics and mathematics. I believe I would have a difficult time now gaining an entry-level position with this background, however, given the number of actuarial programs and graduates. The education of actuaries has, for many years, been the province of the universities and there are estimated to be about 200 North American universities that provide actuarial courses. A considerably smaller number have full-fledged actuarial majors and actuarial programs because these require a critical mass of faculty and industry relationships. Unlike other professions actuaries graduating from actuarial programs have been required to pass all the examinations; this policy is, however, in the process of being changed and graduates with high grades of approved programs will, in the future, be exempted from some exams. Although many actuarial degrees are found within mathematics departments, as a business-oriented science it makes sense to establish a major within the business school. The courses available within a business school will give students a grounding in business that employers often find is lacking in graduates of maths programs.

The market for actuarial talent is a strange one: there is usually an over-supply of entry-level candidates and a shortage of experienced actuaries. Traditionally, the large insurance companies hired and trained a large cohort of entry-level graduates, expecting a certain percentage attrition. This tends no longer to be the case and actuaries are finding employment in a wide range of companies, particularly in the property-casualty and health fields. As an employer we have found in the last year that it has been

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much more difficult to recruit entry-level graduates and we have extended our recruiting outside California as a result. I believe that we and other employers would find an additional school within California from which to recruit to be attractive.

The other area in which the profession is placing emphasis is data science. With the focus on mathematics and statistics in actuarial training, this has been a recent development but it is being given considerable emphasis. The range of programming, data science and forecasting courses available to prospective students within the new major is important.

I congratulate UC Riverside on the new major and look forward to meeting the graduates in the future.

Please feel free to contact me with any additional questions you may have regarding this recommendation.

Sincerely Yours,

Ian Duncan PhD B.Phil. FSA FIA FCIA FCA CSPA MAAA
Adj. Professor, Statistics & Applied Probability

UCLA Anderson

Mikhail Chernov
Warren C. Cordner Professor of Money and Financial Markets
Tel (310) 825-4059 Fax (310) 206-5455
mikhail.chernov@anderson.ucla.edu

16 June 2021

UC Riverside Senate

Reference: UCR proposal for a major in actuarial science

Dear Senate Members,

I am Professor of Finance at the Anderson School of Management at UCLA. In addition, I serve as Faculty Director of the Master in Financial Engineering program at Anderson, which graduate students for careers in quantitative finance. Just like Actuarial Science, the program is eclectic and challenging in terms of its demands. It requires deep knowledge of mathematics, statistics, computational methods and finance. We would not have been able to offer our students a pathway to this popular career in finance by simply offering electives in the framework of a more traditional MBA program.

Because of this experience I fully support the undertaking of UCR's School of Business to create a dedicated major in in actuarial science. This is an exceedingly important career path. That is especially so in California where the elevation of disaster risk is translated by actuaries into insurance premiums, economic justification of mitigation efforts, and development of government policies related to these risks.

The proposal lays out clearly the attractiveness of the major for future careers and how existing UCAP designations (including the one at UCLA) are ultimately inadequate or impractical for students desiring actuarial careers. Furthermore, dearth of CAE universities in the United States, in general, and in California, in particular, makes a good business case for introducing such a major. It offers UCR a tantalizing opportunity to attract quantitively strong students who would otherwise select other colleges.

To conclude, I offer unequivocal support for establishing a major in actuarial science at UCR.

Sincerely,

Mikhail Chernov

www.anderson.ucla.edu

110 Westwood Plaza,
Suite C-417, Box 951481 Los Angeles, California 90095-1481

Associate Professor Steve Sault
Director
Research School of Finance, Actuarial Studies
and Statistics
College of Business and Economics

T: +61 2 6125 4869
E: stephen.sault@anu.edu.au

28 May 2021

UC Riverside Senate

RE: Actuarial Science Undergraduate Major

Dear UC Riverside Senate,

I write in strong support of the proposal for an Actuarial Science Undergraduate Major to be offered at UC Riverside. At the Australian National University, we have offered a bachelor degree in actuarial studies for over 20 years within the Research School of Finance, Actuarial Studies and Statistics. Further, the School was designated a Centre of Actuarial Excellence by the Society of Actuaries in 2016. Particular strengths of the proposed program at UCR include:

- The major in actuarial science has the capacity to appeal to both current and prospective students with a strong quantitative focus, who also share an interest in studying finance. These students are typically high performing and talented.
- The proposed major would signal a pathway to students to complete the necessary courses for their Society of Actuaries exams without the need to overload or seek special permission for enrolment. A named major would also assist in the marketing and promotion of an actuarial pathway at UCR.
- The proposed major leverages current courses offered at UCR, with only one new course needing to be offered, so does not have a significant impact on resourcing requirements.
- The faculty who will instruct courses within the proposed major have excellent training and are leaders in their field. In some departments it is common that the education received by actuarial students is only given by actuarial faculty. This program will see students instructed by academics trained in the relevant fields of finance, economics, statistics and accounting. This ensures that students receive specific discipline training.

As mentioned previously, we have offered a Bachelor of Actuarial Studies within the Research School of Finance, Actuarial Studies and Statistics for the past 20 years, having been designated a Centre of Actuarial Excellence in 2016. Our School also offers a similar program at the postgraduate level. Over the past 5 years, the various programs within the School have had a student cohort of approximately 75 students, and I believe the proposed enrolment at UCR of 20-25 is achievable.

In summary I believe the proposed major in actuarial science at UCR has been well crafted and will prove to be robust and popular. I am certain it will attract a high quality student cohort, and be sustainable in terms of the numbers attracted. I also trust the program will enhance the reputation of UCR for delivering programs of excellence that are in demand.

Yours sincerely,

Steve Sault
Director

Renee Henderson, FCAS
University Outreach Coordinator
Southern California Casualty Actuarial Club (SCCAC)
Renee.Henderson@aig.com
+1 212 458 6131

University of California, Riverside
900 University Avenue
Riverside, CA 92521
+1 951 827 1012

To whom it may concern

Re: University of California, Riverside's Proposal for an Undergraduate Major in Actuarial Science

The Southern California Casualty Actuarial Club is a regional affiliate of the national Casualty Actuarial Society (CAS). The CAS mission statement is as follows: to establish and maintain standards of qualification for membership; to promote and maintain high standards of conduct and competence; to increase the awareness of actuarial science; and, to contribute to the well being of society as a whole.

To be a credentialed actuary through the CAS, one is required to take a series of rigorous exams. The exam structure changes slightly over time, but on average there are a series of a dozen required exams that take an average of seven years to complete. When companies look to hire interns or recent graduates, they are typically expected to have passed at least one or two exams, with this number increasing over time. Along with exams, there is also a "Validation of Educational Experience" (VEE) requirement for credits in Statistics, Economics and Finance courses.

While a major in actuarial science is not necessary to enter the field, it is a huge advantage for students to complete the required VEE courses through school and have courses associated with the entry-level exams to increase their chances of passing these exams before graduating. Without an actuarial science degree program, students in southern California would have to take courses outside their major or study hundreds of hours for exams on their own which can be very difficult. In my personal experience, I decided to go out of state to major in actuarial science since the major was not offered at any schools in southern California at the time. In the Midwest and East Coast, actuarial science majors are much more common and accessible.

Members of SCCAC currently include representatives of many different companies based out of southern California that recruit actuarial students. As a small sample, the current board members work at Farmers Insurance Group, AIG, Liberty Mutual, Oliver Wyman, and Great American Custom.

As both credentialed actuaries and residents of Southern California, we fully support University of California, Riverside (UCR)'s proposed undergraduate degree program in Actuarial Science.

Best regards

Renee Henderson, FCAS

Milliman

Michael L. DeMattei
FCAS, MAAA
Principal & Consulting Actuary

michael.dematteI@milliman.com
milliman.com

251 South Lake Avenue
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To whom it may concern

Re: University of California, Riverside's Proposal for an Undergraduate Major in Actuarial Science

I am an actuary and have spent the entirety of my 33 year career with the Los Angeles office of Milliman. Milliman is one of the largest actuarial consulting firms with locations in major cities worldwide. In Southern California, we have offices in Los Angeles, Irvine and San Diego.

As both an actuary and a lifelong resident of Southern California, I fully support University of California, Riverside's (UCR) proposed undergraduate degree program in Actuarial Science. While the availability of actuarial programs and courses in California has increased since I attended college, we are still limited compared to the Midwestern and Eastern parts of the country.

A degree in Actuarial Science is not necessary to enter the profession, but nowadays students with such degrees have a competitive advantage in securing jobs. The proposed program would also enable students to graduate with three or four actuarial exams, instead of the current one or two. Since exam status is important, particularly early on in one's career, the ability of students to graduate with more exams is significant.

In addition, as a current member of Milliman's Opportunity Scholarship Committee and a past member of the Casualty Actuarial Society/Society of Actuaries Joint Committee on Minority Recruiting, UCR's significant Hispanic & Latino student population is very much the type of talented individuals we are trying to reach. The actuarial profession presents excellent opportunities for people interested in math and finance, and some segments of society are currently very underrepresented. UCR's proposed program can help change this.

Thank you for the opportunity to submit this letter.

Best regards.

Michael L. DeMattei, FCAS, MAAA
Principal and Consulting Actuary

Milliman

4370 La Jolla Village Drive, Suite 700
San Diego, CA 92122

(858) 587-5304 tel
(858) 597-0111 fax

www.milliman.com

May 26, 2021

University of California Riverside

RE: Support for New Actuarial Science Major

Dear UC Riverside:

I am sending this letter on behalf of the San Diego office of Milliman, Inc. to express my support for UC Riverside establishing an actuarial science program.

The actuarial profession is small, but strong, and I have never regretted my decision to become an actuary 32 years ago. The job market for actuaries has been excellent for all of those years, and I do not expect that to change in the foreseeable future.

An often cited quote in our profession is that the work of science is to substitute facts for appearances and demonstrations for impressions. That rigorous pursuit of truth, coupled with the skills to find it, has given actuaries a high degree of respect in the business world. The business leaders that I work with daily need sound, accurate, unbiased information to inform their decisions in environments where the best answer is often unclear. As actuaries we are trained to support decision making, bringing data and science to bear, and then helping our audiences understand and interpret the information to address their business needs. The actuarial profession needs more people with these capabilities—strong skills in analytics, communications, accounting, economics, and business.

If UCR can expand the pool of well prepared actuarial candidates, then you have my support.

Sincerely,

Christopher S. Girod, FSA, MAAA
Principal and Consulting Actuary

Mr Jason Stajich,

I am writing to petition for the Actuarial science major at UCR. I am an UCR alumni graduated in 2010 with a degree in applied mathematics with emphasis on economic, and I am currently working at SoCal as an actuary. I had a master degree in Actuarial Science and obtained highest title, Fellow of Society Actuaries, from the Society of Actuaries.

One of the most important criteria for an entry level job at the actuarial field is passing actuarial exams to obtain the professional title. The professional qualification process involved 8-10 rigorous exams, 5-7 educational modules, and 2 in-person training courses. The proposed curriculum for Actuarial Science major can help UCR student organize educational requirement, prepare for exams and kick start a prestigious career options. I wish I could have a complete guideline on this career 10 years ago.

Local inland empire and SoCal companies offer plenty of employment opportunity for actuarial students. Experience actuaries are still in high demand. I hope the future UCR students would have more helps in getting into actuarial science field.

Sincerely,

Fisher Li, UCR class of 2010.

R'Mail powered by Google

Jean Helwege <helwege@ucr.edu>

UCR Actuarial Science Program

1 message

Kenneth Hsu <kennethshsu@gmail.com> Thu, Jun 3, 2021 at 10:08 PM
To: Jean Helwege <helwege@ucr.edu>

Dear Senate Chair, Jason Stajich,

I am writing to express my support for the University of California, Riverside to launch its Actuarial Science degree. I am a UCR alumnus and the direction of UCR's academic program is very important to me.

I graduated in 2015 with a BS in Statistics and a minor in Computer Science and Engineering. I am now a Fellow of the Casualty Actuarial Society and a practicing actuary at Uber Technologies, Inc based out of San Francisco, CA. I first learned about actuarial science through a cousin and had inquired about it more with my academic advisor. At the time, knowledge was extremely limited and I was often redirected to other campuses such as UCSB or UCLA. In fact, after graduation from UCR, I had such a difficult time getting started as an actuary I went to get a Master's from Columbia University in Actuarial Science. As we know, the actuarial profession is projected for high growth in the next 15 years, yet many students such as myself did not have the adequate resources to learn about this niche yet rewarding career. UCR needs to launch an actuarial science degree so students can be better prepared and have access to the essential support that they need. I have also reviewed the course work proposed and I believe it will adequately prepare students to become successful entry-level actuarial analysts upon completing their degree.

The industry and the society also stand ready to connect and assist the faculty members, should they need any guidance. I am on a University Liaison as a volunteer for the Casualty Actuarial Society, where we provide vital information to prepare students to launch their actuarial careers while they are still in school. Support such as exam preparation tips, summer internships completely run by volunteers, and interviewing prepare all common things that students reach out to volunteers for.

Should you have any questions, please feel free to reach out to me.

Kenneth Hsu, Class of 2015
Uber Technologies, Inc
kenneth.hsu@uber.com

Jason Stajich
900 University Ave
Riverside, CA 92521

Dear Dr. Stajich:

As an alumnus from UC Riverside who has taken over 80% of the proposed curriculum, former Professor, and current professional in the Actuarial field, I am a large supporter of the Senate Proposal for an Undergraduate major in Actuarial Sciences. Introduction of the major utilizes existing resources without compromising curriculum, strengthens the prospects for future graduates, and strengthens interdepartmental relationships at the University.

The rigor of the curriculum matches the expectations of the Actuarial field and is comparable to UCLA and UCSB's curriculum for Actuarial Science majors. Students who follow the Sample Program of Study provided in Appendix B of the proposal would be adequately prepared for success in their three SOA/CAS exams at the end of their 2nd, 3rd, and 4th year. In the current market, a student with three exams combined with relevant internships is competitive and more than qualified for entry-level positions at any firm. The Actuarial field is expected to grow with the increasing use of predictive analytics and expand into non-traditional areas within the next decade. Offering the major would be attractive to incoming students and would garner interest in current students. The proposal utilizes not only the existing resources at the University but strengthens relationships between business, statistics, economics, and math departments. For these reasons, I support the Senate Proposal for an Undergraduate major in Actuarial Sciences. If you have any questions, feel free to contact me.

Sincerely,

Joshua Ng, MA
Actuarial Assistant at California Department of Insurance
916-505-9463
Joshua.Ryan.Ng@gmail.com

June 8, 2021

To whom it may concern,

We are writing this letter to show support to our potentially new major at UCR: Actuarial Sciences. Initiated by our designated Finance Professor at the School of Business Jean Helwege, we (current undergraduates) are in favor of the proposition.

Meeting the demands of a student body who wants to learn and major in this academic field requires funding from the University as well as faculty who are willing to teach the curriculum courses. In line with this, we would like to ask for approval in this endeavor since we cannot do this alone. As a result, we the students are signing this letter for attention towards supporting the cause.

Should you have any more queries or concerns, please feel free to contact us at **661-609-7088** or email the enacting professor: helwege@ucr.edu Thank you in advance for your support. Your generosity shall be remembered.

Regards,
Jeremiah Gonzalez,
Former President of The Actuarial Club at UCR
And other Actuarial students

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