

*A Proposal
for
The Undergraduate Program
in
Actuarial Science and Financial Mathematics*

*by
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Executive Summary

In addition to Actuarial courses, this **Actuarial Science and Financial Mathematics (ASFM) BSc** proposal includes a large component of financial mathematics courses since the current trend in the Actuarial profession is moving towards a *financial insurance* concept in practice. This also goes very well with the domestic demands of Takaful industries in the country. Also, the BSc program curriculum is written such that students are prepared to take at least the first two professional exams of the Society of Actuaries (SOA) and Casualty Society of Actuaries (CSA). This should enhance the program level to “Advanced undergraduate” in the list of internationally accredited Actuarial programs. Finally, the number of credit hours required by the program is 128 hours including 2 credit hours of summer training in the industry.

Rationale for this Proposal

Interest in having a Baccalaureate degree program in Actuarial Science was first initiated in 2001 by a visit to the then Mathematics and Statistics department by representatives from Saudi Arabian insurance industries. In this visit, the departmental chairman was requested to help the industry tackle the urgent and growing need for Actuarial training for insurance professionals. Since then, the now department of Mathematics and Statistics have been regularly forming ad-hoc committees to study the various curricula from reputed universities in the world, namely from the US and other western countries. In addition, after a departmental presentation in 2005, the ad-hoc committee on the program was asked to study other programs in muslim countries to propose some additional courses in Islamic Finance and Takaful to meet the growing domestic demands of these industrial sectors.

The demand for the program is further enforced by recent trend in the Saudi Arabian economy where there is an acute shortage of training programs for qualified insurance professionals. In an April 25th 2008 issue of the *Saudi Gazette*, the newspaper reported that an in-depth study by the Saudi Press Agency (SPA) forecasted that a booming trend in the insurance industry over the next five years is expected to create new jobs for somewhere between 35,000 to 40,000 people in the country. The report also added that this growth is hampered by limited training for insurance personnel in the gulf region with some occasional workshops in Bahrain and some diploma training program by AlMuhanna foundation in Lebanon. That is, at present, there is no training program at the university level in the Kingdom to meet this increasing demand. Also, from the figure quoted by Arab News, it may be reasonable to expect around at least 1% of the jobs will require expertise in the form of Actuarial professionals. In addition to this, Mr Sameer Abdi (head of Ernst & Young’s Islamic Financial Services Group) reportedly said on *Saudi Gazette* (April 16, 2009) that “Saudi Arabia, with contributions totalling \$1.7 billion in 2007, and Malaysia, with \$797 million, are the top two Takaful markets worldwide”. Furthermore, Mr. Omar Bitar (managing partner of Ernst & Young Middle East advisory services) on the same *Saudi Gazette* article reportedly said (italics added) “Takaful operators now need to better manage their costs in a more challenging market as the risk landscape has changed substantially. Investment portfolios, *human resource expertise* and competition will be their most pressing business risks ...”. Ernst & Young in this article recommended (italics added) that “to deal with human resource expertise risk, operators are advised to focus on *developing local talent* and partnering for quick market entry. Hiring indigenous talent and providing *structured internal training programs* helps to create a development culture and reduces turnover.” Thus, the need for training programs such as our BSc program could not be overemphasized.

To complete the proposal for ASFM BSc program, the ad-hoc committee collected 673 survey responses on preparatory year student interest for the program in term 072. The results were very encouraging where about 506 from 623 students expressed interest in possibly majoring in the field. In addition, among 645 students who indicated that they have already made up their choice for majoring at KFUPM, about 560 expressed their interest to double-major in this field. There are a few things to note about the student surveys. One, the method used for collecting the survey data ensured that students had time to register their interest. In particular, information about the program (including a student brochure for the program) was given to the student in class and students were asked to complete the student survey the next day. Two, no information on the actuarial beginning salary was shared with the students at any time. Three, the student survey asks students if they are “interested” in joining the BSc degree program if it is available and not if they “will join” the BSc degree program. Thus at best, the survey results demonstrated the attractiveness of the program to the students but did not guarantee that all interested students would join the program. It is not unreasonable, however, to expect a good fraction of these interested students to be interested enough to later join the program when it is offered.

The interest for the program is also evident from prospective **employers** who participated in the June 2008 career day. For example, a representative of the Compensation and Benefits department of Saudi Hollandi Bank was very interested in hiring graduates who can handle pension and benefits related analyses, *an actuarial-related work*. Representatives from SAMA were also similarly interested in addition to their interest in a work-study relationship with students. Furthermore, several former KFUPM accounting graduates who are working in Saudi Arabian companies came to the ad-hoc committee chairperson for advice as they were encouraged to pursue advanced studies in this field by the amount of respect and distinguished salary their present companies had for their foreign Actuarial staff. In addition, as of April 11 2009, a good number of job announcements requiring Actuarial expertise are steadily appearing in the kingdom’s job market. One example is given in the Appendix.

An undergraduate program in Actuarial Science has been hosted in US and Canadian universities predominantly by the Department of Statistics and Actuarial Science or the Department of Mathematics. In only a minority of US universities, although the courses offered are not as comprehensive, a BSc program in Actuarial Science is hosted by the business school. No such program in the US has been hosted by the Department of Engineering. This mainly is because an Actuary has to have a solid training in mathematics, probability, and statistics in addition to the understanding of finance topics.

In addition, because an Actuary has to pass a series of **seven** professional examinations at the **Associate** level and an additional **two** professional exams at the **Fellowship** level, the Society of Actuaries (SOA) often designates BSc programs that prepare its graduates for at least the initial two professional exams as curricularly “advanced” undergraduate programs. This means that graduates from these programs have been recognized to have graduated from an institution with the essential Actuarial educational experience and the essential actuarial training for passing the first two professional exams. An “advanced” BSc degree in actuarial Science is important for this training and cannot be replaced by a limited diploma program or a specialized masters program. This is because a limited program will not be specific enough to prepare graduates for the often difficult professional exams and what the Society of Actuaries terms as “Validation by Educational Experience” (VEE) while a masters program will be too advanced and/or specialized and thus would be better suited for preparing graduates to take the higher level professional actuarial exams. For instance, actuaries in the USA typically pursue MSc degree education to get more actuarial training for the higher level professional exams.

1. Introduction

The development of sophisticated technology and new ideas of thinking due to the internet boom has modified in many ways the scope and nature of business as well as challenges arising from the on-site situation in the private sector. The roadmarks of the changes, challenges, and opportunities include

- The general trend of high-tech production
- Volatility of the stock market
- Need to equip manpower with skills suited to cope and handle a wide range of complex financial, societal, economical, or industrial risks in an optimized manner
- Increased demand of people who could efficiently model, analyze, and provide solutions to real-life financial, societal, economical, or industrial problems
- Emergence of advanced mathematical and statistical methods as a vital component of Research and Development and an essential management factor in financial, societal, economical, or industrial sector
- Unanticipated emergence of untapped financial businesses such as the Islamic banking system and the Takaful business

This in turn presents a challenge for the academic institutions to develop programs that would combine computational and analytic knowledge with modeling skills of real-life applications. Such a challenge, when confronted, has led to the evolution of Actuarial science programs at many well-known academic institutions in the world.

Keeping in mind the leading role of KFUPM to be at the cutting edge by pioneering research and academic activities related to contemporary progress worldwide, the Department of Mathematics and Statistics is proposing a B.Sc. program in Actuarial Science and Financial Mathematics. The program is designed to produce manpower with ample background for modeling, analyzing, solving, and managing financial and operational risks in the private and government sectors and industries of the country. There is currently no program of this sort at the University.

The term Actuary is not new; the Society of Actuaries (SOA), Casualty Actuarial Society (CAS), and Institute of Actuaries (IA) were established decades ago in North America and European countries. Soon after, many societies and foundations of Actuaries were established in many international countries. Today a large number of universities are offering programs to produce manpower which falls under this rapidly developing discipline. Over the past 5 years, the job almanac in the US rated Actuaries as the first among the top-paying careers in America. This is also true in other countries as well. Currently in Saudi Arabia, one of the top paying careers is “Financial Risk Manager” whose one main line of work is advising individuals and companies the best investments and the best time to invest. The intuitive investment skills a “Financial Risk manager” uses to base these recommendations on are knowledge and skills an actuary acquires from a formal program like the one proposed here. In fact, in addition to insurance related knowledge, an actuary is equipped with the financial, mathematical, and statistical knowledge to scientifically predict which investment is financially less risky, which produces the most investment yield, and at which time. There are several journals devoted to this area and there are numerous professional society-based online sources of activities and research and career support developments in this area.

2. Objectives of the Proposed Program

Actuarial Science and Financial Mathematics is the science that manages risk in the financial and government sector and industries. Specifically, it is the science of analyzing risk data and making informed decisions from it. A combination of deterministic and stochastic approaches to managing risk is one main area of study. A graduate of the program is expected to contribute in all areas of Saudi Arabian financial sector and industry as well as the government sector where the objective of stochastic minimization of risk is the daily main focus. A graduate typically find employment in private and government sectors and industry that deals with investment, insurance, pension funding, business, financial consulting, marketing, manufacturing, healthcare funding, banking, and management of operational risks. An actuary is a professional who analyzes the financial consequences of risk. Actuaries use mathematics, statistics and financial theory to study uncertain future events, such as those of concern to insurance and pension programs and investment returns. They evaluate the likelihood of those events, design creative ways to reduce the likelihood and decrease the impact of adverse events that actually do occur. Actuaries are an important part of the management team of the companies that employ them. Their work requires a combination of strong analytical skills, business knowledge and understanding of human behavior to design and manage programs that control risk. An Actuary also minimizes daily operational risks in industry. An actuary is a value asset in every institution that strives to minimize this risk. The input of the Actuary is essential for the success of every endeavor.

The objective of the BS program in Actuarial Science and Financial Mathematics is to prepare students for career opportunities in government as well as the private sector in such fields as asset liability management, business, banking, investment, insurance or takaful, pension funding, financial consulting, healthcare funding, industry, and for further graduate studies. In addition, the program also prepares the students for international society examinations such as Society of Actuaries (SOA) and Casualty Actuarial Society (CAS) [exams](#) P (Probability) and FM (Financial Mathematics). With an advanced undergraduate curriculum of study, as classified by Society of Actuaries for programs preparing students for at least these first two societal exams with topics covered for the third and fourth exams, a graduate of the program may have a stronger likelihood of employment in the private sector, industry, and government sector in [Saudi Arabia](#) and [abroad](#). The program has a good balance of theory, applications and data analysis, as well as carefully selected sequences of courses from computer science, economics, accounting, finance, and management. This interdisciplinary approach is meant to make the program flexible, and give the students a broad base of education, thus, improving their chances of employment. Graduates of the program are well-qualified scientists with good knowledge in mathematics, probability, statistics, computing, economics, accounting, finance, and management.

- **Significance to the Kingdom**

The economic development of the kingdom has reached a high level of sophistication. A program in “Actuarial Science and Financial Mathematics ” will certainly enhance this development by providing manpower who not only understands the economic, societal, operational, and financial risks facing the country’s businesses but also know how best to advise them on the best course of action to minimize and manage these risks. In addition, this program will open up avenues for our graduates. Degree holders of this program will play a vital role in many organizations such as banking institutions, insurance or takaful companies, Financial consulting firms, commerce, social sector, investments, security trading, pension funding, healthcare funding, industry, national environmental risks agencies, national retirement planning, and national demography and census management.

- **Significance for KFUPM**

On the forefront, the output of the program seems to be centered on production of specialized skilled manpower with high ability to help the country's businesses and organizations manage economic, operational, societal, and financial risks. Another important aspect of the program is the crucial part it plays in fostering interdisciplinary activities at KFUPM. The program, once launched, will create mutually beneficially link between the private and governmental sectors and the various departments at KFUPM, leading to more research collaborations of interdisciplinary nature. This can ultimately contribute in

- Introducing challenging new research areas with a direct bearing on the development of interdisciplinary research at KFUPM.
- Developing, jointly with several departments at KFUPM, new ideas and approaches of research of a multidisciplinary nature.

The role of Mathematics and Statistics as a ground of all scientific disciplines and areas is widely recognized. Hence, it is only natural to emphasize its contribution in the development of new research avenues that cuts across disciplines.

- **Degree to be awarded**

Bachelor of Science in Actuarial Science and Financial Mathematics

- **Availability of the resources**

- a. Manpower**

The Department of Mathematics and Statistics has about twenty faculty members in Applied Mathematics, Numerical Analyses, Probability, and Statistics. Some of them can contribute in program instruction. Moreover, the interdisciplinary nature of the program and the presence of cross-listed courses in the program, faculty members from other departments are also expected to participate. However, given the more specialized Actuarial major courses, the program may need faculty with some specialized Actuarial training to teach these courses. Currently, the Department of Mathematics and Statistics has only one faculty member who was trained as an Actuary and a Statistician with specialization in educational measurement and testing, another faculty member with training in Statistics and whose research area is Stochastic Process, and several faculty members with specialization in Wavelet analyses. The Department of Finance has some faculty members currently teaching the required finance courses such as Investments course and Risk Management and Insurance course. However, currently there are no faculty members with specialization or training in Islamic Finance or with fellowship from Actuarial Societies.. At present, there are more courses than there are faculty members with training or specialization in areas supportive of the program courses. So, there is a need to add faculty members with specializations in line with this program, particularly starting from the third year of the degree program onwards. On the whole, the program is estimated to need at least six new faculty members to teach all the proposed new courses.

- b. Research and Teaching Facilities**

Several computer laboratories are available ranging from PCs to servers running under different operating systems. These laboratories, scattered across campus, are under the supervision of the ITC. The Department of Mathematics and Statistics has a PC Lab with forty networked machines. The College of Industrial Management has two PC labs with around thirty and around

forty networked machines. The program will, therefore, need a minimum of other computing facilities, mainly regarding parallel computation that is now available at a reasonable cost. In addition, the Actuarial Programming Language (APL) software will also be needed.

c. Main Library

The main library is well equipped in terms of scientific and engineering literature. However, some Actuarial-related books especially those recommended by international society of Actuaries, Actuarial-related journals, and conference proceedings on Islamic Finance or similar conference proceedings will need to be ordered for references.

• **Rationale for the contents of courses**

The curriculum development for this program is focused on providing an enriched sequence in which analytic, stochastic modeling, and computation techniques for real-world economic, operational, societal and financial problem solving are synthesized. The design of course content is based on a careful selection of topics relevant to the needs of the private and governmental sectors and industries of the Kingdom. Core courses provide the common basis needed to understand, analyze, model, and manage real-life social, operational, financial, and economic problems arising from different situations. They also provide specific stochastic tools to solve such problems. With the core courses, graduates of the program are well equipped with knowledge to work in any sector that uses actuarial and financial optimization skills.

The program is also structured to offer electives from a wide range of courses integrating modern stochastic tools with practice. Some of the electives are of true multidisciplinary nature. This versatility will equip graduates of the program, contingent on their choice of elective, with capabilities of working in diverse areas of Saudi institutions.

For instance, with the indicated choice of electives, the graduates of the program can apply their skills as a specialist or team member in the following sectors.

- **Banking**
With the core courses and the listed elective courses below, a graduate will be a financial optimization scientist or specialist working in the Banking industry. He will be equipped with knowledge on financial transactions in the banking industry as well as the actuarial skills to manage banking-related risks.
 - FIN 410, ECON 305
- **Chambers of Commerce**
With the core courses and the listed elective courses below, a graduate will be a financial optimization scientist or specialist working in the Chambers of Commerce. He will be equipped with knowledge on financial transactions in business as well as the actuarial skills to advise the Chamber on regulating commerce-related risks.
 - MGT 301, ECON 305
- **Investments**
With the core courses and the listed elective courses below, a graduate will be a financial optimization scientist or specialist working in speculating returns and risks related to investments. He will be equipped with knowledge on financial transactions in investments as well as the actuarial skills to minimize investment-related risk, model stock market data, predict the next time stock prices are expected to rise or decline, and maximize investors' investment returns.
 - FIN 410, FIN 425
- **Financial Consulting**

With the core courses and the listed elective courses below, a graduate will be a financial optimization scientist or specialist working in the Financial Consulting industry. He will be equipped with knowledge on financial transactions in the business as well as the actuarial skills to manage financial-related risk as well as conduct feasibility studies on financial projects. With these skills, he would be a very important team member in a financial consulting firm.

- FIN 410, FIN 425

- Financial securities management

With the core courses and the listed elective courses below, a graduate will function as a financial optimization scientist or specialist working in the financial securities management. He will be equipped with knowledge on financial transactions in the securities trading as well as the actuarial skills to manage financial-related risk on these security trading. With these skills, he would be a very important member in a financial security management team.

- FIN 410, FIN 401, MGT 311

- Asset and Fund management

With the core courses and the listed elective courses below, a graduate will function as a financial optimization scientist or specialist working in the Asset and Fund Management department in any company. He will be equipped with knowledge on financial fund and asset management as well as the actuarial skills to manage financial-related risk on these funds and asset. With these skills, he would be a key member of any company.

- FIN 470, STAT 461, FIN 410

- Healthcare funding

With the core courses and the listed elective courses below, a graduate will function as a scientist or specialist working in the healthcare funding field. He will be equipped with knowledge on mortality rates as well as the actuarial skills to minimize the impact of mortality-related risk on society with adequate funding appropriation and maximize society's readiness in terms of funding for the next occurrence of sickness. With these skills, he would be a very important member in a healthcare funding organization.

- MATH 480, ASFM 498

- Pension Funding

With the core courses and the listed elective courses below, a graduate will function as a scientist or specialist working in the pension funding field. He will be equipped with knowledge on mortality rates and finance as well as the actuarial skills to minimize the impact of mortality-related risks on an employer's responsibility for adequate pension funding appropriation. With these skills, he would be a very important member in any company responsible for an attractive pension funding package for their employees.

- ASFM 498, STAT 355

- Insurance and Takaful

With the core courses and the listed elective courses below, a graduate will function as a scientist or specialist working in the conventional and Islamic (takaful) insurance field. He will be equipped with knowledge on mortality rates or accident rates and

finance as well as the actuarial skills to minimize the impact of these risks on an insurer's responsibility for adequate insurance or takaful funding appropriation.

○ ASFM498, STAT 461

- National Insurance and Takaful Regulation

With the core courses and the listed elective courses below, a graduate will function as a scientist or specialist working in the conventional and Islamic (takaful) insurance field. He will be equipped with knowledge on mortality rates or accident rates and finance as well as the actuarial skills to minimize the figure out and regulate the insurance premiums that are charged by insurance or takaful companies. A national insurance of takaful regulator will ensure that the monetary value of protection against risks is justified.

○ ASFM498, ECON 306

- National Census and demography management

With the core courses and the listed elective courses below, a graduate will function as a scientist or specialist working in the census and demography management of the country. He will be equipped with knowledge on various rates of the nation's demography as well as the actuarial skills to manage demographic and census data, to project some future rates and to evaluate shifts in the current demographic rates to advise the government on the need for a new census.

○ STAT355, STAT 440, STAT 365

- National Environmental Risk Agency

With the core courses and the listed elective courses below, a graduate will function as a scientist or specialist working in the Environmental Risk Agency of the country. He will be equipped with knowledge on risks related to the environment on the set-up of a new business or company and the actuarial skills to forecast the impact of these environmental risks. With this information, he can advise the governmental agency on the impact of these environmental risks.

○ STAT 461, STAT 440

- Operational Risk Management for Industries

With the core courses and the listed elective courses below, a graduate will function as a scientist or specialist working in the country's industries on managing daily risks in their operation. For example, the expected on-the-job risks of different techniques of the operation of drilling oil to employees at ARAMCO can be calculated by an actuary so that these risks can be kept to the minimum. Also, the probability models for drilling oil can be developed and used by an actuary to maximize oil productions. With this information, he can advise the company what is the best option for each company's operation.

○ STAT 461, STAT 325

**REQUIREMENTS FOR THE B.S. DEGREE IN
ACTUARIAL SCIENCE AND FINANCIAL MATHEMATICS**

General Education Requirements (59 credit hours)		Credit Hours
English	ENGL 101, 102	6
Communication Skills	ENGL 214	3
	IAS 101, 201	4
Islamic & Arabic Studies	IAS 111, 211, 418	6
Physical Education	PE 101, 102	2
Mathematics	MATH 101, 102, 201, 202, 280	17
Computer Programming	ICS 102	3
Social and Behavioral Sciences	ECON 101 , 202	6
Accounting and Finance	ACCT 201, ACCT 202	6
General Studies	Any 2 GS courses	<u>6</u>
		59

Major requirements (47 credit hours)

Pre-requisite requirements (9 credits)

Quantitative Methods for Actuaries	MATH 322 (new)	3
Statistical Methods for Actuaries	STAT 213 (new)	3
Financial Management I	FIN 301	3

Core requirements (38 credits)

Introduction to Probability Theory	STAT 301	3
Statistical Inference	STAT 302	3
Regression Analysis	STAT 310	3
Time Series	STAT 460	3
Financial Mathematics	ASFM 201 (new)	3
Actuarial Contingencies I	ASFM 381 (new)	3
Actuarial Contingencies II	ASFM 482 (new)	3
Stochastic Processes for Actuaries	STAT416 (new)	3
Actuarial Science Problem Labs	ASFM 488 (new)	<u>2 (1 cr ea)</u>
Investments	FIN 320	3
Security Analysis and Portfolio Management	FIN 421	3
One of the following two group A courses		3
1) Islamic Finance	FIN 420 (new)	
2) Risk Management, Insurance and Takaful	FIN 430 (modified)	
One of the following two group B courses		3
1) Survival Models for Actuaries	ASFM 475 (new)	
2) Actuarial Risk Theory and Credibility	ASFM 483 (new)	
3) Topics in Actuarial Science and Financial Mathematics (Graduation theory, Advanced Risk Theory, Stochastic Simulation Methods, or other advanced topics)	ASFM 498 (New) with variable content	

38

Major Electives (3 credit hours)

Choose courses from any of the following

Any Group A or B courses		3
Operations Research I	STAT 361	3

Demographic Methods	STAT 355	3
Numerical Analysis II	MATH 472	3
Operations Research II	STAT 461	3
Linear & Nonlinear Programming	MATH 480	3
Advanced Calc I	MATH 311	3
Advanced Calc II	MATH 411	3
Advanced Calc III	MATH 412	3
Intro to Measure Theory & Functional Analysis	MATH 431	3
Methods of Applied Mathematics	MATH 301	3
Wavelet Analyses	MATH 485	3
Multivariate Analysis	STAT 440	3
Linear Models	STAT 435	3
Numerical Analyses I	MATH 471	3
Money and Banking	ECON 305	3
Intermediate Financial Management	FIN 401	3
International Financial Management	FIN 410	3
Financial Modeling	FIN 425	3
Introduction to Financial Engineering	FIN 470	3
Nonparametric Statistical Methods	STAT 325	3
Data Collection and Sampling Methods	STAT 365	3
Experimental Design	STAT 430	3
Graph Theory	MATH 425	3
Principles of Marketing	MKT 301	3
Principles of Management	MGT 301	3
Legal Environment	MGT 311	3
Economy of Saudi Arabia	ECON 306	3
Islamic Economics	ECON 420	3

With the core courses, students are well qualified for careers in General Actuarial practice. For more specific tracks, students are advised to take the following major electives:

- Insurance and Takaful Track
 - ASFM 498
- Financial Mathematics Track
 - FIN 410
- Operational Risk Management Track
 - STAT 461

Free Electives (6 credit hours)

- In consultation with his academic advisor, a student should choose any 300 or above level courses or any additional courses listed in the major electives above for a total of 6 credit hours.

Co operative Work Requirement (9 credit hours)

Students registered under this option must participate in a 28-week program of industrial experience and submit a report for ASFM 351, “Actuarial Science and Financial Mathematics Cooperative Work”.

Total Requirements (124 credit hours)

The B.S. degree in Actuarial Science and Financial Mathematics requires a minimum total of 124 credit hours.

Actuarial Science and Financial Mathematics Course Description

ASFM 201 Financial Mathematics

3-0-3

The course concentrates on the theory of compound interest and the mathematics of investment and credit; however, life contingencies are also introduced toward the end of the semester. Major topics include the measurement of interest, annuities certain (level, non-level, and continuous), amortization schedules, sinking funds, investment yield rates, and valuation of bonds and other securities. A basic knowledge of calculus and probability is assumed. **Methods of loan measurement and payments (Islamic and Conventional) are illustrated in amortization and sinking fund schedules. Islamic views on interest and investments will be discussed.** This course is intended for Actuarial Science and Financial Mathematics majors who are studying for the professional exam on [Financial Mathematics](#) (FM) given by the Society of Actuaries and the Casualty Actuarial Society.

Prerequisites: MATH 102 and STAT 213

ASFM 351 Actuarial Science and Financial Mathematics Cooperative Work 0-0-9

A period of 28 weeks of industrial employment for Actuarial Science and Applied Financial Mathematics students to work in appropriate industries or firms. Students are evaluated on their performance on the job and are required to submit an extensive formal report on their work experience.

(Limited to ASFM students).

Prerequisites: ENGL 214, ASFM 201, STAT 301 and STAT 310

ASFM 381 Actuarial Contingencies I

3-0-3

This course is an introduction to life insurance mathematics based on a stochastic approach. Major topics include life insurance, annuities, benefit premiums, and net reserves. **Parallel treatment of topics based on Takaful system will also be addressed.** Students are assumed to be proficient in Multivariable calculus. A required course for Actuarial Science and Financial Mathematics majors.

Prerequisites: ASFM 201 and STAT 301

ASFM 475 Survival Models for Actuaries

3-0-3

The statistical process of analyzing survival data, particularly for insurance applications. Techniques for estimating mortality rates; construction of mortality tables from the records of insured lives, employee benefit plans, and population statistics. Life tables, graph and related procedures. **Special attention to censoring and truncation.** Single samples: complete or Type II censored data and Type I censored data for Exponential, Weibull, Gamma and other Distributions. Parametric regression for Exponential, Weibull and Gamma Distributions. Distributions-free methods for proportional hazard and related regression models. **This course section is required for Actuarial Science & Financial Mathematics major.**

Prerequisites: STAT 302, STAT 310

ASFM 482 Actuarial Contingencies II

3-0-3

A continuation of Life Contingencies I. Development is based on a stochastic approach to life insurance models. Major topics include benefit premiums and reserves, and multi-life and multiple-decrement models. **Parallel treatment of topics based on Takaful system will also be compared.** Application of such area in life insurance and property. A required course for Actuarial Science and Financial Mathematics majors. Students are assumed to be proficient in Multivariable calculus. Material in this course is based on the syllabus of Course 3 of the Casualty Actuarial Society and the Society of Actuaries.

Prerequisites: ASFM 381

ASFM 483 Actuarial Risk Theory and Credibility**3-0-3**

This course studies the distribution of aggregate claims associated with insurance including analysis of the risk due to variations in expected claim numbers and amounts. Also covers frequency and severity distributions, individual and collective models, ruin theory, continuous-time compound Poisson surplus processes, reinsurance, dividend formulas, credibility models, and simulation. An introduction to empirical Bayes and statistical distributions used to model loss experience. Application of risk theory to the operation of insurance and **takaful** system and assessment of the credibility of data for ratemaking.

Prerequisites: STAT 416 (Stochastic Process for Actuaries)

ASFM 488 Actuarial Science Problem Labs**0-1-1**

This problem lab is designed to prepare Actuarial majors for the first two Society of Actuaries and Casualty Actuarial Society Examinations: Exam P (Probability) and FM (Financial Mathematics). Students are assumed to have taken the appropriate prerequisite courses prior to registering for this society exam preparation lab.

Prerequisites: STAT 301 for Exam P, or ASFM 201 for Exam FM

ASFM 498 Topics in Actuarial Science and Financial Mathematics**3-0-3**

Open for Actuarial majors interested in studying an advanced topic in Actuarial Science and Financial Mathematics. Course content is variable. Possible Topics: (1) Graduation Theory, (2) Advanced Risk Theory, (3) Stochastic Simulation Methods, or (4) Other Advanced Actuarial Science and Financial Mathematics topic.

Prerequisites: Senior Standing, permission of the Department Chairman upon recommendation of the instructor.

FIN 420 Islamic Finance**3-0-3**

New course offered by the Department of Finance and Economics.

Introduction to the theory and practice of Islamic Financial instruments and institutions. Topics include the theory of Islamic banking, structure, and management of Islamic banks, theory of Islamic contracts, Islamic bond instruments, Islamic insurance instruments, risk and liquidity management in Islamic financial institutions. Other topics include cost of capital determination, project evaluation techniques, and Zakat accounting in the Islamic financial system.

Prerequisites: FIN 301, IAS418 (Contemporary Financial Transactions in Islam).

FIN 430 Risk Management, Insurance, and Takaful**3-0-3**

A modification to the current FIN 430 course to include Takaful components. Description drafted and agreed upon by Mathematics & Statistics and Finance & Economics interdepartmental committee on Actuarial Science and Financial Mathematics.

This course is an introductory course which presents basic theories, concepts, analytical techniques in the area of risk management, insurance, and Takaful. Topics covered in the course include theory of risk and risk management; identification; measurement and arrangements to deal with risk in a personal and business situation; types of insurance coverage; basic features of selected insurance contracts; principles and models of Takaful; family Takaful contracts; and re-Takaful.

MATH 322 Quantitative Methods for Actuaries**3-0-3**

Algorithms; linear and quadratic programming, simplex and dual method; Solution of non-linear equations; finite differences; graduation; cubic splines; individual risk models; life tables. Floating-point arithmetic and error analysis. Interpolation. Polynomial interpolation. Numerical integration and differentiation. Data fitting. Solution of linear algebraic systems. Initial and boundary value problems of ordinary differential equations. Prerequisites: multivariate calculus and linear algebra. This course section is designed to meet the Actuarial Science and Financial Mathematics course degree requirement. It cannot be taken for credit with MATH 321 or SE 301.

Prerequisites: MATH 201; ICS 101, ICS 102, or ICS 103

STAT 213 Statistical Methods for Actuaries**2-2-3**

Descriptive Statistics: Frequency table; histogram, measure of central tendency and variability, scatter diagram and correlation. Probability theory; sampling techniques; probability distributions; estimation; hypothesis testing for means and variances; index number and introductory time series analyses; simple linear regression and correlation analysis; multiple regression analysis; the chi-squared and F distributions and their applications; application for financial decisions; application using statistical packages. This course section is designed to meet the Actuarial Science and Financial Mathematics course degree requirement. It cannot be taken for credit with STAT 201, STAT 211, STAT212, or STAT 319.

Prerequisites: MATH 102

STAT 416 Stochastic Processes for Actuaries**3-0-3**

Basic classes of Stochastic processes Poisson (regular, compound, compound surplus, and non-homogenous) and renewal processes with applications in simple queuing systems and actuarial science. Discrete and continuous time Markov chains. Birth-Death and Yule processes. Branching models of population growth and physical processes. Frequency and severity distributions; individual and collective risk models; simulation. Arithmetic and geometric Brownian motions, and applications of these processes in computation of resident fees for continuing care retirement communities, and pricing of financial instruments. This course section is designed to meet the Actuarial Science and Financial Mathematics course degree requirement. Cannot be taken for credit with STAT 415.

Prerequisites: STAT 301

ACTUARIAL SCIENCE AND FINANCIAL MATHEMATICS CURRICULUM

COURSE	TITLE	LT	LB	CR	COURSE	TITLE	LT	LB	CR
Prep Year (Preparatory)									
ENGL 001	Preparatory English I	15	5	8	ENGL 002	Preparatory English II	15	5	8
MATH 001	Preparatory Math I	3	1	4	MATH 002	Preparatory Math II	3	1	4
PYP 001	Preparatory Physical Sciences	2	0	2	PYP 002	Preparatory Computer Sciences	0	2	1
PYP 003	University Study Skills	0	2	1	ME 003	Preparatory Engineering Technology	0	2	1
PE 001	Preparatory Physical Education I	0	2	1	PE 002	Prep. Physical Educ. II	0	2	1
		20	10	16			18	12	15
Total credit hours required in Preparatory Program: 31									
First Year (Freshman)									
ENGL 101	English Composition I	3	0	3	ENGL 102	English Composition II	3	0	3
IAS 111	Belief and its Conseq.	2	0	2	IAS 101	Practical Grammar	2	0	2
ICS 102	Intro to Computing	2	3	3	IAS 212	Professional Ethics	2	0	2
GS xxx	General Studies	3	0	3	MATH 102	Calculus II	4	0	4
MATH 101	Calculus I	4	0	4	ECON 202	Prin of Economics II (MACRO) ^{VE}	3	0	3
ECON 101	Prin of Economics I (MICRO) ^{VE}	3	0	3	PE 101	Physical Education I	0	2	1
		17	3	18			14	2	15
Second Year (Sophomore)									
ENGL 214	Technical Report Writing	3	0	3	MATH 280	Intro to Linear Algebra	3	0	3
ASFM 201	Financial Mathematics ^{FM}	3	0	3	ACCT 202	Prin of Accounting II (investment acct)	3	0	3
ACCT 201	Prin of Accounting I	3	0	3	ASFM 488	Actuarial Lab I	0	1	1
MATH 201	Calculus III	3	0	3	STAT 301	Intro to Probability Theory ^P	3	0	3
PE 102	Physical Education II	0	2	1	STAT 310	Regression Analysis ^{VS}	3	0	3
STAT 213	Statistical Methods for Actuaries ^{VS}	2	2	3	IAS 418	Contemporary Financial Transactions in Islam	2	0	2
		14	4	16			14	1	15
Third Year (Junior)									
IAS 201	Objective Writing	2	0	2	FIN xxx	Group A course	3	0	3
FIN 301	Financial Management I ^F	3	0	3	ASFM 381	Life Contingencies I ^C	3	0	3
STAT 416	Stochastic Process for Actuaries ^M	3	0	3	xxx xxx	Free Elective II	3	0	3
MATH 202	Elements of Differential Equations	3	0	3	FIN 320	Investments ^{VF}	3	0	3
STAT 302	Statistical Inference	3	0	3	MATH 322	Quantitative Meth for Actuaries	3	0	3
ASFM 488	Actuarial Lab II	0	1	1	STAT 460	Time Series ^{VS}	3	0	3
xxx xxx	Free Elective I	3	0	3			18	0	18
		17	0	18	ASFM 350	Cooperative work	0	0	0
Fourth Year (Senior)									
ASFM 351	Cont. of Cooperative work	0	0	9	ASFM/ STAT xxx	Group B course	3	0	3
					ASFM 482	Life Contingencies II ^C	3	0	3
					xxx xxx	ASFM Elective I	3	0	3
					FIN 421	Security Analysis and Portfolio Management	3	0	3
					GS xxx	General Studies	3	0	3
		0	0	9			15	0	15

Total credit hours required in Degree Program: 124

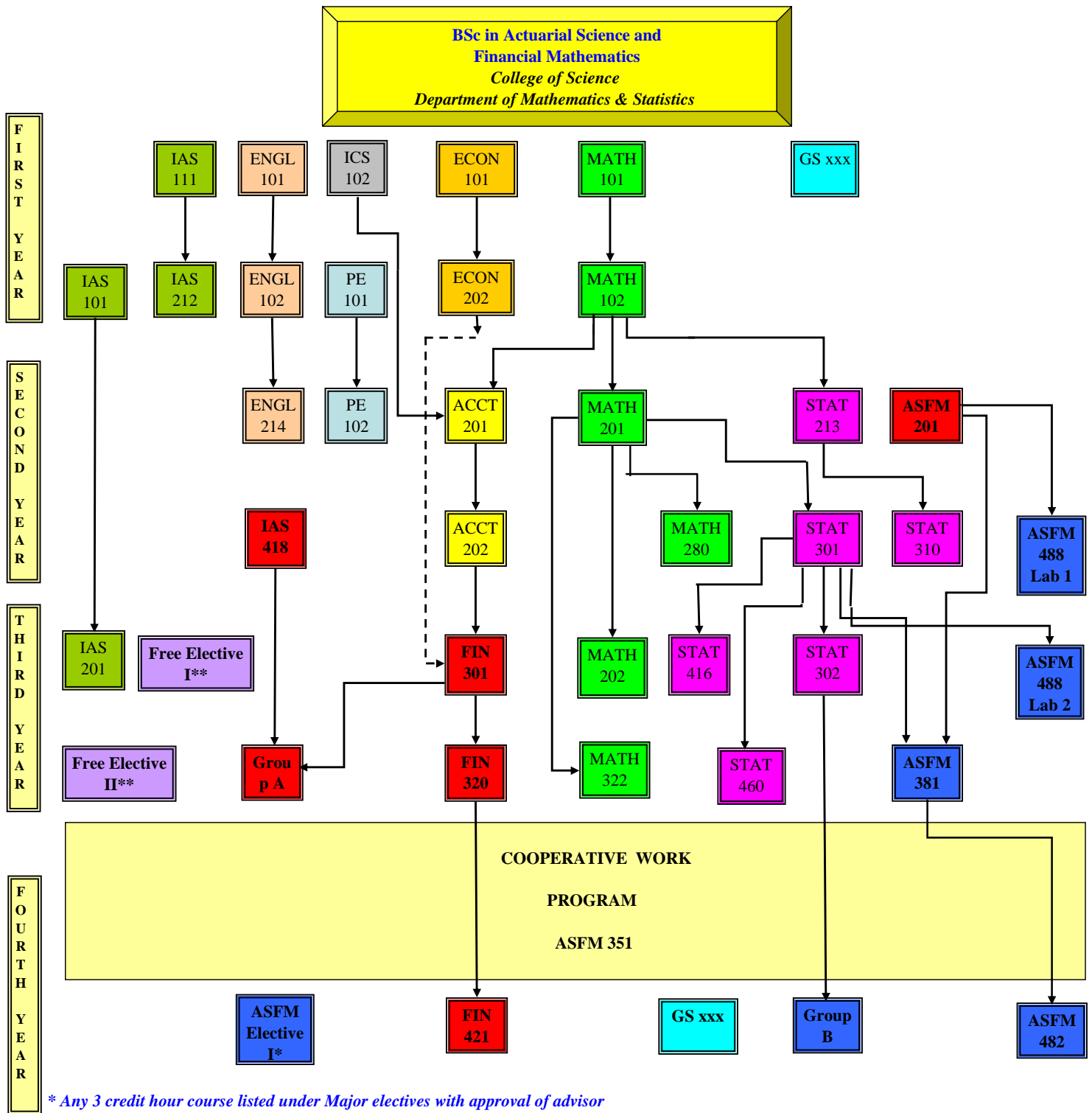
Total credit hours required in General Education Hours: 59

Total credit hours required in Major Requirement Hours: 47

Total credit hours required in Major Electives: 3

Total credit hours required in Other Electives: 6

- VF courses covering Finance topics for the SOA Validation by Educational Experience (VEE)
- VE courses covering Economics topics for the SOA Validation by Educational Experience (VEE)
- VS courses covering Applied Statistical Methods topics for the SOA Validation by Educational Experience (VEE)
- P courses covering topics for the SOA professional exam P (Probability)
- F courses covering topics for the SOA professional exam FM (Financial Mathematics)
- M courses covering topics for the SOA professional exam M (Actuarial Models)
- C courses covering topics for the SOA professional exam C (Constructing & Validating Actuarial Models)



* Any 3 credit hour course listed under Major electives with approval of advisor

** Any 300 level 3 credit hour course including those listed under Major electives with approval of advisor

Appendix

List of new courses introduced in the program

	<u>Course Title</u>	<u>New Code</u>	<u>Cross-Listing</u>	<u>Category</u>
1)	Financial Mathematics	ASFM 201		Core
2)	Actuarial Contingencies I	ASFM 381		Core
3)	Actuarial Contingencies II	ASFM 482		Core
4)	Actuarial Risk Theory and Credibility	ASFM 483		Core
5)	Islamic Finance	FIN 420		Core Elective
6)	Actuarial Science Problem Labs	ASFM 488		Core
7)	Quantitative Methods for Actuaries	MATH 322		Core
8)	Statistical Methods for Actuaries	STAT 213		Prerequisite
9)	Stochastic Processes for Actuaries	STAT416		Core
10)	Survival Models for Actuaries	ASFM 475		Core Elective
11)	Topics in Actuarial Sciences (Graduation theory, Advanced Risk Theory, Stochastic Simulation Methods, or other advanced topics)	ASFM 498 with variable content		Core Elective
12)	Actuarial Science and Financial Mathematics Cooperative Work	ASFM 351		Coop

List of modified courses introduced in the program

	<u>Course Title</u>	<u>New Code</u>	<u>Cross-Listing</u>	<u>Category</u>
1)	Risk Management, Insurance, & Takaful	FIN 430		Core Elective

List of existing courses utilized by program

	<u>Course Title</u>	<u>Code</u>	<u>Cross-Listing</u>	<u>Category</u>
	Contemporary Financial Transactions in Islam	IAS 418		General
	Principle of Economics I (Microeconomics)	ECON 101		General
	Principle of Economics II (Macroeconomics)	ECON 102		General
	Computer Programming	ICS 102		General
	Principles of Accounting I (Basic Accounting)	ACCT 201		General
	Principles of Accounting II (Financial Accounting)	ACCT 202		General
	Financial Management I	FIN 301		General
	Calculus I	MATH 101		General
	Calculus II	MATH 102		General
	Finite Mathematics	MATH 131		Pre-requisite
	Calculus III	MATH 201		General
	Introduction to Linear Algebra	MATH 280		General
	Elements of Differential Equation	MATH 202		General
	Introduction to Probability Theory	STAT 301		Core
	Statistical Inference	STAT 302		Core

Regression Analysis	STAT 310	Core
Time Series	STAT 460	Core
Investments	FIN 320	Core
Security Analysis and Portfolio Management	FIN 421	Core
Linear & Nonlinear Programming	MATH 480	Elective
Operations Research I	STAT 361	Elective
Demographic Methods	STAT 355	Elective
Operations Research II	STAT 461	Elective
Methods of Applied Math	MATH 301	Elective
Advanced Calculus I	MATH 311	Elective
Advanced Calculus II	MATH 411	Elective
Advanced Calculus III	MATH 412	Elective
Numerical Analysis II	MATH 472	Elective
Wavelets and Applications	MATH 485	Elective
Multivariate Analysis	STAT 440	Elective
Linear Models	STAT 435	Elective
Numerical Analyses I	MATH 471	Elective
Intermediate Financial Management	FIN 401	Elective
International Financial Management	FIN 410	Elective
Finance Modeling	FIN 425	Elective
Introduction to Financial Engineering	FIN 470	Elective
Nonparametric Statistical Methods	STAT 325	Elective
Data Collection and Sampling Methods	STAT 365	Elective
Experimental Design	STAT 430	Elective
Graph Theory	MATH 425	Elective
Principles of Marketing	MKT 301	Elective
Principles of Management	MGT 301	Elective
Legal Environment	MGT 311	Elective
Money and Banking	ECON 305	Elective
Economy of Saudi Arabia	ECON 306	Elective
Stochastic Systems Simulations	SE 405	Elective
Islamic Economics	ECON 420	Elective

North American or European Universities offering similar programs

Several North American and European universities are offering similar programs under the Actuarial Science, Quantitative Finance, or similar titles. Some examples are

- University of Regina, Saskatchewan, Canada
- University of Western Ontario, Ontario, Canada
- University of Iowa, Iowa City, USA
- University of Wisconsin, Madison, USA
- University of Nebraska, Lincoln, USA
- University of Illinois, Urbana-Champaign, USA
- University of Texas, Austin, USA
- University of Pennsylvania, Philadelphia, USA
- Leipzig University of Applied Science, Germany
- University College Cork, Ireland

- University College Dublin, Ireland
- Heriot-Watt University – Edinburgh, United Kingdom

Universities in Muslim countries offering similar programs

With the growing Takaful and Islamic banking market, some organizations and universities in Muslim countries are also offering similar programs with some concentration on the Islamic finance. However, because of the relatively new growth in this market, literature and internet search results on the subject are very few. In addition, some organizations like the [K-Professional Development Academy](#) Sdn Bhd (KPDA), in cooperation with Camden University, are offering graduate level degrees in area of Islamic Banking and Finance with ongoing research areas like Islamic Takaful and re-Takaful and Islamic Risk management. The relatively few examples of Universities with takaful and actuarial science program components are

- National University of Malaysia (UKM), Bangi, Malaysia (B.Sc. in Actuarial Sciences)
- Univeristy of Malaya (UM), Kuala Lumpur, Malaysia. (B.Sc. in Actuarial and Financial Mathematics)
- Universiti Utara Malaysia (UUM), Sintok, Malaysia ([Bachelor of banking](#))

Curriculum Comparison with some Universities in North America, Europe, and Muslim Countries

A survey of programs in some North American, European, and muslim countries is summarized in the following table

University	Program	Core Courses
University of Iowa, Iowa City: Dept of Statistics & Actuarial Sciences	B.Sc. in Actuarial Sciences (courses up to the 4 th CAS Exam)	Economics, Accounting , Multivariable calculus and linear algebra, computer science, Probability Theory, Mathematical Statistics, Regression, Time Series Analyses, Quantitative Methods for Actuaries, Actuarial Models, Mathematics of Finance, Life Contingencies I & II
University of Wisconsin, Madison: Dept of Act Sc, Risk Mgt, & Insurance	BBA. (Business Bach of Arts) in Actuarial Sciences (courses up to the 4 th CAS Exam)	linear algebra, Calculus to Multivariable Calculus, Computer science, Probability Theory, Mathematical Statistics, Regression, Time Series Analyses, Stochastic Process, Theory of Interest and Life Insurance, Actuarial Mathematics I, Risk Theory and Credibility II, Loss Distributions and Survival Models,
University of Illinois, Urbana-Champaign: Dept of Mathematics	B.Sc. in Actuarial Sciences (courses up to the 4 th CAS Exam)	linear algebra, Calculus to Multivariable Calculus, Computer science, Probability Theory, Mathematical Statistics, Linear Algebra, Methods of Applied Statistics, Economics, Accounting, Finance, Theory of Interest, Actuarial Statistics I & II, Actuarial Theory I & II, Actuarial Risk Theory, Survival Analysis, Actuarial Modeling
University of Western Ontario, Ontario Canada	B.Sc in Actuarial Science (courses up to the 4 th CAS Exam)	Linear Algebra, Calculus I & II, Statistical Sciences, Advanced Calculus I & II, Introduction to Probability, Introduction to Mathematical Statistics, Introduction to Mathematical Statistics, Probability I, Mathematics of Finance, Corporate Finance, Statistical and Actuarial Computing, Contingencies Analysis
University of Regina, Regina, Saskatchewan,	B.Sc in Actuarial Science (courses up to the 4 th CAS Exam)	Linear Algebra, Calculus, Numerical Analysis, Statistics, Economics I & II, Finance I & II , Applied and Mathematical Statistics, Advanced courses in Mathematics, Advanced Courses in Statistics, Advanced Courses in Actuarial Science

Canada		
National University of Malaysia (UKM), Bangi: College of Science and Technology	B.Sc. in Actuarial Sciences (courses up to the 4 th CAS Exam)	Computer science, linear algebra, Calculus to Multivariable Calculus, Probability Theory, Mathematical Statistics, Regression, Time Series Analyses, Accounting & Financial Principles, Portfolio Management and Investment Analysis I & II, Financial Mathematics, Actuarial Mathematics I & II, Risk Theory, Survival Models, Actuarial Planning & Investigations, Introduction To Conventional & Islamic Insurance
University of Malaya Kuala Lumpur Malaysia	B.Sc in Actuarial and Financial Mathematics (New Program established in 2005 with courses up to the 4 th CAS Exam)	Linear Algebra, Calculus I-III (multivariable calculus), Differential equation, Probability Theory, Mathematical Statistics I & II, Introductory Financial Mathematics, Microeconomics, Macroeconomics, Introductory Accounting, Financial & Investment Analysis I & II, Loss Reserve, Ratemaking and reinsurance for property and casualty, Advanced Life Contingencies, Introductory Risk Theory. Core electives: Introductory operations research, Introduction to Statistical Computing, Stochastic Process, Regression Analysis, Advanced Mathematical Statistics, Introduction to Time Series, Monte Carlo simulation Methods, Introduction to Lifetime Data Analysis, Credibility and Ruin Theory, Life Insurance and Takaful.
Leipzig University of Applied Science, Germany	B.Sc in Actuarial and Financial Mathematics	Compulsory Subjects: Introduction to Computing, Database systems II, Analysis I & II, Linear Algebra I & II, Differential Equations, Numerical Analysis, Optimization I, Mathematical Software, Discrete Mathematics, Business Administration, Business Accounting, Management, Business Statistics, Foreign Languages, Theory of Probability, Statistics I & II, Mathematical Seminar, Operations Research I, Stochastic Processes, Forecasting and Time Series Methods, Theory of Risk, Financial Mathematics, Actuarial Mathematics.

Some Actuarial and Financial Mathematics degree program accredited by the Faculty of Actuaries and Institute of Actuaries, United Kingdom (<http://www.actuaries.org.uk>) are summarized in the following table. These programs prepare the graduates for the following modules of the professional exams.

- CT1 Financial Mathematics
- CT2 Finance and Financial Reporting
- CT3 Probability and Mathematical Statistics
- CT4 Models
- CT5 Contingencies
- CT6 Statistical Methods
- CT7 Economics
- CT8 Financial Economics

University	Program	Core Courses
University College Cork, Ireland	B.Sc in Financial Mathematics and Actuarial Science	linear algebra, calculus, advanced calculus, differential equations, numerical computing, mathematical analysis, abstract algebra, mathematical software, mechanics, mathematical modeling, probability, statistics, statistical inference, statistics and computing, Finance, Economics, Asset and Option Pricing, Computational Finance, Financial Derivatives, Actuarial Mathematics
University College Dublin, Dublin Ireland	B.Sc in Actuarial & Financial Studies	Computer Programming, Linear Algebra and Geometry, Data Structures and Algorithm, Differential and Integral Calculus, Statistical Inference, Statistics I & II, Mathematics I & II, Probability

		distribution, Linear Models, Regression analysis, Time Series, Survival Models, Stochastic Models, Financial Accounting 1 , Fundamental of Actuarial and Financial Mathematics I & II, International Monetary Economics, Aspects of Financial Theory, Info Mgt for Actuaries, Economics I & II, Finance, Investment, related Actuarial Science and Business subjects, Advanced Actuarial Science, Advanced Economics, Corporate Finance, Advanced Statistics, Advanced Finance, Financial economics, Financial Management, Actuarial Investment, Actuarial Mathematics I & II, Actuarial Statistics, Asset and Liability Management for Actuaries
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Brief Course-wise Comparison Between Actuarial Programs and Proposed KFUPM program

Type	Minor	Description	Credit(s)	CAS/SOA Requirements	Courses at Universities							
					UWiscon	UillinoisUC	UNLincoln	UTexas	Ulowa	UKM	KFUPM	
Core	must	Mathematical Statistics I (Intro to Probability)	3	P / CAS Exam 1	STAT309	Math408		M362K	22S:153	STQS 1113	STAT301	
Core	must	Mathematical Statistics II (Stat Inference)	3		STAT310	Math409		M358K	22S:154	STQS 1123	STAT302	
Core1	must	Financial Mathematics	3	FM / CAS Exam 2	Act Sci 303	MATH 210	ACTS440	ACF329	22S:180	STOA2133	ASFM301(n)	
Core2		Life Contingencies I	3	M /CAS 3	Act Sci 650	Math 471	ACTS470	M339U	22S:181	STOA2533	ASFM381(n)	
Core3		Life Contingencies II	3	M /CAS 3	Act Sci 651	Math 472	ACTS471	M339V	22S:182	STOA3153	ASFM482(n)	
Core4		Risk Theory and Credibility II	3	C/ CAS Exam 4	Act Sci 652	Math 476	ACTS473			STOA3163	ASFM483(n)	
Core4		Actuarial Models (Stochastic Process)	3 or 4	M /CAS 3	Math 632	Math 478	ACTS450		22S:175		STAT416(n)	
Core5		Actuarial statistical estimates/ Credibility & Loss Distributions	3	C/ CAS Exam 4	Act Sci 653		ACTS410	M449P	22S:176		ASFM475(n)	
Core5		Survival Models for Actuaries	3	M /CAS 3	Act Sci 653	Math 477	ACTS425	M389J		STOA3253	ASFM475 (n)	
Core6		Quant Methods (Num Analy) for Actuaries	3		Act Sci 300				22S:174	STQP 2033	Math322(n)	
		Optimization Techniques								STQP 2043		
Core7		Investment Analysis & Portfolio Mgmt I								STQA 2543	FIN 320	
Core8		Islamic Finance									FIN420(n)	
Core9		Risk Management, Insurance, & Takaful								STQP2523	FIN430(m)	
<u>Prerequisites</u>												
		Calculus Courses through MultiVariable Calculus OR Accelerated Calculus II	3		to Math 230	to MATH 242 or MATH 245		M408K, L & M	to 22M:028	STQM 1113 to 1123	Math101, Math 102 to MATH201	
		Linear Algebra	3			MATH 415		M341	22M:027	STQM1223	MATH301	
		Methods of Applied Statistics	3		STAT320	MATH 469		M339J		STQS 2433	STAT213(n)	
		Fundamental Prop of Spaces & functions I & II	6						22M:055&056		MATH301	
<u>Society Exams Preparation</u>												
		Actuarial Exam Preparation					Problem Labs		22S:188			
<u>SOA Validation by Educational Experience (VEE)</u>												
	must	Applied Statistical Methods		Regression	Stat 333	MATH 469	ACTS430	M349R	22S:152	STQS 2433	STAT310	
	must				Stat 349	MATH 469			22S:150		STAT460	
	must	Corporate Finance		Finance		FIN221 FIN300 & 321	FIN461	FIN357		STQP 2533	FIN301	
	must			Investment							FIN320	
	must	Economics		Microeconomics	Econ 301	ECON 302	ECON211	E304K & L & 420K	06E:001	STQP 1523	ECON101	
	must			Macroeconomics	Econ 410	ECON303	ECON212		06E:002		ECON202	
<u>Electives</u>												
		Actuarial Pricing in Practice					ACTS 475			STQA 3553	FIN 421	
		Investment Analysis & Portfolio Mgmt II							22S:185			
		Asset and Liability Management								STQA 3263		
		Actuarial Investigation and Mgmt								STQP 3063		
		History and Philosophy of Mathematics										
		Individual Readings in Stat &/or Act Sci							22S:197			
Total credits							54	57	52	54	57	57

Survey of Saudi Industries

The accompanying brochure provides some information regarding KFUPM's newly proposed *Actuarial Science and Financial Mathematics* Bachelor of Science program. Kindly please take several minutes of your valuable time to answer the following survey questions that would help us assess the need for graduates from this program. Your assistance in this regard will greatly help us in this effort.

Company/Factory/Divison name: _____

- 1) What is the nature of your business? (please tick all that apply)
 - Investment
 - Insurance
 - Islamic Insurance (or Takaful)
 - Banking (1)
 - Islamic Banking
 - Pension Funding
 - Healthcare Funding
 - Marketing (1)
 - Business
 - Financial consulting
 - Manufacturing (5)
 - Industry (4)
 - Government
 - Other, please specify _____ (1)

- 2) At the present, do you have an **actuary or a financial manager/analyst/modeler** in your company?
 - Yes (9)
 - No

- 3) If your answer is No to question 2, did you have an **actuary or a financial manager/analyst/modeler** in your company in the past?
 - Yes (3)
 - No (1)

- 4) Do you have a **science** (Statistics or Mathematics) **or a business** (finance, economics, accounting, or marketing) graduate in your organization to deal with **modelling, simulation, investment management and/or minimization of financial risks**?
 - Yes (8)
 - No (1)

5) If your answer is Yes to question 4, please specify **(for results see next page)**

<u>Number</u>	<u>Major</u>	<u>Degree</u>				
___	_____	Diploma <input type="checkbox"/>	Bachelor <input type="checkbox"/>	Masters <input type="checkbox"/>	PhD <input type="checkbox"/>	
___	_____	Diploma <input type="checkbox"/>	Bachelor <input type="checkbox"/>	Masters <input type="checkbox"/>	PhD <input type="checkbox"/>	
___	_____	Diploma <input type="checkbox"/>	Bachelor <input type="checkbox"/>	Masters <input type="checkbox"/>	PhD <input type="checkbox"/>	
___	_____	Diploma <input type="checkbox"/>	Bachelor <input type="checkbox"/>	Masters <input type="checkbox"/>	PhD <input type="checkbox"/>	
___	_____	Diploma <input type="checkbox"/>	Bachelor <input type="checkbox"/>	Masters <input type="checkbox"/>	PhD <input type="checkbox"/>	

6) What is the anticipated number of potential employees with such a qualification (actuarial and financial mathematics degree) and skills you will most likely need within the next 5 years?

- 0 (1)
- 1
- 2 (4)
- 3
- More than 3, please specify _____ (1) max 10

7) For these potential employees, what are the technical/scientific skills you would like them to possess immediately after graduation? (tick all that applies)

- Data Analysis (8)
- Statistical skills (5)
- Marketing (6)
- Computer programming (2)
- Forecasting (i.e, Stock market prediction) (2)
- Cost optimization (4)
- Investment portfolio management (2)
- Islamic Insurance (Takaful) (1)
- Islamic Banking (2)
- Analyses and management of company financial risks (8)
- Management of Insurance risks (3)
- Others, please specify _____

8) What attributes do you want these graduates to possess beyond the academic qualifications?

- Pass international Actuarial exams (2)
- High Organizational skills (6)
- Ability to work on many projects simultaneously (5)
- Other, please specify _____
- _____
- _____

9) What is the minimum base monthly salary (in Saudi Riyal) that you would most likely offer to graduates in Actuarial Science and Financial Mathematics?

- Below SAR 7,000 monthly, please specify _____ (3)
- SAR 7,000 to SAR 15,000 monthly, please specify _____ (5)
- More than SAR 15,000 monthly, please specify _____ (see next page)

No	<u>Current Employees</u>					<u>SalaryASF</u>	
	<u>Q5a</u>	<u>Q5b</u>	<u>Q5c</u>	<u>Q5d</u>	<u>Q5e</u>	<u>Q9</u>	<u>Q9specific</u>
1	Accounting						
2	BS(1)					a	3,500 to 4,000
3	Accounting					a	
	BS(2)						
4	Accounting					b	10,000
	BS(4)						
	MS(1)						
5	Financial	Business	Management	Statistic	Marketing	b	7,500
	Manager	BS(6)	Science	BS(1)	BS(1)		
	MS(5)		BS(22)				
6	Economy	Finance	Accounting	Sharea		a	4,000 to 5,000
	PHD(1)	MS(2)	BS(4)	Dip(20)			
	Dip (5)						
7	Finance	Accounting	Economy	Marketing	Mathematics	b	
	BS(100)	BS(100)	BS(100)	BS(100)	BS(10)		
8	Accounting					b	
	BS(5)						
9						b	

a= less than SAR 7000
b= SAR 7000 to 15000
c= more than SAR 15000

An Example Announcement in Saudi Arabian Job Market as of April 11, 2009



Underwriter – Medical Insurance

Al Rajhi Company for Cooperative Insurance

(ARCCI)

Riyadh, Saudi Arabia

Ref: KP121-04



The Role

Designing, pricing and underwriting sophisticated and tailor made health insurance products.

Experience analysis, reserving bases.

Communication with Clients, Agents and Brokers.

Preparation of MIS Reports meant for Management and the Regulators.

Preparation of Reinsurance Statements & Statistics

Requirements

ACII or equivalent qualified with specialisation in health insurance:

Skills in Underwriting and Reinsurance.

Actuarial Assistance Skills.

Excellent Communication and MS Office skills

Working knowledge of Arabic desirable.

Minimum 5 years as a Medical Underwriter in the Head Office of a successful Insurance Company with an internal claim administration (not depending on a TPA).

Gulf experience preferred.

About the Company

Al Rajhi Company for Cooperative Insurance is promoted among others by Al Rajhi Bank (The largest Islamic Bank in the world). The Company aims to provide the best insurance solutions, fully complying with the "Shariah" principles, to the individual & corporate customers and establish itself as one of the top insurers in the Kingdom of Saudi Arabia. Head office is located in Riyadh with 3 branches in Riyadh, Jeddah and Dammam with a plan to open more offices in different cities in Saudi Arabia.

Student Survey

The accompanying brochure provides some information regarding KFUPM's newly proposed *Actuarial Science and Financial Mathematics* Bachelor of Science degree program. As such, we require your help us to assess the students' need for this new program

Please take 5 minutes or so to read the enclosed brochure and then, kindly answer the following survey questions. Your participation will be highly appreciated.

- 1) At the present, do you have a **career** you are **aiming for by studying** at KFUPM?

<input type="checkbox"/> Yes	(177)
<input type="checkbox"/> No	(496)

- 2) If you answered "Yes" to question 1 above, what is your **career aim**? (please tick)

<input type="checkbox"/> Petroleum Engineering	(46)
<input type="checkbox"/> Mechanical Engineering	(112)
<input type="checkbox"/> Systems Engineering	(51)
<input type="checkbox"/> Computer Science	(27)
<input type="checkbox"/> Mathematics	(0)
<input type="checkbox"/> Statistics	(0)
<input type="checkbox"/> Science-related career	(19)
<input type="checkbox"/> Business-related career	(47)
<input type="checkbox"/> Undecided and undeclared yet	(55)
<input type="checkbox"/> Others, please specify _____	(190)

- 3) Have you ever heard about **Actuarial Science and Financial Mathematics (ASFM) profession**?

<input type="checkbox"/> Yes	(588)
<input type="checkbox"/> No	(62)

- 4) (Please read the enclosed brochure). Given your reading of the enclosed brochure, would you be interested to **major** in **Actuarial Science and Financial Mathematics (ASFM)**?

<input type="checkbox"/> Yes	(506)
<input type="checkbox"/> No	(117)

- 5) If you already have in mind a different major, are you willing to **double major** in **Actuarial Science and Financial Mathematics (ASFM)**?

<input type="checkbox"/> Yes	(560)
<input type="checkbox"/> No	(85)