

KING FAHD UNIVERSITY OF PETROLEUM & MINERALS
DEPARTMENT OF MATHEMATICS & STATISTICS
DHAHRAN, SAUDI ARABIA

AS 381: Actuarial Contingencies I
Term 191 – Fall 2019

Instructor: Abedalhay Elmughrabi, MS Actuarial Science & MS Mathematics
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Office Hours: UTR 10:00 AM – 10:50 AM or by appointment

Time: UTR 09:00 AM – 09:50 AM
Place: Building 59 – Room 2013

Prerequisite: AS 201 and STAT 301
Credit Hours: (3-0-3)

Course Description:

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 may also be addressed. Students are assumed to be proficient in Multivariable calculus. A required course for Actuarial Science majors.

Course Material:

1. Course Syllabus: (Posted on Blackboard)
2. Text: Dickson, D.C., Hardy, M. R., & Waters, H. R. (2011) Actuarial Mathematics for Life Contingent Risks. Cambridge University Press: Cambridge, UK.
3. Reference: Bowers N., Gerber, H., Hickman, J., Jones, D. & Nesbitt, C. (1997 or later printing) Actuarial Mathematics, 2nd edition. Society of Actuaries Publishing.
4. Class Notes: (In class & Black Board notes)
5. Calculator: Texas BAII Plus Calculator or Texas BAII Professional

Supplemental Course Material:

1. October, 2019 Exam LTAM Syllabus as given by SOA.
<https://www.soa.org/globalassets/assets/files/edu/2019/fall/fall-2019-ltam-syllabus.pdf>
2. Tables for Exam LTAM:
<https://www.soa.org/globalassets/assets/Files/Edu/2018/ltam-standard-ultimate-life-table.pdf>
3. Exam LTAM Sample Questions:
<https://www.soa.org/education/exam-req/syllabus-study-materials/edu-multiple-choice-exam>
4. SOA Notation & Terminology of Exam LTAM
<https://www.soa.org/globalassets/assets/Files/Edu/2018/ltam-notation-note.pdf>

Attendance:

The student is responsible for all material presented in class. Some of the material presented in class might not be in the textbook. Generally, attendance will be checked once the teacher enters the class room. Entering the class after that, is considered as late where two late cases will be considered as one Absence. Students' late more than 10 minutes will be considered absent regardless of any excuse. Unexcused absences and late cases might be penalized by grade deductions as announced by the instructor. Excessive unexcused absences will result in a grade of **DN** in accordance with University rules.

Communication:

For regular announcements, students are advised to check Blackboard regularly.

Grading:

Your course grade will be based on the total of points accumulated on class work (60 points: 20 points Homework & 40 Points Quizzes), two major exams (100 points each), and Final Exam (140 points). The following scale gives the cut-off points for the course grades.

Letter grade	A+	A	B+	B	C+	C	D+	D	F	DN
Cut-off	90%	85%	80%	75%	67%	60%	55%	50%	<50%	≥ 9 absences

Activity	Weight
Exam 1 Date: October 13th 2019, Time: TBA & Location: TBA	100 points (25%)
Exam 2 Date: November 17th 2019, Time: TBA & Location TBA	100 points (25%)
Class Work In class	60 points (15%)
Final Exam (Comprehensive) Final Exam Date: December 26th, 2019 , Time: 8 AM	140 points (35%)

Missing Exam I or II:

No makeup exam will be given under any circumstance. When a student misses Exam I or Exam II for a legitimate reason (such as medical emergencies), his grade for this exam will be determined based on the existing formula, which depends on his performance in the non-missed exam and in the final exam. It is to the professor's discretion whether to accept or refuse the student's excuse for missing an exam.

Exam Questions:

The questions of the common exams are based on class examples and at home practice problems.

General Comments:

- It is essential that you keep up with the material as it is presented. This, unfortunately, is not one of those course where it is possible to catch up the last minute. In particular, it is important to do the problems as the material is presented.
- I encourage you to discuss the assigned problems with other students and work on them in groups. Discussing the assigned problems with others will also help you explain them clearly in the quizzes or exams.
- Students are required to carry pens, note-taking equipment and a calculator to EVERY lecture and exam. It is strongly recommended to keep a binder for class-notes.
- Bonus points might be awarded for showing alertness and participation in class discussions.
- The schedule is tentative and might be adjusted based on the progress of the class.
- To successfully prepare for the SOA exams, students MUST solve problems regularly. The selected assigned problems are specifically designed to prepare you for major and final exams, and SOA Exam FM. So, it is expected that you complete these problems step-by-step and with comprehension.
- For every exam, so you need to bring with you *pens, pencils, a sharpener, an eraser, and a SOA approved calculator.*

Student Learning Outcomes:

<https://www.soa.org/globalassets/assets/files/edu/2019/fall/fall-2019-Itam-syllabus.pdf>

Academic Integrity:

All KFUPM policies regarding **ethics** and **academic honesty** apply to this course.

Week	Date	Topic	Important Dates
1	Sep 1 st – Sep 5 th	<p>Chapter 1: Introduction to Life Insurance Sec 3: Life Insurance and annuity contracts Sec 4: Other Insurance Contracts Sec 6: Mutual & Proprietary Insurers Sec 7: Typical Problems</p> <p>Chapter 2: Survival Models Sec 2: The future Lifetime Random Variable Sec 3: The Force of Mortality Sec 4: Actuarial Notation Sec 5: Mean and Standard Deviation of T_x</p>	
2	Sep 8 th – Sep 12 th	<p>Chapter 2: Survival Models Sec 6: Curtate Future Lifetime Sec 7: Notes and Further Reading</p> <p>Chapter 3: Life Tables and Selection Sec 2: Life Tables Sec 3: Fractional Age Assumptions 3.3.1 Uniform Distribution of Deaths</p>	
3	Sep 15 st – Sep 19 th	<p>Chapter 3: Life Tables and Selection Sec 3: Fractional Age Assumptions (Continued) 3.3.2 Constant Force of Mortality Sec 4: National Life Tables Sec 5: Survival Models for life insurance policy holders Sec 6: Life Insurance Underwriting Sec 7: Select and Ultimate Survival Models Sec 8: Notation & Formulae for Select Survival Models Sec 9: Select Life Tables</p>	
4	Sep 22 nd – Sep 26 th	<p>Chapter 4 : Insurance Benefits Sec 2: Introduction Sec 3: Assumptions Sec 4: Valuation of Insurance Benefits 5.4.1 Whole Life Insurance: The Continuous Case 5.4.2 Whole Life Insurance: The Annual Case 5.4.3 Whole Life Insurance: The 1/mthly Case 5.4.4 Recursions</p>	Sep 23 rd : National Holiday
5	Sep 29 nd – Oct 3 rd	<p>Chapter 4 : Insurance Benefits (Continued) Sec 4: Valuation of Insurance Benefits 5.4.5 Term Insurance: Three cases 5.4.6 Pure Endowment 5.4.7 Endowment Insurance 5.4.8 Deferred Insurance Benefits Sec 5: Relating \bar{A}_x, A_x and $A_x^{(m)}$ 4.5.1 Using the Uniform Distribution of Deaths Principle 4.5.2 Using the claims acceleration Approach</p>	
6	Oct 6 th – Oct 10 th	<p>Chapter 4 : Insurance Benefits (Continued) Sec 6: Variable Insurance Benefits</p> <p>Chapter 5 : Annuities Sec 2: Introduction Sec 3: Review of Annuities Certain Sec 4: Annual Life Annuities 5.4.1 Whole Life Annuity Due 5.4.2 Term Annuity Due 5.4.3 Whole Life Annuity Immediate 5.4.4 Term Immediate Annuity</p>	
7	Oct 13 th – Oct 17 th	<p>Chapter 5 : Annuities Sec 5: Annuities Payable Continuously 5.5.1 Whole Life Continuous Annuity 5.5.2 Term Continuous Annuity Sec 6: Annuities payable m times per year 5.6.1 Introduction 5.6.2 Annuities payable m times a year 5.6.3 Term Annuities payable m times a year Sec 7: Comparison of Annuities by payment frequency</p>	Oct 13 th : First Major Exam.

8	Oct 20 th – Oct 24 th	Chapter 5 : Annuities Sec 8: Deferred Annuities Sec 9: Guaranteed Annuities Sec 10: Increasing Annuities 5.10.1 Arithmetically Increasing Annuities 5.10.2 Geometrically Increasing Annuities	
9	Oct 27 th – Oct 31 st	Chapter 5 : Annuities Sec 11: Evaluating Annuity Functions 5.11.1 Recursions 5.11.2 Applying the UDD assumption 5.11.3 Woolhouse's Formula Sec 12: Numerical Illustrations Sec 13: Functions for Select Lives	
10	Nov 3 rd – Nov 7 th	Chapter 6: Premium Calculation Sec 2: Preliminaries Sec 3: Assumptions Sec 4: The present Value of Future Loss Random Variable Sec 5: The Equivalence Principle 6.5.1 Net Premiums Sec 6: Gross Premium Calculation	
11	Nov 10 th – Nov 14 th	Chapter 6: Premium Calculation Sec 7: Profit Sec 8: The Portfolio Percentile Premium Principle 6.5.1 Net Premiums Sec 9: Extra Risks 6.9.1 Age Rating 6.9.2 Constant Addition to μ_x 6.9.3 Constant Multiple of Mortality Rates	
12	Nov 17 th – Nov 21 st	Chapter 7: Policy Values Sec 2: Assumptions Sec 3: Policies with Annual Cash Flows 7.3.1 The Future Loss Variable 7.3.2 Policy Values for policies with Annual Cash Flows	Nov 17 th : Second Major Exam
13	Nov 24 th – Nov 28 th	Chapter 7: Policy Values Sec 3: Policies with Annual Cash Flows 7.3.3 Recursive Formulae for policy values 7.3.4 Annual Profit	
14	Dec 1 st – Dec 5 th	Chapter 7: Policy Values Sec 4: Policy Values for policies with cash flows at discrete intervals other than annually Sec 5: Policy Values wit Continuous Cash Flows 7.5.1 Thiele's Differential Equation 7.5.2 Numerical Solution of Thiele's Differential Equation	
15	Dec 8 th – Dec 15 th	Review	
Final Examination Day: Thursday Date: December 26th, 2019 Time: 8 AM Location: TBA			