

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

AS381: Actuarial Contingencies I - Term 181 (3-0-3)

Course Objectives:

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.

Prerequisites: AS 201 and STAT 301

Textbook and Package:

- Bowers N., Gerber, H., Hickman, J., Jones, D. & Nesbitt, C. (1997 or later printing) *Actuarial Mathematics*, 2nd edition. Society of Actuaries Publishing.
- Texas BAII Plus Calculator or Texas BAII Professional

Reference:

Dickson, D.C., Hardy, M. R., & Waters, H. R. (2011) *Actuarial Mathematics for Life Contingent Risks*. Cambridge University Press: Cambridge, UK.

LTAM exam syllabus on SOA site.

Instructor: Dr. Mohammad H. Omar

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Office Hours: UR (10.00-11.45am), and T (10.00-10.55am), or by appointment.

Assessment

Assessment for this course will be based on attendance, homework, term report, 3 major exams and a comprehensive final exam, as in the following:

Activity	Weight
Attendance and homework	(2%+5%)
Term Paper Report + poster presentations	(10%+5%)
Exam 1 (Chapters 1, 2, & 3) Monday (Oct 8– week 6), 6.00 pm (venue TBA)	23%
Exam 2 (Chapters 4 & 5) Monday (Nov 5 - week 10), 6:00 pm (venue TBA)	25%
Final Exam (Comprehensive) Thursday Dec 6 7pm (venue TBA)	30%

IMPORTANT NOTE on GRADES: There is no quota on the number of students who can get an A+ grade.

- ✓ **Attendance** on time is *very* important. Mostly, attendance will be checked within the *first five minutes* of the class. Entering the class after that, is considered as late (**2 lates= 1 Absence**) and
- ✓ **More than 10 minutes late = Absence** (regardless of any excuse).

Letter grade	A+	A	B+	B	C+	C	D+	D	F	DN
Cut-off	90%	85%	80%	75%	70%	60%	55%	50%	<50%	≥ 9 absences

General Notes:

- Students are required to carry **pens, note-taking equipment** and a **calculator** to **EVERY lecture and exams**. It is strongly recommended to keep a **binder** for class-notes.
- Students are also expected to bring the book, take notes and organize their solved questions in a **binder** for easy retrieval to help them in study and review for class, exams, etc
 - It is to the student's advantage to keep a binder for storing class notes, homework, and other graded assignments. Students who are **organized** will find it **easier** to find important materials when **studying for exams**.
- To successfully prepare for the SOA exams, students MUST **solve problems** regularly and with discipline. The selected assigned problems are specifically designed to prepare you for major and final exams. So, it is expected that you complete these problems **step-by-step** and **with comprehension**.
 - If you happen to stumble upon a solution manual somewhere, remember 2 important points. (1) Due to publishing costs and deadlines, these solutions are brief and may have mistakes and (2) in your career as an actuary and your exams and quizzes in this class, you are expected to know every step to a problem and to know if a solution is incorrect. Thus, the best way to solve problem is without these brief solutions.
- **Never round** your intermediate results to problems when doing your calculations. This will cause you to lose calculation accuracy. Your answers may then be different from the SOA exam key even when you use the right procedure.
- For every exam, so you need to bring with you **pens, pencils, a sharpener, an eraser**, and a **SOA approved calculator**.
- Students should wait until completion of the next course AS482 and AS475 before they attempt to take the professional exam LTAM.

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

Student Learning Outcomes: From the Society of Actuaries Exam LTAM (Long-Term Actuarial Mathematics – Fall 2018) will be observed.

Syllabus (Tentative)

<i>Week</i>	<i>Sections</i>	<i>Topics</i>	<i>Notes</i>
1 (Sep 2-6)	Selected sections of Ch 1 and 2	Brief Introduction to Life Insurance Economics , Insurance & Utility Theory. Elements of Insurance. Optimal Insurance. Individual Risk Models for a Short Term Models for individual claim random variables	Sept 23: Natl Day Holiday.
2 (Sep 9-13)	Ch 2 (2.4 & 2.5) Ch 3	Individual Risk Models for a Short Term (continued) Approx for the Distribution of the Sum. Application to insurance. Survival Distribution and Life Tables . Probability at the age of death. Life Tables & Characteristics. Fractional Ages.	
3 (Sep 16-20)	Ch 3 Ch 4	Survival Distribution and Life Tables (continued) Some analytical Law of Mortality. Life Insurance Insurance models for payment at the moment of death. Models with payment at the end of the year of death. Relationship between models.	
4 (Sep 24-27)	Ch 4	Life Insurance (continued) . Differential Equations for Insurance payable at the moment of death.	Declare your Term paper topic: Tues Sep 25
5 (Sep 29-Oct 4)	Ch 5	Life Annuities . Continuous and Discrete Life Annuities. Life Annuities with m -thly payments.	
Monday (Oct 8– week 6) , 6.00 pm – 1st Major Exam (chapters 1, 2, & 3)			
6 (Oct. 7 -11)	Ch 5	Life Annuities . Apportionable Annuities-Due and Complete Annuities-Immediate.	(2 wks): Midterm grade reports starts
7 (Oct. 14– 18)	Ch 6	Benefit premiums (continued) Fully continuous and Discrete Premiums. True m -thly payment premiums.	
8 (Oct 21-25)	Ch 6	Benefit premiums (continued) Apportionable premiums. Accumulation-Type Benefits.	
9 (Oct 28- Nov 1)	Ch 7	Benefit Reserves (continued) . Fully continuous Benefit Reserves. Fully Discrete Benefit Reserves. Other Formulas for fully continuous Benefit reserves. Semicontinuous Benefit Reserves.	
Monday (Nov 5 - week 10), 6:00 pm – 2nd Major Exam (chapters 4 & 5)			
10 (Nov 4- 8)	Ch 7	Benefit Reserves (continued) . True m -thly benefit Reserves. Benefit Reserves on Apportionable or Discounted Continuous Basis.	
11 (Nov 11 -15)	Ch 8	Analysis of Benefit Reserves Benefit Reserves for General Insurances. Recursion Relations for Fully Discrete Benefit Reserves.	
12 (Nov 18 - 22)	Ch 8	Analysis of Benefit Reserves Benefit Reserves for General Insurances. Ben. Reserves at Fractional durations. Risk Allocation to Insurance Years.	Sun Nov 18: Term Paper Report due to instructor.
13 (Nov 25 - 29)	Ch 8	Analysis of Benefit Reserves (continued) . Differential Equations for Fully continuous Reserves	
14 (Dec 2 - 6)	Assigned reading	Concept of Mutual Insurance and Introduction to Takaful . What is Takaful? How is it different from conventional insurance? Current models for Takaful. Relationship/contrast with conventional insurance models.	
Thursday (Dec 6 - week 14), 9:00am - 9:50pm - Poster Presentations			
15 (Dec 9 -13)	Assigned reading	Practical issues in calculation of reserves . IBNR and IBNER	
Final Exam (Comprehensive): Saturday Dec 15 7pm			