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

AS380: Actuarial Contingencies I - **Term 211** **(2-2-3)**

Course Objectives:

Introduction to life insurance mathematics based on a stochastic approach. Life insurance, annuities, benefit premiums, and net reserves. Parallel treatment of topics based on Takaful system.

Prerequisites: AS 201 and STAT 301

Textbook and Package:

1. Bowers N., Gerber, H., Hickman, J., Jones, D. & Nesbitt, C. (1997 or later printing) *Actuarial Mathematics*, 2nd edition. Society of Actuaries Publishing.
2. Texas BAII Plus Calculator or Texas BAII Professional
3. Li & Ng (2020). ACTEX Study Manual for SOA Exam LTAM. ACTEX. ISBN: 978-1-63588-929-1

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 **Office:** Bldg – 5, room – 508. **Phone:** 2471
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Office Hours: UT (9.55-10.45am) and UTR (12.30-1.20pm), 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
Classwork (Attendance, Quiizes, and Hwk)	15%
Lab work (Attendance, computer assignments, quizzes)	15%
Mid Term (Handout, Chapters 2 & 3) **Tuesday (Oct 5– week 6), 6.00 pm**	20%
Term Paper Report **Sunday (Nov 7 - week 11)**	15%
Final Exam (Comprehensive) **As announced by Registrar**	35%

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 before they attempt to take the professional exam MLC.

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

Student Learning Outcomes: See Society of Actuaries Exam LTAM (Long-Term Actuarial Mathematics – Fall 2019) LO.

Syllabus (Tentative)

Week	*Sections*	*Topics*	*Notes*
1 (Aug 29- Sep 2)	Handout and Ch 2	**Brief Introduction to Insurance Contracts:** Short Term versus various Long Term Insurance contracts. **Individual Risk Models for a Short Term** Models for individual claim random variables	.
2 (Sep. 6- 9)	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.	**Declare your Term paper topic: Tues Sep 8**
3 (Sep. 12- 16)	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.	Sept 23-24: Natl Day Holiday
4 (Sep. 19- 21)	Ch 4	**Life Insurance (continued).** Differential Equations for Insurance payable at the moment of death.	
5 (Sep. 26- 30)	Ch 5	**Life Annuities.** Continuous and Discrete Life Annuities. Life Annuities with *m*-thly payments.	
Tuesday (Oct 5– week 6) , 6.00 pm – Midterm Exam (Handout, chapters 2 & 3)			
6 (Oct. 3 - 7)	Ch 5	**Life Annuities.** Apportionable Annuities-Due and Complete Annuities-Immediate.	**(2 wks):** Midterm grade reports starts
7 (Oct. 10- 14)	Ch 6	**Benefit premiums (continued)** Fully continuous and Discrete Premiums. True *m*-thly payment premiums.	
Student Break: Oct 17			
8 (Oct. 18- 21)	Ch 6	**Benefit premiums (continued)** Apportionable premiums. Accumulation-Type Benefits.	
9 (Oct. 24- 28)	Ch 7	**Benefit Reserves (continued).** Fully continuous Benefit Reserves. Fully Discrete Benefit Reserves. Other Formulas for fully continuous Benefit reserves.	
10 (Oct 31 - Nov. 4)	Ch 7	**Benefit Reserves (continued).** Semicontinuous Benefit Reserves.True *m*-thly benefit Reserves.	
Sun Nov 7: Term Paper Report due to instructor			
11 (Nov. 7 - 11)	Ch 8	**Benefit Reserves (continued).** Benefit Reserves on Apportionable or Discounted Continuous Basis.	
12 (Nov. 14- 18)	Ch 8	**Analysis of Benefit Reserves** Benefit Reserves for General Insurances. Recursion Relations for Fully Discrete Benefit Reserves. Risk Allocation to Insurance Years.	.
13 (Nov. 21- 25)	Ch 8	**Analysis of Benefit Reserves (continued).** Differential Equations for Fully continuous Reserves	
Midterm Break: Nov. 28-Dec. 2			
14 (Dec.5 - 9)	Ch 8	**Analysis of Benefit Reserves (continued).** Differential Equations for Fully continuous Reserves	
15 (Dec. 12- 16)	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.	
Dec. 19-20		Review	Normal Thursday Class
Final Exam (Comprehensive): will be announced by Registrar			

Homework	1	2	3	4	5	6	7
Chapter	Ch 2	Ch 3	Ch 4	Ch 5	Ch 6	Ch 7	Ch 8
Problems	2.7 & 2.16	20, 30, 35, & 44	4.1, 6, 16, 24, and 35	1, 3, 12, 22, 28, 51, and 56	6.3, 6.4, 6.10	7.1, 7.23	8.18, 8.30

Lab Syllabus (Tentative)

Week (Every Thurs)	*Lab Sections*	*Lab Discussion Topics*	*Notes and Assessments*
1	Handout	**Brief Introduction to *R* and to *R* package (*lifecontingencies*)** **Individual Risk Models for a Short Term using *R*** (*R convolution*)	.
2	Handout	**Practical issues in calculation of Short term reserves.** IBNR (calculation using *R*)	
3	Ch 1	**Survival Distributions**	Lab Quiz 1 (on *R*)
4		**No lab (see week 16)**	Sept 23-24: Natl Day Holiday
5	Ch 2	**Life Tables** **Appendix 3 Illustrative Life Table A3-1**	Lab Quiz 2 (on Ch 1)
6	Ch 3	**Life Insurances.**	
7	Ch 4	**Life Annuities.**	Lab Quiz 3 (on Ch 2 & 3)
8	Ch 5	**Premium Calculations**	
9	Ch 6	**Net Premium Reserves**	Lab Quiz 4 (on Ch 4 & 5)
10	Ch 7	**Insurance Models Including Expenses**	
		Sun Nov 7: Term Paper Report due to instructor	
11	SoA	**LTAM Oct 2018**	Lab Quiz 5 (on Ch 6)
12	SoA	**LTAM April 2019**	.
13	SoA	**LTAM Oct 2019**	
14	SoA	**MLC April 2018**	
15	SoA	**MLC Oct 2017 and Final Lab Quiz**	