

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

**AS483: Actuarial Risk Theory and Credibility (152)**

**Course Description:**

Distribution of aggregate claims associated with insurance including analysis of the risk due to variations in expected claim numbers and amounts. 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.

We shall often refer to the description of SOA Exam C at:

<http://www.beanactuary.org/exams/preliminary/exams/syllabi/2013-02-exam-c.pdf>

**Textbook and package:**

1. Klugman, S. A., Panjer, H. H., and Willmot, G. E. (2012). Loss Models: from Data to Decisions 4th edition. John Wiley and Sons
2. Texas BAI Plus Calculator or Texas BAI Professional
3. R statistical package (whenever necessary)

**Reference:**

1. Computational Actuarial Science with R, Edited by Arthur Charpentier, Chapman and Hall, 2015.
2. SOA Exam C/CAS Exam 4 sample on the SOA official website.

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**Office Hours:** UTR: 11:00 am - 11:55 am & UT 12.30pm - 1:45pm or by appointment.

**Optional biweekly lab:** 12.15-1.00pm R.

**Assessment**

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

Activity	Weight
Attendance and homework	(2%+5%)
Exam 1 (Chapters 3, 4, 5, & 6) <b>Monday (Feb 15 – week 5) , 6.00 pm (venue TBA)</b>	25%
Exam 2 (Chapters 8, 9, 10, & 14) <b>Wednesday (Mar 30- week 10), 7:00 pm (venue TBA)</b>	23%
Term Paper Report <b>Sunday (Apr 17 – week 13) – in class</b>	15%
Final Exam (Comprehensive) <b>Tuesday May 10 (as posted on registrar website)</b>	30%

**IMPORTANT NOTE on GRADES:** There is no quota on the number of students who can get an A+ or F 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).
- ✓ Excessive unexcused absences will result in a grade of **DN** in accordance with University rules.

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

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

**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.

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#### Syllabus (Tentative)

Week	Dates	Sections	Topic	Notes
1	17-Jan - 21-Jan	Ch 3	<b>Basic Distributional Quantities</b> (Generating functions & sums of RV, Tails of distributions, Risk Measures)	
2	24-Jan - 28-Jan	Ch 4	<b>Characteristics of Actuarial Models</b>	
3	31-Jan - 4-Feb	Ch 5	<b>Continuous Models</b>	
4	7-Feb - 11-Feb	Ch 6	<b>Discrete Distributions</b>	Declare your Term paper topic: Sun Feb 7
5	14-Feb - 18-Feb	Ch 8	<b>Frequency &amp; Severity with Coverage modifications</b>	(2 wks): Midterm grade reports starts
<b>Monday, Feb 15 – 1st Major Exam (chapters 3, 4, 5, &amp; 6)</b>				
6	21-Feb - 25-Feb	Ch 9	<b>Aggregate Loss Models</b>	
7	28-Feb - 3-Mar	Ch 9	<b>Aggregate Loss Models (cont.)</b>	
8	6-Mar - 10-Mar	Ch 10 & 14	<b>Review of Mathematical Statistics (only new material)</b> <b>Frequentist Estimation of Discrete Data</b>	
	13-Mar - 17-Mar	Midterm Break		
9	20-Mar - 24-Mar	Ch 20	<b>Simulation</b>	
<b>Wednesday, Mar 30 – 2nd Major Exam (chapters 8, 9, 10 &amp; 14)</b>				
10	27-Mar - 31-Mar	Ch 17	<b>Introduction and Limited Fluctuation Credibility</b>	
11	3-Apr - 7-Apr	Ch 18	<b>Greatest Accuracy Credibility</b>	
12	10-Apr - 14-Apr	Ch 15	<b>Bayesian Estimation</b>	
13	17-Apr - 21-Apr	Ch 19	<b>Empirical Bayes Credibility</b>	<b>Sun Apr 17:</b> Term Paper Report due to instructor
14	24-Apr - 28-Apr	C review if time permits	<b>Practice format from SOA C professional exam</b>	
15	1-May - 5-May	Review	<b>Review</b>	
16	<b>Tues 10-May</b>	<b>"Comprehensive" Final Exam</b>		

**Student Learning Outcomes:** (From the Society of Actuaries Exam C) May change in 2016

As a summary, the number of SOA C learning outcomes per KFUPM course is as follows:

Course	# SOA C Learning Outcomes
STAT301	3
STAT302	4
AS475	23
AS483	34
AS475/AS483	1
<b>Total</b>	<b>65</b>



<b>AS483 HOMEWORK</b>	<b>CHAPTER</b>	<b>QUESTIONS</b>							
Homework 1	3	3.11,	3.20,	3.21, 3.29, 3.35					
	4	4.4, 4.7, 4.12							
Homework 2	5	5.3, 5.17, 5.19,				5.22,	5.26		
	6	6.1,	6.3,			6.5			
Homework 3	8	8.1,	8.6, 8.13,	8.14,	8.17, 8.26,		8.30		
Homework 4	9	9.1,	9.3,	9.6,	9.39,	9.48,	9.55,	9.63,	9.74
Homework 5	10	10.8,		10.11,			10.13		
	20	20.2,	20.4,		20.8,	20.21, 20.24			
Homework 6	17	17.1,				17.8			
	18	18.11, 18.15, 18.16							
Homework 7	19	19.2, 19.6, 19.10							
	15	15.4,				15.23			