

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

AS484: Actuarial Risk Theory and Credibility – Term 232 (3-2-4) 9am UTR 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 ASTAM at:

<https://www.soa.org/globalassets/assets/files/edu/2020/2020-02-exam-stam-syllabi.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 BAII Plus Calculator or Texas BAII Professional
3. R studio statistical package (whenever necessary)
4. SOA Exam STAM reading on Credibility <https://www.soa.org/Files/Edu/2018/2018-stam-23-18.pdf>

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.
3. Tables for Exam ASTAM:
<https://www.soa.org/Files/Edu/2019/2019-02-exam-stam-tables.pdf>
4. Exam ASTAM sample Questions (Only those related to AS 483 coverage of Exam STAM material):
<https://www.soa.org/Files/Edu/2018/2018-04-exam-stam-questions.pdf>
<https://www.soa.org/Files/Edu/2018/2018-04-exam-stam-solutions.pdf>
5. Exam ASTAM Past Exams Questions (Only those related to AS 483 coverage of Exam STAM material):
<http://www.soa.org/education/exam-req/syllabus-study-materials/edu-multiple-choice-exam.aspx>

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Phone: 0592130097. **Office Hours:** UT: 11.00am-12:00pm (office), or by appointment on MS Teams chat or Email.

Assessment

Assessment for this course will be based on the following:

Activity	Weight
Attendance*+, Quiz*, and homework*	18% (5+8+5)%
Labwork and Lab Exam	9% (3+6)%
Mid-Term (Chapters 3, 4, 5, 6, & 8) Sunday (Feb 25 – week 7) 6.00 pm	20%
Term Paper Report Monday (Mar 18 – week 10)	18%
Final Exam (Comprehensive) (as posted by registrar)	35%

* for both coursework and labwork; + >7 absences = zero mark for attendance

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 randomly during class to ensure sustained presence.
- ✓ **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+3 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.

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Syllabus (Tentative)

Week	Dates	Sections	Topic	Notes
1	Jan 14 - 18	Ch 3	Basic Distributional Quantities (Generating functions & sums of RV, Tails of distributions, Risk Measures)	
2	Jan 21 - 25	Ch 4	Characteristics of Actuarial Models	
3	Jan 28 – Feb 1	Ch 5	Continuous Models	Declare your Term paper topic: Sun Jan 28
4	Feb 4 - 8	Ch 6	Discrete Distributions	
5	Feb 11 - 15	Ch 8	Frequency & Severity with Coverage modifications	(2 wks): Midterm grade reports starts
6	Feb 18 - 22	Ch 9	Aggregate Loss Models	Saudi Founding Day: Thur Feb 22
Sunday, Feb 25 – Midterm Exam (chapters 3, 4, 5,6& 8)				
7	Feb 25 - 29	Ch 9	Aggregate Loss Models (cont.)	
8	Mar 3 - 7	Ch 10 & 14	Review of Mathematical Stats (new material only) Frequentist Estimation of Discrete Data	
9	Mar 10 - 14	Ch 17	Introduction and Limited Fluctuation Credibility	
Monday, Mar 18 – Term Paper due to instructor				
10	Mar 17 - 21	Ch 15	Credibility Bayesian Estimation (Review)	
11	Mar 24 - 28	Ch 18	Greatest Accuracy	
Eid Al-Fitr Holidays: March 29 – April 18				
12	Apr 21 – 25	Ch 19	Empirical Bayes Credibility	
13	Apr 28 – May 2	Ch 20	Simulation (Note: Not in STAM but in practice)	
14	May 5 - 9	STAM review if time permits	Practice format from SOA STAM exam	
15	May 12 - 16	Review	Review	
16	May 19	Normal Sunday Class		
"Comprehensive" Final Exam				

Student Learning Outcomes: (From the Society of Actuaries Exam ASTAM)

As a summary, the number of SOA ASTAM learning outcomes are distributed across the following KFUPM courses:

- (1) STAT302 (2) AS 476 (3) AS 484 (majority)

For 2020 ASTAM learning outcomes with SOA weights discussed in this course, check

<https://www.soa.org/globalassets/assets/files/edu/2020/2020-02-exam-stam-syllabi.pdf>

AS484 HOMEWORK	CHAPTER	QUESTIONS
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
Homework 6	17	17.1, 17.8
	15	15.4, 15.23
Homework 7	18	18.11, 18.15, 18.16
	19	19.2, 19.6, 19.10

Lab Syllabus (Tentative)

<i>Week</i>	<i>Dates</i>	<i>Sections</i>	<i>Topic</i>	<i>Notes</i>
1	Jan 14 - 18	Ch 3	The R Studio program, the SRM, PA, and IFoA exams	
		Ch 3	Basic Distributional Quantities (Generating functions & sums of RV, Tails of distributions, Risk Measures)	
2	Jan 21 - 25	Ch 4	Characteristics of Actuarial Models	
3	Jan 28 – Feb 1	Ch 5	Continuous Models	Declare your Term paper topic: Sun Jan 28
4	Feb 4 - 8	Ch 6	Discrete Distributions	
5	Feb 11 - 15	Ch 8	Frequency & Severity with Coverage modifications Lab Quiz 1	(2 wks): Midterm grade reports starts
6	Feb 18 - 22	Ch 9	Aggregate Loss Models	Saudi Founding Day: Thur Feb 22
<u>Sunday, Feb 25 – Midterm Exam</u> (chapters 3, 4, 5,6& 8)				
7	Feb 25 - 29	Ch 9	Aggregate Loss Models (cont.)	
8	Mar 3 - 7	Ch 10 & 14	Review of Mathematical Stats (new material only) Frequentist Estimation of Discrete Data Lab Quiz 2	
9	Mar 10 - 14	Ch 17	Introduction and Limited Fluctuation Credibility Lab Midterm Exam (ch 3, 4, 5, & 6)	
<u>Monday, Mar 18 – Term Paper due to instructor</u>				
10	Mar 17 - 21	Ch 15	Credibility Bayesian Estimation (Review)	
11	Mar 24 - 28	Ch 18	Greatest Accuracy	
Eid Al-Fitr Holidays: March 29 – April 18				
12	Nov. 13	Ch 19	Empirical Bayes Credibility Lab Quiz 3	
13	Nov. 27	Ch 20	Simulation (Note: Not in ASTAM but in practice)	
14	Dec.4	STAM review if time permits	Practice format from SOA ASTAM exam	
15	Dec. 11	Review	Review Lab Final Exam (chap 17, 18, 19, 20)	