

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

AS450: Risk Modeling - Term 222 (2-2-3)

Course Objectives:

Types of Risks faced by an organization; Risk Modelling, its evaluation and Analysis; Techniques used in quantifying financial and non-financial risks. Covers value at risk (VaR), extreme value theory (EVT), scenario and stress testing, risk aggregation techniques including use of correlation, integrated risk distributions and copulas. Approaches for managing risk.

Prerequisites: AS 201 and STAT 214

Textbook and Package:

1. Sweeting, Paul (2019). Financial Enterprise Risk Management, 2nd Revised Edition, International Series on Actuarial Science. Cambridge University Press. ISBN13: 9781107184619
2. Rashid (2021). ACTEX Study Manual for SOA ERM, Fall 2021. ACTEX. ISBN: 978-1-64756-454-4
3. Texas BAI Plus Calculator or Texas BAI Professional

Reference:

Jorion, Philippe (2006). Value at Risk: The New Benchmark for Managing Financial Risk (3rd Ed.), McGraw-Hill education. ISBN-13: 978-0071464956.

Society of Actuaries ERM Exam Notes
ERM exam syllabus on SOA site.

Instructor: Dr. Mohammad H. Omar

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Office Hours: UT: 9.05am-9:45am (office) and R (10am – 10.50am) 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 and Hwk)	7%
Lab work (Attendance, computer assignments, lab quizzes)	18%
Major 1 Exam (Topics 1 through 3) Thursday (Mar 2– week 7), 8.00 am (venue TBA)	20%
Major 2 Exam (Topics 4 through 6) Thursday Mar 30 (Date 7 - week 11) 8.00 am (venue TBA)	20%
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 ERM (Enterprise Risk Management – Fall 2021) LO.

Syllabus (Tentative)

<i>Week</i>	<i>Dates</i>	<i>Topic</i>	<i>Sections</i>	<i>Topic</i>	<i>Notes</i>
1	Jan 15 - 19	1	1.3, 1.5, 2.3, 2.4, ch7 (except 7.10), ch 8	Types of Risks faced by an organization (Risk Categories and Identification)	
2	Jan 22 - 26	2	10.3, 10.4	Integrated risk distributions and Copulas	
3	Jan 29 - Feb 2	3	Ch 12	Extreme Value Theory	
4	Feb 5 - 9	4	Ch 14	Techniques used in quantifying particular (financial and non-financial) risks	
5	Feb 12 - 16	5	15.4	Computing VaR	(2 wks): Midterm grade reports starts
Thursday (Mar 2) – 1st Major Exam (Topic 1, 2, 3, and 4)					
6	Feb 19 - 21	6	14.2	Portfolio Risks: Analytical Methods	
Saudi Founding Day (February 22 & 23)					
7	Feb 26 - Mar 2	6	Ch 11 (except 11.7), ch 13, 9.5	Forecasting Risks and Correlations	
8	Mar 5 - 9	7	Handout	Risk Modelling, its evaluation and Analysis	
9	Mar 12 - 16	8	Ch 19	Basel Committee: Technical Underpinnings of Aggregate Methods	
Thursday Mar 30 – 2nd Major Exam (Topics 5, 6, and 7)					
10	Mar 19 - 23	8	9.5, 10.4, ch 18	Aggregation of Risk and Allocation of Capital	
11	Mar 26 - 30	9	Lab c23-24	Stress Testing and Scenario Analysis	
12	Apr 2 - 6	10	Ch 7.10, 14.10	Measuring\Assessing Operational Risk	
13	Apr 9 - 13	10	Ch 15	Risk Measures	
Eid Al-Fitr Holidays: April 14 – 27					
14	Apr 30 - May 4	10	Ch 16	Risk Management Tools & Techniques	
15	May 7 - 11		Review	Risk Management Tools & Techniques (cont.), Review	
16	May 15		Review	Review	Normal Thursday
16	TBA	TBA		"Comprehensive" Final Exam	

Lab Syllabus (Tentative)

<i>Week</i>	<i>Dates</i>	<i>Topic</i>	<i>Sections</i>	<i>Topic</i>	<i>Notes</i>
1	Jan 19	1	10.3, 10.4, Lab C33-C37, 14.3.4	Integrated risk distributions and Copulas (incl principal Component analysis)	
2	Jan 26	2	See above	Integrated risk distributions and Copulas	
3	Feb 2	3	Ch 12, Lab C29-32, C43-45	Extreme Value Theory	
Lab Assessment 1 (Topic 2 & 3)					
4	Feb 9	4	14.2.2, 14.3, 14.9	Techniques used in quantifying particular (financial and non-financial) risks Interest Rates Models Chain Ladder Method	
5	Feb 12 - 16	5	15.4	Computing VaR and TVaR	(2 wks): Midterm grade reports starts
Thursday (Mar 2) – 1st Major Exam (Topic 1, 2, 3, and 4)					
6	Feb 19 - 21	6	14.2	Portfolio Risks: Analytical Methods	
Saudi Founding Day (February 22 & 23)					
7	Feb 26 - Mar2	6	Ch 11 (except 11.7), ch 13, 9.5	Forecasting Risks and Correlations (SVD, Smoothing with splines)	
Lab Assessment 2 (Topic 4 & 5)					
8	Mar 5 - 9	7	Handout	Risk Modelling, its evaluation and Analysis	
9	Mar 12 - 16	8	Handout	Discriminant analysis	
Lab Assessment 3 (Topic 5 & 6)					
Thursday Mar 30 – 2nd Major Exam (Topics 5, 6, and 7)					
10	Mar 19 - 23	8	9.5, 10.4, ch 18	Aggregation of Risk and Allocation of Capital	
11	Mar 26 - 30	9	11.7	Credibility analysis	
12	Apr 2 - 6	10	Ch 7, 14.10	Measuring\Assessing Operational Risk	
13	Apr 9 - 13	10	Ch 15	Risk Measures	
Eid Al-Fitr Holidays: April 14 –27					
14	Apr 30 - May 4	10	Ch 16	Risk Management Tools & Techniques	
15	May 7 - 11		Review	Risk Management Tools & Techniques (cont.), Review	
16	May 15		Review	Review	Normal Thursday
16	TBA	TBA		"Comprehensive" Final Exam	