

King Fahd University of Petroleum and Minerals
Department of Mathematics and Statistics
AS490: Topics in AS & Fin. Math. I - Term 261 (3-0-3) 12pm UTR

Instructor: Dr. Ridwan A. Sanusi

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Office Hours: UT (10.00 - 10.50am) or by appointment via email.

Course Objectives: supervised versus unsupervised learning, regression versus classification, assessing model accuracy, bias-variance tradeoff, resampling methods for model validation including Training set vs. test set approach, k -fold cross-validation, and Leave-one-out cross-validation, K-nearest neighbors, LASSO, Ridge regression, regression-based time series models, Decision Trees

Prerequisites: Junior Standing

Textbook and Package:

1. *An Introduction to Statistical Learning, with Applications in R Second Edition*, James, Witten, Hastie, Tibshirani, New York: Springer. <https://www.statlearning.com>
2. *Regression Modeling with Actuarial and Financial Applications*, Edward W. Frees, 2010, New York: Cambridge. ISBN: 978-0521135962.
3. Texas BAII Plus Calculator or Texas BAII Professional

Reference:

1. Tables for Exam SRM
2. Sample Questions and Solutions
3. Society of Actuaries regulations and sample exams for Statistics for Risk Modeling Exam
4. R Studio software

Assessment

Assessment for this course will be based on the following:

Activity	Weight
Attendance, Quiz ⁺ , Classwork, and homework	30% (5+10+10+5)%
Mid-Term (Wk 10)	20%
Term Project, Presentation (Wk 15)	15% (10+5)%
Final Exam (Comprehensive) (as posted on registrar website)	35%

⁺ 2 announced + 1 pop quizzes - best 2 will be selected. **No make-up for quiz/classwork under any circumstances.**

IMPORTANT NOTE on GRADES:

This course uses relative grading. The A+ grade is granted to students who score 95% or above. There is no quota on the number of students who can get an A+ grade. The passing score for the course is 50%. DN grade is awarded to those with excessive total absences.

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

Exams:

Cheating in Exams: Cheating or any attempt of cheating by use of illegal activities, techniques and forms of fraud will result in a grade of F in the course along with reporting the incident to the higher university administration. Cheating in exams includes (but not restricted to)

- Looking at the papers of other students,
- Talking to other students,
- Using mobiles or any other electronic devices.

Exam Issues:

- No student will be allowed to take the exam if not having his/her KFUPM ID or National/Iqama ID.
- Students are not allowed to carry mobiles, smart watches, or electronic devices to the exam halls/rooms.
- Students must take the exam in the place assigned to them.

Missing an Exam:

In case a student misses an exam (Exam I, Exam II, or the Final Exam) for a legitimate reason (such as medical emergencies), he must bring an official excuse from Students Affairs with the **"Exam Included"** box checked. Otherwise, he will get zero in the missed exam.

Attendance: Students must adhere to the attendance policy of KFUPM. Students are expected to attend all lecture and recitation classes. Students are expected to arrive on time for class, consistent with expectations in professional settings. **Stay seated throughout class; handle bathroom/phone needs before/after, leave quietly/quickly if unavoidable (extended absences count as absent), and only 1 student may step out at a time.**

- If a student misses a class, he is responsible for any announcement made in that class.

- Out of the 5 marks for attendance: Absence #1-3: Free; Absence #4-8: 1-mark deduction.
- After 2 warnings, a DN grade will be awarded to any student who accumulates
 - 9 unexcused absences. (20%)
 - 15 excused and unexcused absences. (33%)

Note:

- **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).
- Only University Blue paper Official excuses will be accepted as valid excuse.

Absences are counted as follows:

- Missing a lab is counted as 2 absences.
- Missing a lecture is counted as 1 absence.

General Notes:

- Laptops/tablets are permitted only for note-taking or assigned classwork.
- 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**.

Home Work:

- 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.
- AI is a great study buddy. Use it to explain tricky concepts, check your work, or explore different problem-solving approaches. But don't let it do your work for you. Submissions that are copied and pasted from AI will receive no marks. Your learning matters most, rewrite, rethink, and revise to make sure the final answer is truly yours.
- **Homework is due in Teams for the class on the first Sunday after completing a chapter.**
- **No late homework will be accepted, and**
- **Actuaries don't act like the guy in the cartoon below.**



They **manage risk**.

They **don't** let risk manage them

- **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**.

Honor code

Students of this course are expected to maintain the highest level of academic integrity and ethics. A KFUPM student does not cheat or tolerate those who do. Every student is expected to submit work that is entirely their own, to properly cite all sources used, and to refrain from any form of academic misconducts.

Plagiarism

Use of another person's ideas, processes, results, or words requires appropriate credit or reference to the author. Use of Generative AI tools is subject to the instructor's authorization. Submitting the same work in more than one course without the instructor's permission is not allowed.

Examinations Policies

You are expected to adhere to KFUPM policies for all examinations in this course, including quizzes, major exams, midterms, and final exams. The following policies are enacted in this course during examinations:

- Students are expected to arrive at the examination hall on time with proper University ID.
- Students are seated according to the instructor's seat assignment and may request a seat change only for legitimate reasons.
- Late arrival to the exam may result in the student being denied admission. Once any student has begun finishing the exam, no further admission will be allowed under any circumstance.
- Students are not permitted to leave the examination room to use the restroom during an exam, except in rare cases involving a documented medical condition (e.g., diabetes, kidney disease). Any excused restroom leave will be fully supervised by a same-gender proctor.
- Students must leave all smart devices outside the examination hall, including smartphones, smartwatches, earbuds, and unauthorized calculators. Possession of any unauthorized device will be considered a cheating attempt and will be handled accordingly.
- Cheating attempts will be reported according to KFUPM policy and will result in a DN grade in the course, along with potential further penalties upon investigation.

Learning Outcomes: from the Statistics for Risk Modeling (January 2026) will be observed. By completing this course, students should be able to understand key concepts

- of statistical learning
- concerning generalized linear models
- concerning regression-based time series models
- concerning decision tree models.
- concerning principal component and cluster analysis
- Solve SOA type SRM problems

Tentative Lecture Schedule

<i>Week</i>	<i>Sections</i>	<i>Topics</i>	<i>Notes</i>
1		No Class	
2	Ch 2.1	What Is Statistical Learning?	
3	Ch 2.2 – 2.3	Assessing Model Accuracy Lab: Introduction to R	
4	Ch 3.1 - 3.2	Simple Linear Regression Multiple Linear Regression	
5	Ch 3.3 - 3.5	Other Considerations in the Regression Model The Marketing Plan Comparison of Linear Regression with K Nearest Neighbors	
6	Ch 3.6	Lab: Linear Regression	
7	Ch 5.1	Resampling Methods: Cross-Validation	
8	Ch 5.2 - 5.3	The Bootstrap Lab: Cross-Validation and the Bootstrap	
9	Ch 6.1 – 6.3	Linear Model Selection and Regularization: Subset Selection Shrinkage Methods Dimension Reduction Methods	
10	Ch 6.4 – 6.5	Considerations in High Dimensions Lab: Linear Models and Regularization Methods	
11	Ch 8.1 – 8.2	Tree-Based Methods: The Basics of Decision Trees Bagging, Random Forests, Boosting, and Bayesian Additive Regression Trees	
12	Ch 8.3	Lab: Decision Trees	
13	Ch 12.1 – 12.2	Unsupervised Learning: The Challenge of Unsupervised Learning Principal Components Analysis	
14	Ch 12.4 – 12.5	Clustering Methods Lab: Unsupervised Learning	
15		Presentation	
16		Review	
17		Review	
Final Exam (Comprehensive): TBA			