

King Fahd University of Petroleum and Minerals

Department of Mathematics and Statistics

AS-388: Actuarial Science Prob Lab II

Term 181

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Office Hours: 11:05 am – 12:30 pm UTR (Tentative)

Course Objectives: This problem lab is designed to prepare Actuarial majors for the first Society of Actuaries (SOA) and Casualty Actuarial Society (CSA) Examinations, Exam P (Probability). Students are assumed to have taken the appropriate prerequisite courses (STAT301 or equivalent) prior to registering for this society exam preparation lab.

Textbook: Broverman, S.A., ACTEX P/1 Study Manual, 2012 edition, ACTEX Publications Inc.

Assessment*

Activity	Weight
Class Participation (home works, quizzes, attendance, etc.)	10%
First Major Exam	20%
Second Major Exam	30%
Final Exam (Comprehensive)	40%

Grade Assignment

Score	89 – 100	83 – 88.9	78 – 82.9	72 – 77.9	66 – 71.9	60 – 65.9	55 – 59.9	50 – 54.9	0 – 49.9
Grade	A+	A	B+	B	C+	C	D+	D	F

General Notes:

- Students are required to carry pens, binder and a calculator with statistical functions to EVERY lecture, quiz, and exam.
- Students are also expected to take class notes and organize their learning material 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 effectively learn statistics, students need to solve problems and analyze data. The selected assigned problems are specifically designed to prepare you for class quizzes, lab, majors and final exam. So, it is expected that you complete these problems step-by-step and with comprehension.
- Never round your intermediate results to problems when doing your calculations. This will cause you to lose calculation accuracy. Round only your final answers and you should not round less than 4 decimal places unless required otherwise.
- A formula sheet and statistical tables will be given for you in every exam, so you only need to bring with you pens, pencils, a sharpener, an eraser, and a calculator.

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

Student Learning Objectives: (Extracted from SOA professional exam P objectives).

By completing this course, students should be able to prepare themselves for the SOA exam P for which the objectives are as follows:

Candidates should be able to use and apply the following concepts in a risk management context:

1. General Probability (15-30% of SOA-P Exam)

- Set functions including set notation and basic elements of probability
- Mutually exclusive events
- Addition and multiplication rules
- Independence of events
- Combinatorial probability
- Conditional probability
- Bayes Theorem/Law of total probability

2. Univariate probability distributions (including binomial, negative binomial, geometric, hypergeometric, Poisson, uniform, exponential, chi-square, beta, Pareto, lognormal, gamma, Weibull, and normal) (30-50% of SOA-P Exam)

- Probability functions and probability density functions
- Cumulative distribution functions
- Mode, median, percentiles, and moments
- Variance and measures of dispersion
- Moment generating functions
- Transformations

3. Multivariate probability distributions (including the bivariate normal) (30-45% of SOA-P Exam)

- Joint probability functions and joint probability density functions
- Joint cumulative distribution functions
- Central Limit Theorem
- Conditional and marginal probability distributions
- Moments for joint, conditional, and marginal probability distributions
- Joint moment generating functions
- Variance and measures of dispersion for conditional and marginal probability distributions
- Covariance and correlation coefficients
- Transformations and order statistics
- Probabilities and moments for linear combinations of independent random variables

Tips on how to enhance your problem-solving abilities:

1. Please try as many questions in the manual.
2. You are urged to practice (but not memorize) more problems than assigned.
3. You should always try to solve a problem on your own before reading the solution or asking for help.
4. If you find it difficult to handle a certain type of problem, you should try more problems of that type.
5. You are encouraged to solve some of the review problems at the end of each chapter.
6. The practice you get doing homework and reviewing the class lectures and recitations will make exam problems easier to tackle.
7. Try to make good use of the office hours of your instructor.

Important Notes:

- In accordance with University rules, 20% or 3(THREE) unexcused absences will automatically result in a grade of DN.
- 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 one late, and every two times late equals to one absence.

Home Work Problems:

- Homework problems will be posted on the Blackboard.
- Students are expected to solve as many problems in the manual as possible to prepare for the SOA exam.

Tentative Syllabus

Week	Chapter	Topics
1	Ch 0	Algebra and Calculus Review. Introduction. Set Theory, Graphing Inequality in 2 Dimensions, Properties of Functions, Limits and Continuity, Differentiation, Integration, Geometric and Arithmetic Progressions (series), Problem Set 0
2	Ch 1	Basic Probability Concepts. Probability Spaces and Events, Probability, Problem Set 1
3-4	Ch 2	Conditional Probability and Independence. Definition of Conditional Probability, Bayes' Theorem and the Law of Total Probability, Problem Set 2
5	Ch 3	Combinatorial Principles. Permutations and Combinations, Problem Set 3
6	Ch 4	Random variables and Probability Distribution. Discrete Random Variable, Continuous Random Variable, Mixed Distribution, Cumulative Distribution Function, Independent Random Variables, Problem Set 4.
7	Ch 5	Expectation and Other Distribution Parameters. Expected Value, Moments of a Random Variable, Variance and Standard Deviation, Moment Generating Function, Percentiles, Median, and Mode, Problem Set 5
8-9	Ch 6	Frequently Used Discrete Distributions. Discrete Uniform Distribution, Binomial Distribution, Poisson Distribution, Geometric Distribution, Negative Binomial Distribution, Hypergeometric Distribution, Multinomial Distribution, Summary of Discrete Distributions. Problem Set 6
10-11	Ch 7	Frequently Used Continuous Distributions. Continuous Uniform Distribution, Normal Distribution, Approximating a Distribution Using a Normal Distribution, Exponential Distribution, Gamma Distribution, Summary of Continuous Distributions, Problem Set 7
12-13	Ch 8	Joint, Marginal, and Conditional Distributions. Definition of Joint Distribution, Expectation of a Function of Jointly Distributed Random Variables, Marginal Distributions, Independence of Random Variables, Conditional Distributions, Covariance and Correlation Between Random Variables, Moment Generating Function for a Joint Distribution, Bivariate Normal Distribution, Problem Set 8.
14	Ch 9	Transformation of Random Variables. Distribution of a Transformation of X, Distribution of a Transformation of Joint Distribution of X and Y, Distribution of a Sum of Random Variables, Distribution of the Maximum or Minimum of Independent RV $\{X_1, X_2, \dots, X_n\}$, Order Statistics, Mixtures of Distributions, Problem Set 9.
15	Ch 10	Risk Management Concepts. Loss Distributions and Insurance, Insurance Policy Deductible, Insurance Policy Limit, Proportional Insurance, Problem Set 10.
Final Exam (Comprehensive) Monday December 24, 2018 (8:00 AM)		