

King Fahd University of Petroleum and Minerals
 Department of Mathematics and Statistics
STAT319: Probability and Statistics for Engineers and Scientists
 Term 222

Instructor:
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Office Hours:

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Course Objectives: Introduce the basic concepts of probability and statistics to engineering students. Emphasis will be given on the understanding of the nature of randomness of real world phenomena; the formulation of statistical methods by using intuitive arguments, solving them and thereby making meaningful decisions.

Learning Outcomes: By completing this course, students should acquire/learn

- A thorough understanding of descriptive statistics, both graphical and numerical
- A working knowledge of sample spaces, events, and operations on events
- Elementary probability concepts
- A good understanding of random variables and their means and variances
- Basic discrete and continuous random variables
- The concept of a sampling distribution, and the central limit theorem
- Point and interval estimation of means and proportions
- Basic concepts of hypothesis testing including the hypothesis testing setup, procedure, p-values
- Correlation
- Simple and multiple linear regression, including estimation and testing of model parameters

Text: Applied Statistics and Probability for Engineers by D. Montgomery and G. Runger, 6th Edition, Wiley, 2014

Software Package: R language and R studio, See STAT-319 Lab syllabus.

Grading Policy

Assessment	Date	Material	Weight
Exam 1 (18 MCQ)	Week 7	Chapters 2, 3, 4	22.5% (90 points)
Exam 2 (18 MCQ)	Week 13	Descriptive Statistics + Chapters 7, 8	22.5% (90 points)
Final Exam (24 MCQ)	As per registrar website	(Comprehensive)	30% (120 points)
homework	Homework on Blackboard		5% (20 points)
Class Work (Quizzes, Tests etc.)	The average total grade of the quizzes of each section shall be in the interval [14, 15], i.e., [70%, 75%] of 20 points.		5% (20 points)
Lab Work (See Lab syllabus)	The average total grade of the lab of each section shall be in the interval [42, 45], i.e., [70%, 75%] of 60 points.		15% (60 points)
	Total		400

Schedule

WEEK	Topics
Week 1 15/Jan-19/Jan	Ch 2: Probability 2-1.1 2-1.3 Random Experiments, Sample Spaces and Events 2-2 Interpretations and Axioms of Probability 2-3 Addition Rules 2-4 Conditional Probability 2-5 Multiplication Rule 2-6 Independence 2-7 Bayes' Theorem <div style="text-align: right;"><i>4 Lectures</i></div>
Week 2 22/Jan-26/Jan	Ch 3: Discrete Probability Distributions 3-1 Discrete Random variables 3-2 Probability Distributions and Probability Mass Functions 3-3 Cumulative Distribution Functions 3-4 Mean and Variance of a Discrete Random Variable 3-5 Discrete Uniform Distribution 3-7 Geometric and Binomial Distributions <div style="text-align: right;"><i>4 Lectures</i></div>
Week 3 29/Jan-02/Feb	3-8 Hypergeometric Distribution 3-9 Poisson Distribution Ch 4: Continuous Probability Distributions 4-1 Continuous Random Variables 4-2 Probability Distributions and Probability Density Functions 4-3 Cumulative Distribution Functions 4-4 Mean and Variance of a Continuous Random Variable <div style="text-align: right;"><i>4 Lectures</i></div>
Week 4 05/Feb-09/Feb	4-5 Continuous Uniform Distribution 4-6 The Normal Distribution 4-7 Normal Approximation to the Binomial and Poisson Distributions <div style="text-align: right;"><i>3 Lectures + 1 Lab</i></div>
Week 5 12/Feb-16/Feb	4-8 Exponential Distribution 4-10 Weibull Distribution 4-11 Lognormal Distribution <div style="text-align: right;"><i>3 Lectures + 1 Lab</i></div>
Week 6 19/Feb-21/Feb	Ch 2 (Lab Manual): Descriptive Statistics (Chapter 6-Text book) 2.1 Introduction 2.2 The Population and the Sample 2.3 Stem and Leaf Plot 2.4 Frequency Tables 2.5 Graphs of Frequency Distributions 2.6 The Bar Chart and the Pie Chart <div style="text-align: right;"><i>3 Lectures + 1 Lab</i></div>
Saudi Founding Day (February 22 & 23, 2023)	
Week 7 26/Feb-02/Mar	2.7 Numerical Measures 2.8 The Empirical Rule 2.9 The Box Plot 2.10 Approximate Mean and Variance of Grouped Data <div style="text-align: right;"><i>2 Lectures + 2 Lab</i></div>
Week 8 05/Mar-09/Mar	Ch 7: Sampling Distributions 7-1 Point Estimation 7-2 Sampling Distributions and the Central Limit Theorem

		<i>2 Lectures + 2 Lab</i>
Week 9 12/Mar-16/Mar	Ch 8: Statistical Intervals for a Single Sample 8-1 Confidence Interval for the Mean of a Normal Distribution with Known Variance 8-2 Confidence Interval for the Mean of a Normal Distribution with Unknown Variance 8-4 Large Sample Confidence Interval for a Population Proportion	<i>3 Lectures + 1 Lab</i>
Week 10 19/Mar-23/Mar	Ch 9: Tests of Hypotheses for a Single Sample 9-1 Hypothesis Testing 9-2.1 Tests on the Mean of a Normal Distribution with Known Variance 9-2.3 Large-Sample Test	<i>3 Lectures + 1 Lab</i>
Week 11 26/Mar-30/Mar	9-3.1 Tests on the Mean of a Normal Distribution with Unknown Variance 9-5.1 Tests on a Population Proportion	<i>2 Lectures + 2 Lab</i>
Week 12 02/Apr-06/Apr	Ch 11: Simple Linear Regression and Correlation 11-1 Empirical Models 11-2 Simple Linear Regression 11-3 Properties of the least squares estimators 11-4 Hypothesis Tests in Simple Linear Regression	<i>3 Lectures + 1 Lab</i>
Week 13 09/Apr-13/Apr	11-5 Confidence Intervals 11-6 Prediction of New Observations 11-7 Adequacy of the Regression Model 11-8 Correlation	<i>3 Lectures + 1 Lab</i>
Ramadhan break & Eid Al-Fitr Holidays (April 14-27)		
Week 14 30/Apr-04/May	Ch 12: Multiple Linear Regression 12-1 Multiple Linear Regression Model 12-2 Hypothesis Tests in Multiple Linear Regression 12-3 Confidence Intervals in Multiple Linear Regression	<i>3 Lectures + 1 Lab</i>
Week 15 07/May-11/May	12-4 Prediction of New Observations 12-5.1 Residual Analysis 12-5.2 Influential Observations 12-6 Aspect of Multiple Regression Modeling	<i>3 Lectures + 1 Lab</i>

Important Remarks:

Academic Integrity

- All KFUPM policies regarding **ethics** and **academic honesty** apply to this course.

Letter grades

- The letter grades will be assigned based on relative performance of the registered students..

Attendance

- Students must adhere to the attendance policy of KFUPM.
- A **DN** grade will be awarded to any student who accumulates more than 20% (9 lectures and labs) unexcused absences or more than 33% (15 lectures and labs) excused and unexcused absences of lectures and labs.
- A DN grade will be assigned to the eligible student after being warned twice by his/her instructor.
- Students are expected to attend all lecture classes.
- If a student misses a class, he is responsible for any announcement made in that class.

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/she must bring an official excuse from Students Affairs. Otherwise, he/she will get zero in the missed exam.
- 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 for further action. Cheating in exams includes (but is not limited to):
 - looking at the papers of other students
 - talking to other students
 - **using mobiles or any other electronic devices including smart watch.**

Mobiles and Smart Watches

- Students are not allowed to use mobiles for any purpose during class time.
- Students who want to use electronic devices to take notes must take permission from their instructor.
- Violations of these rules will result in a penalty decided by the instructor.
- Academic Integrity: All KFUPM policies regarding ethics apply to this course. See the Undergraduate Bulletin.
- **Students are not allowed to carry mobile phones and smart watches to the exam halls.**

Homework (HW)

- To successfully learn statistics, students need to solve problems and analyze data. The selected assigned problems are specifically designed to help you understand the material.
- No late homework will be accepted.

Tips on how to enhance your problem-solving abilities

- Do all homework assignments on time.
- Practice (but not memorize) more problems than those in the above list.
- Solve review problems available at the end of each chapter.
- Solve the problems on your own before reading the solution or asking for help.
- If you find it difficult to handle a certain type problems, you should try more problems of the same type.
- Practicing HW problems and reviewing the class lectures will make exam problems easier to tackle.
- Try to make good use of the office hours of your instructor. Always bring partial solutions of the questions that you want to discuss with your instructor.