King Fahd University of Petroleum and Minerals
Department of Mathematics
STAT 319 Syllabus, Term 241 (2024-25)
Coordinator: Dr. Nasir Abbas (nasirabbas@kfupm.edu.sa)

Course Title: Probability and Statistics for Engineers and Scientists

Course Credit Hours: 3-1-3

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

Software Package: R language and R studio.

Course Objective: 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.

Course Description: Presentation and interpretation of data, elementary probability concepts, random variables and probability distributions, binomial, Poisson, exponential, Weibull, normal and lognormal random variables. Estimation, tests of hypotheses for the one sample problem. Simple and multiple linear regression, application to engineering problems. The lab session will be devoted to problem solving using statistics software.

Prerequisite: MATH 102

Course Learning Outcomes: Upon successful completion of the course, a student should be able to
- ➢ Discuss the concept of sampling distribution of a sample mean and proportion.
- ➢ Summarize data using common graphical and numerical tools.
- ➢ Calculate the probabilities of operations on events based on sample space for random experiments.
- ➢ Calculate the mean, the variance, and the probabilities for discrete and continuous distributions.
- ➢ Estimate the unknown population mean and proportion using confidence interval technique and testing of hypothesis.
- ➢ Recognize the meaning of sample correlation coefficient and model real life problems using simple and multiple linear regression including estimation and testing of model parameters.
- ➢ Use a statistical package to compute descriptive statistics, construct confidence intervals.

Grading Policy:

	Date	Time	Place	Material	Percentage
Exam I	TBA	TBA	TBA	Chapters 6, 2, 3	(70 points) 14 MCQ
Exam II	TBA	TBA	TBA	Chapters 4, 7, 8	(70 points) 14 MCQ
Final Exam	As per registrar website			Comprehensive	(100 points) 20 MCQ
Online Homework	through Blackboard				(10 points)
Lab Work (See Lab syllabus)	Assessments: Midterm Exam: 8 points, Date: TBA. Final Exam: 12 points, Date TBA.				(20 points)
Class Work	- It is based on quizzes, class tests, or other class activities determined by the instructor. - The average (out of 30) of the class work of each section has to be in the interval $[y-1, y+1]$, where $$y = \frac{\text{Median(Exam I)\% + Median(Exam II)\%}}{20} \times 3$$				(30 points)
				Total	300 points

Letter Grades: The letter grades will follow a grading curve, which depends on the average of all students enrolled in the course.

Exam Questions: The questions of the exams are similar to the examples and exercises in the textbook.

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 DN in the course along with reporting the incident to the higher university administration for further action. Cheating in exams includes (but is not restricted to):
- Looking at the papers of other students.
- Talking to other students.
- Using mobiles, smart watches or any other electronic devices.

Coverage Plan

Week	Topics	Suggested Problems
Week 1 Aug. 25 – 29	**Ch 6: Descriptive Statistics** 6-1 Numerical Summaries of Data (mean, median, mode, variance, Standard deviation, quartiles. percentiles & IQR) 6-2 Stem-and-Leaf Diagrams 6-3 Frequency Distributions and Histograms 6-4 Box Plots (Shapes of distributions and the outlier)	**Chapter # 6** 6.8, 6.21(a), 6.27,6.31, 6.46, 6.51, 6.65, 6.69, 6.71
Week 2 Sept. 1 – 3	**Ch 2: Probability** 2-1 Sample Space and Events (2.1.1 - 2.1.3) 2-2 Interpretations and Axioms of Probability 2-3 Addition Rules 2-4 Conditional Probability 2-5 Multiplication Rule	
Week 3 Sept. 8 – 12	2-6 Independence 2-7 Bayes' Theorem **Ch 3: Discrete Probability Distributions** 3-2 Probability Distributions and Probability Mass Functions 3-3 Cumulative Distribution Functions	**Chapter # 2** 8, 25, 37, 42, 55, 63, 77, 88, 102, 108, 125, 141, 149, 153 and 172
Wek 4 Sept. 15 – 19	3-4 Mean and Variance of a Discrete Random Variable 3-6 Binomial Distribution 3-8 Hypergeometric Distribution 3-9 Poisson Distribution	**Chapter # 3** 3, 5, 12, 17, 23, 37, 42, 58, 65, 85, 122, and 137.
	National Holidays Sept. 22 – 23	
Week 5 Sept. 24 – 26 (3 days)	**Ch 4: Continuous Probability Distributions** 4-2 Probability Distributions and Probability Density Functions 4-3 Cumulative Distribution Functions	
Week 6 Sept. 29 – Oct. 3	4-4 Mean and Variance of a Continuous Random Variable 4-6 The Normal Distribution 4-8 Exponential Distribution 4-10 Weibull Distribution 4-11 Lognormal Distribution	**Chapter # 4** 4, 10, 14, 23, 35, 49, 51, 53, 61, 68, 70, 83, 87, 99, 105, 131 and 141
Week 7 Oct. 6 – 10	**Ch 7: Sampling Distribution** 7-1 Point Estimation 7-2 Sampling Distributions and the Central Limit Theorem (**Example 7.1 and 7.2 ONLY the single sample case**) **Ch 8: Statistical Intervals for a Single Sample** 8-1 Confidence Interval for the Mean of a Normal Distribution with Known σ^2	**Chapter # 7** 3, 7, 10 and 12.

Week 8 Oct. 13 – 17	8-1.1 Development of The Confidence Interval and Its Basic Properties 8-1.2 Choice of Sample Size 8-1.5 Large-Sample Confidence Interval for μ 8-2 Confidence Interval for the Mean of a Normal Distribution with Unknown σ^2 8-4 Large Sample Confidence Interval for a Population Proportion	**Chapter # 8** 4, 7, 11, 27, 35, 40 and 58.
Week 9 Oct. 20 – 24	**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	
Week 10 Oct. 27 – 31	9-2.3 Large-Sample Test 9-3.1 Tests on the Mean of a Normal Distribution with Unknown Variance 9-5.1 Tests on a Population Proportion	**Chapter# 9** 5, 9, 26, 40, 66, 67, 90 and 93.
Week 11 Nov. 3 – 7	**Ch 11: Simple Linear Regression and Correlation** 11-1 Empirical Models 11-2 Simple Linear Regression	
<td colspan="3" align="center">**Midterm Break Nov. 10 – 14**</td>		
Week 12 Nov. 17 – 21	11-3 Properties of the least-squares estimators 11-4 Hypothesis Tests in Simple Linear Regression 11-5 Confidence Intervals	
Week 13 Nov. 24 – 28	11-6 Prediction of New Observations 11-8 Correlation	**Chapter #11** 2, 8, 24, 44 and 70.
Week 14 Dec. 1 – 5	**Ch 12: Multiple Linear Regression (based on R output ONLY)** 12-1 Multiple Linear Regression Model 12-2 Hypothesis Tests in Multiple Linear Regression	
Week 15 Dec. 8 – 12	12-3 Confidence Intervals in Multiple Linear Regression 12-4 Prediction of New Observations 12-5.1 Residual Analysis (Using residuals plots ONLY)	
Week 16 Dec. 15 – 16 (2 days)	Review / Catch up	

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 a score of zero in the missed exam.

Other Exam Issues:

➤ No student will be allowed to take the exam if he/she does not bring his/her KFUPM ID, or National/Iqama ID, or Driver's License with him/her to the exam hall.

➤ Students are not allowed to have their mobiles, smart watches, or any electronic device in the exam hall. A violation of this will be considered an attempt at cheating.

➤ A student must sit in the seat assigned to him/her. A violation of this will be considered an attempt at cheating.

Some tips to enhance your problem-solving skills:

❖ Do all homework assignments on time.
❖ Practice (but not memorize) more problems than those given in the above list.
❖ Solve some review exercises 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 of problem, you should try more problems of the same type.
❖ Try to make good use of the office hours of your instructor. Always bring your solution trials to discuss them with your instructor.

Attendance: Students are expected to attend all lectures and labs.

➤ If a student misses a class/lab, he/she is responsible for any announcement made in that class/lab.

➤ After warned **twice** by the instructor, a DN grade will be awarded to any student who accumulates

- 12 unexcused absences combined in lecture and lab. (20%)
- 20 excused and unexcused absences combined in lecture and lab. (33%)

The Usage of Mobiles in Class: Students are not allowed to use mobiles for any purpose during class time. Students who want to use electronic devices to take notes must get 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 on the Registrar's website.