جامعة الملك عبدالله
للعلوم والتقنية
King Abdullah University of
Science and Technology

Course Syllabus: Probability and Statistics - STAT 220

Division	Computer, Electrical and Mathematical Sciences & Engineering
Course Number	STAT 220
Course Title	Probability and Statistics
Academic Semester	Fall
Academic Year	2021
Semester Start Date	08/30/2020
Semester End Date	12/15/2020
Class Schedule (Days & Time)	Computer, Electrical and Mathematical Sciences & Engineering

Instructor(s)				
Name	**Email**	**Phone**	**Office Location**	**Office Hours**
Raphael Georges Huser	raphael.huser@kaust.edu.sa	+966128080682	4125, 1, Al-Khawarizmi (bldg. 1)	Sunday from 16:00 to 17:00 PM or by appointment

Teaching Assistant(s)	
Name	**Email**
TBA	TBA

Course Information	
Comprehensive Course Description	This course is an introduction to probability and statistics at the MS level for students in statistics, applied mathematics, electrical engineering and computer science. This core course is intended to provide a solid general background in probability and statistics that will form the basis of more advanced courses in statistics. **Course Content (tentative):**

	• **Probability:** Probability; Random variables; Expectation; Inequalities; Convergence of random variables. • **Statistical inference:** Models, statistical inference and learning; Estimating the CDF and statistical functionals; The bootstrap; Parametric inference; Hypothesis testing and p-values; Bayesian inference; Statistical decision theory. • **Statistical models and methods:** Multivariate models; Inference about independence.
Course Description from Program Guide	This course is an introduction to probability and statistic for students in statistics, applied mathematics, electrical engineering and computer science. This core course is intended to provide a solid general background in probability and statistics that will form the basis of more advanced courses in statistics. Content: Probability; Random variables; Expectation; Inequalities; Convergence of random variables. Statistical inference: Models, statistical inference and learning; Estimating the CDF and statistical functionals; The bootstrap; Parametric inference; Hypothesis testing and p-values; Bayesian inference; Statistical decision theory. Statistical models and methods: Multivariate models; Inference about independence.
Goals and Objectives	At the end of this course, students should understand the fundamental concepts of: (1) Probability; (2) Statistical inference; (3) Statistical models and methods; and apply them for basic data analysis.
Required Knowledge	Advanced and multivariable calculus, linear algebra.
Reference Texts	Textbook: Wasserman, L. (2004), All of Statistics: A Concise Course in Statistical Inference, Springer. Reference Books: Ross, S. (2002), First Course in Probability, Sixth Edition, Prentice-Hall. Hogg, R., and Tanis, E. (2009), Probability and Statistical Inference, Eighth, Edition, Prentice Hall. Casella, G., and Berger, R. (2002), Statistical Inference, Second Edition, Duxbury. Ugarte, M. D., Militino, A., and Arnholt, A. T. (2016), Probability and Statistics with R, 2nd edition, CRC Press.
Method of evaluation	**40.00**% - Final exam **20.00**% - Exam 2 **20.00**% - Exam 1 **20.00**% - Homework /Assignments

Nature of the assignments	• **Homeworks**: Homework sets will be assigned on Wednesday and will be due in class on the following Wednesday. Some homework assignments may require the use of the free statistics software R for calculations and/or plots. Late homeworks will not be accepted (except in university established cases of illness or emergency). Solutions of homeworks will be provided. Collaboration and checking answers on homeworks is allowed and encouraged. Of course copying homeworks is not tolerated. In brief you are allowed to collaborate on all homework problems according to the following rules: You must first attempt to solve each problem on your own. If you get stuck you can then talk to any student currently enrolled in the class about the problem, as well as the instructor or TA. However, solutions should not be exchanged (i.e., you still must work through the details of the problem after you have gotten help, write the final solutions alone, and understand them fully). • **Exams**: Two midterm-exams are scheduled in class during the semester. The final exam is scheduled during the final week. The exams are closed books and closed notes. However, you are allowed to bring one sheet of notes, formulas, or any other information you would like to put on the page (no photocopy and no homework solutions are allowed). This note sheet should be limited to one sheet (front and back) of paper (8.5 x 11 inches: A4 format) for the first exam. However, you can bring 2 such sheets for the second exam and 3 for the final exam.
Course Policies	All exams are required. Students who miss exams should expect a grade of zero on that assignment. If you dispute your grade on any homework or exam, you may request a re-grade (from the TA for the homeworks or from the instructor for the exams) only within 48 hours of receiving the graded exam. Incomplete (I) grade for the course will only be given under extraordinary circumstances such as sickness, and these extraordinary circumstances must be verifiable. The assignment of an (I) requires first an approval of the dean and then a written agreement between the instructor and student specifying the time and manner in which the student will complete the course requirements.
Additional Information	Engineers and scientists, and in particular statisticians, are required to practice “continuous” or “life-long” learning. This course will cover a significant amount of material which will require the students to do a lot of self-study, reading of the textbooks and handouts, learning how to use software, etc... Although the instructor and the TA are committed to help the students in this course, the students are also expected to take initiatives and to get used to this notion of self-study that will be anyway (i) expected from them in their future careers and (ii) imperative to their success and survival in the real

	engineering, scientific, statistical, and academic worlds. Academic integrity is expected from all participants.

Tentative Course Schedule
(Time, topic/emphasis & resources)

Week	Lectures	Topic
1	Sun 08/30/2020 Wed 09/02/2020	Probability
2	Sun 09/06/2020 Wed 09/09/2020	Random variables
3	Sun 09/13/2020 Wed 09/16/2020	Expectation
4	Sun 09/20/2020 Wed 09/23/2020	Inequalities
5	Sun 09/27/2020 Wed 09/30/2020	Convergence of random variables
6	Sun 10/04/2020 Wed 10/07/2020	Models, statistical inference and learning
7	Sun 10/11/2020 Wed 10/14/2020	Estimating the CDF and statistical functionals + review
8	Sun 10/18/2020 Wed 10/21/2020	Exam + The Bootstrap
9	Sun 10/25/2020 Wed 10/28/2020	Parametric inference
10	Sun 11/01/2020 Wed 11/04/2020	Hypothesis testing and p-values
11	Sun 11/08/2020 Wed 11/11/2020	Bayesian inference
12	Sun 11/15/2020 Wed 11/18/2020	Statistical decision theory + review
13	Sun 11/22/2020 Wed 11/25/2020	Exam + Multivariate models
14	Sun 11/29/2020 Wed 12/02/2020	Inference about independence
15	Sun 12/06/2020 Wed 12/09/2020	Inference about independence + review

16	Sun 12/13/2020	-

Note

The instructor reserves the right to make changes to this syllabus as necessary.