King Fahd University of Petroleum and Minerals

STAT 501 - Probability and Mathematical Statistics (Term 251)

Dr. Maher Boudabra

Course Syllabus

Instructor Information

Instructor: Dr. Maher Boudabra
Office: 203-5
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Office Hours: Monday from 11.00 to 12.00 and Wednesday from 13.00 to 14.00

Course Description

Axioms and foundations of probability. Conditional probability and Bayes' theorem. Independence. Random variables and distribution functions and moments. Characteristic functions. Laplace transforms and moment generating functions. Function of random variables. Random vectors and their distributions. Convergence of sequences of random variables. Laws of large numbers and the central limit theorem. Random samples, sample moments and their distributions. Order statistics and their distributions.

References

- An Introduction to Probability and Statistics, by Rohatgi, V.K. and Saleh, A.K (3rd Edition)*
- Introduction to Probability for Data Science, by Stanley H. Chan (2021)

Course Schedule (15 Weeks)

- Week 1: Probability spaces: axioms of probability; events, σ-algebras, sample space
- Week 2: Conditional probability; Bayes' theorem with examples
- Week 3: Independence of events and random variables; applications in modeling
- Week 4: Random variables (discrete and continuous); distribution functions (CDF, PMF, PDF)
- Week 5: Expectation, variance, covariance, higher-order moments
- Week 6: Moment generating functions (MGF); Laplace transforms
- Week 7: Functions of random variables (change of variables, examples)
- Week 8: Random vectors; joint distributions
- Week 9: Marginal and conditional distributions
- Week 10: Convergence of random variables (in probability, distribution, almost sure)
- Week 11: Laws of large numbers (weak and strong forms, applications)
- Week 12: Central Limit Theorem (statement, examples)

- Week 13: Random samples; sample moments and their distributions
- Week 14: Order statistics: distribution, examples (min, max)
- Week 15: Applications and review; course wrap-up and problem-solving session

Assessments and Grading

Final Exam	40%
Midterm Exam	25%
Class Evaluation	15%
Final Project	20%

Course Policies

Attendance: Students are expected to attend all classes. More than 25% absences may result in failing the course. Excused absences must be justified with valid documentation.

Cheating and Plagiarism: Academic dishonesty in any form (cheating, plagiarism, unauthorized collaboration, or falsifying data) will result in disciplinary action in accordance with university regulations, which may include a failing grade in the course.

Make-up Exams: Make-up exams will only be given in exceptional cases with documented evidence.