King Fahd University of Petroleum & Minerals

Department of Mathematics

Syllabus of the Comprehensive Exam

MATH 563 Probability theory

Topics

- **Elements of measure theory**: Measurable spaces , measurable functions, Measures and Integration, Lp spaces , Product measures.
- **Probability**: Random Variables, laws, expectation, independence, Moments, Variance, Covariance, Jensen inequality, Characteristic functions, Laplace transform, Multivariate Guassian laws.
- **Convergence**: Different types of convergence of random variables, Weak and strong law of large numbers, The central limit theorem.
- **Conditioning**: Conditional expectation, Conditional Laws, Conditional laws of Gaussian vectors.
- **Martingales**: General definition of a martingale, The stopping time theorem, L1 convergence and regularity.

References

- P. Baldi, *Probability An Introduction Through Theory and Exercises.* 1st edition (2023).
- D. Rick, *Probability: Theory and Examples.* Cambridge University Press, 2019.