



Birzeit Univeristy
Mathematics Department
Second Semester 2023/2024
STAT 3321 – PROBABILITY THEORY
Course Outline

Classes / Instructors / Office Hours:

- **Classes:** Check Ritaj.
- **Instructor:** Dr. Hani Kabajah
- **Office Hours:** Check Ritaj.

Textbook:

- R. V. Hogg and A. T. Craig. **Introduction to Mathematical Statistics**, 5th edition, Prentice-Hall, 1995.

References:

- D. Wackerly, W. Mendenhall, and R. L. Scheaffer, **Mathematical Statistics with Applications**, 7th edition, Thomson Learning, 2008.
- I. Miller and M. Miller, **John E. Freund's Mathematical Statistics with Applications**, 8th edition, Pearson, 2014.

Grading Policy:

- The grading policy will be announced. Check Ritaj continuously!

Dates / Topics of Exams:

- The dates and the topics of the exams will be announced when the reservation system is open. Check Ritaj continuously!

Notes:

- You must attend all lectures.
- You need a scientific calculator for the lectures and the exams.
- You are highly encouraged to take notes during the lecture.
- Further notes, material, and information will be posted using Ritaj Course Board. Check Ritaj continuously!

In the following you can find:

- The lectures planned for each topic (where 1 lecture stands for 80 minutes).
- **The best way of studying is to solve questions.**
- **Check the Exercises/Problems at the end of each Chapter/Section.**

Detailed Topics:

| Lecture | Chapter 1 | Probability and Distributions |
|---------|-----------|---|
| 1 | 1.1 | Introduction |
| 2 | 1.2 | Set Theory |
| 3 | 1.3 | The Probability Set Function |
| 4 | 1.4 | Conditional Probability and Independence |
| 5 | 1.5 | Random Variables of the Discrete Type |
| 6 | 1.6 | Random Variables of the Continuous Type |
| 7 | 1.7 | Properties of the Distribution Function |
| 8 | 1.8 | Expectation of a Random Variable |
| 9 | 1.9 | Some Special Expectations |
| 10 | 1.10 | Chebyshev's Inequality |
| Lecture | Chapter 2 | Multivariate Distributions |
| 11 | 2.1 | Distributions of Two Random Variables |
| 12 | 2.2 | Conditional Distributions and Expectations |
| 13 | 2.3 | The Correlation Coefficient |
| 14 | 2.4 | Independent Random Variables |
| 15 | 2.5 | Extension to Several Random Variables |
| Lecture | Chapter 3 | Some Special Distributions |
| 16 | 3.1 | The Binomial and Related Distributions |
| 17 | 3.2 | The Poisson Distribution |
| 18 | 3.3 | The Gamma and Chi-Square Distributions |
| 19 | 3.4 | The Normal Distribution |
| 20 | 3.5 | The Bivariate Normal Distribution |
| Lecture | Chapter 4 | Distributions of Functions of Random Variables |
| 21 | 4.1 | Sampling Theory |
| 22 | 4.2 | Transformations of Variables of the Discrete Type |
| 23 | 4.3 | Transformations of Variables of the Continuous Type |
| 24 | 4.4 | The Beta, t , and F Distributions |
| 25 | 4.5 | Extensions of the Change-of-Variable Technique |
| 26 | 4.6 | Distributions of Order Statistics |
| 27 | 4.7 | The Moment-Generating-Function Technique |
| 28 | 4.8 | The Distributions of \bar{X} and nS^2/σ^2 |
| 29 | 4.9 | Expectations of Functions of Random Variables |