

American University of Beirut

STAT 230: Introduction to Probability and Statistics

Course Syllabus (2024–2025 Spring; Section 4)

General course information:

- Number of credits: 3
- Course level: Undergraduate
- Course format: Lectures
- Pre-requisites: MATH 201
- Schedule: MWF 10:00–10:50 (January 16 – April 26)
- Location: Nicely 212

Instructor: Siamak Taati (Email: st71@aub.edu.lb; Office: Bliss Hall 312B; Extension: 4328)

Office hours:

- Mondays 13:30–14:30 and Wednesdays 11:30–12:30 (to be updated at the beginning of the semester)

Course description: Statistics is the science of extracting reliable information from empirical data. Probability Theory is the mathematics of reasoning about chance and randomness. Although these are two distinct disciplines, they are inherently intertwined. This course is an introduction to probability theory and statistics for students of engineering, computer science and natural sciences. It is calculus-based in that the students are assumed to be comfortable with the concepts and techniques of calculus such as limits, (partial) derivatives and (multiple) integration. It is also calculus-styled meaning that its emphasis is on modeling, conceptual understanding and problem solving rather than on mathematical rigor.

Course learning outcomes: Upon completion of this course, you are expected to be able to

- Use the language of probability theory (including terminology and notations) accurately;
- Translate word descriptions of random experiments/phenomena into precise mathematical models;
- Use mathematical reasoning and tools (such as calculus and combinatorics) to correctly analyze mathematical models of probabilities in order to extract desired information;
- Correctly interpret the results of the analysis of mathematical models in terms of the original random experiments/phenomena they model;
- Use the process of modeling, analysis, interpretation to quantitatively reason and argue about random experiments/phenomena;
- Accurately recall the mathematical statements of the (weak) law of large numbers and the central limit theorem, including their hypotheses;
- Recognize the applicability or inapplicability of the (weak) law of large numbers and the central limit theorem and use them accurately in concrete situations;
- Correctly interpret basic summary statistics and plots;
- Propose strategies for estimating parameters (such as probabilities and means) using random experiments or computer simulations and rigorously assess the margin of error and the confidence level of the estimates;
- Propose strategies for judging between competing hypotheses using random experiments or computer simulations and rigorously assess potential errors and their probabilities;
- Correctly interpret the results of such estimates and hypothesis testing, and assess any possible shortcomings;
- Effectively communicate reasoning regarding probabilities and statistics orally and in writing.

Program learning outcomes addressed in the course:

- Communicate mathematical concepts orally and in writing.
- Carry out significant mathematical computations.
- State theorems and give examples where they are used.
- Understand the mathematical foundations of Probability and Statistics.
- Carry out statistical reasoning using inferential methods.
- Interpret and communicate the results of a statistical data analysis.

Textbooks:

- Some lecture notes will be posted on Moodle.
- Supplementary: *Elementary Probability for Applications*, by Rick Durrett.
- Supplementary: *Introduction to Probability and Statistics for Engineers and Scientists*, by Sheldon Ross.
- Optional: *Understanding Probability*, by Henk Tijms.

Note: The electronic versions of all three books can be accessed via the [university library](#). You may be prompted to login with your AUB account.

Tentative contents:

- Basic descriptive statistics
- Mathematical language of probabilities
- Counting techniques and their applications in probability
- Dependence and conditional probabilities
- Discrete and continuous random variables; their individual and joint distributions
- Expected value and variance of random variables and their covariance and correlation
- Important classes of random variables
- Bernoulli and Poisson processes
- Law of large numbers
- Central limit theorem
- Point estimation
- Confidence intervals (classical interval estimation)
- Statistical hypothesis testing (classical significance tests)

Homework: Suggested problems will regularly be posted. These will not be graded.

Assessment:

- Quizzes: Occasionally during lecture times
- Midterm 1: Tuesday, February 25, 18:30 (venue TBA)
- Midterm 2: Tuesday, March 25, 18:30 (venue TBA)
- Final: To be scheduled by the Registrar's office

The midterms will focus (though not entirely) on recent materials. The final exam will be cumulative.

Grading policy: The term grade will be calculated in two ways and the higher grade will be used.

	method 1	method 2
Active participation + in-class quizzes	10%	5%
Midterms	60%	35%
Final	35%	60%
Total	105%	100%

Unique learning needs of students with disabilities: AUB strives to make learning experiences as accessible as possible. If you anticipate or experience academic barriers due to a disability (including mental health, chronic or temporary medical conditions), please inform your instructor so that we can privately discuss the options. In order to help establish reasonable accommodations and facilitate a smooth accommodation process, you are encouraged to contact the [Accessible Education Office](#) (Email: accessibility@aub.edu.lb; Phone: +961-1-350000 ext. 3168; Location: West Hall 304).

Academic integrity: Please refer to [AUB Student Code of Conduct](#), in particular to Section 1.1, which concerns academic misconduct including cheating, plagiarism, in-class disruption, and dishonesty. Please be aware that misconduct is vigorously prosecuted and that AUB has a zero tolerance policy. The course policy is that credible evidence of cheating will result in failure in the course and referral to the disciplinary committee.

Non-discrimination: In line with its commitment to the principle of equal opportunity in education and employment, AUB policies protect you from discrimination on the basis of protected characteristics, including discriminatory harassment and sexual harassment. Protected characteristics include: race, color, religion, age, national or ethnic identity, sex, gender or gender identity, sexual orientation, pregnancy, marital status, disability, genetic predisposition or carrier status, alienage or citizenship status, and political affiliation.

If you think you have experienced discrimination, discriminatory harassment, or sexual harassment, we encourage you to inform the Equity/Title IX Coordinator, Mitra Tauk at +961-1-350000 ext. 2514, or titleix@aub.edu.lb, report to a Title IX deputy at your faculty or at any other faculty [<https://www.aub.edu.lb/titleix>], or report online [<http://www.aub.ethicspoint.com>]. Reports may be submitted anonymously or not. Please know that the University will maintain the confidentiality of the complaint and privacy of the persons involved to the greatest extent possible, consistent with its goal of conducting a thorough and complete investigation and to the extent permitted by law.