

Middle East Technical University
Department of Economics
Fall 2025-2026
ECON 205
ERDİL

Synopsis:

This course deals with frequency distributions, measures of central tendency and variability, basic theorems of probability, independent and joint events, conditional probability, discrete probability distributions, normal distributions, sampling distributions and sample drawing techniques.

Aims and Learning Outcomes:

At the end of this course, the student will learn:

- basic concepts used in probability analysis
- use of discrete and continuous random variables
- basics of multivariate probability distributions
- finding the probability distribution of a function of random variables

Student, who passed the course satisfactorily will be able to:

- calculate the probability of an event and conditional probability and the independence of events
- use the probability distribution for discrete and continuous random variables
- evaluate multivariable probability distributions
- finding the probability distribution of a function of random variables

Schedule:

Section 01: Monday 09:40-12:30 FZ14

Requirements: The course requires active participation of students though it seems to be a lecture-based course. The students are required attend all classes on a regular basis and study on weekly basis so that you can benefit from the course at maximum level.

Grading:

Midterm 45%, Final 50%, Assignments and Quizzes 5%. **THE MID-TERM EXAM WILL BE HELD ON NOVEMBER 26, 2025.**

Cheating: All university, faculty, and department principles on academic honesty will be strictly enforced. The usual consequence for academic dishonesty is failure in the course and additional disciplinary action. Examinations are individual and are to be completed without unauthorized outside assistance. Persons observed cheating during examinations will automatically receive a failing grade in the course. Homework assignments are individual, unless otherwise specified by the instructor, and are to be completed *without unauthorized outside assistance including generative AI* (unless otherwise stated) as well. Persons observed cheating in their homework assignments will receive a score of zero for the portion of the semester grade that is allocated to such assignments. In addition to the consequences above, the instructor will initiate disciplinary action against the student(s) involved in academic dishonesty.

Plagiarism: The instructor assumes that students will do their own work. By placing their names (individual or team) on assignments, students are affirming that the contents are their original work. Ideas should be stated in the student's own wording. Violation of this provision will be considered as unethical behavior, subject to disciplinary action. If you have any doubt about the use of a specific material, see the instructor ahead of time.

Examination Rules: Students must present a valid METU Student ID during the exam. Cellular phones must be turned off and stowed away during the examinations. Students whose phones are observed to be turned on and/or not stowed away will receive a score of zero for the examination. Under no circumstances will a make-up exam be administered if a student misses a midterm or final. If a student misses a midterm exam due to an unanticipated and serious medical emergency or due to a death in the immediate family proven with the necessary documents, then that student will be required to take a makeup final exam administered by the Department at the officially announced day and time. There will be no make-ups for quizzes. **STUDENTS WILL NOT BE ALLOWED TO LEAVE THE EXAM FOR ANY REASON EXCEPT PROVEN MEDICAL RECORD.**

Student with Disabilities: Any student, who, because of a disabling condition, may require special arrangements in order to meet course requirements, should contact the instructor as soon as possible. Students should present the appropriate documentation from the university's Disability Support Office (Engelsiz ODTÜ Birimi, ODTÜ Kütüphanesi, Solmaz İzdemir Salonu, Phone: 2107196; engelsiz@metu.edu.tr) verifying their disability, and outlining the special arrangements required. Please note that no accommodations will be provided to the disabled students prior to the completion of this approved University process.

Know your rights and responsibilities! <http://oidb.metu.edu.tr/en/middle-east-technical-university-rules-and-regulations-governing-undergraduate-studies-theturkish-ve>

COURSE OUTLINE

1. Probability

Probability and Inference
The Discrete Case
Calculating the Probability of an Event
Conditional Probability and the Independence of Events
Laws of Probability
The Law of Total Probability and Bayes' Rule
Introduction to random Variables and their distributions

2. Discrete Random Variables and Their Probability Distributions

Discrete Random Variable
The Probability Distribution for Discrete Random Variable
The Expected Value of Random Variable
Moments and Moment-Generating Functions
The Bernoulli Probability Distribution
The Binomial Probability Distribution
The Geometric Probability Distribution
The Negative Binomial Probability Distribution
The Hypergeometric Probability Distribution
The Poisson Probability Distribution
Probability-Generating Functions

3. Continuous Random Variables and Their Probability Densities

Continuous Random Variable
The Probability Distribution for Continuous Random Variable
The Expected Value for Continuous Random Variable
Moments and Moment-Generating Functions
The Uniform Probability Distribution
The Normal Probability Distribution
Exponential Probability Distribution
Chi-Square Probability Distribution
Tchebysheff's Theorem

4. Multivariate Probability Distributions

Bivariate and Multivariate Probability Distributions
Independent Random Variables
Marginal and Conditional Probability Distributions
The Expected Value of a Function of Random Variables
Special Theorems
The Covariance of Two Random Variables
The Expected Value and Variance of Linear Functions of Random Variables
The Multinomial Probability Distribution
The Bivariate Normal Distribution
Conditional Expectations

5. Functions of Random Variables

Finding the Probability Distribution of a Function of Random Variables
The Method of Distribution Functions
The Method of Transformations
The Method of Moment-Generating Functions
Multivariable Transformations Using Jacobians

COURSE MATERIAL:

1. Devore, J.L. and Berk, K.N. (2021) Modern Mathematical Statistics with Applications, 3rd Edition, New York: Springer.
2. Hogg, R.V., Tanis, E.A. and Zimmerman, D.L. (2015) Probability and Statistical Inference, 9th Global Edition, London: Pearson.
3. Akdi, Y. (2014), Matematiksel İstatistiğe Giriş, Ankara: Gazi Kitabevi
4. Wackerly, D.D., Mendenhall, W. and Scheaffer, R.L., (2008) Mathematical Statistics with Applications, 7th Edition, Pacific Grove: Duxbury.
5. Bain, L.J. And Engelhardt, M., (1992) Introduction to Probability and Mathematical Statistics, 2nd Edition, Belmont: Duxbury.
6. Hines, W.W. And Montgomery, D.C., (1990) Probability and Statistics in Engineering and Management Science, 3rd Edition, New York: John Wiley&Sons.
7. Hogg, R.V., McKean, J.W., and Craig, A.T., (2005) Introduction to Mathematical Statistics, 5th Edition, New Jersey: Prentice Hall.

8. Newbold, P., Carlson, W.L., and Thorne, B., (2003) Statistics for Business and Economics, New Jersey: Prentice Hall.
9. Mood, A.M., Graybill, F.A. and Boes, D.C. (1986) Introduction to The Theory of Statistics, 3rd Edition, Singapore: McGraw Hill.