

İzmir Institute of Technology / Department of Civil Engineering
CE 205 Statistical Methods for Civil Engineers / Fall 2026-27 - Course Outline

COURSE

INSTRUCTOR Dr. Korkut Kaynardag

Department of Civil Engineering

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COURSE

ASSISTANT Ergun Alper Kurt

Department of Civil Engineering

Office Hour: [TBA]

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COURSE

SCHEDULE Tuesday 08:45 to 9:30 Room: CE B211

Wednesday 10:45 to 12:30 Room: CE B211

COURSE PAGE

A course page (Teams, or an equivalent platform) will be activated at the start of the semester and used throughout for announcements, lecture material, and homework assignments.

TEXTBOOK/REFERENCES

- Probability Concepts in Engineering: Emphasis on Applications in Civil and Environmental Engineering, A.H-S. Ang & W.H. Tang, John Wiley and Sons, 2007, (Textbook),
- Probability and Statistics, M. Bayazit & B. Oğuz, Birsen Yayınevi, 1998,
- Applied Statistics and Probability for Engineers, D.C. Montgomery & G.C. Runger, John Wiley, 2006,
- Introductory Statistics for Engineering Experimentation, P. Nelson, K. Copeland & M. Coffin, Academic Press, 2003,
- Applied Statistics for Engineers and Scientists, J. Devore & N. Farnum, Duxbury Press, 2004.

OBJECTIVES

The objective is to learn the fundamentals of probability and statistics, as well as their use for civil engineering decision making under uncertainty. By the end of the course, students should be able to:

- Apply the axioms and rules of probability, including conditional probability and Bayes' theorem, to engineering problems involving uncertain events,
- Characterize discrete and continuous random variables using probability mass, density, and cumulative distribution functions, and compute their moments,
- Select and apply standard probability distributions, including the normal, lognormal, binomial, Poisson, and exponential distributions, to model civil engineering quantities,
- Propagate uncertainty through engineering formulas and estimate the reliability of a simple system using the First Order Second Moment method,

- Estimate distribution parameters from sample data using the method of moments and maximum likelihood estimation,
- Construct confidence intervals and carry out hypothesis tests to support engineering decisions from data,
- Fit and interpret a simple linear regression model and evaluate the validity of an assumed probability model against observed data.

COURSE CONTENT

- Introduction
 - Engineering Uncertainty and Descriptive Statistics
- Fundamentals of Probability
 - Set Theory and Combinatorics
 - Conditional Probability and Bayes' Theorem
- Random Variables
 - Discrete and Continuous Random Variables
 - Moments and Descriptors
- Common Probability Distributions
 - Normal and Lognormal Distributions
 - Binomial, Poisson, and Exponential Distributions
- Joint Distributions and Functions of Random Variables
 - Covariance, Correlation, and the Central Limit Theorem
 - Uncertainty Propagation
- Introduction to Reliability Analysis
 - First Order Second Moment Method
- Statistical Estimation
 - Sampling and Bias
 - Maximum Likelihood Estimation
- Statistical Inference
 - Confidence Intervals
 - Hypothesis Testing
- Regression Analysis
 - Model Validation

GRADING

The tentative overall grade constitution is as follows:

- | | |
|---------------------------|--|
| • Midterm: 30 % | <i>Week 7, tentative</i> |
| • Quizzes: 20 % | <i>Throughout the semester</i> |
| • Homework: 10 % | <i>Throughout the semester</i> |
| • Final Examination: 40 % | <i>University final exam period, tentative</i> |

COURSE CONDUCT

Attendance to lectures is COMPULSORY as stated by the regulations of İzmir Institute of Technology.

Academic integrity is expected in accordance with İYTE's academic integrity and student conduct regulations.

A makeup examination is offered only with a documented excuse recognized by the university, arranged in advance whenever possible.