DEPARTMENT OF STATISTICS

PROFESSORS
İLK DAĞ, Özlem (Chairperson): B.S., METU; M.S., Ph.D, Iowa State University.
AKKAYA (DENER), Ayşen: B.S. M.S., Ph.D, METU.
BATMAZ, İnci: B.S., METU; M.S., Ph. D., Ege University.
ISLAM, M. Qamarul: B.S., Agra University; M.S., University of Karachi; Ph.D., METU.
SÜRÜCÜ, Barış: B.S., M.S., Ph.D., METU.
PURUTCUOĞLU, Vilda: B.S., M.S., METU; Ph.D., Lancaster University.

ASSOCIATE PROFESSORS
YOZGATLIGİL (TALU), Ceylan (Associate Chairperson): B.S., M.S., METU; Ph.D., Temple University.
KALAYLIOGLU, I. Zeynep: B.S., METU; M.S., Ph.D, North Carolina State University.
ERKAN BAŞBUĞ, B. Burçak: B.S., METU; M.S., University of Warwick; Ph.D., London School of Economics.
VARDAR ACAR, Ceren: B.S., M.S., METU; Ph.D., Bowling Green State University

ASSISTANT PROFESORS
GOKALP YAVUZ, Fulya: B.S. Hacettepe University, M.S., Purdue University, Ph.D., Yıldız Technical University.

GENERAL INFORMATION: The Department of Statistics offers courses leading to the degree of Bachelor of Science, Master of Science and Doctor of Philosophy.

The purpose of the programs is to train students and researchers to carry out research based on extensive observations and experimentations; collection and analysis of data in laboratories and social, economic and public systems and organizations and to derive inferences about the behavior of such systems. The students who complete the statistics education in the Department will be able to make their skills available in the science of inductive inference for research, industrial and social organizations by playing an important part in solving problems of science and practical life. Graduates are expected to take part in research and development activities in such institutions as the Ministry of Development, Turkish Statistical Institute, Ministries, State Economic Enterprises and other public and private organizations. To this end, the Department emphasizes the theoretical and applied statistics together with computational statistics in its undergraduate and graduate programs.

LABORATORIES AND EQUIPMENT: The department has its own computer facilities. A laboratory is open to the use of the students of the department. A large number of statistical and graphical package programs are available in the PC’s of the laboratory.

MAJOR RESEARCH INTERESTS OF THE STAFF: The major graduate level research areas are, design of experiments, reliability, time series analyses, survival analyses, actuarial risk and insurance, disaster risk management, extremes of random functions and applications, stochastic modeling of engineering systems, computational statistics, response surface methodology, simulation, survey methods research, categorical data analysis, robust statistical methods, biostatistics, data mining, longitudinal data analysis, multilevel statistical modeling, Bayesian data analysis.

UNDERGRADUATE PROGRAM: The required courses for the Bachelor of Science (B.S.) degree in Statistics are listed in the following pages. All students are required to develop working knowledge and skills in the computers, scientific and statistical computing.
GRADUATE PROGRAMS:

Degrees
The Department of Statistics offers M.S. and Ph.D. degrees in Statistics. The programs enable students to acquire a sound understanding of the theoretical basis of statistics and emphasize the formation of research capability in applied research work.

In addition to the relevant regulations of the Graduate School for granting the M.S. and Ph.D. degrees, the following are required by the Department,

a) For the M.S. degree: The completion of at least seven courses with credits.
b) For the Ph.D. degree: The completion of at least eight courses with credits.

The main objective of the master's program is to train students in applied statistics by imparting knowledge of the theory and practice of statistics. This program will furnish its graduates with abilities to take part in studies involving extensive observations and experimentations; collection and analysis of data in laboratories, social, economic and public systems, organizations and to derive inferences about the behavior of underlying systems. On the other hand, the Ph.D. program is structured with the objective of preparing students for careers in university teaching and research and for industrial and government positions that involve consulting and research in new statistical methods.

CAREER OPPORTUNITIES: The graduate programs are designed to train students for positions in industry, government and academic institutions. The graduates of the programs will be able to make their skills available in the science of inductive inference to research, industrial and social organizations by playing important part in solving problems of science and practical life. The interdisciplinary nature of the programs brings together faculty and students interested in statistical applications in engineering, science, social sciences, management and planning, as well as statistical theory, and this nature enriches the career opportunities for graduates. Some career opportunities for the graduates are:

Research and teaching staff opportunities in academia; wide spectrum jobs at the industry and government offices; private sector opportunities such as consulting; opportunities at R&D and statistical software development centers.

STATISTICAL COMPUTING: All graduate students are required to develop working knowledge and skills in the computers and scientific computing.
# Undergraduate Curriculum

## First Year

### First Semester

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credit(h/w)</th>
<th>ECTS</th>
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<tbody>
<tr>
<td>STAT 155</td>
<td>Principles of Statistics</td>
<td>4(3-2)</td>
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<tr>
<td>MATH 119</td>
<td>Calculus with Analytic Geometry</td>
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<td>CEIT 101</td>
<td>Introduction to Scientific Thought and Research Methods</td>
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<td>ENG 101</td>
<td>English for Academic Purposes I</td>
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<td>IS 100</td>
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<td>STAT 111</td>
<td>Statistics by Real Life Examples</td>
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<td>STAT 156</td>
<td>Statistical Methods</td>
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<td>MATH 120</td>
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<td>Probability I</td>
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<tr>
<td>STAT 291</td>
<td>Statistical Computing I</td>
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<tr>
<td>MATH 219</td>
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<td>MATH 260</td>
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<td>HIST 2201</td>
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<td>STAT 363</td>
<td>Linear Models I</td>
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<td>STAT 365</td>
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<td>STAT 361</td>
<td>Computational Statistics</td>
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<td>STAT 364</td>
<td>Linear Models II</td>
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<td>STAT 376</td>
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## Fourth Year

### Seventh Semester

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<td>STAT 467</td>
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### Eighth Semester

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<td>STAT 412</td>
<td>Statistical Data Analysis</td>
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MINOR PROGRAM IN STATISTICS

This program is designed for students of non-statistical background.

**Preliminary courses required for admission:**
- MATH 119 Calculus I or equivalent
- MATH 120 Calculus II or equivalent
- MATH 260 Basic Linear Algebra or equivalent
- STAT 156 Statistical Methods or equivalent

**Compulsory Courses**
- STAT 203 Probability I
- STAT 204 Probability II
- STAT 303 Mathematical Statistics I
- STAT 304 Mathematical Statistics II
- STAT 363 Linear Models I

Plus one elective course offered by the Department of Statistics.
DESCRIPTION OF UNDERGRADUATE COURSES

STAT 111 Statistics by Real Life Examples (3-0)
Readings and projects in areas of current statistical real life application including environmental science, industrial statistics, official statistics, actuarial statistics, business statistics, physical and social sciences, and medical statistics.

STAT 155 Principles of Statistics (3-2)

STAT 156 Statistical Methods (3-2)
Sampling distributions, estimation, confidence intervals, hypothesis testing, distribution fitting, analysis of variance for one factor design, linear regression, association between two categorical variables, basic nonparametric procedures.
Prerequisite: STAT 155

STAT 201 Introduction to Probability and Statistics I (3-0)

STAT 202 Introduction to Probability and Statistics II (3-0)
Prerequisite: STAT 201

STAT 203 Probability I (3-2)
Sample space, events, basic combinatorial probability, conditional probability, Bayes’ theorem, independence, random variables, distributions, expectation.

STAT 204 Probability II (3-2)
Transformations of random variables, generating functions, conditional expectation, limit theorems, central limit theorem, limiting distributions.
Prerequisite: STAT 203, MATH 119

STAT 250 Applied Statistics (4-2)
Prerequisite: STAT 156

STAT 256 Numerical Methods (3-2)
Prerequisites: STAT 291 or STAT 292, MATH 260

STAT 291 Statistical Computing I (3-2)
Introduction to statistical techniques in statistical software. Managing and analyzing data using statistical database packages. Introduction to MATLAB with applications to matrix algebra.
Prerequisites: CENG 230, STAT 156
STAT 292 Statistical Computing II (3-2)4
Introduction to programming and computation. Introduction to computer organization and basic data structures. An advanced programming language with applications to statistical procedures.
Prerequisite: CENG 230

STAT 303 Mathematical Statistics I (3-2)4
Prerequisite: STAT 204 or CD, MATH 120

STAT 304 Mathematical Statistics II (3-2)4
Region (interval) estimation. Hypothesis testing. Optimality properties for hypothesis testing. Likelihood ratio tests. Sequential tests.
Prerequisite: STAT 303

STAT 361 Computational Statistics (3-2)4
Prerequisite: STAT291

STAT 363 Linear Models I (3-2)4
Prerequisites: MATH 260, STAT 156

STAT 364 Linear Models II (3-2)4
Simple nonlinear models, Less than full rank models: One-way, Two-way ANOVA models, Multiple comparison tests, Analysis of Covariance (ANCOVA) Models, Introduction to generalized linear models (GLM), Poisson regression, Logistic regression.
Prerequisite: STAT 363

STAT 365 Survey Sampling Techniques (4-2)5
Prerequisite: STAT 156 or CD

STAT 376 Stochastic Processes (4-2)5
Prerequisite: MATH 260, STAT 204

STAT 412 Statistical Data Analysis (3-2)4
Prerequisite: STAT 291 or STAT 292, STAT 363, or CD

STAT 444 Advanced Statistical Computing (3-0)3
Reading raw data files and Statistical Analysis Software (SAS) data sets, and writing the results to SAS data sets; subsetting data; combining multiple SAS files; creating SAS variables and recoding data values; creating listing and summary reports.
Prerequisite: STAT 156 or CD
STAT 457 Statistical Design of Experiments (3-2) 4
Strategies for experimentation, randomized complete and balanced incomplete block designs, Latin squares.
General, two-level and fractional factorials. Blocking and confounding in two-level factorials. Three and mixed
level factorial and fractional factorials. Introduction to response surface methodology. Second-order experimental
designs. Nonnormal responses. Unbalanced data in factorials. Split-plot designs, Nested designs, Random effect
models. Repeated measures.
Prerequisite: STAT 363 or CD.

STAT 460 Nonparametric Statistics (3-0) 3
Review of basic statistics. Distribution-free statistics, ranking statistics, U statistics. Large sample theory for U
statistics. Tests based on runs. Asymptotic relative efficiency of tests. Hypothesis testing, point and interval
estimation. Goodness of fit, rank-order (for location and scale), contingency table analysis and relevant models.
Measures of association, analysis of variance.
Prerequisite: CD.

STAT 461 System Simulation (3-2) 4
Introduction to discrete-event system simulation and simulation software. Statistical models in simulation. Queuing
Output analysis for a single model. Comparison and evaluation of alternative system design.
Prerequisite: STAT 156 and STAT 292

STAT 462 Biostatistics (3-2) 4
Populations and samples. Types of biological data. Data transformations. Survival data analysis. Life tables. Sample
size determination in clinical trials. Measures of association. The odds ratio and some properties. Application of
generalized linear models and logistic regression to biological data. Analysis of data from matched samples.
Prerequisite: STAT 156

STAT 463 Reliability (3-0) 3
Reliability studies. Statistical failure models. Censoring and truncation and their types. Useful limit theorems in
testing.
Prerequisite: STAT 304

STAT 464 Operations Research (2-2) 3
Basic operations research methodology. Basic models such as network flow models, project scheduling, dynamic
programming, and production and inventory control. LP and game theory. Two person zero-sum games and mixed
strategies.
Prerequisite: MATH 260

STAT 467 Multivariate Analysis (4-2) 5
Sample mean vector and sample covariance matrix; matrix decomposition; multivariate normal and Wishart
distributions; parameter estimation; hypothesis testing; MANOVA; principal components; factor analysis;
multivariate classification and clustering; canonical correlation.
Prerequisites: MATH 260, STAT 156

STAT 472 Statistical Decision Analysis (3-2) 4
Introduction to decision making and types of decision situations. Bayes theorem and Bayesian decision theory.
Prior, posterior and conjugate prior distributions. Loss functions. Empirical Bayesian approach. Utility theory for
Prerequisite: STAT 204
STAT 477 Statistical Quality Control (2-2)3
Prerequisite: STAT 156

STAT 479 Linear Programming (2-2)3
Prerequisite: MATH 260

STAT 480 Application of Statistical Techniques in Socio-Economic Research (3-2)4
Principals of empirical socio-economic research. Formulation of research problems, determination of research design, application of sampling design. Strategies of field work, collection of data, improving data quality, selecting appropriate statistical methods. Evaluation of test of hypothesis and interpretation of findings. Preparation and presentation of a research proposal and report.
Prerequisite: STAT 412

STAT 482 Categorical Data Analysis (3-2)4
Prerequisite: STAT 304

STAT 487 Insurance and Actuarial Analysis (3-0)3
Prerequisite: Consent of the department.

STAT 493 New Horizons in Statistics (3-0)3
New advances in the field of statistics.
Prerequisite: CD

STAT 495 Applications in Statistics (2-2)3
Applications of different statistical methods in various disciplines such as medicine, science, engineering and social sciences. Presentation of projects involving these applications as group studies.
Prerequisite: STAT 156

STAT 497 Applied Time Series Analysis (3-2)4
Prerequisite: CD

STAT 499 Undergraduate Research (1-4)3
This course is intended to improve the research capabilities of graduating students. Each student will be given a project and an academic advisor; lectures will be given on research design, data evaluation and report writing. A final report and/or seminar is required at the end of the semester.
Prerequisite: CD

*CD: Consent of the Department