Course Information

Course Code	5710222
Course Section	1
Course Title	STATISTICAL METHODS FOR COMPUTER ENGINEERING
Course Credit	3
Course ECTS	5.0
Course Catalog Description	Introduction to probability. Discrete and continuous random variables and their distributions. Simulations of random variables. Descriptive statistics. Statistical inference. Regression. Monte Carlo methods. Stochastic processes. Queuing systems. Prerequisite: MATH 120
Prerequisites	Students must complete one of the following sets to take this course.

Set	Prerequisites
1	2360120

Schedule	Tuesday , 09:40 - 10:30, BMB1 Thursday , 09:40 - 11:30, BMB1
Course Website	https://user.ceng.metu.edu.tr/~tcan/ceng222_s2021/overview.shtml
Learning Management System	ODTU-Class

Instructor Information

Name/Title	Prof.Dr. TOLGA CAN
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Office Hours	By appointment

Course Assistants

Name/Title	Araş.Gör. MAZLUM FERHAT ARSLAN
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Name/Title	Araş.Gör. MUSTAFA DUYMUŞ
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Course Objectives

At the end of this course the students will be able to:

- analyze and interpret large scale data,
- apply probability theory and statistics to handle uncertainty,
- infer facts and relationships from collected data, and
- construct simulations by sampling from arbitrary distributions

The course will provide the students the ability to apply knowledge of mathematics, science, and engineering; therefore supporting the corresponding student outcome.

Course Learning Outcomes

The course supports the following student outcomes defined in ABET General Criterion 3 for engineering programs:

- an ability to apply knowledge of mathematics, science, and engineering
- an ability to design and conduct experiments, as well as to analyze and interpret data
- an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

Program Outcomes Matrix

Undergraduate

		Contribution	
	Program Outcomes	**No**	**Yes**
1	An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics		X
2	An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors	X	
3	An ability to communicate effectively with a range of audiences	X	
4	An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts	X	
5	An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	X	
6	An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions		X
7	An ability to acquire and apply new knowledge as needed, using appropriate learning strategies	X	

Instructional Methods

Formal lectures (3 hrs per week)

Tentative Weekly Outline

Week	Topic	Relevant Reading	Assignments
1	Probability (Chapter 2) • Events and their probabilities (2.1.1) • Rules of probability (2.2) • Combinatorics (2.3 - student reading) • Conditional probability and independence (2.4)	Chapter 2	
2	Discrete Random Variables (Chapter 3) • Distribution of a random variable and a random vector. (3.1 and 3.2) • Expectation and variance. (3.3 - excluding 3.3.7)	Chapter 3 (3.1, 3.2, 3.3)	

Week	Topic	Relevant Reading	Assignments
3	Discrete distributions (3.4) • Bernoulli distribution, Binomial distribution, Negative Binomical Distribution, Geometric distribution, Poisson distribution, Poisson approximation to Binomial.	Chapter 3, section 4 (3.4)	
4	Continuous distributions (Chapter 4) • Probability density (4.1) • Families of continuous distributions: Uniform distribution, Exponential distribution, Gamma distribution, Normal distribution, Normal approximation to Binomial. (4.2) • Central Limit Theorem. (4.3)	Chapter 4	
5	Week 4 continued	Chapter 4	
6	Statistics (Chapter 8) • Population and sample, parameters and statistics (8.1) • Simple descriptive statistics. (8.2) • Graphical statistics. (8.3)	Chapter 8	
7	Statistical inference (Chapter 9) • Parameter estimation. (9.1) • Confidence intervals. (9.2) • Unknown standard deviation. (9.3)	Chapter 9, Sections 9.1, 9.2, and 9.3	
8	Statistical inference continued (Chapter 9) • Hypothesis testing. Type I and Type II errors. Level alpha tests. P-value. (9.4)	Chapter 9, Section 9.4	
9	Statistical inference continued (Chapter 10) • Chi-square tests (10.1)	Chapter 10 Section 10.1	
10	Regression (Chapter 11) • Least squares estimation. (11.1)	Chapter 11, Section 11.1	
11	Simulations and Monte Carlo methods (Chapter 5) • Simulation of random variables (5.2) • Monte Carlo methods (5.3.1 and 5.3.2)	Chapter 5	
12	Stochastic processes (Chapter 6) • Markov processes and Markov chains. (6.2)	Chapter 6, Section 6.2	
13	Stochastic processes continued (Chapter 6) • Counting processes (6.3) • Simulation of stochastic processes (6.4)	Chapter 6, Sections 6.3 and 6.4	

Course Textbook(s)

Probability and Statistics for Computer Scientists, Second Edition, Michael Baron, 2013, 978-1439875902

Course Material(s) and Reading(s)

Material(s)

No additional physical material is required.

Reading(s)

Additional readings:

- Introduction to Probability, Statistics, and Random Processes. Hossein Pishro-Nik, 2014, 978-0990637202
- Probability Theory: The Logic of Science, E. T. Jaynes, 2003, 978-0521592710
- Probability and Random Processes, Grimmett, Geoffrey, and David Stirzaker, 2001, 978-0198572220
- Probability and Statistics with Reliability, Queuing, and Computer Science Applications, Kishor S. Trivedi, 2001, 978-0471333417

Supplementary Readings / Resources / E-Resources

Resources

Michael Baron's course web site:

http://www.utdallas.edu/~mbaron/3341/Spring13/index.html

Assessment of Student Learning

Assessment	Dates or deadlines
Homeworks (4 in total)	
Exams (1 midterm, 1 final exam)	

Course Grading

Deliverable	Grade Points
4 Homeworks (8 percent each)	32
Midterm exam	30
Final exam	30
10 quizzes (best 8 will be counted towards your grade)	8
Total	100

Course Policies

Class Attendance

Make sure that the section you follow is the section to which your are registered. In case of schedule conflicts, petition for section change.

Class Participation

Communication platform (cow, odtuclass, web page, emails etc.) may depend on the section. Please follow your section instructor, and check your metumail (or the address you registered in the metu system) regularly.

Make up for Exams and Assignments

Students need to submit approved medical reports to take make-up exams (for the midterm or the final exams).

Other

Information for Students with Disabilities

Students who experience difficulties due to their disabilities and wish to obtain academic adjustments and/or auxiliary aids must contact ODTU Disability Support Office and/or course instructor and the advisor of students with disabilities at academic departments (for the list: http://engelsiz.metu.edu.tr/en/advisor-students-disabilities) as soon as possible. For detailed information, please visit the website of Disability Support Office: https://engelsiz.metu.edu.tr/en/

Academic Honesty

The METU Honour Code is as follows: *"Every member of METU community adopts the following honour code as one of the core principles of academic life and strives to develop an academic environment where continuous adherence to this code is promoted. The members of the METU community are reliable, responsible and honourable people who embrace only the success and recognition they deserve, and act with integrity in their use, evaluation and presentation of facts, data and documents."*