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	Not available
Course Website	http://user.ceng.metu.edu.tr/~tcan/ceng222_s1819/overview.shtml
Learning Management System	ODTU-Class

Instructor Information

Name/Title	Prof.Dr. TOLGA CAN
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Course Assistants

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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

		Level of Contribution			
	Program Outcomes	**0**	**1**	**2**	**3**
1	an ability to apply knowledge of mathematics, science, and engineering				X
2	an ability to design and conduct experiments, as well as to analyze and interpret data				X
3	an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health, and safety, manufacturability, and sustainability	X			
4	an ability to function on multidisciplinary teams	X			
5	an ability to identify, formulate, and solve engineering problems		X		
6	an understanding of professional and ethical responsibility	X			
7	an ability to communicate effectively	X			
8	the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context	X			
9	a recognition of the need for, and an ability to engage in life-long learning		X		
10	a knowledge of contemporary issues		X		
11	an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice				X
12	an ability to apply design and development principles in the construction of software systems of varying complexity.	X			

0: No Contribution **1:** Little Contribution **2:** Partial Contribution **3:** Full Contribution

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	

Week	Topic	Relevant Reading	Assignments
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)	
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	

Week	Topic	Relevant Reading	Assignments
13	Stochastic processes continued (Chapter 6) • Counting processes (6.3) • Simulation of stochastic processes (6.4)	Chapter 6, Sections 6.3 and 6.4	
14	Queuing systems (Chapter 7) • Main components of a queueing system (7.1) • The Little's Law (7.2) • Bernoulli single-server queueing process (7.3) • M/M/1 system (7.4)	Chapter 7, Sections 7.1, 7.2, 7.3, and 7.4	

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 (5 pts each)	20
Midterm exam	35
Final exam	40

Deliverable	Grade Points
Section specific (active participation, quiz etc.)	5
Total	100

Course Policies

Class Attendance

Students are encouraged to follow the sections they are registered to as there may be section specific items in grading. In case of conflicts, students should contact to their section instructor for help with a section change.

Class Participation

Active participation to class will be appreciated under section specific %5 along with other section specific items.

You are expected to follow posts and emails -- both cow and odtuclass announcements.

Please check you metumail (or the address you registered in the metu system) regularly.

Late Submission of Assignments

Assignments can be submitted late up to to three days with 10 pts per day late penalty.

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

Homeworks and exams will be common among all three sections.

Information for Students with Disabilities

To obtain disability related academic adjustments and/or auxiliary aids, students with disabilities must contact the course instructor and the ODTÜ Disability Support Office as soon as possible. If you need any accommodation for this course because of your disabling condition, please contact me. For detailed information, please visit the website of Disability Support Office: http://engelsiz.metu.edu.tr/

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."*