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MIDDLE EAST TECHNICAL UNIVERSITY

STAT 154 - PROBABILITY II (3-2) 4

COURSE OUTLINE

**Spring, 2017**

**Instructor:** Ceylan YOZGATLIGİL, Ph.D.

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**Teaching Assistant:** Ceyda Yazıcı

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**Course Schedule**

Tuesday 9:40 a.m. – 11:30 a.m. (Z-22)

Wednesday 9:40 a.m. – 10:30 a.m. (P-5)

Thursdayday (R) 10:40 a.m. – 12:30 p.m. (FZ-19)

**Office Hours:**  WBA

**Course Web page:** <http://www.metu.edu.tr/~ceylan/STAT154.htm>

**Course description and objectives:** This course is the second part of probability as the continuation of STAT 153. The goal of this course is to introduce students to the basic probability theory (part II) and help them in establishing a good theoretical background for their future professions. Problem solving is required, and some theorem proving can be done, but the course emphasizes computation and intuition.

**Background:** The course is required for all undergraduate statistics majors, and it is a prerequisite for courses in STAT 271. Calculus skills is harder compared to STAT. So, you need to pass MATH 119 course.

**Learning Goals:**

• To understand the why we need order statistics and how to find their probability distributions.

• To be able to find the distribution of a function of a random variable or random variables.

• To understand the meaning and importance of moments and moment generating functions.

• To be able to find a limiting or asymptotic distribution of a given function of random variables.

• To develop probabilistic thinking

**Suggested Textbook:**

* A First Course in Probability (2010), ninth edition, by Sheldon Ross.
* Introduction to Probability and Mathematical Statistics (1992), Lee J. Bain and Max Engelhardt.

**Some Alternate Textbooks:**

* A Course in Probability (2006), Neil A. Weiss.
* Understanding Probability (2012), Henk Tijm.
* Introduction to Probability and Mathematical Statistics (1992), Lee J. Bain and Max Engelhardt.
* Introduction to Probability Theory (1971) Hoel, P. G., Port, S. C. and Stone, C. J..
* <http://wiki.stat.ucla.edu/socr/index.php/EBook>
* Many introductory probability books from the library will be helpful.

**Course Content:** Emphasize problem solving and intuition. Some advanced concepts should be presented without proof, so as to devote more attention to the examples.

1st week: Jointly distributed random variables: Joint distribution functions, independence, conditional distributions, expectation, covariance Sums of independent random variables: expectation, variance.

2nd week: Introduction to order statistics

3rd week: Distributions of order statistics for discrete and continuous random variables

4th week: Transformations of discrete random variables

5th week: Transformations of continuous random variables

6th week: Introduction to generating functions, moment generating functions, characteristic generating functions, factorial moment generating functions

7th week: Generating functions for discrete random variables and continuous random variables

8th week: Computing expectations by conditioning, computing variances by conditioning

9th week: Introduction to limit theorems, Chebychev’s inequality

10th week: Convergence in distribution, convergence in probability

11th week: Limiting moment generating functions

12th week: The central limit theorem

13th week: Normal approximations, applications to sampling

14th week: Some theorems on limiting distributions

**Attendance:** Mandatory, though I will not take roll. You are responsible for everything we do in class, even on days you do not attend.

**Calculator:** You are expected to have a calculator, Casio FX-82ES. Advanced calculators will not be allowed in the exams.

**Exams and Grading:** There will be two in-class midterms and a final exam. This semester, you will not need calculators in the exams.

Midterm exam 1 (25%)

Midterm exam 2 (25%)

Homework & Quiz (15%)

Final (35%)

**Make-Up Work:**Make-up exams will only be given in **very unusual circumstances**, with one week prior notification (or, in the event of an emergency, **\*very\* strong documentation** of that emergency). If you have this kind situation and don’t **contact with me one week before or after the exam**, you **cannot** take the make-up exam. Make-up exam will be given at the **end of the semester** and it will be **similar to the final exam** (cover all the topics).

**Course preparations & mechanics:** Please try your best to read the assigned sections in the text before each lecture. The course moves at a brisk pace, so don't fall behind!

Homework assignments form an integral component of the course. You should make every effort to solve the assigned problems, using the concepts learned from the lectures and readings. If you have any question, come see me during office hours, and/or talk to your teaching assistant. Help each other out! I genuinely want everyone to succeed in mastering the basics of probability by the end of the course!

**Homework:** Assignments are due at the beginning of class on Thursdays. You can be a group of **at most two** to solve the problems. Please clearly write down your name(s) on top of the first page. And if your assignment contains multiple pages, please staple them!

Please write down your solutions legibly and neatly. Don't skimp on margins! Remember to properly define your variables, label your diagrams, etc., so that we know what you're trying to communicate.

In general, you should show enough work/reasoning in deducing the final answer. If you need to refer to a specific result mentioned in class or in the textbook, please indicate so as well. Insufficient or uncited work will receive reduced or no credit.

Collobration is allowed as idea-sharing. However, you should write up your work on your own and in your own words. Exact duplication of others' work is considered plagiarism.

Your homework will not be graded, if you bring it after the recitation hour.

# Academic Integrity: All assignments, quizzes, and exams must be done on your own. Note that academic dishonesty includes not only cheating, fabrication, and plagiarism, but also includes helping other students commit acts of academic dishonesty by allowing them to obtain copies of your work. You are allowed to use the Web for reference purposes, but you may not copy code from any website or any other source. In short, all submitted work must be your own. Should a student be caught cheating during an examination or be involved in plagiarism, a zero (0) will be assigned for the exam, quiz or writing assignment.

Please look at the following page for further information:

<http://www.ueam.metu.edu.tr/TURKCE/ueam/ueam_ilkeler/ueam_ilkeler_honor_code_tab.htm>

**Important Dates:**

* Week of the ADD-DROP for the classes: **February 27 - March 3, 2017**
* National Holiday (National Sovereignty and Children's Day, Sunday) April 23, 217
* Labor and Solidarity Day (Monday) May 1, 2017
* National Holiday (Commemoration of Atatürk & Youth and Sports Festival, Friday) May 19, 2017
* Withdrawal applications: **April 24 – 30, 2017**
* End of lectures: May 26, 2017
* Final exams: **May  29 – June 10, 2017**
* Announcement of final grades: June 19, 2017