Syllabus - The Theory of Probabilities and Mathematical Statistics
MAT 307, ID 3215,
Fall-2017

Lecturer:

Instructor	Email
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Class meetings: 2 classes (75 minutes) per week, 15 working weeks.
Office hours: according to the individual schedules of the instructors, office: 415, phone: 915000 (ext. 426).

I. Course Description

This course will introduce the basic tools of theory of probability and statistics with applications to natural and social sciences, business. The course consists of the following topics: counting techniques; basic probability concepts and theorems; discrete and continuous probability distributions; statistical inference and sampling, the central limit theorem, confidence intervals for the mean of a normal population, hypothesis testing for the mean of a normal population.

Prerequisite: MAT 131.1/ MAT 131.2/ MAT 132

II. Course Objectives

In this course, you will

- to develop abstract and logical (probative) thinking,
- understanding how to set and solve problems,
- acquiring as basic knowledge of probability and statistical analysis techniques,
- to use the knowledge of probability and statistics for the problems solving in majors.

III. Core Sources

1. http://e-course.auca.kg
2. Alan H. Kvanli Introduction to business statistics. 1989.
3. Mario Triola Elementary statistics. 2002.
4. Alan Hoenig Applied finite mathematics. 1986.
5. Amir D. Azel Complete Business Statistics. 1986.
6. Lawrence L. Lapin Statistics for modern business. 1978.

IV. Course Requirements and Grading

a) Grading scale

$0 \le F \le 40 < D \le 45 < C- \le 50 < C \le 60 < C+ \le 6565 < B- \le 70 < B \le 80 < B+ \le 85 < A- \le 90 < A \le 100$.

b) Grade components

Quiz 1	10 points
Midterm Exam	30 points
Quiz 2	10 points
Final Exam	40 points
Home works, class activity	10 points

c) Make-up Exams

- If the reason for missing the midterm exam is valid, the student's final exam will be worth up to 60 points. Extra assignments will be included into final exam.
- If the reason for missing a quiz is valid, the quiz can be written at another time and will be worth 5 points.
- If the reason for missing the Final Exam is valid, the student can apply for the grade of "I".
- If a student misses both exams, he/she will not be attested for the course.
- If the reason for missing any graded activity is not valid, then the grade 0 will be given for the

missing work.

V. Course Protocol

- **Attendance Requirements** It is important to attend classes to master the materials in the course. Attendance affects grades: students lose 1 point for any unexcused absence. Missing 10 or more classes for any reasons will result in a grade of "F" in the course.
- **Academic Honesty** The Applied Mathematics and Informatics Department has zero tolerance policy for cheating. Students who have questions or concerns about academic honesty should ask their professors or refer to the University Catalog for more information.
- **Calculators and cell phones** We ask students to turn off their cell phones during math classes. Using graphic calculators and cell phones during quizzes and exams prohibited.
- **Syllabus change** Instructors reserve the right to change or modify this syllabus as needed; any changes will be announced in class.

VI. Tentative Academic Calendar

1 -2 week

- Combinatorial analysis. Permutations, combinations. A principle of multiplication and addition (Counting rules). [2]: Ch. 4.6, [4]: Ch. 5.4-5.6, [3]: Ch. 3.6.
- Space of events. Elementary events. Operations with random events. [4]: Ch. 6.1, [3]: Ch. 3.2.

3-5 weeks

- Probability. Definition of probability. [2]: Ch. 4.1-4.5, [4]: Ch. 6.2 - 6.4, [3]: Ch. 3.1-3.5.
- Operations with probabilities. [2]: Ch. 4.1-4.5, [4]: Ch. 6.2 - 6.4, [3]: Ch. 3.1-3.5.
- Conditional probability. The formula of complete probability. Bayes' theorem. [4]: Ch. 6.5, [3]: Ch. 3.4.

6-8 weeks

- Random variables. Representing probability distributions for discrete random variables. Mean and variance of discrete random variables. [2]: Ch. 5.1-5.3, [4]: Ch. 9.5, [3]: Ch. 4.1-4.5.
- Binomial Random variables. [2]: Ch. 5.4, [4]: Ch. 9.5, [3]: Ch. 4.1-4.5.
- The hypergeometric distribution. Using Binomial distribution to approximate the hypergeometric distribution. [2]: Ch. 5.5, [3]: Ch. 4.4, [6]: Ch. 17.1.
- The Poisson distribution. Poisson approximation to the Binomial. [2]: Ch. 5.6, [3]: Ch. 4.4.

9-13 weeks

- Continuous random variable. Normal random variables. Determining probability for normal random variables. [2]: Ch. 6.1-6.5, [3]: Ch. 5.1-5.4, [4]: Ch. 9.4.
- Random sampling and distribution of sample mean. The central limit theorem. [2]: Ch.7.1-7.2, [4]: Ch. 4.1-4.4, [3]: Ch. 5.6.
- Normal approximation to the Binomial. [2]: Ch. 6.6, [3]: Ch. 5.5, [6]: 3.7, 7.5.
- The confidence interval if mean of a normal population is known. [2]: Ch. 7.3, [4]: Ch. 5.1-5.2.
- Definition of necessary volume of sample. [2]: Ch. 7.4 -7.5, [3]: Ch. 7.1,7.2, [4]: Ch. 5.3.
- Hypothesis testing on the mean of a population: large sample. On tailed test for mean of a population: large sample. Reporting testing results using a p-value. [2]: Ch. 8.1-8.3, [5]: Ch. 6.1-6.3, 6.6-6.8, [3]: Ch. 6.3.
- Hypothesis testing on the mean of a normal population: small sample. [2]: Ch. 8.4, [5]: Ch. 6.4.
- Inference for the variance and standard deviation of a normal population. [2]: Ch. 8.4, [5]: Ch. 6.4.

14-15 weeks

- Independent versus dependent samples. Comparing two means using two large independent samples. [2]: Ch. 9.1-9.2, [3]: Ch. 8.3, [5]: Ch. 7.1-7.5.
- Comparison of two normal dependent populations [2]: Ch. 9.5, [3]: Ch. 8.3, [4]: Ch. 7.1-7.2, [6]: Ch. 6.10.
- Estimation and confidence interval for a population proportion. [2]: Ch. 10.1, [3]: Ch. 7.3, [4]: Ch. 5.4 -5.6, [6]: Ch. 5.1-5.2.
- Hypothesis testing for the population proportion [2]: Ch. 10.2, [3]: Ch. 6.5, [4]: Ch. 6.5, 6.6, [6]: Ch. 5.3, 5.4.

Out-of class assignments

- Distribution function of discrete random variables. [5]: Ch. 2.2, [6]: Ch. 6.4.
- Distribution function of continuous variables. [4]: Ch. 2.6.