Óbuda University John von Neumann Faculty of Informatics	Institute of Applied Mathematics

Name and code of subject: **Credits: 5**

Probability theory and mathematical statistics NMXVS1EBNE

Computer Engineering BSc *Full-time course* *2019/20 academic year, spring*

Responsible lecturer:	Dr. Kárász, Péter			
Prerequisites: (with code)	Calculus II. NMXAN2EBNE Discrete mathematics and linear algebra II. NMXDM2EBNE			
Periods per week:	Lectures: 2	Seminars: 2	Laboratory: –	Consultation: (as requested)
Way of assessment:	examination			

Course description

Objectives: An introduction to probability and mathematical statistics, discussion of basic concepts, developing problem-solving skills; it provides an insight into practical applications.

Course material: Probability, statistics and inference. Probability model. Conditional probability, independent events. Random variables and their characteristics. Specific discrete and continuous distributions. Functions of random variables. Laws of large numbers. The central limit theorem. Elements and concepts of (mathematical) statistics. Confidence intervals. Hypothesis testing methods. Hypotheses concerning the parameters of the normal variable. Non-parametric tests. Correlation and regression.

Schedule

Week	Topic
1.	Algebra of events. Axioms of probability. Classical probability space.
2.	Geometrical probability space. Conditional probability, independence of events.
3.	Law of total probability, Bayes' theorem.
4.	Discrete random variables and their characteristics.
5.	Specific discrete distributions.
6.	Continuous random variables and their characteristics.
7.	Specific continuous distributions.
8.	Distributions of functions of random variables. The joint distribution of more random variables. Independence of random variables.
9.	Chebyshev's inequality. Laws of large numbers. The central limit theorem.
10.	Easter break.
11.	Descriptive statistics. Specific distributions in statistics. Estimates. Criteria of good estimates.
12.	Interval estimates. Hypotheses testing the parameters of the normal variable: *u*-, *t*-, and *F*-test.
13.	Non-parametric tests: test of fit, independence and homogeneity.
14.	Linear correlation and regression.

Mid-term requirements

Students are required to write two mid-term tests of 50 points, which comprise only calculation exercises. One of the tests can be retaken at the test retake.

Test retake is

- **compulsory** for those who missed one of the tests, otherwise they will be **banned** from further exams;
- **optional** for those who have written both tests but would like to achieve better grades. In this case the test with the lower score can be retaken, and its result will replace the original score (no matter if it is lower).

Students receive the end-term signature (and thus have the right to take the exam), if they have written the two tests, their overall score is at least 50, and their absence from classes does not exceed the allowed 30%.

Attendance at seminars is compulsory. If absence at seminars exceeds the 30% of the total number of lessons, the student is banned from exams, teacher's signature is rejected and the student is not allowed to write the signature retake exam described below. In this case the student gets a "banned" entry in their credit book.

Week				
7.	Test 1	Venue: F.08	Time: 26 Mar 2020	09:50
13.	Test 2	Venue: F.08	Time: 7 May 2020	09:50
14.	Test retake	Venue: ???	Time: (provisional) 13 May 2020	16:15

Signature retake:
In case the student has written both mid-term papers, but their result is under 50%, and their absence at seminars does not exceed the 30% of the total number of classes, they have one opportunity to write a paper covering the whole course material in the exam-period. Students can register for the signature retake through the Neptun system after paying the appropriate registration fee. The test contains simple questions and students need to achieve at least 60% of the scores for the end-term signature.

Examination

The examination is written. The test contains theoretical questions (30 points) and calculation exercises (40 points) of the overall course material (altogether 70 points max). If the student does not reach at least 50% of the maximum score of any of the two parts, the result is fail (1). Otherwise, 30% of their mid-term test result will be added to the exam score, thus a total 100 points can be achieved. In case the student fulfilled the signature requirements at the signature retake exam, their mid-term score is 15, regardless of the actual score. The final exam grade can be determined by the chart below:

Score	Exam grade
86–100	excellent (5)
74–85	good (4)
62–73	satisfactory (3)
50–61	pass (2)
0–49	fail (1)

Literature

Compulsory:

http://elearning.uni-obuda.hu/

Recommended:

http://nik.uni-obuda.hu/karasz/

Miscellaneous:
https://www.probabilitycourse.com/