Syllabus

August 31, 2023

Lecturer: Prof. dr.hab. Viorel Bostan
E-mail address: viorel.bostan@adm.utm.md
Lecture hall: 3-3 Amdaris Auditorium
Lecture hours: Thursday 9:45–11:15
ECTS credits: 4
Course web page: on platform `else.fcim.utm.md`
Office: 3-204
**Office hours:** Monday 18:00 online on MS TEAMS
Prerequisites: High school mathematics and elementary knowledge of programming.

Course outline. This is a fast-paced course. This course gives an introduction to probability and basics of applied statistics and not only. We will cover topics from Discrete and Continuous Probability, Combinatorics, Statistics, Random Processes and Information Theory. On completion of this course, you will understand and have the ability to apply special models, methods and tools to analyze problems and data with an uncertainty component. Probability in a complex world become an important part of scientific literacy together with mathematics, physics or computer science.

Course Objectives. There are 3 main objectives and 11 specific learning outcomes.
O1. Understand ideas and techniques underlying the probabilistic methods.
O2. Be able to use probability concepts to analyze random processes from real life, simulate them on a computer and make predictions about experiments whose outcomes depend upon chance.
O3. Understand the fundamental ideas of statistical inference.
O4. Obtain some familiarity with information theory and its basic concepts.
LO1. Become familiar and master the fundamental probability concepts such as sample space, probability laws, random variables and common associated distributions.
LO2. Understand the concept of conditional probability, Bayes probability and independence.
LO3. Learn hot to model and simulate computationally real-life problems with uncertainty.
LO4. Calculate the number of elements in a set, count possible outcomes of elementary combinatorial processes such as permutations and combinations.
LO5. Calculate discrete and continuous probabilities, find distributions for simple random processes, calculate expectations and deviations.
LO6. Understand the power of laws of large numbers and be able to use them in applications.
LO7. Become familiar with basic methods and tools from statistics to estimate and test hypothesis.

Class procedure. The majority of each class period will be lecture oriented. Suggested and required reading as well as homework and lecture slides will be posted on course page. I strongly advise to attend lectures and seminars, do your homework, work consistently, and ask questions. Lecture time is at premium; you cannot be taught everything in class. **It is your responsibility to learn the material**, the instructor's job is to guide you in your learning. As a general rule, you will find it necessary to spend approximately 2-3 hours of study for each lecture meeting, and additional time will be needed for HW and exams preparation. **It is strongly advised that you start working on this course from the very beginning**. The importance of doing the assigned homework and projects cannot be over emphasized.
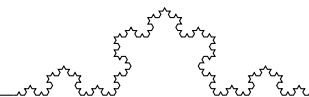
Grading policy. The final grade will be based on quizzes, 2 exams, homework, projects and seminar participation as follows:

1. There will be two 1-hour written midterm exams given after 7, and respectively 11 weeks of classes at a time arranged later. These exams will count each 15% of the final course grade.
2. The final comprehensive 2-hour exam will be given during the scheduled examination time at the end of the semester, it will cover all of the material, and it will count 40%.
3. HWs and quizzes grades will count 15%.
4. Lab Projects grade will count 15%.

NOTICE. Late homework and projects are not accepted!

Exams. The exams will be closed notes, i.e. you will not be allowed to use your class notes or any other materials. It is very important that you take the examinations at the scheduled times. Alternate exams will be scheduled only in exceptional circumstances.

Quizzes. There will be given up to 10 multiple choice tests in the first 10–15 minutes of the class. **Don't be late!** Tests will cover previous lectures. For each question there will be allocated 0.5–1min. Each question will have four possible answers with only one answer being correct and/or complete. For each correct answer you get +1 pt, incomplete or wrong answers are worth 0 pt.

Homework. There will be given 7-8 homeworks. Work on them individually. Show your work! In case you got assistance from someone else, you should mention it. The HWs will be graded on a scale form 0 to 4 with a possibility of getting extra bonus point at each homework. Grades will be given according to the following guidelines: 0 – no homework turned in; 1 – poor lousy job; 2 – incomplete job; 3 – good job; 4 – very good job. Also, an additional bonus +1 point will be given for bonus problems.

NOTICE 1. The smallest HW grade and quiz grade will be dropped at the end of semester.

Projects. There will be given 4 computer projects (labs).
Details will be provided by your project coordinator.

NOTICE 2. In order to be admitted to the final exam, the grades for midterm, HWs and Labs should be 5 or higher!

Collaboration. I encourage you to discuss homework and projects. Studying together is a good idea to learn, but you must write up solutions on your own, neither copying solutions nor providing solutions to be copied. If you do collaborate on individual homework or project (exceptions are possible in case of team projects), you must mention in your written solutions and reports, all of your collaborators. Do not be neither a "free rider" nor a "free rider" provider. ("Free rider" = individuals who are allowed to consume more than their fair share of the shared resource or pay less than their fair share of the costs).

Academic misconduct. Any kinds of academic misconduct (such as cheating, plagiarism or other non-ethical behavior) will not be tolerated. If a situation arises where you and your instructor disagree on some matter and cannot resolve the issue, you should see the Program Coordinator or the Dean. However, any problems concerning the course should be first discussed with your instructor (Me!).