

Discrete Mathematics - general rules of the course

Grzegorz Kosiorowski

Krakow University of Economics

- 1 Discrete Mathematics
- 2 Credit, examination, attendance
- 3 „Virtual” course and lecture slides
- 4 Copyrights
- 5 Contacting the lecturer
- 6 Lecturer’s manual

What is discrete mathematics?

- Discrete mathematics deals with discrete sets (namely, such that each element of the set is distinctly separated from the rest).
- For this lecture (barring Presentation 2 and, to some extent, 3), we deal with finite sets, \mathbb{N} and \mathbb{Z} .
- The set of real numbers (\mathbb{R}) is not considered a discrete set because its elements are not „distinctly separated” from the rest: the real numbers are ”densely packed” around each other.
- Natural applications: computers work on discrete, usually finite sets.

Plan of the lecture

Discrete mathematics deals with an extremely wide range of subjects. Through this course, we will learn only about a basics of a few chosen areas:

- Basics of logic
- Theory of functions (in particular, inverse functions).
- Asymptotics (Big O notation)
- Number theory and its application to cryptology (RSA algorithm)
- Recurrence/recursion (mathematical induction, recursive algorithms, solving linear recurrence relations)
- Counting elements of sets and sequences (combinatorics)
- Elementary informations about graphs and trees

Introductory requirements

We are going to need basic arithmetic skills from school (especially for integers), in particular solving quadratic equations. Moreover, some information from the course of Calculus and Algebra, in particular the definition of a limit of a function and de L'Hospital's rule will be useful.

It might be helpful (but not necessary) to know about the following issues:

- Elementary logic.
- Elements of number theory from school (GCD - greatest common denominator, LCM - least common multiple, division with remainder)
- Elements of combinatorics from school (variations, permutations, combinations).

Algorithms

As we focus on applications of mathematics in computer science, we will deal with quite a few algorithms.

- We are going to have no classes in a computer lab so there is no point in presenting the final code for algorithms.
- Thus, most algorithms of the course will be presented in the forms of pseudocodes (namely, descriptions of the steps in algorithms using a mix of notations typical for programming languages with informal notation of actions and conditions). You should be able to easily transform pseudocodes to code in your favorite languages.
- There will be a system of notation based on tables presenting partial results for the most important algorithms to verify your understanding of said algorithms. This will be a preferred way of presenting your results during tests and exams (although any notation clearly showing the results of the algorithm after each step will suffice).

I do not require you to learn anything more than the content of the lecture, presentations and classes. However, to broaden your knowledge or get a different angle on some problems discussed during the lecture, I particularly recommend delving into:

- *Discrete Mathematics*, K.Ross, C.Wright.
- *Concrete Mathematics*, R.Graham, D.Knuth, O.Patashnik.

How to pass the course?

To pass the course you simply need to pass the exam.
The detailed rules for the exam, including its structure and examples of tasks, can be found in a separate file on the website:
kosiorowski.edu.pl (we will discuss this website later).

Rules of the examination - quick review

- You will be graded mostly on the basis of a written examination.
- The duration of the exam will be about 90 minutes.
- The exam will consist of 4-6 "practical" tasks similar to ones that you will be solving during classes and one "theoretical" task - a question about the theorems and definitions from the lecture.
- The date of the examination will be published on the Moodle platform as soon as possible.

Grading rules

- To take the exam, you need to obtain credit from the classes - otherwise, you fail the entire course.
- The result of the course is a weighted average of the result of the classes (40%) and the written exam (60%).
- The thresholds for grades are as follows: 50% to get 3,0 and half a grade up for each extra 10% (up to 5,0 for the result of 90%+). However, to obtain a grade higher than 2,0 you need to obtain at least $\frac{1}{3}$ of the points from the exam. In case of failing in the first term of the exam, you cannot get a higher grade than 4, 0.
- If someone has already passed a course of discrete mathematics (as a part of another major) and wants to have his grade transferred instead of attending the course, one should contact the director of the Institute of Computer Science.

Technicalities

- During the exam, you should only have a simple calculator, an analog watch and something to write (also something to drink, if necessary) by yourself.
- In particular, you cannot have anything that enables you to contact "the world outside" (e.g. a phone/smartphone/smartwatch/tablet etc.) not to mention any cribs. The consequences for breaking this rule are severe, up to automatically failing the course.
- Generally, I try to make the first term of the exam easier than the second (to compensate for extra time to prepare).
- There are only and exactly two terms for passing the course. In case of emergencies (e.g. justified absences), one can write an exam at a different time, but there will be no third term after writing two.

Justifying absences

- To justify an absence during the exam, you need medical leave or something equally important.
- It is possible to justify an absence for more trivial reasons, but it should be consulted with me individually, in advance (at least a week before the exam).
- Barring emergencies, you should inform about problems, reasons for absence etc. as soon as possible (preferably by e-mail).
- If the absence is not justified in line with the rules above, the exam is failed.

Lecture attendance

- Attending lectures is not compulsory (or: at least, I am not checking attendance and there are no consequences for not attending).
- I will try to make your presence at the lecture worthwhile.
- I am going to provide you with all the slides from the lecture (including this very presentation) but I hope that my extra explanations will help you understand the course (and you can always ask questions during the lecture).

Moodle platform: e-card

- On the UEK Moodle platform you can find my (Grzegorz Kosiorowski) page (e-wizytówka/e-card)
- There you can find my e-mail address, my website address (with all materials for the course), details of my office hours and a link to a moodle page of our course (Discrete Mathematics, Computer Science, full-time, 1st year)

Moodle platform: course

I strongly recommend signing up for the moodle course of Discrete Mathematics (link in my e-card, no password). You will find

- Forums: announcements (such as: date and other details of the exam, responses to group requests and any other information for all of you), e-consultations and corrections for slides and other course files;
- Link to the website with all materials for the course;
- Results of the exam (!);
- A syllabus.

Learning materials website

The most important learning tools for the course will be available on the website www.kosiorowski.edu.pl: you need to choose our course from the menu or to go there directly following the link from the moodle platform. There you can find:

- Complete sets of slides of each lecture (for now, only for a few first lectures but there will be all of them before the end of the course), including this presentation of the rules.
- All necessary information on the exam (for now: a file explaining the detailed rules of grading the course and on the structure of the exam, including examples of tasks).

Corrections to slides

I did my best to ensure that the slides are correct and helpful. I aim to improve them further. However, this is the first time I run the course in this exact form, so some mistakes are inevitable. Pointing out the mistakes and obscurities in the slides (preferably, through the appropriate forum in the moodle course) will be rewarded with bonus exam points.

The amount of such bonus points naturally depends on the weight of a correction: pointing out one typo or a grammar error will not bring you any points but if you find multiple (for example, about 10), then you will be rewarded. On the other hand, finding a factual error in a theorem, a definition or an algorithm may give you even more than 100 "small points" for the exam (depending on the seriousness of the mistake).

Lecture, learning materials and copyrights

I did not invent the claims and definitions of the lecture, they mostly come from the sources listed in the bibliography (in the syllabus) and I shaped them to fit our course. Main conclusions:

- Here and there I use some materials on the CC (Creative Commons) licence. It is always denoted on one of the neighboring slides.
- The rest is created by me. You can use the slides freely.
- If anyone knows about any copyright infringement by any part of this lecture, just let me know, it will be easy to change.
- I don't mind you recording the lecture if it helps you learn (just try not to make noise and bother me or other students).

Contact

There are three basic forms of contact outside the lecture:

- e-mail (standard UEK address:
grzegorz.kosiorowski@uek.krakow.pl) - for personal matters (justifying absence, BON attestation etc.)
- e-consultation forum in our moodle course - for any issues that may concern more than one individual: in particular any factual questions about discrete mathematics (or any other part of mathematics), learning materials, office hours, exams, extra classes etc. I respond to such questions regularly (every 2-3 days). Please, read the rules of the forum before asking the question.
- Standard office hours (consultations) - usually in room 003 of building F. Details on my e-card.

Office hours

I strongly recommend taking the opportunity to visit me during my office hours if you have any questions about the course - particularly in the first months of the semester. Just before the exam-time there are usually many students who need to talk and there might not be enough time to fully respond to the needs of everyone.

If you have only a short, simple question (e.g. you need a clue for solving a particular task or you do not understand one theorem from the lecture), then I suggest making use of the e-consultation forum on the Moodle platform: it is very likely that you are not the only person with such a problem and an open discussion can be useful to every one of them.

If there are several students who needs more help with the course, I am willing, after arranging that in advance, to establish extra office hours or even extra classes (again, the closer it is to the exam-time, the less likely it is that I will have time for that).

My requirements

I require that:

- You get a credit from classes.
- You study for the exam (this is serious!)
- You do not cheat at the exam or in classes.
- You do not disrupt the lecture. In particular, you should switch off your mobile phones and avoid making unnecessary noise. Of course, please ask questions if you don't understand something. Just put your hand up. But remember that you are not the only person in the lecture room.
- If you come to a particular agreement with me (e.g. different date of exam, BON attestation), write an e-mail to me with a summary of your case (precaution against forgetting).

My non-requirements

I do not require:

- A particular set of clothes at the exam (as long as it does not bother anyone else).
- Listening at the lecture - as long as you do not disrupt the lecture and you do not bother either me or the rest of students.
- If you need to leave the lecture room for any reason, you may do so and you should not ask permission. But please leave quietly. If you arrive late, seat yourself as quietly and unobtrusively as possible.

Recommendations

I recommend:

- General good will
- Asking questions if anything is not clear (or might be incorrect)
- Taking advantage of lectures and office hours
- Thinking during lectures.
- Passing the course in June.

Final remarks

I strongly discourage:

- Asking for non-standard privileges without a non-standard justification (such as asking for an extra term of exam because "I really want to pass").
- Breaking the rules presented here and pretending that you didn't know.
- Disrupting the lecture (you can leave at any moment if you need).
- Not respecting agreements.
- Plagiarism.
- Corruption or intimidation.