

Syllabus

General Info

Course MAT210 Math Topics for the Liberal Arts

Instructor Charilaos Skiadas (skiadas at hanover dot edu)

Term Spring 2014-2015

Office SCH 121C

Office Hours MTWTF 2pm-4pm

Book *For All Practical Purposes*, 9th edition, by COMAP.

Websites for notes¹, for assignments and quizzes²

Class times MTWRF 10am-2pm in SCH102. With break for lunch.

Course Description

Students are traditionally exposed to the “Calculus” side of mathematics, learning all about functions, derivatives, integrals, lots of complicated formulas and equations.

This is not that class.

At its core Mathematics is about providing a systematic and structured approach to solving problems, and this is what we will learn in this class. We will treat a variety of topics, ranging from graph theory and scheduling problems to optimization techniques to voting systems and bar codes.

In this course you:

- will be exposed to a diverse set of applications of mathematics to real world problems.
- get an appreciation for the power of mathematical reasoning and abstract thinking.
- develop your abstract reasoning skills and apply them to practical problems.
- will learn to articulate your reasoning both verbally and in writing.

The course will begin with a survey of a number of graph-theoretic concepts. Graphs consist of *vertices* connected with *edges*. These can represent for example airports connected via flight paths, or the servers and routers that form the Internet. We will be examining a number of properties of such graphs, for example looking for efficient ways of traversing every vertex, or looking for the fastest way of going from one vertex to another. This will be the first part of the course, which wraps up with our first midterm.

Afterwards we will look at linear programming techniques, which have to do with optimal allocation of resources. Most such problems can be reduced to looking for

¹skiadas.github.io/MathTopicsCourse/site/

²<https://moodle.hanover.edu/course/view.php?id=676>

the maximum or minimum value that a function can take given a set of constraints on the parameters. We will then consider social choice problems and voting systems. We will look at a number of different voting methods and their properties, including Arrow's celebrated Impossibility Theorem that describes limitations on what we can expect from a voting system. We close this second part of the course with a discussion of manipulation of voting systems by means of an disingenuous ballot. The second midterm follows.

The course ends with a look at topics related to information science. We will take a look at techniques related to the "Digital revolution". We'll look at error-correcting codes used in identification and credit-card numbers, as well as the codes used to accomplish data compression. Finally we look at some simply cryptographic techniques. The course ends with a third midterm that covers this third section.

Course Components

Reading Notes and Practice Problems

On the website you will find a schedule³ with links to documents for each class day. In those documents you will find notes for the day's lesson, a reading assignment, and a list of practice problems. You should work on those practice problems, and ask any questions you have about them. You do not have to turn the problems in.

Class Attendance

You are expected to attend every class meeting, including labs. You are only allowed to miss 2 classes without excuse. From that point on, every unexcused absence will result in a reduction of your final score by one percentage point, up to a total of 5 points. Excused absences should be arranged in advance, and backed by appropriate documentation. Emergencies will be dealt with on an individual basis. There are very few reasons that would qualify as an excuse for an absence.

Online quizzes

We will be using the Moodle platform⁴ for online quizzes. You will typically have one quiz each day. You will be expected to read ahead in the book and notes for the next day's material, then answer some quiz questions about it. You are allowed to take the quiz up to 3 times before that deadline, and you receive feedback after each attempt. Only the best of those 3 tries will count. You are expected to work on the quizzes on your own. You should take them *only after* you have read the relevant notes and book sections, and you should *not* have your book and notes available while you take the quizzes. Your quiz score is 20% of your final grade.

³<http://skiadas.github.io/MathTopicsCourse/site/schedule.html>

⁴<http://moodle.hanover.edu>

Exams

There will be three exams, on Tuesday, May 5th, Thursday, May 14th, and Friday, May 22nd. In terms of your final grade, the exam you did better on will weigh a bit more, the one you did worse on a bit less.

Getting Help

- You should never hesitate to ask me questions. I will never think any less of anyone for asking a question. Stop by my office hours or just email me your question, which has the great benefit of forcing you to write it down in clear terms, which often helps you understand it better. And it also gives you more time to process my answer.
- You are allowed, and in fact encouraged, to work together and help each other regarding the notes and the practice problems. However, I strongly encourage you to try the problems out on your own first before talking to someone about them.
- You may discuss homework problems with others, but only after you have spent some time trying them on your own. And in any event you should make sure you can solve the homework on your own! So even though you may talk to others about the problem, when you sit down to write the answers you should be on your own.
- Your work on the online quizzes must be your own. You may ask me for questions.

Grading

Your final grade depends on class attendance, homework, project, quizzes, midterms and the final, as follows:

Component	Percent
Attendance	5%
Quizzes	20%
Worst Midterm	20%
Middle Midterm	25%
Best Midterm	30%

This gives a number up to 100, which is then converted to a letter grade based roughly on the following correspondence:

Letter grade	Percentage Range
A, A-	90%-100%
B+, B, B-	80%-90%
C+, C, C-	70%-80%

Letter grade	Percentage Range
D+, D, D-	60%-70%
F	0%-60%