

# Graph Theory 1MA170: Course information

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7 September 2023

This file is intended to contain all the practical information you may need about the course – when is the exam, what is the assignment, when are the lectures, and so on.<sup>2</sup>

The course literature for this course is Reinhard Diestel's *Graph Theory*<sup>3,4</sup> and "notes from the lecturer". The course will of course be closer to the notes than to the book, but the book should still be a useful reference or alternative perspective – though I do not guarantee that everything the lecture notes cover will be in the book. Since the course has a new lecturer this year<sup>5</sup>, "notes" could really refer both to the old notes and the new ones. **Update this bit closer to the beginning of the course to reflect the state of the notes.**

## Lecture plan

There will be a total of twenty scheduled sessions, of which **how many** will be lectures, and the rest will be exercise sessions. The exercise sessions are important – we will use them to introduce new concepts, and I *will* assume in the lectures that you have been at the exercise sessions as well.<sup>6</sup> As stated in the hand-in assignment section, attendance in two of the exercise sessions is mandatory for that assignment.

The exact planning of the content of the lectures is still subject to change. **Update this to reflect the state of the notes nearer to the start of the course. Add in reminder to register for the exam.**

## The exam

The ordinary exam for the course is on the fifth of January 2024 – remember to register at least twelve days in advance, i.e. by Christmas Eve<sup>7</sup>, in order to get to write it. Studying for an exam and then not getting to write it is pretty dispiriting.<sup>8</sup> The exam corresponds to 2hp out of the total of 5hp that the course consists of.

There will be reexams for the course **when** and **when**.

## The hand-in assignment

The course has a *mandatory* hand-in assignment, which corresponds to three out of the total of five hp of the course.

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<sup>2</sup> If you notice some information is missing, please do tell me and I will add it.

<sup>3</sup> Reinhard Diestel. *Graph theory: 5th edition*. Springer-Verlag, February 2017

<sup>4</sup> Which is available in a free pdf format from the university library:  
<https://tinyurl.com/UUGraphTheoryBook>

<sup>5</sup> The previous one defended his PhD and is no longer at Uppsala.

<sup>6</sup> Of course, we all sometimes have to miss a lecture or exercise session. Attendance is, outside of the group project, voluntary. However, just as you would read the lecture notes to catch up on a missed lecture, you should attempt the exercises to catch up on a missed exercise session!

<sup>7</sup> Some people get presents for Christmas, you get to register for an exam!

<sup>8</sup> This may or may not have happened to me once or twice during my undergrad and master's...

L#	Date & Time	Content
1	???	E1: Introduction – what is graph theory?
2	???	L2: Simple graphs and subgraphs
3	???	L3: Trees
4	???	L4: Counting spanning trees
5	???	L5: Weights and distances
6	???	L6: Hamilton cycles
7	???	L7: ???
8	???	L8: The max-flow min-cut theorem
9	???	L9: Matchings
10	???	L10: Connectivity
11	???	L11: Planarity
12	???	L12: Vertex colourings
13	???	L13: More on colourings
14	???	L14: Edge-colourings and Ramsey theory
15	???	L15: ???
16	???	L16: Szemerédi’s regularity lemma
17	???	L17: The Rado graph
18	???	L18: The Erdős-Rényi random graph
19	???	L19: More on random graphs
20	???	L20: ???

The assignment will be done in groups of four or five, and each group can pick between two tasks, either

1. picking one of the lectures in the course, improving the lecture notes on it and writing up solutions to its attached exercises<sup>9</sup>, or
2. reading a research paper in graph theory or network science and writing a short (no more than five pages) summary of what problem the paper addresses and the methods they use.

You will be required to show up at one of the exercise sessions before you hand in your assignment to work on it, and to show up at an exercise session after you hand it in in order to talk about your work with me.<sup>10</sup> The deadline for the assignment is two weeks before the final exercise session, if you pick the paper, and two weeks after the lecture if you choose to work on one of the lectures.<sup>11</sup>

If you have a reasonable reason, we can extend your group’s deadline *if you request this extension before the deadline*. Extension requests after you have already exceeded the deadline are much more difficult to grant.

<sup>9</sup> The way to do this is to edit the  $\text{\LaTeX}$  source of the lecture notes – come talk to me after a lecture for practical instructions on how to do this. It is much easier to just do it in reality than try to write a step-by-step guide here.

<sup>10</sup> Partially, this is of course in order to prevent you from using ChatGPT or similar to cheat on the assignment. That is, however, not the main reason – the main reason is to be able to help you with your work on it, and to be able to give better feedback on it afterwards. In-person feedback is a hundred times better than written feedback, and the goal of an assignment should be primarily that you learn from doing it – the need for assessment is secondary.

<sup>11</sup> If you pick a lecture very near the start or the end of the course we may have to adjust the deadlines slightly to fit within the course and with the exercise session requirement – come talk to me about it if you need an adjustment of the deadline.

*References*

Reinhard Diestel. *Graph theory: 5th edition*. Springer-Verlag, February 2017.