1 Content, style, and participation

*Evolution Equations* is an advanced-level masters course, that builds on many concepts and methods that have been treated before. The power of *semigroup theory*, the main topic of the course, is that it provides a unified treatment of an extremely wide class of evolution equations that arise in practical applications. The theory is abstract, the applications very applied, and we will often move between these two viewpoints.

The style of the teaching will be informal, and I expect you be an active participant. For instance, I expect you to

- do the exercises;
- prepare for the next lecture by making sure you understand the earlier ones;
- tell me when topics are not clear;
- participate in class discussions;
- generally contribute to an *academic* atmosphere.

*Do not underestimate* the importance of the exercises. Because of the to-and-fro between abstract theory on one hand and applications to PDEs on the other, you will find that it is *only* through hard confrontation with your inability to do the exercises that you realize you don’t yet *really* understand the concepts. Believe me, I’ve been there.

2 Teachers

Laurent van den Bos will be marking your homework, under my supervision. All of the lectures (Tuesdays) and most of the exercise classes will be taught by me, Mark Peletier. Some of the exercise classes will be taught by Laurent van den Bos.

For questions and queries you should contact me, preferably by email.

3 Times and places

Lectures: Tuesdays 10.45-12.30, Paviljoen L10
4 Exercises, tests, and exams

Each week you are expected to hand in worked exercises. The schedule is as follows:

- In week $k$, on Tuesday after the lecture I will post a set of exercises for week $k$. You can start working on them right away, if you wish.

- In week $k$ on Thursday you can work on the exercises during the exercise class, and discuss together and with me (and Laurent, when he’s around).

- In week $k + 1$, on Tuesday you are to hand in the worked exercises during the lecture.

- Laurent will then mark the exercises.

- In week $k + 2$ on Tuesday I will hand out the marked exercises, so that you can look at Laurent’s comments, and ask me for further information. At the end of the Tuesday lecture I take the worked exercises in again, and keep them for the oral exam.

5 Topics and schedule

(as far as is known now)

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<tr>
<th>Session</th>
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<th>topic</th>
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<td>Unbounded and closed operators</td>
<td>Ch. 1</td>
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<td>1 Thu</td>
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<td>exercises Week 1</td>
<td>Ch. 1</td>
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<td>2 Tue</td>
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<td>Recalling some functional analysis</td>
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<tr>
<td>3 Tue</td>
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<td>More functional analysis</td>
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<tr>
<td>4 Tue</td>
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<tr>
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<td>5 Thu</td>
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<td>Integration of vector-valued functions</td>
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<td>Mark</td>
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<tr>
<td>6 Tue</td>
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<td>Generators and uniformly continuous semigroups</td>
<td>Ch. 4–5</td>
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<td>6 Thu</td>
<td>19/3</td>
<td>exercises Week 6</td>
<td>Ch. 4–5</td>
<td>Laurent</td>
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</table>

6 Literature

The main source for this course is Georg Prokert’s lecture notes. These notes have recently been written, and probably contain errors, so please let us know about any typos or other errors that you find.

Other good sources are

A. Pazy: Semigroups of Linear Operators and Applications to PDE, Springer 1983
A. Lunardi: Analytic Semigroups and Optimal Regularity in Parabolic Problems, Birkhäuser 1995
I like Ben Schweizer’s lecture notes a lot; I think he hits the sweet spot between abstract and concrete very nicely. But you need to read german to profit from them.