UPPSALA UNIVERSITY
DEPARTMENT OF MATHEMATICS
Jordi-Lluís Figueras

Applied Mathematics
Fall 2014

Applied Mathematics

The course Applied Mathematics 1MA060 consists of 20 lectures.
The course Applied Mathematics 1MA148 consists of 15 lectures.

Course literature
J. David Logan, *Applied Mathematics*, Third Edition, Wiley.

Teaching

The lectures intend to give an overview of a number of basic methods and techniques in applied mathematics. In my pursuit of introducing as many topics as possible, I shall often illustrate general methods through examples. Basic ideas will be given priority to precise statements and proofs. Indeed, parts of the subject, such as asymptotic analysis, to some extent constitute a collection of methods which must be adapted to the problem at hand, rather than a collection of theorems.

A syllabus of both courses can be found below.

Syllabus

Course	Contents	Sections in the book
1MA060 and 1MA148	Introduction. Dimensional analysis and scaling.	1.1–1.2
1MA060 and 1MA148	Perturbation methods.	2.1–2.6
1MA060 and 1MA148	Calculus of variations.	3.1–3.6
1MA060 and 1MA148	Dynamical systems.	1.3–1.4, 5.1–5.2
1MA060 and 1MA148	Introduction to partial differential equations.	6.1–6.3, 7.1–7.4
1MA060 and 1MA148	Sturm-Liouville problems and eigenfunction expansions.	4.1–4.2, 6.4
Only 1MA060	Theory of transforms.	6.5
Only 1MA060	Integral equations, Green's functions and distributions.	4.3–4.5

Although much of the lecture time will be devoted to concrete problem solving, you are strongly advised to solve additional problems on your own.

A preliminary lecture plan, which can also seen as an outline of the course itself, can be found below. I will certainly not have time to cover everything in class, during which I can only hope to explain the basic ideas. You are expected to study the rest on your own.

Preliminary lecture plan	
Lecture	Contents
1	Introduction. Dimensional analysis.
2	Scaling.
3	Perturbation methods (I).
4	Perturbation methods (II).
5	Perturbation methods (III).
6	Calculus of variations (I).
7	Calculus of variations (II).
8	Theory of transforms (I).
9	Theory of transforms (II).
10	Calculus of variations (III).
11	Dynamical systems (I).
12	Dynamical systems (II).
13	Integral equations, Green's functions and distributions (I).
14	Dynamical systems (III).
15	Introduction to partial differential equations (I).
16	Integral equations, Green's functions and distributions (II).
17	Introduction to partial differential equations (II).
18	Introduction to partial differential equations (III).
19	Sturm-Liouville problems and eigenfunction expansions.
20	Integral equations, Green's functions and distributions (III).

The 8th, 9th, 13th, 16th and 20th lectures are targeted solely for the students attending the course 1MA060. All the other lectures are targeted to the students attending the courses 1MA148 and 1MA060.

Examination

There will be a written exam. Maximum score: 40 points. A total score of 18 is needed for the grade 3, 25 for the grade 4, and 32 for the grade 5.

Uppsala, 2nd of September 2014.

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