TATA57 Transform Theory 4hp – Course information spring 2024

Literature

Exercises: Exercises in Transform Theory by G. Baravdish & B.O. Turesson. Linköpings Universitet 2007
Extended lecture notes: see course web page.
Collection of formulas. see course web page.
Course book (if you want a book): *Fourier Series and Integral Transforms*, A. Pinkus och S. Zafrany, CUP 1997. ISBN 0-521-59209-7.

Course page

`http://courses.mai.liu.se/GU/TATA57/`.

Examination

The examination in this course consists of a written exam.

Responsible examiner and lecturer

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Prerequisites

This course assumes that you're familiar with single variable and multivariate analysis, meaning both differential and integral theory. Linear algebra is also extensively used, in particular projections and inner products. There's some complex analysis in the course, but a previous course in complex analysis is not assumed.

Lectures

The lectures do not completely cover all the material the course covers, so they should be considered a complement to the theory presented in the course book and in the extended lecture notes that can be found on the home page. To maximize your retention of the lectures, it is recommended that you go through the theory beforehand (perhaps by going through the lecture notes) and then going through the notes and book in detail afterwards. Note that the lecture notes on the home page are quite in depth (but not completely covering the book) and the things I cover in each lecture is covered by the written notes (if not the other way around). There are quite a few proofs in this course and also some rather technical content here and there. This is part of the course plan and should not be skipped completely.

Tutorials

The idea of the tutorials is that you yourself should practice solving problems. Prepare questions beforehand since the time scheduled is not sufficient for solving all the problems (only about 30% of the required time is scheduled).

On the next page, there's a curriculum for the course that contains recommended exercises. Recommended in this instance means that if you can solve and understand these exercises, you should have a good chance at passing the exam.

Course program

Table 1: Course plan spring 2024

Moment	What	Chapter
	Fourier Series	
Le 1	Periodic functions. Series. Fourier series.	Le
Le 2	Inner products and ON systems. Fourier coefficients. Parseval's identity.	**B**1.0–1.5
T 1	**K** 2.3.1a, 3.1.1, 3.1.4, 3.2.1, 3.2.2, 3.2.6, **B** 1.1, 1.5 (p.29)	
Le 3	Function series and convergence. Fourier series.	**B**2.1–2.4, Le
T 2	**K** 2.3.6, 2.2.1, 2.2.2, 3.1.2, 3.1.3, 3.1.5, 3.1.6, 3.1.7	
Le 4	Uniform convergence for Fourier series. Rules.	**B**2.1–2.4 + Le
T 3	**K** 2.3.3, 2.3.4, 3.7.1, 3.7.2, 3.2.7, 3.2.9, 3.3.1, 3.7.3, 2.3.2	
Le 5	More about convergence of Fourier series.	**B** 2.5–2.9 + Le
T 4	**K** 3.3.3, 3.5.2, 3.6.1, 3.6.2, 3.6.8, 3.6.11, 2.2.3, 2.3.7	
	The Fourier Transform	
Le 6	The Fourier transform.	**B**3.0–3.3
T 5	**K** 4.1.1, 4.1.2, 4.2.1, 4.2.2, 4.2.5, 4.4.1, (4.2.6, 4.2.7)	
Le 7	Inversion. Convolution. Plancherel's formula.	**B**3.4–3.5, 3.7–3.8
Le 8	Uniqueness.	**B**3.4–3.5, 3.7–3.8
T 6	**K** 4.2.3, 4.2.4, 4.3.1, 4.3.2, 4.3.6, 4.5.1, 4.5.2, 4.5.3, 4.6.2, 4.6.3, 4.6.4	
	The Laplace Transform	
Le 9	The unilateral Laplace transform.	**B**4.0–4.3
T 7	**K** 5.1.1, 5.1.2, 5.1.3, 5.2.1, 5.2.3, 5.4.2, 5.4.3	
Le 10	Convolution. The inversion formula.	**B**4.0–4.3
T 8	**K** 5.2.7, 5.3.1, 5.3.2, 5.5.1, 5.5.2, 5.5.4	
	The Z-transform	
Le 11	The Z-transform.	Le
T 9	**K** 6.1.1, 6.2.1, 6.2.2a-e, 6.2.3, 6.4.1, 6.4.2, 6.4.3, 6.4.4, 6.4.5, 6.4.6, 6.4.7	
Le 12	Inversion. Convolution. More transforms.	Le
T 10	**K** 6.2.2f, 6.3.1, 6.3.4, 6.5.2, 6.5.3, 6.5.6, 6.5.7, 6.5.9, **B** 1.R4, **L** 1, 2, 3, 4	

B The course book (Pinkus & Zafrany)
K Exercises for transform theory 2007 (Turesson & Baravdish)
L Lecture notes