

Lecture plan TATM85 Funktionalanalys HT2024

(preliminary)

Send me an email at jana.bjorn@liu.se to get information about lecture notes.

3/9	Lecture 1	Metric spaces, open sets	Kreyszig 1.1–1.3
4/9	Lecture 2	Quantifiers, closed sets, convergence	Kr 1.3, 1.4
6/9	Lecture 3	Continuity, Cauchy sequences, Completeness	Kr 1.3-1.5
9/9	Lecture 4	Compactness	Kr 2.5, Notes
10/9	Lecture 5	More on compactness + examples, completion	Kr 2.5, (1.6) Notes
13/9	Lecture 6	Normed and Banach spaces	Kr 2.2-2.5
16/9	Lecture 7	Series in Banach spaces, Schauder basis	Kr 2.2-2.5
17/9	Lecture 8	Integration theory, outer measure,	Beals Ch. 10, Notes
20/9	Lecture 9	Measurable sets, Lebesgue measure	Beals Ch. 10, Notes
22/9		Hand in Assignment 1, Le 1–5	
23/9	Lecture 10	Measurable functions, Lebesgue integral	Beals Ch. 11, Notes
24/9	Lecture 11	Convergence theorems, L^p norm	Beals Ch. 11, Notes
27/9	Lecture 12	L^p spaces, Hölder inequality	Beals Ch. 12, Notes
30/9	Lecture 13	Inner product and Hilbert spaces, orthogonal projection	Kr 3.1-3.3
1/10	Lecture 14	Orthogonal projection, examples, ON-sequences	Kr 3.3-3.6
15/10		Hand in Assignment 2, Le 6–12	
16/10	Lecture 15	ON-bases, Linear operators and functionals	Kr 3.5, 3.6, 3.8, (2.6, 2.8)
18/10	Lecture 16	More on bounded linear operators and functionals	Kr (2.6), 2.7, 2.8, 2.10
21/10	Lecture 17	Duals	Kr 2.10
22/10	Lecture 18	Banach fixed point theorem and applications	Kr 5.1, 5.3, 5.4
4/11	Lecture 19	Hahn–Banach theorem	Kr (4.1), 4.2, 4.3
5/11		Hand in Assignment 3, Le 13–16	
5/11	Lecture 20	Consequences of H-B theorem, weak convergence	Kr 4.3, 4.8
8/11	Lecture 21	Weak convergence, second dual, reflexive spaces	Kr 4.6, 4.8-4.9
12/11	Lecture 22	Weak* convergence, Banach–Alaoglu theorem	Kr 4.8-4.9, Notes
15/11	Lecture 23	Baire and Banach–Steinhaus theorems	Kr 4.7, Notes
18/11	Lecture 24	Open mapping and closed graph	Kr 4.12-4.13
19/11	Lecture 25	Compact operators	Kr 8.1, 8.7
22/11	Lecture 26	Fredholm alternative, adjoint operators	Kr 8.2, 8.5-1, 8.6-1, 8.7
26/11	Lecture 27	Fredholm alternative, Examples, Spectrum	Kr 8.2, 8.7
28/11		Hand in Assignment 4, Le 17–23	
29/11	Lecture 28	Spectral theory	Kr 7.2-7.5
2/12	Lecture 29	Spectral theorem for compact self-adjoint operators	Kr 9.1-9.2, 8.3, Notes
3/12	Lecture 30	Final examples, Sturm–Liouville problem	Notes
15/12		Hand in Assignment 5, Le 24–30	