Lecture plan TATM85 Funktionalanalys HT2025

(preliminary)

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

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