List of Topics – Functional Analysis

I. Banach Spaces

1. Banach Spaces
2. Direct sum and quotient space
3. Topological vector space

II. Dual Spaces

1. Bounded linear functions
2. Hahn-Banach Theorem
3. Second dual space, reflections
4. Distribution basics

III. Hilbert Spaces

1. Inner product, Hilbert spaces
2. Projection, orthogonal complement
3. Dual space, Riesz theorem
4. Orthonormal basis, Gram-Schmidt process
5. Tensor products

IV. Bounded Linear Operators

1. Linear operators on linear spaces
2. Composition, reverse operator
3. Fixed-point theorems
4. Linear Analysis Basics: Baire theorem, Banach-Steinhaus theorem, Banach theorem on reverse operator, closed graph theorem
5. Weak topologies, Banach-Alaoglu theorem, weak topologies on operator spaces
6. Adjoint operators

V. Compact operators

1. Compact sets on Banach spaces
2. Compact operators

Reference

Conway, J.B.	A course in functional analysis
Davis, M.	A first course in functional analysis
Edwards, R.E.	Functional analysis; theory and applications
Kantorovich, L.	Elements of functional analysis
Kirillov, A.A., Gvishiani, A.D.	Theorems and problems in functional analysis
Kolmogorov, A.N., Fomin, S.V.	Elements of the theory of functions and functional analysis
Riesz, F., SziNagy, B.	Functional analysis
Rudin, W.	Functional analysis
Treves, F.	Topological vector spaces, distributions and kernels
Yosida, K.	Functional analysis