ANALYSIS PRELIM SYLLABUS

DEPARTMENT OF MATHEMATICS
UNIVERSITY OF COLORADO

Note. The analysis prelim will be based on material related to the topics listed below. This list is not meant to be exhaustive, but is intended to be a guide to subjects to be studied thoroughly.

Metric Spaces. Completeness, compactness, connectedness, Ascoli-Arzela Theorem, Stone–Weierstrass Theorem.

Measure and Integration. Integration theory on general measure spaces including Lebesgue integral and Lebesgue-Stieltjes integral on the line, Lusin's Theorem, Egoroff's Theorem, Fatou's Lemma, the Monotone and Dominated Convergence Theorems, convergence in measure, dense subspaces of L^1 (e.g., simple functions, continuous functions with compact support, etc.) Radon-Nikodym Theorem, Tonelli and Fubini Theorems.

L^p spaces. Hölder and Minkowski Inequalities, Riesz Representation Theorem for L^p spaces, completeness of L^p, dense subspaces of L^p.

Hilbert spaces. Bases, L^2 convergence of Fourier series.

Differentiation. Differentiation of monotone functions, differentiation of an indefinite integral, functions of bounded variation, absolute continuity, Fundamental Theorem of Lebesgue Calculus, Lebesgue points.

References

G. B. Folland, *Real Analysis.* Second edition. John Wiley & Sons, Inc., 1999.

T.M. Apostol, *Mathematical Analysis.* Second edition. Addison-Wesley, 1974.

H. L. Royden, *Real analysis.* Third edition. Macmillan Publishing Company, 1988.

W. Rudin, *Real and Complex Analysis.* Third edition. McGraw-Hill Book Co., 1987.