Analysis

Semester I

- Derivatives in multivariable calculus, Inverse function theorem, Implicit function theorem
- Holomorphic functions, The local Cauchy theorem, Power series representation, Zeros and singularities, The open mapping theorem, The global Cauchy theorem, The calculus of residues, the argument principle, Rouche's theorem
- Runge's theorem, Mittag-Leffler theorem, Simply connected regions. Schwarz lemma, the automorphisms of the disc and the upper half plane, Conformal mappings, Montel's theorem, Hurwitz's theorem, Riemann mapping theorem

Semester II

- Definition and examples of general measures, Integration of measurable functions, Monotone and Dominated convergence theorems, Fatou's lemma, Holder's inequality, Minkowksi's inequality, Lp spaces
- Normed linear spaces: Definition and examples, bounded linear operators, Hahn-Banach theorem, Banach spaces, Definition and examples, Arzela-Ascoli Theorem, uniform boundedness principle, open mapping theorem, closed graph Theorem, quotient spaces, projections, dual spaces, weak and weak* convergence, reflexivity, compact operators, spectrum of compact operators, Hilbert spaces: Definition and examples, geometry of Hilbert spaces, orthonormal sets, orthogonal projections, Riesz representation theorem, Spectral theory: Adjoint of an operator,
unitary operators, normal operators, spectral theorem for compact self-adjoint operators.

References

- L.V. Ahlfors: Complex Analysis
- Sheldon Axler: Measure theory integration and real analysis
- J.B. Conway: A Course in Functional Analysis
- G.B. Folland: Real analysis
- B.V. Limaye: Functional Analysis
- W. Rudin: Principle of Mathematical Analysis
- W. Rudin: Functional Analysis
- W. Rudin: Real and Complex Analysis
- M. Spivak: Calculsu on Manifolds
- E.M. Stein and R. Shakarchi: Real Analysis
- E.M. Stein and R.Shakarchi: Complex Analysis