MA 502: Functional Analysis (3-1-0:4)

Fundamentals of normed linear spaces: normed linear spaces, Riesz lemma, characterization of finite dimensional spaces, Banach spaces. Bounded linear maps on a normed linear spaces: examples, linear map on finite dimensional spaces, finite dimensional spaces are isomorphic, operator norm. Hahn-Banach theorems: geometric and extension forms and their applications. Uniform boundedness principle, divergence of Fourier series, closed graph theorem, open mapping theorem. Dual spaces and adjoint of an operator: Duals of classicalspaces, weak and weak* convergence, BanachAlaoglu theorem, adjoint of anoperator.

Hilbert spaces: inner product spaces, orthonormal set, Gram-Schmidt ortho-normalization, Bessel's inequality, orthonormal basis, separable Hilbert spaces. Orthonormal complements, orthogonal projections, projection theorem, Riesz representation theorem.

Bounded operators on Hilbert spaces: adjoint, normal, unitary, self adjoint operators, compact operators, eigenvalues, eigenvectors, spectral theorem for compact self adjoint operators.

Text Books and References

1.E. Kreyszig, "Introductory Functional Analysis with Applications",Wiley Eastern.
2. J. B. Conway, "A Course in Functional Analysis",Springer.
3. W. Rudin, "Functional Analysis", Tata McGraw-Hill Ed.
4. B. V. Limaye, "Functional Analysis",New Age Publishers.
5. R. G. Douglas, "Banach Algebra Techniques in Operator Theory", Springer.