

# MA601 Real and Functional Analysis

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Credit: 2-1-0-3

Approval: Approved in 1st Senate

Students intended for: Masters/Pre. Ph.D

Prerequisite: Basic Analysis

Elective or Core: Elective

Semester: Odd/Even

## Course objective:

The objective of this course is to give Masters and Pre PhD students and advances introduction in real and functional analysis. The contents are designed in such a way that it will be very useful to them in their research. Many of the concepts and results like Uniform convergence, Hahn Banach, open mapping, closed graph theorems etc are very useful in proving many results in fields like Differential Equations, Numerical Analysis etc.

## Course Content:

- **Metric spaces:** Open sets, Closed sets, Continuous functions, Completeness, Cantor intersection theorem, Baire category theorem, Compactness, Totally boundedness, finite intersection property. Definition and existence of Riemann-Stieltjes integral, Properties of the integral, Differentiation and integration. Uniform convergence, Uniform convergence and continuity, Uniform convergence and integration, Uniform convergence and differentiation.

- **Normed linear spaces:** Normed linear spaces, Riesz lemma, characterization of finite dimensional spaces, Banach spaces. Bounded linear maps on normed linear spaces: Examples, linear map on finite dimensional spaces, finite dimensional spaces are isomorphic, operator norm. Hahn-Banach theorems. Uniform boundedness principle, closed graph theorem, open mapping theorem, inner product spaces, orthonormal set, Gram-Schmidt orthonormalization orthonormal basis, orthonormal complements.

## Text Books:

J. Conway, "A Course in Functional Analysis", 2nd Ed., Springer.

W. Rudin, "Principles of Mathematical Analysis", McGraw-Hill (1986).

N. L. Carother, "Real Analysis", Cambridge University Press (2000).

## References:

E.T. Copson, "Metric Spaces", Cambridge University Press (1968).

Claude W. Burril, John R. Knudsen "Real Variables", Holt, (1969). t, Reinhart and Winston

Tom M. Apostol, "Mathematical Analysis", Addison Wesley (1974).

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