

FUNCTIONAL ANALYSIS - II

Course Code: **MM24407DCE**

Semester: **MA/M.Sc. 4th Semester**

Continuous Assessment: **Marks 20, Theory: Marks 80**

Total Credits: **04**

Total Marks: **100**

Time Duration: **2½ hrs**

Course Objectives: To enable the student to understand the properties of Banach spaces in terms of bounded linear operators, separability and reflexivity of such spaces.

Course Outcomes: The students shall be able to undergo various advanced topics in the field of functional analysis with main focus on duality, completeness, Banach's advanced theorems and Mazur-Ulam theorem.

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Unit -I

Relationship between analytic and geometric forms of Hahn-Banach theorem, applications of Hahn-Banach theorem, Banach limits, Markov-Kakutani theorem for a commuting family of maps, complemented subspaces of Banach spaces, complementability of dual of a Banach space in its bidual, uncomplementability of c_0 and l_∞ .

Unit -II

Dual of subspaces, quotient spaces of a normed linear space, weak and weak* topologies on a Banach space, Goldstine's theorem, Banach Alaoglu theorem and its simple consequences, Banach's closed range theorem, injective and surjective bounded linear mappings between Banach spaces.

Unit -III

l_∞ and $C[0,1]$ as universal separable Banach spaces, l_1 as quotient universal separable Banach spaces, Reflexivity of Banach spaces and weak compactness, Completeness of $L_p[a, b]$, extreme points, Krein-Milman theorem and its simple consequences.

Unit -IV

Dual of l_∞ , $C(X)$ and L_p spaces. Mazur-Ulam theorem on isometries between real normed spaces, Muntz theorem in $C[a, b]$.

Recommended Books:

1. J. B. Conway, A First Course in Functional Analysis, Springer Verlag, 4th Edition, 1997.
2. R. E. Megginson, An Introduction to Banach Space theory, Springer Verlag, GTM, Vol. 183, 1998th Edition, 1998.
3. Lawrence Bagget, Functional Analysis, A Primer, Chapman and Hall, 1991.
4. B. Ballobas, Linear Analysis (Cambridge University. Press, 2nd Edition, 1999).
5. B. Beauzamy, Introduction to Banach Spaces and their geometry, Elsevier Science, 2nd Edition, 1985.
6. Walter Rudin, Functional Analysis, Tata McGrawHill, 2nd Edition, 1990