

2-Year/1-Year Master's Program in Mathematics (NEP-2020)

ADVANCED FUNCTIONAL ANALYSIS

Master's Mathematics (4th Semester)

Course Code: MMTHDAF426 (15 hours per credit)

Continuous Assessment: Marks 30, Theory: Marks 70

Total Credits: **04**

Total Marks: **100**

Time Duration: 2½ hrs

Course Learning Outcomes(CLO's): Upon successful completion of this course, students will be able to

CLO1. Understand and apply the Hahn-Banach and Banach Fixed Point theorems to functional and differential equations.

CLO2. Analyze spectral properties of bounded operators and explore Banach algebras.

CLO3. Study compact operators, their spectra, and solve related operator equations.

CLO4. Examine unbounded operators, their adjoints, and spectral representations in Hilbert spaces.

Unit-I

Relationship between analytic and geometric forms of Hahn-Banach theorem, applications of Hahn-Banach theorem. Banach Fixed point theorem and its generalizations. Applications of Banach Fixed point theorem to linear equations, differential equations and integral equations.

Unit-II

Spectral theory in finite dimensional normed spaces: Basic concepts, spectral properties of bounded linear operators. Properties of resolvent and spectrum. Banach algebras and its properties.

Unit-III

Compact linear operators on normed spaces. Spectral Properties of Compact linear operators. Operator equations involving compact linear operators. Spectral Properties of bounded self-adjoint linear operator.

Unit-IV

Unbounded linear operators and their Hilbert adjoint operators. Symmetric and self-adjoint linear operators. Closed linear operators and closures. Spectral Properties of self-adjoint linear operators. Spectral representation of Unitary operators.

CLO-PLO Mapping Matrix (Strength version)

CLO 	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	Average CLO
MMTHDAF426.1	3	3	3	3	3	2	1	3	2.63
MMTHDAF426.2	3	3	2	2	3	2	2	3	2.5
MMTHDAF426.3	3	3	3	2	3	2	1	3	2.5
MMTHDAF426.4	3	3	3	2	3	2	3	3	2.75
Average PLO	3	3	2.75	2.25	3	2	1.75	3	2.6

Recommended Books:

1. Erwin Kreyszig, Introductory functional Analysis with Applications, Wiley Publication, Reprint 2015.
2. J.B. Conway, A Course in Functional Analysis, Springer, 4th Edition, 1994.
3. Walter Rudin, Functional Analysis, McGraw-Hill, Edition 2010
4. B. V. Limaya, Functional Analysis, New Age International Pvt. Ltd; 3rd edition, 2014.