

Information of the graduate level course on **Functional Analysis**  
(MAD040P6E) at IIT Jammu, India

## Instructors:

- Dr. Arvind Kumar
- Dr. Manmohan Vashisth

## Course contents:

- Normed linear spaces: definition and examples, continuous linear transformations, Riesz lemma and applications. Banach spaces and examples. Hahn-Banach separation and extension theorems. Dual spaces and adjoint operators. Weak and weak\* topologies.
- The uniform boundedness principle. The open mapping and closed graph theorems and their applications.
- Definition and examples of Hilbert spaces, The Riesz representation theorem and its applications to variational inequalities. Projection theorem and orthonormal basis.
- Compact operators: General results on compact operators, Fredholm Alternative and Riesz-Schauder theory of compact operators. Compact self adjoint operators on Hilbert spaces. Weak convergence and compact operators.

## Class and tutorial timings for the course:

- Monday, 4:00 PM to 6:00 PM
- Friday, 4:00 PM to 6:00 PM
- Friday, 11:30 AM to 1:00 PM (Tutorial)

## Credit system for the course:

- 10 marks for homework assignments.
- 20 marks for class tests. There will be two class tests.
- 30 marks for mid-sem exam.
- 40 marks for end-Sem exam.

## References for the course:

1. S. Kesavan, Functional analysis, Hindustan Book Agency, 2009.
2. S. Kumaresan and D. Sukumar, Functional Analysis: A first course, Narosa Publishing House, 2020.
3. T. Nair, Functional Analysis: A First Course, Prentice Hall of India, 2008.
4. B. V. Limaye, Functional Analysis, New Age International Pub., Reprint: 2012.
5. H. L. Royden and P. M. Fitzpatrick, Real Analysis, Pearson publication, 4th ed. 2019.