Course Code	MTH598
Course Name	Introduction to Functional Analysis
Credits	4
Course Offered to	UG/PG
Course Description	MTech and PhD students frequently find that their mathematical foundation is inadequate to pursue research for their thesis, and it is difficult for them to achieve the required level entirely through self-study. This course has the objective of providing the essential knowledge required to remove this inadequacy. The course is essentially advanced linear algebra (infinite-dimensional spaces) combined with mathematical analysis (i.e. considerations of convergence and continuity). Since this would be a first course on the subject for most of the students, there will be more emphasis on developing mathematical skills, and only limited applications.

Pre-requisites

Pre-requisite (Mandatory)	Pre-requisite (Desirable)	Pre-requisite(other)	
Linear Algebra (MTH100 for UG)	Knowledge of Calculus and complex Variables (MTH203 for UG)	None	

Post Conditions

CO1	CO2	CO3	CO4
Students will be familiar with the concepts and main theorems indicated in the contents list provided to students	Students will able to analyse and construct epsilon-delta proofs for consequences and subsidiary results related to the concepts and theorems covered.	Students will be able to apply the given results to specific spaces.	

Weekly Lecture Plan

Week Number	Lecture Topic	COs Met	Assignment/Labs/Tutorial
Week 1	Topology of the real line	CO1,CO2,CO3	Homework, quiz consisting of related short problems
Weeks 2-5	Metric Space Preliminaries: compactness and completeness, convergence issues, fixed point theorems, sequences and series of Functions	CO1,CO2,CO3	Homework, tutorial, quiz consisting of related short problems
Weeks 6-9	Normed spaces: function spaces, bounded linear transformaions, four major theorems and their applications, Spectral theory	CO1,CO2,CO3	Homework, tutorial, quiz consisting of related short problems
Weeks 10-13	Hilbert spaces: Lp spaces, Schauder bases, Spectral theory	CO1,CO2,CO3	Homework, tutorial, quiz consisting of related short problems

Assessment Plan

Type of Evaluation	% Contribution in Grade
Test	10
Mid-Semester Exam	20
Weekly submission, quiz	25
End-Semester Exam	45

Resource Material

Type	Title
Textbook	None
Reference Book	Rudin: Principles of Mathematical Analysis, McGraw-Hill
Reference Book	Aliprantis & Birkenshaw: Principles of Real Analysis, Elsevier
Reference Book	Simmons: Introduction to Topology and Modern Analysis, McGraw-Hill
Reference Book	Saxe: Beginning Functional Analysis, Springer