20MSM602T					Functional Analysis					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	1	0	4	4	25	50	25	--	--	100

COURSE OBJECTIVES

- To familiarize the students with the basic concepts, principles and methods of functional analysis.
- To introduce the concepts of Banach spaces and Hilbert spaces.
- To give students a working knowledge of the basic properties of bounded linear operators.
- To illustrate the uses of the theory of functional analysis.

UNIT 1 SPACES AND OPERATORS **12Hrs**

Metric spaces, Normed and Banach spaces, Compactness and Finite Dimension, Linear operators, Bounded and Continuous Linear Operators, Inner product and Hilbert spaces, Orthogonal Complements and Direct Sums, Representation of Functional on Hilbert Spaces, Self-Adjoint, Unitary and Normal Operators.

UNIT 2 FUNDAMENTAL THEOREMS **8 Hrs**

Hahn-Banach theorem, Uniform boundedness theorem, Open mapping theorem, Closed graph theorem.

UNIT 3 SPECTRAL THEORY **10 Hrs**

Basic concepts, Complex analysis on Banach spaces, Spectral Properties of Compact Linear Operators, Spectral Properties of Bounded Self-Adjoint Linear Operators.

UNIT 4 APPLICATIONS **10 Hrs**

Unbounded Linear Operators, Momentum Operator, Heisenberg Uncertainty Principle, Time-Independent Schrodinger Equation.

40 Hrs

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 – Understand and appreciate the basic concepts of functional Analysis.
CO2 – Illustrate linear operators, self adjoint, isometric and unitary operators on Hilbert spaces.
CO3 – Understand the fundamentals of spectral theory.
CO4 – Understand how the abstract theory works in practice.
CO5 – Thoroughly explain Banach and Hilbert spaces.
CO6 – Apply fundamental theorems from the theory.

TEXT/REFERENCE BOOKS

1. Walter Rudin, Functional Analysis-McGraw-Hill, 1991.
2. Karen Saxe, Beginning functional analysis-Springer,2002.
3. Erwin Kreyszig, Introductory functional analysis with applications.
4. John B. Conway, A Course in Functional Analysis, z-lib.org.
5. D. H. Griffel , Applied Functional Analysis-Ellis Horwood, 1985.
6. Yu.I. Lyubich, N.K. Nikol'skij, I. Tweddle, Functional Analysis I_Linear Functional Analysis -Springer, 1992.