CURRICULUM TRANSACTIONAL STRATEGY

MMT-C 401: Functional Analysis-II

Prerequisites: Functional Analysis-I

COURSE OBJECTIVES

- To get introduced to the concept of Weak and Weak* topologies on normed linear spaces
- To Understand the Goldstine theorem.
- To understand Banach Alaoglu theorem and its simple consequences.
- The separation form of Hahn Banach theorem, Banach limits and Markov kakutani theorem.
- To Understand the connection between reflexivity of Banach spaces and weak compactness.
- To get introduced to the complementability of a subspace in a normed linear space and the Dixmir's theorem.
- To show the uncomplementability of c_0 in l_∞
- To Understand the Banach's Closed range theorem and Characterisation of surjective and injective bounded linear maps between Banach spaces
- To construct the Duals of l_∞, L_p spaces and C(X).
- To Understand the Mazur-Ulam theorem
- To Understand the Muntz's theorem
- To Understand the application of fundamental theorems of functional analysis to prove Radon-Nikodym theorem and non-surjectivity of Laplace transform.
- To realize l_∞ and $C[0,1]$ as universal separable Banach spaces and same for Quotients of l_1.
- To get introduced to the idea extreme points and understand Krein-Milman theorem and its simple consequences.
- To understand Banach Stone theorem.

COURSE OUTLINE

UNIT I

- Weak and Weak* topologies on normed linear spaces.

- The Goldstine theorem.
- TheBanach Alaoglu theorem and its simple consequences
- The separation form of Hahn Banach theorem, Banach limits and Markov kakutani theorem
- The reflexivity of Banach spaces and weak compactness.
- Quotient space of a normed linear space

UNIT II

- The Complemented subspaces of a normed linear space and Dixmir's theorem.
- The uncomplementability of c_0 in l_∞.
- The Banach's Closed range theorem.
- The Characterisation of surjective and injective bounded linear maps between Banach spaces.

UNIT III

- Completeness of $L_p[a,b]$.
- The Duals of l_∞, L_p spaces and C(X).
- The Mazur-Ulam theorem.
- The Muntz's theorem.
- the application of fundamental theorems of functional analysis to prove Radon-Nikodym theorem and non-surjectivity of Laplace transform.

UNIT IV

- l_∞ and $C[0,1]$ as universal separable Banach spaces and same for Quotients of l_1..
- Extreme points , Krein-Milman theorem and its simple consequences.

- Banach Stone theorem.

Classroom Transaction

Unit	Topic	Activity	No. of Tutorials	No. of lectures
I	Weak and Weak* topologies on normed linear spaces.	Assignment and Presentation	02	01
	The Goldstine theorem.	Assignment	01	01
	The separation form of Hahn Banach theorem, Banach limits and Markov kakutani theorem	Assignment	03	04
	The reflexivity of Banach spaces and weak compactness.	--	01	01

	Quotient space of a normed linear space	Assignment	01	01

Unit	Topic	Activity	No. of Tutorials	No. of lectures
II	The Complemented subspaces of a normed linear space and Dixmir's theorem.	Assignment	02	02
	The uncomplementability of c_0 in l_∞.	Assignment and Presentation	02	02
	The Banach's Closed range theorem.	Assignment	02	03
	The Characterisation of surjective and injective bounded linear maps between Banach spaces	Assignment and Presentation	02	03

Unit	Topic	Activity	No. of Tutorials	No. of lectures
III	Completeness of $L_p[a,b]$.	Assignment	02	02
	The Duals of l_∞, L_p spaces and C(X).	Assignment and Presentation	04	07
	The Mazur-Ulam theorem.	Assignment and Presentation	02	02
	The Muntz's theorem. .	Assignment	02	03
	the application of fundamental theorems of functional analysis to prove Radon-Nikodym theorem and non-surjectivity of Laplace transform.	Assignment	02	04

Unit	Topic	Activity	No. of Tutorials	No. of lectures
IV	l_∞ and C[0,1] as universal separable Banach spaces and same for Quotients of l_1.	Assignment and Presentation t	03	06
	Extreme points , Krein-Milman theorem and its simple consequences.	Assignment	03	04
	Banach Stone theorem.	Assignment	02	05

Text books:

1. Ballobas, B; Linear Analysis(Camb. Univ.Press).
2. Beauzamy, B; Indroduction to Banach Spaces and their geometry

(North Holland).
3. Walter Rudin; Functional Analysis (Tata McGrawHill).
4. C.D.Aliprantis and K C Border, Infinite Dimensional Alaysis \
(Springer Verlag, 2006).
5. C. Goffman and G.Pedrick; A first course in functional Analysis
(Prentice Hall)

Suggested Books:

1. B.V. Limaye, “Functional Analysis”, 2nd Edition, New Age International (P) Ltd, 1996.
2. Martin Schechter, “Principles of Functional Analysis”, 2nd Edition, AMS Bookstore, 2002.
3. W. Rudin, “Functional Analysis”, McGraw Hill, Inc., 1991.
4. Kosaku Yoshida, “Functional Analysis”, Springer Verlag 1974.