MATH 908 Fixed Point Theory

Credits Hours: 3-0

Prerequisites: Some basic knowledge of Analysis

Course objectives: Aims: to teach elements of the metric fixed point theory with applications. Objectives: a successful student will:

Be acquainted with some aspects of the metric fixed point theory;

Have sufficient grounding in the subject to be able to read and understand some researchtexts;

be acquainted with the principal theorems as treated and their proofs and able to use them in theinvestigation of examples.

Detailed Course Contents: The course includes Lipschitzian, contraction, contractive & non- expansive mappings, Banach's contraction principal with application to differential and integral equations, Brouwer's fixed point theorem with applications, Schauder's fixed point theorem with applications, uniformly convex and strictly convex spaces, properties of non- expansive mappings, Extension's of Banach's contraction principal, Fixed Point Theory in Hausdorff Locally Convex Linear Topological Spaces, Contractive and non-expansive Multivalued maps.

Text Book:

1. Introductory Functional Analysis with Applications, E. Kreyszig, John Wiley & Sons, NewYork, 1978.(IFAA)
2. Fixed Point Theory and Applications, Agarwal, R., Meehan, M., &O'Regan,(Cambridge Tracts in Mathematics). Cambridge: Cambridge University Press, 2001. (FPTA)

Reference Books:

1. An Introduction to Metric Spaces and Fixed Point Theory, M. A. Khamsi, W. A. Kirk, JohnWiley & Sons, New York, 2001.
2. Fixed Point Theory, V. I. Istratescu, D. Reidel Publishing Company, Holland, 1981.

ASSESSMENT SYSTEM

Nature of assessment	Frequency	Weightage (%age)
Quizzes	Minimum 3	10-15

Assignments	-	5-10
Midterm	1	25-35
End Semester Examination	1	40-50
Project(s)	-	10-20

Weekly Breakdown		
Week	***Section***	***Topics***
1	1.1, 1.2, 1.3(IFAA)	Metric Spaces, Examples of metric spaces. Open sets closed sets.
2	2.2, 2.3 (IFAA)	Normed spaces, Banach spaces, Properties of normed spaces
3	5.1 (IFAA)	Banach fixed point theorem
4	5.2 (IFAA)	Applications of Banach's Theorem to Linear equations
5	5.3 (IFAA)	Applications of Banach's Theorem to Differential equations
6	5.4 (IFAA)	Applications of Banach's Theorem to Integral equations
7	1 (FPTA)	Contractions
8	2(FPTA)	Non-expansive maps
9	**Mid Semester Exam**	
10	3(FPTA)	Continuation Methods for Contractive and non-expansive mappings
11	4(FPTA)	The Theorems of Brouwer , Shauder
12	5(FPTA)	Nonlinear alternatives of Leray-Shauder type
13	6(FPTA)	Continuation Principles for Condensing Maps
14	7(FPTA)	Fixed point Theorem in Conical Shells
15	8(FPTA)	Fixed Point Theory in Hausdorff Locally Convex LinearTopological Spaces
16	9(FPTA)	Contractive and non-expansive Multivalued maps
17		Review
18	**End Semester Exam**	