**University of Management and Technology**

**Course Outline**

Course code: MTH743 Course titleApproximation theory and its applications

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| --- | --- |
| Program | MS/PhD |
| Credit Hours | 03 |
| Duration | 01 Semester |
| Prerequisites | Basic acquiring general knowledge in and concepts of Fixed point theory, as well as enabling students to successfully apply it when needed in other courses. |
| Resource Person | Dr. Naeem Saleem |
| Counseling Timing  (Room# ) | 3S-39 |
| Contact | [naeem.saleem@umt.edu.pk](mailto:naeem.saleem@umt.edu.pk)  03214262145 |

**Chairman/Director signature………………………………….**

**Dean’s signature…………………………… Date………………………………………….**

**Learning Objective:**

This course has been designed for graduate students of computer sciences, economics, mathematics and applied mathematics.

The first part of the course deals with the basics of various metric spaces, and notions like convergence and continuity in these spaces. We will discuss fixed point results in several metric saces. Second part of this course is about the application fixed point theorems in these spaces. Moreover, some applications in computer sciences, game theory, economics, behavioral sciences and biology will be covered as well.

**Learning Methodology:**

After successfully completing the course, students should be

1. comfortable with several concepts involving metric spaces,
2. able to understand several tools related to fixed point theorems
3. able to apply the concepts in problems related to computer sciences, economics, and behavioral sciences.

**Grade Evaluation Criteria**

Following is the criteria for the distribution of marks to evaluate final grade in a semester.

**Marks Evaluation Marks in percentage**

Quizzes 10

Assignments 10

Mid Term 25

Attendance & Class Participation 00

Term Project 10

Presentations 05

Final exam 40

Total

**Recommended Text Books:**

1. B. Bollobas: W. Fulton, A. Katok, F. Kirwan and P. Sarnak: Fixed Point Theory and Applications, Cambridge University Press, 2001.
2. K. Geoble and W.A Kirk: Topics in Metric Fixed Theory, Cambridge university Press, 1990
3. W.A. Kirk and B. Sims: Handbook of Metric Fixed Point Theory, Klawer Academic Publishers 2001

**Reference Books:**

1. Erwin Kreyzig: Introduction to functional analysis and applications, John wiley and sons,2006
2. A.L.Brown and A. Page , Elements of functional analysis. Van Nostrand Reinhold, 1970
3. M.C. Joshi And R.K. Bose: Some Topics in Nonlinear Functional Analysis, John Wiley and Sons, 1985
4. James Dugundji and A. Granas: Fixed Point Theory, Vol. 1, Polish Scientific Publishers, 1982

**Calendar of Course contents to be covered during semester**

**Course code……………………………...... Course title………………………………………**

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| **Week** | **Course Contents** | **Reference Chapter(s)** |
| 1 | The fixed point theorems of Banach, Kannan |  |
| 2 | Chatterjee and Zamfirecsu and the Meir-Keeler theorem, |  |
| 3 | generalized contractions of Ćirić  Reich's theorem, |  |
| 4 | Fixed point results of Hardy and Rogers  Fixed point results of Das and Naik,  Fixed point theorem of Ćirić'squasi contraction, |  |
| 5 | Fixed point theorem of Jungck  Fixed point theorem of Sesse, |  |
| 6 | Fixed point theorem of Fisher  Fixed point theorem of Sehgal  results of Guseman results of Ćirić |  |
| 7 | Mid Term  the theorem of Ray and Roades  the theorem of Matkowski. |  |
| 8 | Fixed point results Multivalued mappings,  Haussdorff metric |  |
| 9 | Fixed point results in Dislocated metric space, fixed point results in b-metric space |  |

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| --- | --- | --- |
| 10 | Fixed point results in 0-complete Partial metric space,  Fixed point results in Generalized metric space,  Fixed point results in 2 metric space, |  |
| 11 | Existence of solutions of ordinary equations and systems of linear equations in several unknowns  applications in the theory of differential and integral equations |  |
| 12 | Project Presentations  fixed point results Fuzzy metric space, |  |
| 13 | Project Presentations  fixed point results in Quasi Metric Spaces,  Mann and Ishikawa iterations; |  |
| 14 | Project Presentations  Stability of fixed point iteration procedures; |  |
| 15 | Final Term |  |