**Code and Name:**

**MAT5700 Banach Spaces and Their Geometric Properties**

**Unit:**

Institute of Science, Department of Mathematics

**Details:**

* **Term:** 2023-2024 Spring
* **Status:** Elective
* **Class Level:** 1
* **Credit Hours:** 3-0-0-3
* **ECTS:** 6
* **Language:** Turkish

**Course Instructors:**

* **Course Coordinator:** ...
* **Assistant Instructor:** ...
  + **Phone:** ...
  + **Email:** ...@firat.edu.tr
  + **Social Accounts:** ...

**Weekly Schedule**

| **Monday** | **Tuesday** | **Wednesday** | **Thursday** | **Friday** | **Saturday** |
| --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |

**Teaching Method:**  
Each weekly hour will include at least 45 minutes of face-to-face teaching.

**Location:**

* **In-person (YY):** Classroom (To be announced)
* **Remote (UE):** -

**Objective:**

To express convex analysis and its related concepts in Banach spaces.

**Materials:**

1. Bernard Beuzamy, *Introduction to Banach Spaces and Their Geometry*, North-Holland Publishing Company, 1982
2. Charles Chidume, *Geometric Properties of Banach Spaces and Nonlinear Iterations*, Springer-Verlag London, 2009

**Student Responsibilities:**

Students are required to attend at least 70% of the classes.

**Weekly Lesson Plan:**

| **Week** | **Topic** | **Methodology** |
| --- | --- | --- |
| 1 | Finite metric products | Face-to-Face |
| 2 | Fundamental properties of convex analysis: Uniform convexity, strong convexity, modulus of convexity, smoothness properties, Gateaux differentiability | Face-to-Face |
| 3 | Finite representation in Banach spaces, ultra-reflexivity | Face-to-Face |
| 4 | Super-reflexive spaces and their properties | Face-to-Face |
| 5 | Sequences in super-reflexive Banach spaces | Face-to-Face |
| 6 | Non-square Banach spaces | Face-to-Face |
| 7 | J-convex Banach spaces | Face-to-Face |
| 8 | Norm sequences in super-reflexive spaces | Face-to-Face |
| 9 | **Midterm Exam** | Face-to-Face |
| 10 | Duality between strong convexity and smoothness | Face-to-Face |
| 11 | Uniform Frechet differentiability | Face-to-Face |
| 12 | Dual transformations in specific spaces and applications | Face-to-Face |
| 13 | Gurrarii modulus of convexity | Face-to-Face |
| 14 | Geometric properties of sequence spaces | Face-to-Face |

**Assessment and Evaluation:**

| **Method** | **Quantity** | **Weight** |
| --- | --- | --- |
| **Midterm Exam** | 1 | 50% |
| **Quizzes** | None | - |
| **Assignments** | Pre- and post-midterm activities | - |
| **Projects** | None | - |
| **Final Exam** | 1 | 50% |

**Learning Outcomes:**

1. Learn the fundamental concepts of convex analysis.
2. Understand strong and uniform convexity in Banach spaces.
3. Learn uniform Frechet differentiability in Banach spaces.
4. Understand duality between spaces.
5. Learn dual transformations of specific spaces.

**Special Notes:**

* **UE:** Remote Education
* **YY:** Face-to-Face Education