**Code and Name:**

**MAT5220 Matrix Transformations and Divergent Series**

**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 provide graduate-level students in mathematics with fundamental knowledge about matrix transformations, divergent series, and important theorems. This knowledge aims to enhance their abstract thinking abilities.

**Materials:**

1. B. Choudhary, Sudarsan Nanda, *Functional Analysis with Applications*
2. G. H. Hardy, *Divergent Series*
3. C. G. Cullen, *Matrix and Linear Transformations*
4. Maddox, *Elements of Functional Analysis*

**Student Responsibilities:**

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

**Weekly Lesson Plan:**

| **Week** | **Topic** | **Methodology** |
| --- | --- | --- |
| 1 | Introduction to the course and basic concepts | Face-to-Face |
| 2 | **Mathematical Foundations**: Inequalities, metric space, and topological space definitions | Face-to-Face |
| 3 | **Metric and Topological Spaces**: Continuity, semi-continuity, and the category theorem | Face-to-Face |
| 4 | **Semi-Continuous Functions and Category Theorem**: Linear spaces, convexity, and semi-convexity | Face-to-Face |
| 5 | Linear spaces: Semi-norms, para-norms, normed linear spaces, and p-normed spaces | Face-to-Face |
| 6 | Properties of normed spaces: Kernel of a linear transformation, bounded transformations | Face-to-Face |
| 7 | Linear transformations and functionals: Sequence spaces and their relation to matrix transformations | Face-to-Face |
| 8 | Important theorems: Silverman-Toeplitz theorem and Kojima-Schur theorem | Face-to-Face |
| 9 | **Midterm Exam** | Face-to-Face |
| 10 | **Matrix Transformations**: Transformations from series to sequences | Face-to-Face |
| 11 | Types of averages: Nörlund, Hölder, Cesàro, and arithmetic means | Face-to-Face |
| 12 | Power series and Tauberian theorems | Face-to-Face |
| 13 | **Methods in Divergent Series**: Euler and Borel methods | Face-to-Face |
| 14 | Applications and examples | 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. Gain advanced knowledge of matrix transformations and divergent series.
2. Develop research-based and evidence-based suggestions.
3. Acquire advanced expertise in graduate-level mathematics.
4. Enhance abstract thinking skills.
5. Gain a solid understanding of matrix transformations.

**Special Notes:**

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