**Code and Name:**

**MAT5680 q-Analysis and Applications**

**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 introduce the applications of q-analysis, including the statistical convergence of q-operators, q-difference equations, and the q-Sturm-Liouville equation.

**Materials:**

1. A. Aral, V. Gupta, R. Agarwal, *Applications of q-Calculus in Operator Theory*
2. M.H. Annaby, Z.S. Mansour, *q-Fractional Calculus and Equations*

**Student Responsibilities:**

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

**Weekly Lesson Plan:**

| **Week** | **Topic** | **Methodology** |
| --- | --- | --- |
| 1 | **Introduction to q-Analysis**: Concepts, definitions, and notations | Face-to-Face |
| 2 | **Convergence of q-Operators**: General class of positive linear operators, q-Szász-King and q-Baskakov-Kantorovich operators | Face-to-Face |
| 3 | **q-Derivatives, Series, and Integrals**: Definitions and properties | Face-to-Face |
| 4 | **q-Szász Operators**: Construction, convergence | Face-to-Face |
| 5 | **q-Difference Equations**: Successive approximation, q-initial value problems, linear q-difference equations, q-type Wronskian, and zeros of q-functions | Face-to-Face |
| 6 | **q-Bleimann-Butzer-Hahn Operators**: Construction and properties | Face-to-Face |
| 7 | **q-Integral Operators**: q-Picard and q-Gauss-Weierstrass singular integral operators | Face-to-Face |
| 8 | Continued discussions on q-Picard and generalized Picard operators | Face-to-Face |
| 9 | **Midterm Exam** | Face-to-Face |
| 10 | **q-Sturm-Liouville Problems**: Definitions, theorems, self-adjoint problems, Green's function, and expansion formulas | Face-to-Face |
| 11 | **q-Meyer-König-Zeller-Durmeyer Operators** | Face-to-Face |
| 12 | **q-Bernstein Operators**: Kantorovich, Durmeyer variants | Face-to-Face |
| 13 | **Discrete q-Bernstein Operators**: Genuine q-Bernstein-Durmeyer operators | Face-to-Face |
| 14 | **q-Sturm-Liouville Problems**: Fourier analysis in the q-framework | 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 convergence of q-operators.
2. Understand q-derivatives, integrals, and series expansions.
3. Solve q-difference equations.
4. Learn q-Sturm-Liouville problems.
5. Understand Fourier analysis in the q-framework.

**Special Notes:**

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