**MAT5520 Theory of Difference Equations**

**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 difference equations, teach their solution methods, and explore their applications.

**Materials:**

1. Hüseyin Bereketoğlu, Vildan Kutay, *Difference Equations*
2. W.G. Kelley, A.C. Peterson, *Difference Equations: An Introduction with Applications*
3. R.P. Agarwal, *Difference Equations and Inequalities*, Marcel Decker, New York, 1993

**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 key concepts | Face-to-Face |
| 2 | **Difference Operator**: Definitions and properties | Face-to-Face |
| 3 | **Shift Operators**: Properties and applications | Face-to-Face |
| 4 | **Difference and Differential Operators**: Similarities between them | Face-to-Face |
| 5 | **Inverse Difference Operator**: Definitions and properties | Face-to-Face |
| 6 | **Scalar Difference Equations**: Definitions and properties | Face-to-Face |
| 7 | **Linear Difference Equations**: Theory and properties | Face-to-Face |
| 8 | **First-Order Linear Difference Equations** | Face-to-Face |
| 9 | **Midterm Exam** | Face-to-Face |
| 10 | **Linear Homogeneous Equations**: Second-order solutions | Face-to-Face |
| 11 | **Undetermined Coefficients Method**: Definitions and properties | Face-to-Face |
| 12 | Applications of the undetermined coefficients method | Face-to-Face |
| 13 | **Method of Variation of Constants**: Definitions and properties | Face-to-Face |
| 14 | Applications of the method of variation of constants | 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 difference operator.
2. Understand difference equations and their basic functionality.
3. Apply the method of undetermined coefficients to difference equations.
4. Apply the method of variation of constants to difference equations.
5. Develop operational skills for solving problems.

**Special Notes:**

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