**Code and Name:**

**MAT5150 Time Scale Analysis and Dynamic Systems**

**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 students with the foundational knowledge required for time scale analysis.

**Materials:**

1. *Dynamic Equations on Time Scales: An Introduction with Applications*, M. Bohner, Allen Peterson
2. *Advances in Dynamic Equations on Time Scales*, M. Bohner and Allen Peterson

**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 | **Basics of Time Scales**: Forward and backward jump operators, classification of points, granularity function | Face-to-Face |
| 3 | **Derivatives on Time Scales**: Hilger derivative, mean value theorems, chain rule, nabla derivative | Face-to-Face |
| 4 | Maximum and minimum on time scales | Face-to-Face |
| 5 | Convexity and concavity, geometric meaning of the Hilger derivative, regular functions, rd-continuity, indefinite and definite delta integrals | Face-to-Face |
| 6 | Properties of delta integrals and generalized integrals | Face-to-Face |
| 7 | **Series on Time Scales**: Taylor series expansions | Face-to-Face |
| 8 | **L'Hôpital's Rule on Time Scales**: Proofs and examples | Face-to-Face |
| 9 | **Midterm Exam** | Face-to-Face |
| 10 | Double integrals on time scales: Properties over rectangles | Face-to-Face |
| 11 | Double integrals on more general sets | Face-to-Face |
| 12 | **Line Integrals on Time Scales**: Curve length | Face-to-Face |
| 13 | First- and second-type line integrals, Green's theorem | Face-to-Face |
| 14 | Surface integrals, delta surface areas | 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. Understand the definition and basic concepts of time scales.
2. Learn Hilger delta, nabla derivatives, chain rule, convexity, concavity, and optimization problems on time scales.
3. Understand Taylor series, L'Hôpital's rule, definite and indefinite integrals, and generalized integrals on time scales.
4. Learn double integrals on time scales.
5. Understand line and surface integrals on time scales.

**Special Notes:**

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