**Code and Name:**

**MAT5970 Fuzzy Differential 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 provide the foundational knowledge required for fuzzy differential equations.

**Materials:**

* V. Lakshmikantham, R.N. Mohapatra, *Theory of Fuzzy Differential Equations and Inclusions*

**Student Responsibilities:**

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

**Weekly Lesson Plan:**

| **Week** | **Topic** | **Methodology** |
| --- | --- | --- |
| 1 | Fuzzy sets and their properties, Hausdorff metric, support functions, metric space (En,d)(E^n, d)(En,d), fuzzy functions and examples | Face-to-Face |
| 2 | Fuzzy measurability, fuzzy derivatives, differentiability | Face-to-Face |
| 3 | Integrability | Face-to-Face |
| 4 | Initial value problems, fundamental theory | Face-to-Face |
| 5 | Comparison theorems, existence theorems | Face-to-Face |
| 6 | Successive approximations method and convergence | Face-to-Face |
| 7 | Continuous dependence, global existence, approximate solutions, stability criteria | Face-to-Face |
| 8 | Fuzzy differential systems | Face-to-Face |
| 9 | **Midterm Exam** | Face-to-Face |
| 10 | Fuzzy differential equations | Face-to-Face |
| 11 | Impulsive fuzzy differential equations | Face-to-Face |
| 12 | Delay fuzzy differential equations | Face-to-Face |
| 13 | Hybrid fuzzy differential equations, fixed points of fuzzy transformations, boundary value problems | Face-to-Face |
| 14 | Formulation of fuzzy differential inclusions, differential inclusions, fuzzy Volterra integral equations | 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 fuzzy sets, Hausdorff metric, and support functions.
2. Learn boundary value problems, fuzzy differential inclusions, and fuzzy Volterra integral equations.
3. Gain knowledge of measurability, integrability, differentiability, and fundamental theory.
4. Learn initial value problems, existence theorems, and the convergence of successive approximations.
5. Understand continuous dependence, global existence, approximate solutions, and stability criteria.

**Special Notes:**

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