**Code and Name:**

**MAT5860 Fractal Geometry**

**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 concept of fractal geometry, construct new fractal structures using conventional geometric shapes, gain knowledge of specific fractal types, and develop the foundational skills to understand and apply fractal geometry in natural applications and architecture.

**Materials:**

1. B.B. Mandelbrot, *The Fractal Geometry of Nature*, W.H. Freeman, 1983
2. N. Lesmoir-Gordon, W. Road, R. Edney, *Introducing Fractals: A Graphic Guide*, 2009
3. M. Barnsley, *Fractals Everywhere*, Morgan Kaufmann, 1993
4. J. Feoler, *Fractals*, Plenum Press, 1988
5. H.H. Hacısalihoğlu, *Fractal Geometry*, Ankara, 2015

**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 | **Fractal Concept**: Definitions in nature, space, and mathematics | Face-to-Face |
| 3 | **Classical Fractals**: Sierpinski triangle and Koch snowflake | Face-to-Face |
| 4 | **Square Fractals**: Construction, Sierpinski carpet, and Menger sponge | Face-to-Face |
| 5 | **Circle Fractals**: Examples and properties | Face-to-Face |
| 6 | **Classical Fractals and Dimensions**: Properties and dimensions of classical fractals | Face-to-Face |
| 7 | **Box Counting Dimension**: Calculations for line, square, and triangle | Face-to-Face |
| 8 | Exercises on fractals and dimensionality | Face-to-Face |
| 9 | **Midterm Exam** | Face-to-Face |
| 10 | **Space-Filling Curves**: Relationships between curves and fractals | Face-to-Face |
| 11 | **Mandelbrot and Julia Sets**: Convergence and relationships | Face-to-Face |
| 12 | **Topological Dimensions**: Covering dimension | Face-to-Face |
| 13 | **Hausdorff Measure and Dimension**: Applications and examples | Face-to-Face |
| 14 | Examples of fractals in nature and architecture | 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 knowledge about the concept of fractals.
2. Learn about classical fractals such as the Sierpinski triangle and Koch curve.
3. Develop the ability to construct new examples of fractals.
4. Understand space-filling curves and their properties.
5. Learn to calculate fractal dimensions.

**Special Notes:**

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