**Code and Name:**

**MAT5240 Theory of Curves**

**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 differential geometry of curves in high-dimensional spaces.

**Materials:**

1. H.Hilmi Hacısalihoğlu, *Differential Geometry*, 1993
2. Arif Sabuncuoğlu, *Differential Geometry*, 2014
3. Manfredo P. do Carmo, *Differential Geometry of Curves and Surfaces*, 1976
4. M. Spivak, *A Comprehensive Introduction to Differential Geometry*, 1970

**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 | **Curves in n-Dimensional Euclidean Space**: Arc length function, arbitrary parameters | Face-to-Face |
| 3 | **Frenet Vector Fields of Unit-Speed Curves**: Frenet equations, Frenet frame | Face-to-Face |
| 4 | **Frenet Vector Fields of Arbitrary Parameterized Curves**: Serret-Frenet r-frame field | Face-to-Face |
| 5 | **Curvatures**: Curvature, torsion, geometric interpretation | Face-to-Face |
| 6 | **Curvature Axis and Center**: Characterizations | Face-to-Face |
| 7 | **Curvature Sphere**: Characterizations related to the curvature sphere | Face-to-Face |
| 8 | Applications and examples | Face-to-Face |
| 9 | **Midterm Exam** | Face-to-Face |
| 10 | **Spherical Curves**: ppp-hyperspherical curves, osculating ppp-sphere, mmm-curvature functions | Face-to-Face |
| 11 | **Inclination Lines in n-Dimensional Euclidean Space**: Definitions and theorems | Face-to-Face |
| 12 | **Higher-Order Curvatures**: Relationships with harmonic curvatures | Face-to-Face |
| 13 | **Special Curves in n-Dimensional Euclidean Space**: Bertrand curves, involute-evolute curves | Face-to-Face |
| 14 | Applications and examples | 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. Recognize and provide examples of curves in nnn-dimensional Euclidean space.
2. Perform parameter changes for curves.
3. Understand the Frenet frame, curvatures, and geometric interpretations of curves in nnn-dimensional Euclidean space.
4. Define the osculating hyperplane of a curve.
5. Learn spherical curves and their characterizations.

**Special Notes:**

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