**Code and Name:**

**MAT5230 Riemannian 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 study the properties of curves and hypersurfaces in 3-dimensional and n-dimensional Euclidean spaces, to understand the relationship between curves and surfaces, and to explore the geometry of ruled and minimal surfaces.

**Materials:**

1. H.H. Hacısalihoğlu, *High Differential Geometry and Introduction*, Fırat University Press, 1980
2. S. Yüce, *Differential Geometry*, Pegem Publishing, 2018
3. B. O’Neil, *Elementary Differential Geometry*, Academic Press, 1983
4. H.H. Hacısalihoğlu and N. Ekmekci, *Tensor Geometry*, Ankara University Press, 2004
5. W. Kühnel, *Differential Geometry: Curves, Surfaces, Manifolds*, AMS Press

**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 | **Theory of Curves**: Curves in two- and three-dimensional spaces and applications | Face-to-Face |
| 3 | Curves in n-dimensional Euclidean space, Serret-Frenet frame, special curve applications | Face-to-Face |
| 4 | **Surface Theory**: Surfaces in E3E^3E3 space | Face-to-Face |
| 5 | Curves on surfaces in E3E^3E3: Torsion lines, asymptotic curves, geodesic curves | Face-to-Face |
| 6 | Differential forms on surfaces in E3E^3E3 | Face-to-Face |
| 7 | Hypersurfaces in EnE^nEn, shape operator, and algebraic invariants | Face-to-Face |
| 8 | Parametric surfaces in EnE^nEn: Curves and metrics on parametric 2-surfaces | Face-to-Face |
| 9 | **Midterm Exam** | Face-to-Face |
| 10 | Ruled surfaces: Invariants, integral invariants, and parameters of ruled surfaces | Face-to-Face |
| 11 | Ruled surfaces and spatial motions: Expansion angle, expansion length, and dispersion parameters | Face-to-Face |
| 12 | **Minimal Surfaces**: Properties and characteristics | Face-to-Face |
| 13 | Surfaces and curvatures: Curvature equations on surfaces | Face-to-Face |
| 14 | Curvature tensors and applications | 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 general properties of curves in 3-dimensional and n-dimensional Euclidean spaces.
2. Understand the relationship between surfaces and curves in Euclidean spaces.
3. Learn the properties of ruled and minimal surfaces.
4. Calculate curvatures of surfaces.
5. Grasp minimal surfaces, surface curvatures, curvature tensors, and their computations.

**Special Notes:**

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