**Code and Name:**

**MAT5960 Submersion Theory**

**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 teach the fundamental structures of manifolds and their applications, with a focus on Riemannian submersions and their practical uses.

**Materials:**

1. Şahin, B., *Riemannian Submersions, Riemannian Maps in Hermitian Geometry, and Their Applications*, Academic Press, 2017
2. Şahin, B., *Differential Geometry of Manifolds*, Ankara, 2012

**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 | **Basic Structures of Manifolds**: Riemannian manifolds, vector bundles, Riemannian submanifolds | Face-to-Face |
| 3 | **Basic Structures of Manifolds**: Riemannian submersions and the geometric structure of a transformation | Face-to-Face |
| 4 | Applications of Riemannian submersions in robotics | Face-to-Face |
| 5 | Kaluza-Klein theory | Face-to-Face |
| 6 | Riemannian submersions from almost Hermitian manifolds: Examples | Face-to-Face |
| 7 | Holomorphic and invariant submersions from almost Hermitian manifolds | Face-to-Face |
| 8 | Slant, semi-slant, and hemi-slant submersions | Face-to-Face |
| 9 | **Midterm Exam** | Face-to-Face |
| 10 | Einstein metrics and Clairaut submersions in almost Hermitian manifolds | Face-to-Face |
| 11 | **Riemannian Transformations**: Geometric structures | Face-to-Face |
| 12 | Umbilical Riemannian transformations | Face-to-Face |
| 13 | Harmonic and Clairaut Riemannian transformations | Face-to-Face |
| 14 | Circles along Riemannian transformations | 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 fundamental structures of manifolds.
2. Learn the applications of Riemannian submersions.
3. Gain knowledge of Kaluza-Klein theory.
4. Understand Riemannian submersions from almost Hermitian manifolds.
5. Learn about Riemannian transformations.

**Special Notes:**

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