**Code and Name:**

**MAT5360 Tensors and Vector Analysis**

**Unit:**

Institute of Science, Department of Mathematics

**Details:**

* **Term:** 2023-2024 Spring
* **Status:** Mandatory
* **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 knowledge of tensors, which have broad applications in mathematics, physics, and engineering; to define inner product, metric, Christoffel symbols, and their properties; and to calculate divergence, Laplacian, gradient functions, and various curvature tensors.

**Materials:**

1. Z. Soyuçok, A. Soyuçok, *Tensor Analysis and Applications*, Yıldız Technical University Press, 2003
2. K. Sağel, *Introduction to Vector and Tensor Analysis*, AÜFF Press, 2003
3. M.R. Spiegel, *Vector Analysis and Introduction to Tensor Analysis* (Translated by Cevdet Cerit), Birsen Press, Istanbul
4. David C. Kay, *Tensor Calculus*, McGraw Hill Inc., 1988

**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 | N-dimensional space and coordinate transformations | Face-to-Face |
| 3 | Gradient vector, tangent vector, general tensors | Face-to-Face |
| 4 | Operations with tensors | Face-to-Face |
| 5 | Inner product and its properties | Face-to-Face |
| 6 | Contraction | Face-to-Face |
| 7 | Symmetric and antisymmetric tensors | Face-to-Face |
| 8 | Affine and Cartesian tensors, relative tensors | Face-to-Face |
| 9 | **Midterm Exam** | Face-to-Face |
| 10 | Symmetric tensors | Face-to-Face |
| 11 | Metric and conjugate metric tensors | Face-to-Face |
| 12 | Christoffel symbols | Face-to-Face |
| 13 | Divergence, Laplacian, and rotation | Face-to-Face |
| 14 | Riemann curvature tensor and its properties | 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 fundamental concepts of tensor analysis.
2. Perform operations with tensors.
3. Understand special tensor types and curvature tensors.
4. Express tensors using Christoffel symbols.
5. Understand the applications of tensors in geometry and mechanics.

**Special Notes:**

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