**Code and Name:**

**MAT6060 Mathematical Optimization**

**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 enable students to mathematically formulate real-life problems and find the best solutions using optimization and modeling methods. The course emphasizes applying these techniques to business problems.

**Materials:**

1. Abbas Azimli, *Mathematical Optimization*, Nobel Publishing
2. M.A. Bhatti, *Practical Optimization Methods with Mathematica Applications*, Springer-Verlag New York, Inc., 2000
3. R. Fletcher, *Practical Methods of Optimization*, 2nd Edition, John Wiley & Sons Ltd., 1987
4. O.L. Mangasarian, *Nonlinear Programming*, McGraw-Hill, 1969

**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 | **Modeling and Optimization**: Definitions, content, and history | Face-to-Face |
| 3 | **Optimization Models**: Creation and properties | Face-to-Face |
| 4 | **Linear Programming**: Models and characteristics | Face-to-Face |
| 5 | Types of linear programming | Face-to-Face |
| 6 | Graphical solution procedure for linear programming, integer-mixed linear models | Face-to-Face |
| 7 | **Nonlinear Programming**: Models and properties | Face-to-Face |
| 8 | Methods: Simplex method, Big M method, Karush-Kuhn-Tucker (KKT) conditions | Face-to-Face |
| 9 | **Midterm Exam** | Face-to-Face |
| 10 | Solution methods for optimization problems using Lagrange multipliers | Face-to-Face |
| 11 | Comparisons and formulations | Face-to-Face |
| 12 | **Network Optimization**: Definitions and features | Face-to-Face |
| 13 | Computational complexity of algorithms | Face-to-Face |
| 14 | Complexity classes: P and NP problems | 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. Explain mathematical modeling.
2. Apply modeling and optimization to business problems.
3. Recognize and solve general optimization problems analytically.
4. Find approximate solutions for nonlinear problems.
5. Explain the concepts and steps of optimization.

**Special Notes:**

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