**Code and Name:**

**MAT5510 Advanced Engineering Mathematics**

**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 fundamental methods for solving mathematical equations involving initial and boundary value problems, which arise as a consequence of physical laws.

**Materials:**

1. Tyn Myint-U, *Linear Partial Differential Equations for Scientists and Engineers*, Birkhäuser, Boston, 2007
2. Selçuk Bayın, *Mathematical Methods in Science and Engineering*, Wiley Interscience, New Jersey, 2006
3. Mehmet Çağlayan, Okay Çelebi, *Partial Differential Equations*, Dora Publications, Bursa, 2010
4. Kerim Koca, *Partial Differential Equations*, Gündüz Education and Publishing, Ankara, 2001

**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 | **Initial-Boundary Value Problems**: Solutions for wave equations in polar coordinates | Face-to-Face |
| 3 | **Initial-Boundary Value Problems**: Exercises on wave equations under given conditions | Face-to-Face |
| 4 | **Initial-Boundary Value Problems**: Heat equation and exponential solutions | Face-to-Face |
| 5 | **Initial-Boundary Value Problems**: Homogeneous and non-homogeneous initial value problems for heat equations | Face-to-Face |
| 6 | **Initial-Boundary Value Problems**: Separation of variables for heat equations | Face-to-Face |
| 7 | **Initial-Boundary Value Problems**: Applications | Face-to-Face |
| 8 | **Initial-Boundary Value Problems**: Heat flow in a rectangular region | Face-to-Face |
| 9 | **Midterm Exam** | Face-to-Face |
| 10 | **Initial-Boundary Value Problems**: Laplace and Poisson equations | Face-to-Face |
| 11 | **Initial-Boundary Value Problems**: Separation of variables for Laplace equations | Face-to-Face |
| 12 | **Initial-Boundary Value Problems**: Solutions for Laplace equations in polar coordinates | Face-to-Face |
| 13 | **Initial-Boundary Value Problems**: Exercises on solutions for Laplace equations | Face-to-Face |
| 14 | **Initial-Boundary Value Problems**: General problem-solving for initial and boundary value 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. Understand fundamental methods for solving boundary value problems.
2. Acquire skills in mathematical applications for other scientific and engineering fields.
3. Establish connections between mathematics and other disciplines, and develop mathematical models.
4. Learn initial-boundary value problems for partial differential equations.
5. Understand solution methods for Laplace and Poisson equations.

**Special Notes:**

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