**Code and Name:**

**MAT5500 Initial and Boundary Value Problems**

**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 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 | **Boundary Value Problems**: For ordinary differential equations | Face-to-Face |
| 3 | **Existence and Uniqueness of Solutions**: For boundary value problems | Face-to-Face |
| 4 | **Sturm-Liouville Systems**: Eigenvalue and eigenfunction problems | Face-to-Face |
| 5 | Applications of Sturm-Liouville systems | Face-to-Face |
| 6 | **Orthogonal Function Spaces**: Properties and expansions | Face-to-Face |
| 7 | **Series Expansions and Completeness Theorems** | Face-to-Face |
| 8 | Applications of series expansions and completeness theorems | Face-to-Face |
| 9 | **Midterm Exam** | Face-to-Face |
| 10 | **Green’s Function**: Solutions for boundary value problems | Face-to-Face |
| 11 | **Initial and Boundary Value Problems**: For partial differential equations | Face-to-Face |
| 12 | **Initial Value Problems**: For homogeneous and inhomogeneous wave equations | Face-to-Face |
| 13 | **Cauchy Problem for Hyperbolic Equations**: Solutions using Riemann’s method | Face-to-Face |
| 14 | **Separation of Variables for Wave Equations** | 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 mathematical application skills for other scientific and engineering fields.
3. Develop mathematical models and establish connections between mathematics and other disciplines.
4. Learn boundary value problems for ordinary and partial differential equations.
5. Gain the ability to use mathematical knowledge in other disciplines and build a foundation for academic research.

**Special Notes:**

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