**Code and Name:**

**MAT5440 Mathematical Physics**

**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 partial differential equations and their solution methods.

**Materials:**

1. Tyn Myint-U, *PDEs of Mathematical Physics*
2. Eutigou C. Young, *Partial Differential Equation*
3. Paul W. Brg, James L. McGreger, *Elementary PDE*
4. Murray H. Protter, Hans F. Weinberger, *Maximum Principles in DEs*

**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 | **Canonical Forms**: Parabolic equations and applications | Face-to-Face |
| 3 | **Canonical Forms**: Hyperbolic equations and applications | Face-to-Face |
| 4 | **Canonical Forms**: Elliptic equations and applications | Face-to-Face |
| 5 | **Riemann Method**: Explanation and examples | Face-to-Face |
| 6 | **Goursat Problem** | Face-to-Face |
| 7 | **Boundary Value Problems**: Definitions and uniqueness | Face-to-Face |
| 8 | General applications and problem-solving | Face-to-Face |
| 9 | **Midterm Exam** | Face-to-Face |
| 10 | **Maximum Principles** | Face-to-Face |
| 11 | **Harmonic Functions**: Laplace equation and harmonic functions | Face-to-Face |
| 12 | **Laplace Equation**: Special boundary value problems | Face-to-Face |
| 13 | **Harnack Inequalities** | Face-to-Face |
| 14 | **Green’s Formula**: Directed derivatives in n-dimensional space and Green’s formula | 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. Learn parabolic, elliptic, and hyperbolic equations.
2. Understand the Riemann method, Goursat problem, boundary value problems, and uniqueness.
3. Learn maximum principles, Laplace equation, and harmonic functions.
4. Solve special boundary value problems related to the Laplace equation.
5. Understand Harnack inequalities, directed derivatives in n-dimensional space, and Green’s formula.

**Special Notes:**

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