**Code and Name:**

**MAT5430 Advanced Partial Differential Equations**

**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 introduce 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 | **General Introduction**: Basic definitions | Face-to-Face |
| 3 | **Linear Partial Differential Equations**: First-order equations with constant and variable coefficients | Face-to-Face |
| 4 | **Lagrange Method**: Applications and solutions | Face-to-Face |
| 5 | **Quasilinear Equations**: Solutions using Lagrange method | Face-to-Face |
| 6 | **Existence and Uniqueness for Quasilinear Equations** | Face-to-Face |
| 7 | **Cauchy Problem for Quasilinear Equations**: Solutions and applications | Face-to-Face |
| 8 | **Existence and Uniqueness Theorems**: Cauchy-Kowalewsky theorem | Face-to-Face |
| 9 | **Midterm Exam** | Face-to-Face |
| 10 | **Sonia Kowalewsky Theorem** | Face-to-Face |
| 11 | **Compatible Systems**: Definitions and applications | Face-to-Face |
| 12 | **Charpit’s Method**: Applications and solutions | Face-to-Face |
| 13 | **Second-Order Equations**: Classification and canonical forms | Face-to-Face |
| 14 | **Classification of PDEs**: Quasilinear PDEs with more than two independent variables | 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 first-order linear PDEs with constant and variable coefficients.
2. Understand the Lagrange method and solutions of quasilinear equations.
3. Grasp the existence and uniqueness theorems for quasilinear equations, and solve the Cauchy problem.
4. Learn the Cauchy-Kowalewsky theorem and Sonia Kowalewsky theorem.
5. Understand compatible systems, Charpit’s method, and canonical forms for second-order equations.

**Special Notes:**

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