**Code and Name:**

**MAT5550 Analytical Solutions of Nonlinear 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 teach methods for solving nonlinear partial differential equations and finding analytical solutions.

**Materials:**

1. Lokenath Debnath, *Nonlinear Partial Differential Equations for Scientists and Engineers*
2. Tomás Roubíček, *Nonlinear Partial Differential Equations with Applications*

**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 | **Nonlinear Equations**: Mathematical models | Face-to-Face |
| 3 | **Nonlinear Partial Differential Equations** | Face-to-Face |
| 4 | Transforming partial differential equations into ordinary differential equations | Face-to-Face |
| 5 | **Solution Methods**: (G′/G)(G'/G)(G′/G)-expansion method | Face-to-Face |
| 6 | **Solution Methods**: (G′/G)(G'/G)(G′/G)-expansion method and balancing term | Face-to-Face |
| 7 | Solving traveling wave equations using (G′/G)(G'/G)(G′/G)-expansion method | Face-to-Face |
| 8 | Exponential and modified exponential function methods | Face-to-Face |
| 9 | **Midterm Exam** | Face-to-Face |
| 10 | Solving equations with exponential and modified exponential function methods | Face-to-Face |
| 11 | Comparison of (G′/G)(G'/G)(G′/G)-expansion and exponential methods | Face-to-Face |
| 12 | **Extended Bernoulli Sub-Equation Method** | Face-to-Face |
| 13 | Applications of the extended Bernoulli sub-equation method | Face-to-Face |
| 14 | Comparison of methods | 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 nonlinear equations and mathematical models.
2. Learn nonlinear partial differential equations.
3. Master the (G′/G)(G'/G)(G′/G)-expansion method.
4. Learn exponential and modified exponential function methods.
5. Understand the extended Bernoulli sub-equation function method.

**Special Notes:**

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