**Code and Name:**

**MAT5600 Laplace Transform and Applications**

**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 provide a deep understanding of the Laplace transform, which is a significant tool for finding analytical solutions of differential and fractional differential equations.

**Materials:**

1. Nagle, R.K., Saff, B.E., Snider, A.D., *Fundamentals of Differential Equations and Boundary Value Problems*
2. Bayrakçı, E., *Engineering Mathematics for Linear Systems*, Çağlayan Kitabevi, Istanbul, 1990
3. Balcı, M., *Analysis II*, Balcı Publications, Ankara, 1997
4. Cerit, C., Eraslan, S., *Laplace Transforms*, Education Publications, 2001
5. Murray R. Spiegel, *Schaum's Outline of Laplace Transforms*

**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 | **Laplace Transform**: Definition, properties, and existence | Face-to-Face |
| 3 | **Laplace Transform of Derivatives**: Applications and examples | Face-to-Face |
| 4 | **Laplace Transform of Periodic Functions**: Applications and examples | Face-to-Face |
| 5 | **Inverse Laplace Transform**: Definition and uniqueness | Face-to-Face |
| 6 | **Inverse Laplace Transform of Derivatives**: Applications and examples | Face-to-Face |
| 7 | **Inverse Laplace Transform of Integrals**: Convolution property | Face-to-Face |
| 8 | **Applications of Laplace and Inverse Laplace Transforms**: Initial value problems | Face-to-Face |
| 9 | **Applications of Laplace and Inverse Laplace Transforms**: Systems of ODEs (Midterm Exam) | Face-to-Face |
| 10 | **Applications**: Matrix solutions of ODEs | Face-to-Face |
| 11 | **Applications in Engineering and Physics**: Electrical circuits, mechanics, and PDEs | Face-to-Face |
| 12 | Continued applications in engineering and physics | Face-to-Face |
| 13 | Applications to partial differential equations | Face-to-Face |
| 14 | Applications to the two-dimensional wave equation | 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 the concept of the Laplace transform.
2. Apply the Laplace transform to initial value problems.
3. Solve systems of equations using the Laplace transform.
4. Apply Laplace transforms to partial differential equations.
5. Use Laplace transforms in engineering and physics problems.

**Special Notes:**

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