**Code and Name:**

**MAT5090 Theory of Multivariable Functions**

**Unit:**

Institute of Science, Department of Mathematics

**Details:**

* **Term:** 2024-2025 Fall
* **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 graduate students with advanced knowledge of multivariable functions.

**Materials:**

1. Mustafa Balcı, *Mathematical Analysis II*
2. T. Shifrin, *Multivariable Mathematics: Linear Algebra, Multivariable Calculus, and Manifolds*
3. A. Guzman, *Derivatives and Integrals of Multivariable Functions*
4. C. Henry Edwards, David E. Penney, *Multivariable Calculus*
5. J. Stewart, *Multivariable Calculus*

**Student Responsibilities:**

Students are required to attend at least 70% of the classes.

**Weekly Lesson Plan:**

| **Week** | **Topic** | **Methodology** |
| --- | --- | --- |
| 1 | Definitions, domain and range, graphs, and some topological concepts | Face-to-Face |
| 2 | Limits, continuity, partial derivatives, and chain rule | Face-to-Face |
| 3 | Total differential, closed functions, Taylor series expansion | Face-to-Face |
| 4 | Maximum and minimum problems, functional dependencies, vector fields | Face-to-Face |
| 5 | Geometric meaning of partial derivatives, differentiation under integral signs | Face-to-Face |
| 6 | Double integrals and region transformations | Face-to-Face |
| 7 | Applications of double integrals: Area, volume, moment of inertia, center of mass | Face-to-Face |
| 8 | Midterm Exam | Face-to-Face |
| 9 | Triple integrals, region transformations, spherical and cylindrical coordinates | Face-to-Face |
| 10 | Applications of triple integrals: Volume, mass, center of mass | Face-to-Face |
| 11 | Line integrals: Scalar field line integrals | Face-to-Face |
| 12 | Vector field line integrals: Key theorems, Green's theorem, path independence | Face-to-Face |
| 13 | Surface integrals: Oriented surfaces, fundamental theorems (Stokes, Divergence) | Face-to-Face |
| 14 | Applications of surface integrals: Area, mass, center of mass | 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 multivariable functions, graph plotting, limits, continuity, and partial derivatives.
2. Comprehend total differential, Taylor expansion, and maximum-minimum problems.
3. Learn methods and applications of double integrals.
4. Grasp methods and applications of triple integrals.
5. Master methods and applications of line and surface integrals.

**Special Notes:**

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