

**Izmir Institute of Technology**  
**Department of Civil Engineering**  
**CE 502 Advanced Numerical Methods in Engineering**  
**Spring 2025-2026 Course Outline**

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Course Instructor	Prof. Dr. Gökmen Tayfur	e-mail: gokmentayfur@iyte.edu.tr
Course Schedule	Monday	14:30 – 17:15

### **Textbook / References**

- Applied Numerical Analysis, by Gerald, F.C. and Wheatly, P.O., published by Addison-Wesley Publishing Company, 1989 Fourth Edition.
- Numerical Heat Transfer and Fluid Flow by Patankar, S.V., published by Taylor and Francis, 1980
- Introduction to Numerical Computations' by Yakowitz, S. and Szidarovsky, F. 1990.
- Numerical methods for engineers by Chapra, S. C. 2006.
- Any book on numerical methods...

### **Objectives**

- The objective is to learn the fundamental applications to the solution of numerical problems.

### **Course Content**

1. Root search for system of equations
  - Multivariate Newton's Method
2. Initial Value Problems (IVP)
  - Euler Methods
  - Runge-Kutta Methods
3. Boundary Value Problems (BVP) in 1-D
  - Finite Difference Method
4. BVP in 2-D
  - Finite Difference Method
5. Rayleigh-Ritz Method in solving Differential Equations.
6. Initial and Boundary value problems
  - Explicit Method
  - Implicit Method
7. Finite Elements Method

### **Grading**

2.	Assignments	%30
3.	Term Project	%30
4.	Exam	%40