SEES 505: Numerical Solutions of Ordinary Differential Equations

Instructor: Özgür Kişisel (Office: SZ-31, Office Phone: 2941, e-mail: akisisel@metu.edu.tr)

Lectures: Tue 9:40-10:30 (T-114), Wed 9:40-11:30 (T-115) (please check http://apu.ncc.metu.edu.tr occasionally for updates)

Office Hours: Tue 10:40-12:30 (SZ-31)

Course Webpage: http://www.math.ncc.metu.edu.tr/ sees505

Credit: (3-0) 3

Description: SEES 505 is a graduate level course for engineers, which focuses on numerical methods for solving differential equations. Even though the title mentions only Ordinary Differential Equations (ODE's), we will also discuss Partial Differential Equations (PDE's).

Prerequisites: A sound knowledge of freshman calculus, some linear algebra and differential equations.

Tentative Course Outline:

- **Part 1: Introduction and Preliminaries (approximately 6 hours)**
  Some numerical algorithms, interpolation, numerical differentiation and numerical integration.
- **Part 2: Numerical Methods for ODE's (approximately 15 hours)**
  Euler, modified Euler, Runge-Kutta methods, multistep methods. Finite difference method and the shooting method for boundary value problems.
- **Part 3: Numerical Methods for PDE's (approximately 21 hours)**
  Basic properties of PDE's, elliptic, parabolic and hyperbolic PDE's. Finite difference, finite element and finite volume methods. Spectral methods. Multigrid methods. The level set method.

Grading:

- Homework: 50 % (10 weekly HW's, 5 points each)
- Midterm: 20 % (concept check)
- Final: 30 % (take-home exam, during the final exams period)
- Bonus: 5 % (for 100% attendance)

References: To be added. Please check the website.