**ANKARA UNIVERSITY**

**Department of Energy Engineering**

**Spring 2019-2020**

**ENE210 – Numerical Analysis**

**COURSE SYLLABUS**

**Teaching Assistant**

Bilge Tunçel, MSc.

Office: 221

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**Instructor**

Dr. Özgür Selimoğlu

Office: 208

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**Course Objectives**

This course is an introduction to numerical methods for students in engineering. It covers the solution of equations, interpolation and data ﬁtting, solution of differential equations, eigenvalue problems and optimization.

The algorithms are implemented in Python 3, a high-level programming language. All methods include programs showing how the computer code is utilized in the solution of problems.

**Classroom Hours**

Mondays between 15.30-17:15

Thursday between 12.30- 14.15

**Office Hours**

Monday: 09.30 -10.30

Thursday: 15.30-16.30

**Web site**

You can follow the course content from the website: <https://acikders.ankara.edu.tr>

**Resources:**

1. Jaan Kiusalaas, “Numerical Methods in Engineering wit Python3”, 3rd Edition, Cambridge, NY, 2013
2. S.C. Chapra and R.P. Canale, “Numerical Methods for Engineers”, 6th ed., McGraw-Hill, NY, 2010
3. Richard L. Burden and J. Douglas Faires, “Numerical Analysis”, 9th ed., Brooks/Cole, Cengage Learning, Canada.

**Exams**

One midterm and one final exam will be given.

**Grading**

A weighted average grade will be calculated as follows:

Midterm exam + homework: 30%

Final exam: 80%

**Classroom rules**

Do not arrive late to the class.

You are required to attend at least 70% of the total lecture hours.

**ENE210 – NUMERICAL ANALYSIS**

**2019-2020 SPRING SEMESTER / WEEKLY SCHEDULE**

1. **Week: Brief Introduction to Basic Concepts.** 
   1. Significant Figures, accuracy, precision, error analyses
   2. Introduction to Python language
2. **Week: Linear Algebraic equations**
   1. Gauss Elimination Method
3. **Week: Linear Algebraic equations**
   1. LU Decomposition Methods
4. **Week: Linear Algebraic equations**
   1. Matrix inversion
   2. Iterative Methods
5. **Week: Interpolations and Curve Fitting**
   1. Polynomial Interpolation
   2. Interpolation with Cubic Spline
6. **Week: Interpolations and Curve Fitting**
   1. Least Squares Fit
   2. Midterm -1
7. **Week: Finding roots of equations**
   1. Incremental Search Method
   2. Method of Bisection
8. **Week: Finding roots of equations**
   1. Methods Based on Linear Interpolation
   2. Newton-Raphson Method
9. **Week: Finding roots of equations**
   1. Systems of equations
   2. Other Methods
10. **Week: Numerical Differentiation**
    1. Finite Difference Approximations
    2. Richardson Extrapolation
11. **Week: Numerical Integration** 
    1. Newton-Cotes Formulas
    2. Romberg and Gaussian Integration
12. **Week: Ordinary Differential Equations**
    1. Initial Value Problems
    2. Euler’s Method
    3. Runge-Kutta Method
13. **Week: Optimization**
14. **Week: Optimization**