Engineering Analysis I

Prof. P.K. Newton, RRB 221, 740-7782 (newton@usc.edu)

Fall 2017

Time: MW 5:00-6:15 OHE 132

Office Hours:

Prof. Newton MW 4-5, RRB 221

Robert: MWF 10-12, VHE 202

Saakar: T Th 12-2, VHE 202

TAs: Robert Lawson (rlawson@usc.edu); Saakar Byahut (byahut@usc.edu)

Grader: Yun Jiang (yunjiang@usc.edu)

The course will cover techniques from linear algebra, vector analysis, and complex variable theory.

Grading:

- Homework (required) 20%
- Midterm 35%
- Final 45% 4:30-6:30 Wed Dec. 6th
- No extensions on HWs or exams

Books:

Peter V. O'Neil: Advanced Engineering Mathematics

Lecture sequence:

1. Finite dimensional vector spaces and linear algebra
    - Basic concepts of linear vector spaces
    - Eigenvalues and eigenvectors
    - The Fredholm alternative: Solving $A\vec{x} = \vec{b}$
    - Least squares methods and linear regression
    - Diagonalization and spectral decomposition
    - Singular values and principal component analysis

2. Vector analysis
    - Line integrals in the plane
    - Green's theorem in the plane
    - Path independence
    - Multiply connected domains
    - Line integrals in space
    - Gauss' divergence theorem
    - Green's identities
    - Stokes theorem

3. Complex variable theory
    - Basics concepts
    - Analytic functions and the Cauchy-Riemann equations
    - $x = f(z)$ as a mapping
    - Derivatives
    - Cauchy-Riemann equations
    - Harmonic functions
    - Integrals of complex functions
    - Contour integrals
    - Cauchy-Goursat theorem
    - Cauchy integral formula
    - Residue theory
    - Conformal mapping