Applied Mathematics II — Course Syllabus

Course Number: AMCS 153

Course Title: Applied Mathematics II

Academic Semester: Spring **Academic Year:** 2015/2016
Semester Start Date: Jan 24, 2016 **Semester End Date:** May 19, 2016

Class Schedule: Mon & Thu, 16:00-17:30

Classroom Number:

Instructor(s) Name(s): Lajos Loczi
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Teaching Assistant name:
Email:

Office Location: Bldg 1, MCSE, 4307-CU03
Office Hours: By appointment

COURSE DESCRIPTION FROM PROGRAM GUIDE

Applied Mathematics II (3-0-3) (Equivalent to AMCS 202)
Prerequisites: Advanced and multivariate calculus and elementary complex variables. Part of a fast-paced two-course sequence in graduate applied mathematics for engineers and scientists, with an emphasis on analytical technique. A review of linear spaces (basis, independence, null space and rank, condition number, inner product, norm, and Gram-Schmidt orthogonalization) in the context of direct and iterative methods for the solution of linear systems of equations arising in engineering applications. Projections and least squares. Eigenanalysis, diagonalization, and functions of matrices. Complex analysis, Cauchy-Riemann conditions, Cauchy integral theorem, residue theorem, Taylor and Laurent series, contour integration, and conformal mapping. No degree credit for AMCS majors.

COMPREHENSIVE COURSE DESCRIPTION

AMCS 132 and 153 may be taken separately or in either order. This course is part of a fast-paced two-course sequence in graduate applied mathematics with emphasis on analytical techniques.

Review of complex functions. Analyticity, the Cauchy-Riemann equations. Contour integrals. The Cauchy-Goursat theorem, the Cauchy integral formula. Taylor series, singularities, Laurent series. Classification of isolated singularities. Residues and their applications. Applications to fluid flows.

Fourier and Laplace integrals and transforms. Applications to ordinary and partial differential equations (ODEs and PDEs).

Review of linear algebra. Bases, independence. Linear maps, null space, rank, eigenvalues, inner product, norm, condition number.

Numerical methods for linear algebra problems. Gaussian elimination, LU decomposition. Projections, Gram-Schmidt orthogonalization, and the method of least squares. Matrix functions.

GOALS AND OBJECTIVES

In the first part of the course we consider various applications of complex integrals (residues and the computation of improper integrals).

In the second part we apply the Fourier and Laplace transforms to solve certain linear ODEs or PDEs.

In the third part of the course we study some numerical methods to solve systems of linear algebraic equations.

REQUIRED KNOWLEDGE

Advanced and multivariate calculus and elementary complex variables

REFERENCE TEXTS

— D. G. Zill, M. R. Cullen: Advanced Engineering Mathematics (3rd edition, 2006)

— E. Kreyszig: Advanced Engineering Mathematics (9th edition, 2006)

— J. W. Brown, R. V. Churchill: Complex Variables and Applications (9th edition)

— G. Strang: Linear Algebra and its Applications (4th edition)

METHOD OF EVALUATION

Percentages	Graded content
24%	Homework assignments
25%	Exam 1
25%	Exam 2
26%	Final exam

COURSE REQUIREMENTS

Assignments

There will be 8 homework assignments during the semester; the students should work out the details of the problems individually.
During the course there will be two midterm exams and a final exam; all exams are closed-note, closed-book exams, however, a handwritten formula sheet of size A4 can be used.
To pass the course with a Satisfactory grade (S), one should obtain at least 70% (where Homework assignments + Exams = 100%).

Course Policies

Students are expected to attend all classes and exams. They are required to submit every assignment on time.
Incomplete grade (I) for the course will only be given under extraordinary circumstances (such as sickness).

NOTE

The instructor reserves the right to make changes to this syllabus as necessary.