

SIO 203A/ MAE 294A: Fall 2023
 Introduction to Applied Mathematics I, NH 101 MWF 2-2:50pm
 Instructor: Janet M. Becker, jmbecker@ucsd.edu

Goals

A goal of this course is to help you to obtain and demonstrate proficiency in a variety of advanced mathematical topics that are foundational in science and engineering applications. This is the first course in a three-quarter series in applied mathematics (SIO 203ABC, MAE 294ABC).

Problem sessions and Office hours

Problem sessions: Fridays 3-4pm NH 101

Office hours: directly after class Mondays and Wednesdays or by appointment (e-mail me).

Lecture format

SIO 203A/MAE 294A lecture will be delivered in person in NH 101 at 2pm on the board. Class participation means that part of our meetings will have students present homework solutions or answer questions about class examples. The lectures will be podcast and the recordings posted to the Media Gallery in Canvas.

Course Text and Website

The text is *Mathematical Methods for Physics and Engineering* by Riley, Hobson and Bence, 3rd edition, (RHB3), which is available online through the UCSD library (EBSCO Host) using your campus login. Assignments, solutions, announcements and grades will be posted to the Canvas website. Other references include (but are not limited to) Philip Morse and K. Uno Ingard, *Theoretical Acoustics*, Gilbert Strang, *Linear Algebra and its Applications*, Arfkin, Weber and Harris, *Mathematical Methods for Physicists, 13th edition: A Comprehensive Guide* (available through UCSD library), Mathews and Walker, *Methods of Mathematical Physics*, and Bender and Orszag *Advanced Mathematical Methods for Scientists and Engineers* (1978, 1999).

Homework, Examinations and Grading

We will have approximately five homework assignments that will be assessed through your class/problem session/office hour presentations. Solutions to the assignments will be posted, and you are responsible for correcting mistakes in your homeworks.

There will be two midterms and one final.

Midterm 1: 27 October 2023, 2:00-2:50pm, NH 101 (in person)

Midterm 2: 17 November 2023, 2:00-2:50pm, NH 101 (in person)

Final: 13 December 2023, 3:00pm-5:59pm, TBD (in person)

Course grades are determined according to 20% Class participation and homework discussions, 30% Midterms, and 50% Course final

Course content

(Chapters below refer to RHB3, topics may be modified depending upon the background of the class members)

Introduction

What you already know. How the course content may be useful in your other courses and research.

Ordinary differential equations (ODEs) I

First-order ODEs, briefly, review (Chapter 14)

Higher-order linear ODEs (Chapter 15)

Variation of Parameters, Green's functions

Ordinary differential equations (ODEs) II

Series solutions (Chapters 16)

Eigenfunction methods (Chapter 17)

Special functions (Chapter 18)

Matrices and linear algebra

Systems of linear equations (algebraic and ODEs), Eigenvalues and eigenvectors,

Quadratic forms, Singular Value Decomposition (Chapter 8)

Pseudoinverses (e.g. Gilbert Strang, *Linear Algebra and its applications*)

Fourier Analysis and Integral Transforms

Fourier Series (review, Chapter 12)

Fourier transforms (Chapter 13)

Course policy and Academic integrity:

1. All students are expected to adhere to the UCSD Policy on Integrity of Scholarship. You may discuss homework problems, but must prepare homework reports on your own. Exams will have clear rules provided to students, and will be designed and administered to uphold academic integrity. For problems assigned from the textbook, the use of online solutions is prohibited.

2. Lecture participation is encouraged, appreciated and assessed. This means that you will need to come prepared to lecture (readings and homeworks).

Disability Resources: Students requesting accommodations for this course due to a disability must provide a current Authorization for Accommodation (AFA) letter issued by the Office for Students with Disabilities (OSD) which is located in University Center 202 behind Center Hall. Students should present their AFA letters to Faculty (please make arrangements to contact me privately) at least two weeks prior to an exam to ensure that accommodations may be arranged.

Contact the OSD for further information:

T: 858.534.4382

E: osd@ucsd.edu

W: <http://disabilities.ucsd.edu>