

Math 401 Outline

Section 201, Spring, 2024

Instructor: Brian Wetton, wetton@math.ubc.ca, MATX 1107

Focus: This class concentrates on analytic methods to solve Differential Equations coming from physical applications.

Assignments: Assignments in two parts, A & B, to be submitted in pdf format to the canvas course page. Part A will have four problems and part B will have one challenging problem. Late homework will not be accepted. Solutions to part B problems will not be posted. Assignments will be posted Thursdays, due Tuesdays 12 days later (at midnight).

Marks: The final mark is based on the Assignments with equal weights, with the lowest mark dropped. Two special rules are applied to grades:

- To encourage genuine, individual engagement with the material, a passing grade of 55% is guaranteed if a student attempts the majority of the material.
- To retain a mark of over 84%, students will be required to demonstrate mastery of the course material in an oral exam to be scheduled in the exam period. The resulting grade will be between 84% and the grade calculated from the term material.

Topics:

- Review: linearity, linear systems, eigen-analysis.
- Modelling: scaling, non-dimensionalization, asymptotic methods.
- 1D Boundary value problems: Sturm-Liouville Theory, Green's function solutions. Introduction to the concepts of well-posedness and weak solutions. Eigenanalysis and Variational Principles.
- Green's functions for PDEs: Wave Equation, Laplace and Poisson problems, Heat Equation. Duhamel's Principle. Multipole Methods.

- Functional Optimization, Calculus of Variations, Optimal Travel Paths.
- Finite Element Method.
- More asymptotic methods, as time permits.

Text: No required text. Notes for the course will be posted online.

UBC closure policy: If UBC is closed due to weather or other events on lecture days, an asynchronous video lecture will be provided.