MATH 210 Section 20M

Introduction to Mathematical Computing *Course Outline 2024W2*

Introduction to mathematical software and numerical methods. Basic Python programming including numbers, arrays, functions, vectorization and iteration. Sequences and series, root finding, numerical integration, numerical methods for differential equations, systems of linear equations, eigenvalues and mathematical graphics.

Note: MATH 210 Section 20M is coordinated with MATH 215 Section 20M. This section includes projects which combine key concepts from mathematical computing and differential equations.

Learning Goals

- Create computational documents with Python, Jupyter, Markdown and LaTeX
- Solve problems using mathematical software NumPy, SciPy and Matplotlib
- Approximate solutions of nonlinear equations
- Approximate definite integrals and estimate error
- Approximate solutions of ordinary differential equations
- Compute solutions of linear systems of equations

Instructors

Instructor	Patrick Walls	pwalls@math.ubc.ca
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Lectures

Section 20M	Monday/Wednesday/Friday 1–2pm	LSK 121

Learning Resources

Mathematical Python	Online textbook on mathematical computing with Python
Syzygy	Jupyter notebooks for UBC students
Canvas	All course information posted on Canvas

Assessments

Assignments	5 × 1% each = 5%	Jupyter notebooks submitted to Canvas
Midterm Exams	2 × 20% each = 40%	In class February 12 and March 26
Projects	3 × 1.67% each = 5%	Joint with MATH 215 Section 20M
Final Exam	50%	Exam period April 12–27

Lecture Schedule

Week	Description
1	Jupyter notebooks, markdown and LaTeX
2	Basic Python: numbers, variables and sequences
3	Basic Python: functions, logic and loops
4	Sequences and series, fixed point iteration
5	Root finding: bisection, secant and Newton's method
6	Vectorization, NumPy arrays and functions, plotting with Matplotlib
7	Numerical integration: Riemann sums, trapezoid rule, error formulas
8	Numerical integration: Simpson's rule, error formulas
9	Numerical methods for differential equations, accuracy and stability
10	Numerical methods for systems of differential equations
11	Solutions of linear systems of equations, interpolation, least squares, data fitting
12	Eigenvalues, eigenvectors, power method

Prerequisites/Corequisites

Integral Calculus	One of MATH 101, MATH 103, MATH 105, MATH 121, SCIE 001
Differential Equations	One of MATH 215, MATH 255, MATH 256, MATH 258
Linear Algebra	One of MATH 152, MATH 221, MATH 223
Multivariable Calculus	One of MATH 200, MATH 217, MATH 226, MATH 253, MATH 254

- See UBC Course Descriptions

Important Dates

January 6	First lecture
February 12	Midterm Exam 1
February 17–21	Reading break (no lectures)
March 26	Midterm Exam 2
April 7	Last lecture
April 12–27	Final exam period

- See UBC Academic Calendar 2024/2025

Student Resources

Science Advising	Health and Wellbeing	Centre for Accessibility
Academic Concession	Academic Integrity	Counselling Services

University Policies

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