

MATH 210 Section 201

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.

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 201	Monday/Wednesday/Friday 4–5pm	LSK 201
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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	$5 \times 2\%$ each = 10%	Jupyter notebooks submitted to Canvas
Midterm Exams	$2 \times 20\%$ each = 40%	In class February 12 and March 26
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

UBC provides resources to support student learning and to maintain healthy lifestyles but recognizes that sometimes crises arise and so there are additional resources to access including those for survivors of sexual violence. UBC values respect for the person and ideas of all members of the academic community. Harassment and discrimination are not tolerated nor is suppression of academic freedom. UBC provides appropriate accommodation for students with disabilities and for religious observances. UBC values academic honesty and students are expected to acknowledge the ideas generated by others and to uphold the highest academic standards in all of their actions. Details of the policies and how to access support are available on the [UBC Senate website](#).