

MATH 210

Introduction to Mathematical Computing

Course Outline 2021W2

Mathematical computing with Python and Jupyter. Basic Python programming including datatypes, logic, loops and functions. Optimization, numerical integration, linear systems, eigenvalues and eigenvectors, and numerical methods for differential equations.

Learning Goals

- Create scientific documents in [Jupyter](#) notebooks with text rendered with [markdown](#), mathematical equations rendered with [LaTeX](#) and computations executed by [Python](#) code
- Perform matrix computations with [NumPy](#), create mathematical graphics with [Matplotlib](#) and implement mathematical algorithms with [SciPy](#)
- Approximate solutions of nonlinear equations
- Approximate definite integrals and estimate error
- Compute solutions of linear systems of equations
- Approximate solutions of ordinary differential equations

Instructors

<i>Name</i>	<i>Role</i>	<i>Office</i>	<i>Email</i>
Patrick Walls	Instructor	MATH 229E	pwalls@math.ubc.ca
Liam Yih	Teaching Assistant	MATX 1110	ltyih@math.ubc.ca

Lectures

<i>Section</i>	<i>Time</i>	<i>Location</i>
Lecture 201	Monday/Wednesday/Friday 4–5pm	LSK 200

Learning Resources

<i>Title</i>	<i>Description</i>
Mathematical Python	Online textbook on mathematical computing with Python
Syzygy	Jupyter notebooks for UBC students
Canvas	All course information posted on Canvas

Assessments

Quizzes	$2 \times 5\%$ each = 10%	Jupyter notebooks completed in the lab
Assignments	$4 \times 5\%$ each = 20%	Jupyter notebooks submitted to Canvas
Midterm Exams	$2 \times 15\%$ each = 30%	In class February 16 and March 25
Final Exam	40%	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	Roots and optimization: bisection, secant and Newton's method
5	NumPy arrays and functions, plotting with Matplotlib
6	Numerical integration: Riemann sums, trapezoid rule, error formulas
7	Numerical integration: Simpson's rule and error formula
8	Solutions of linear systems of equations
9	Eigenvalues and eigenvectors
10	Finite differences and numerical methods for differential equations
11	Accuracy and stability of numerical methods for differential equations
12	Numerical methods for systems of differential equations

Prerequisites/Corequisites

Calculus	One of MATH 101, MATH 103, MATH 105, MATH 121
Differential Equations	One of MATH 215, MATH 255, MATH 256
Linear Algebra	One of MATH 152, MATH 221, MATH 223

- See the [UBC Course Schedule](#)

Important Dates

January 10	First day of class
February 21–25	Reading break (no lectures)
April 8	Last day of class
April 12–27	Final exam period

- See the [UBC Academic Calendar 2021/2022](#)

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](#).