MATH 210

Introduction to Mathematical Computing *Course Outline 2022W2*

Mathematical computing with Python and Jupyter. Basic Python programming including datatypes, logic, loops and functions. Root finding, numerical integration, linear systems, eigenvalues 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

Name	*Office*	*Email*
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Lectures

Section	*Time*	*Location*
Lecture 201	Monday/Wednesday/Friday 4–5pm	LSK 201

Learning Resources

Title	*Description*
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 15 and March 29
Final Exam	40%	Exam period April 17–28

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 method 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, eigenvalues and eigenvectors
9	Finite differences and numerical methods for differential equations
10	Accuracy and stability of numerical methods for differential equations
11	Numerical methods for systems of differential equations
12	Advanced topics

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 the UBC Course Schedule

Important Dates

January 9	First lecture
February 20–24	Reading break (no lectures)
April 7	Good Friday (University closed, no lecture)
April 10	Easter Monday (University closed, no lecture)
April 12	Last lecture
April 17–28	Final exam period

- See the UBC Academic Calendar 2022/2023

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.