MATH 210

Introduction to Mathematical Computing   *Course Outline 2020W1*

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 computational narratives in Jupyter notebooks with explanatory text in 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 large linear systems of equation

- Approximate solutions of ordinary differential equations

Online Learning

All communications, course materials, lectures and assessments are delivered through canvas.ubc.ca. This is a new experience for most of us including your instructors. Please visit keeplearning.ubc.ca for resources to help you set up, learn effectively online, understand the technologies used at UBC, take care of yourself, answer questions, and get support in this new context.

Contacts

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Lectures and Labs

Lectures	Monday/Wednesday/Friday 4–5pm
Lab L2A	Tuesday 3–4pm
Lab L2B	Thursday 2–3pm
Lab L2C	Thursday 9–10am

- All lectures and labs hosted on Zoom via Canvas

- All students must be registered in a lab section

Learning Resources

Mathematical Python	Online textbook on mathematical computing with Python
Syzygy	Jupyter notebooks for UBC students

Assessments

Labs	10%	Collaborations, discussions and quizzes, $5 \times 2\%$ each
Assignments	30%	Jupyter notebooks submitted to Canvas, $4 \times 7.5\%$ each
Quizzes	30%	Canvas quizzes, $3 \times 10\%$ each
Final Exam	30%	Delivered on Canvas during exam period December 7–22

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
13	Review

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

Wednesday September 8	First day of class
Monday October 12	Thanksgiving Day (no lecture)
Wednesday November 11	Rembrance Day (no lecture)
Thursday December 3	Last day of class
December 7–22	Final exam period

- See the UBC Academic Calendar 2020/2021

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.