
MATH 210 Introduction to Mathematical Computing

Winter 2018

MATH 210 is an introduction to mathematical computing using the Python programming language. We start with basic Python programming (using Python 3 exclusively) including datatypes, logic, loops and functions and then focus on the scientific computing packages NumPy, SciPy, matplotlib and pandas. We use these packages to solve problems in calculus, linear algebra, differential equations, statistics and data visualization. Our main tool is Jupyter notebook (hosted on ubc.syzygy.ca) for writing Python, L^AT_EX and markdown code.

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Lectures: MWF 2-3pm LSK 201 – We will be writing Python code in Jupyter notebooks during lectures. Students are **strongly encouraged** to bring a laptop (or any device with a keyboard, browser and WiFi) to class.

Labs: Tuesday 3-4pm LSK 121 (L2A) and Thursday 2-3pm LSK 121 (L2B) – Lab quizzes and project feedback sessions are held in labs. Every student must be registered in one lab section.

Canvas: All course information is posted on Canvas (see students.canvas.ubc.ca)

Syzygy: All UBC students have an account on ubc.syzygy.ca which hosts Jupyter notebooks.

Assessments: Final grades are assigned according to the following outline:

- 25% Assignments (5 assignments × 5%/assignment)
- 20% Lab quizzes (2 quizzes × 10%/quiz, computational)
- 15% Midterm Exam (in class, written)
- 10% Final Project
- 30% Final Exam (written and computational)

Python Resources: We will follow the documentation on the official Python website and explore a variety of open resources online such as:

- Official Python Webpage – python.org
- Official SciPy Webpage – scipy.org
- Python Documentation – docs.python.org/3
- SciPy Lecture Notes – scipy-lectures.org
- PEP 8 Style Guide for Python Code – python.org/dev/peps/pep-0008

- SciPy 2017 Conference – [youtube.com](https://www.youtube.com)
- Stack Overflow – stackoverflow.com

Other Resources:

- L^AT_EX – [latex-project.org](https://www.latex-project.org)
- L^AT_EX WikiBook – en.wikibooks.org/wiki/LaTeX
- Jupyter Notebooks – jupyter.org
- Markdown – help.github.com/articles/markdown-basics

Schedule of Topics:

- Week 1-2: Jupyter notebooks, markdown language, L^AT_EX, and an introduction to Python
- Week 3-4: Basic Python: datatypes, logic, loops, and functions
- Week 5-7: Introduction to NumPy, SciPy and matplotlib
- Week 8: Reading Week Break
- Week 9-10: Calculus: numerical integration, differentiation and root finding
- Week 11: Linear Algebra: solving systems of equations, matrix computations
- Week 12: Differential Equations: Euler’s method, numerical solutions to ODEs
- Week 13: Introduction to pandas: data analysis and statistics
- Week 14: Advanced Topics