MATH 210 Introduction to Mathematical Computing
January–April 2016

This course is an introduction to scientific computing in Python. We will start with basic Python programming including datatypes, logical expressions, loops and functions and then focus on the scientific computing packages NumPy, SciPy, matplotlib and pandas. We will use these packages to solve problems in calculus, linear algebra, differential equations, statistics and data visualization. Our main tool will be Jupyter notebooks for writing Python, LaTeX and markdown code.

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Lectures: MWF 2-3pm LSK 201

Office Hours: Tu 2-3pm LSK 121 & Th 2-3pm LSK 310

Learning Goals: By the end of the semester, students will be able to:

◇ Write basic Python code including loops, logical expressions and functions

◇ Use Python packages such as NumPy, SciPy, matplotlib and pandas for scientific computing

◇ Write basic LaTeX and markdown code in Jupyter notebooks

Communication and Course Materials: All discussions and announcements will be posted on Piazza; all assignments will be posted and submitted on Connect:

◇ Piazza – `piazza.com`

◇ Connect – `elearning.ubc.ca/connect`

Assessment: Final grades will be assigned according to the following:

◇ 30% Homework (8 assignments × 3.75%/assignment)

◇ 40% Exams (2 exams × 20%/exam)

◇ 30% Projects (2 projects × 15%/project)

Coursework:

◇ *Homework:* There are 8 assignments in total and their due dates are: January 13, 20 ,27; February 3, 24; and March 2, 16, 30

◇ *Exams:* Computational exams will be held in the computer lab LSK 310 during the weeks: February 8-12 (Exam #1) and March 21-25 (Exam #2)

◇ *Projects:* Projects will be due March 11 (Project #1) and April 8 (Project #2) (Instructions for completing the projects will be provided during the term)

Python Resources: There is no textbook for the course. 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 2015 Conference – `youtube.com`

Other Resources:

- ◇ LaTeX – `latex-project.org`

- ◇ LaTeX WikiBook – `en.wikibooks.org/wiki/LaTeX`

- ◇ Jupyter Notebooks – `jupyter.org`

- ◇ Markdown – `help.github.com/articles/markdown-basics`

Approximate Schedule of Topics:

- ◇ Week 1-2: Jupyter notebooks, markdown language, LaTeX, and an introduction to Python

- ◇ Week 3-4: Basic Python: logical expressions, loops, and functions

- ◇ Week 5-6: Introduction to NumPy, SciPy and matplotlib

- ◇ Week 7: Reading Week Break

- ◇ Week 8-9: Calculus: numerical integration, differentiation and root finding

- ◇ Week 10-11: Differential Equations: Euler's method, numerical solutions to ODEs

- ◇ Week 12-13: Introduction to pandas: data analysis and statistics

- ◇ Week 14: Advanced Topics