MATH 210 Introduction to Mathematical Computing
Winter 2017

This course is an introduction to scientific computing in Python. We will start with basic Python programming (using Python 3 exclusively) including datatypes, logical statements, 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 (hosted on `ubc.syzygy.ca`) for writing Python, LaTeX and markdown code.

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

Office Hours: Monday 4-5pm & Tuesday 1-3pm LSK 310 ~~Tuesday & Thursday 2-3pm LSK 121~~

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

- Write basic Python code including loops, logic 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 are posted on Piazza; all assignments are posted and submitted on Connect; lecture notes are posted on GitHub:

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

- Piazza – `piazza.com` (login via Connect)

- GitHub – `github.com/ubc-math210/2017`

Python and Jupyter (`ubc.syzygy.ca`): All UBC students have an account on `ubc.syzygy.ca` which hosts the Jupyter notebook web app and students can login with CWL.

Assessments: Final grades are assigned according to the following outline (note that there is no final exam):

- 30% Homework (8 assignments $\times$ 3.75%/assignment)

- 40% Exams (2 exams $\times$ 20%/exam)

- 30% Projects (2 projects $\times$ 15%/project)

Coursework:

- *Homework:* There are 8 assignments in total and are submitted online via Connect

- *Exams:* Both computational exams are held in the computer lab LSK 310 during the weeks: February 13-17 (Exam #1) and March 20-24 (Exam #2)

- *Projects:* Projects are due March 17 (Project #1) and April 5 (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 2016 Conference – `youtube.com`

- Stack Overflow – `stackoverflow.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: 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