Course Title: Programming

Lecturer: Tomohiro Uchiyama

Lecture time: Tuesday 9:00-10:30 & Thursday 9:00-10:30
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Course Description:

Computer programming in a high-level language with special emphasis on style and structure. No prior experience in programming is required.

Programming is the nuts and bolts of computer science; it is an essential tool but only a small part of the overall subject. Programming involves using a special language to issue a series of instructions to the computer in order to have it solve a particular problem.

Learning Outcomes:

A student who successfully completes this course will:

- Understand the following Python data types and their methods: strings, lists, tuples, files, sets, and dictionaries.
- Be able to implement basic algorithms using selection, iteration, and function calling.
- Be able to apply their understanding of the Python language in designing, implementing, and testing programs to solve simple problems in science and economics.
- Be able to (re)structure code using modules and functions to reduce complexity.
- Be familiar with simple object oriented programming in Python.
- Be able to implement simple Graphics User Interfaces in Python.
- Be able to review and assess the quality and maintainability of Python code.

Prerequisites:

None.

Textbooks:


Assessment:
Classwork 30%
Quizzes (weekly) 30%
Final Examination 40%

Working on your home computer:

Many students will do at least some of their lab and assignment work on home computers. To do that, you will need to install some course-specific software as follows:

- Anaconda, version 5.3 or later. This can be downloaded from https://www.anaconda.com/download/
- We use Python 3.7 with Spyder inside Anaconda. Note that Python 2.7 is NOT appropriate since it is not compatible with Python 3.7
- Enjoy the course!

Course Outline:

Week 1. Introduction 1:
Getting started with Python programming.

Week 2. Introduction 2:
Input, Processing, Output, Editing, Saving, Detecting syntax errors.

Week 3. Software development, Data types, and Expressions 1:
Case study (Income tax calculator), Strings, Assignment, Comments.

Week 4. Software development, Data types, and Expressions 2:
Numeric data types and character sets, Expressions, Using functions and modules.

Week 5. Loops and selection statements 1:
The for loop, Case study (Investment report).

Week 6. Loops and selection statements 2:
Selection: if and if-else statements, Boolean expressions, Multi-way if statements, Compound Boolean expressions.

Week 7. Loops and selection statements 3:
The while loop, The break statement, Random numbers, Case study (Approximating square roots).

Week 8. Strings and Text files:
Accessing substrings, String methods, Writing/Reading text files.

Week 9. Lists and dictionaries 1:
Lists, Defining simple functions, Case study (Generating sentences).
Week 10. Lists and dictionaries 2:
Dictionaries, Case study (Nondirective psychotherapy).

Week 11. Design with functions 1:
Functions, Recursive functions.

Week 12. Design with functions 2:
Scopes of variables, Higher order functions.

Week 13. Simple Graphics and Image Processing 1:
Turtle graphics, Drawing 2-D shapes, Random walks, Colors and RGB system, Case study (Recursive patterns in fractals).

Week 14. Simple Graphics and Image Processing 2:
Image processing, Converting an image to black and white, Edge detection.

Week 15. Final Examination: