Course Number and Name:

EECE 231 – Introduction to Computation and Programming with Applications

Number of Credits: 3

Catalog Description

This is an introductory programming course that uses the Python programming language, with balanced emphasis on programming concepts, elementary algorithms, and applications. Topics include data types, selection, repetition, lists, tuples, strings, dictionaries, functions, recursion, sorting and searching algorithms, files, plotting and data visualization, introduction to object oriented programming, testing and debugging, elementary numerical analysis methods, symbolic computation, and introduction to Matlab. The course has weekly laboratory assignments.

Contact Hours

150 minutes of lectures per week, and one lab session of two hours per week

Textbook

Guttag, John. *Introduction to Computation and Programming Using Python: With Application to Understanding Data, Second Edition. MIT Press, 2016.*

Reference book

Stormy Attaway*, MATLAB: A Practical Introduction to Programming and Problem Solving, Butterworth-Heinemann, 2018*

Required or Elective:

Required for Chemical, Civil, and Mechanical Engineering Students.

Course Objectives

The objectives of this course are to:
1. Introduce students, with little or no programming experience, to programming concepts that are useful in problem solving
2. Illustrate to students the usefulness of elementary algorithm concepts including searching, sorting, and recursion
3. Teach students useful tools for plotting data, finding roots of equations, doing mathematical modeling, and performing numerical simulations
4. Enable students to learn how to write programs in Python to solve simple engineering problems and extract information from data.

List of Topics Covered

No.	Topics covered	Number of 50-minute lectures
1	Introduction to programming	1
2	Basic elements of Python, programming basics and data types	2
3	Control structures: boolean expressions, selection, and repetition	3.5
4	Lists, tuples, and strings	3
5	Functions, searching, and sorting	3.5
6	Dictionaries, vectors, stacks, queues, matrices, and programming examples	3.5
7	Recursion	2.5
8	Introduction object oriented programming	3
9	Testing and debugging	2
10	Plotting	2
11	Reading and manipulating files, computing statistical parameters of data	3
12	Numerical analysis applications: finding roots, and computing numerical approximations	3
13	Symbolic Computations using Python: mathematical and uncertainty modeling	3
14	Introduction to programming in MATLAB: control structures, arrays, matrices, plotting, solving algebraic equations and ordinary differential equations	3
Total		**38**

Learning Outcomes

After completing the course, the students are able to:

Course Outcome	Correlation with Student Learning Outcomes
Write programs using Python to solve simple engineering problems.	1, 2, 6, 7
Design solutions of computational problems with and without recursion, and implement these solutions in Python	1, 2, 6, 7
Use files to read and analyze data, plot it, and extract its statistics in Python	1, 2, 6, 7
Use elementary data structures such as lists and dictionaries to solve simple data problems	1, 2, 6, 7
Learn how to debug and test Python code to get the program to run correctly	1, 2, 6, 7
Solve roots of algebraic equations, perform numerical approximations	1, 2, 6, 7
Solve simple mathematical problems using the symbolic computations library of Python	2, 6
Write basic programs using Matlab	1, 2, 6, 7

Computer Language

Python, Matlab

Evaluation methods

- Class Contribution (5%)
- Lab assignments (10%)
- In-Lab Quiz 1 (25%)
- In-Lab Quiz 2 (25%)
- In-Lab Final (35%)

Professional component

Engineering topics: 50%
Mathematics and basic sciences: 50%
Quantitative thoughts

Educational Diversity

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AUB Medical Center. Confidential resources are not required to report actual or suspected discrimination or harassment to appropriate university officials, except in cases of suspected abuse of a minor, in the event of an external investigation or prosecution, or in the event of imminent danger to the reporting party or others.

Person(s) who prepared this syllabus

Louay Bazzi and Arij Daou, March 2019.

Revised by

Hassan Artail, October 2019.

Last Revised by

Hassan Artail and Louay Bazzi, January 2020