CS112: Computer Programming for Engineering – Semester 2 (Jan-May 2019)

Instructor:	**Faculty Intern:**
Dr. Justice Kwame Appati *Office*: Adjunct Office (Engineering Building) *Email*: jkappati@ashesi.edu.gh *Office hours: Mondays and Wednesdays 11:30am – 1:00pm* or by appointment	Mr. Constant Likudie Office: Art and Science FIs Office Email: constant.likudie@ashesi.edu.gh *Office hours: Friday 9am – 1pm* or by appointment

Meeting Times:

Lecture: Section A: Mondays & Wednesdays 8:00am – 9:30am
Section B: Mondays & Wednesdays 9:45am – 11:15am
Lab: Section A: Fridays 1:50pm – 3:20pm
Section B: Fridays 3:30pm – 5:00pm

Course Overview:

This course gives students an intensive introduction to programming as a means of problem-solving. It also introduces them to the broader field of computer science and its applicability to engineering, scientific, and other disciplines. Concepts will be illustrated in the Python programming language. This course will introduce the object concept; using and declaring functions (methods). Basic software engineering concepts will also be introduced and will be used to solve problems through approximation, simulations, recursive formulas and data processing. Finally, Computer Science and programming will be applied to various engineering disciplines throughout the class.

Learning Outcomes

At the end of the course, students will be able to:

1. Create algorithms for solving simple problems relevant to a variety of scientific and engineering domains and application areas
2. Use the Python programming language to implement, test, and debug algorithms for solving problems.
3. Implement, analyze and explain the behavior of simple programs involving the fundamental programming constructs variables, expressions, assignments, I/O, control constructs, functions, parameter passing, and recursion.
4. Apply object-oriented design and programming to problem-solving,
5. Design software to process data and design simple simulations

Ashesi Learning Goals Addressed in this Course:

1. **Ethics and Civic Engagement:** *An Ashesi student is an ethical, responsible and engaged member of his/her community*. Students are expected to maintain a very high academic and ethical standard, as described in the "Expectations" section below.
2. **Critical Thinking and Quantitative Reasoning**: *An Ashesi student is able to apply critical thinking and quantitative reasoning to approach complex problems.* This course is all about problem-solving with computers. Students will develop the ability to analyze relevant problems, design algorithms to solve them, and implement these algorithms in the Python programming language.
3. **Communication**: *An Ashesi student is an excellent communicator in a variety of forms*. This course requires students to write short 1-paragraph responses to various assigned reading during quizzes and tests, and also to write a longer technical report on an independent project.

4. **Curious and Skilled**: *An Ashesi student is inquisitive and confident, has breadth of knowledge, and has attained a high level of mastery in their chosen field.* This course aims to develop skilled problem-solvers and programmers who have a widening understanding of the role of computer science in our complex world.
5. **Technology Competence**: *An Ashesi student is an effective and flexible user of technology*. This course focuses on developing a particular aspect of technology competence, namely programming.

Textbook & Reference Material:
Miller, B. N. & Ranum, D. L., *Python: Programming in Context*.

Learning activities:
In this course, learning takes place through a variety of activities, including lectures, reading, labs and assignments. Each of these is carefully designed to help you develop expertise in problem-solving and programming, and none should be neglected. Historically, students who have paid careful attention to each of these aspects have been very successful and students who have neglected one or more of them have struggled.

- *Reading*: The assigned reading introduces new concepts and serves as a foundation for the concepts discussed, clarified, and practiced in class. It includes additional details that we will not have time to dwell on in class, so you must do the reading in order not to miss this information. The reading assignments will be for the next class session.

- *Lectures*: Essential concepts will be presented and will include activities to help you grasp the essential principles and approaches that will make you a good problem-solver and programmer. The best way to get the most of the lectures is to be an active participant: come to class well prepared, ask and answer questions in class, and participate in all discussions.

- *Labs and Assignments*: Labs and assignments are primarily designed to give you practice and help you learn concepts that you cannot learn just by listening to a lecture. It is an opportunity to apply concepts in a context that allows you to seek clarification and guidance from the instructor and teaching assistants. Students who ensure that they complete and understand all the assignments typically go on to do well in the tests and exams, whereas students who fail to complete assignments typically go on to do very poorly in the exams.

Expectations:
The instructor and teaching assistant are committed to helping you to be successful in this course. In return, there are some fundamental expectations of you:

Participation
Your active participation enriches the course experience for everyone. Do not be afraid to ask questions! Your questions will probably help others in the class as well.

Professionalism
You are expected to interact with your course colleagues, as well as the instructor and teaching assistant in a professional and polite manner at all times.

Academic honesty
You are expected to keep in mind at all times that *"An Ashesi student is an ethical, responsible and engaged member of his/her community"*. The work in this course is designed to help you develop skills essential to your future career success. You can only develop these skills if you do the work **yourself**.

All the work that you turn in ***must*** be your own. For programming assignments, you are allowed and encouraged to brainstorm about the problems with your peers. You can talk in **English** (not in Python) about algorithms and approaches. However, unless you are explicitly asked to work in a team, you must sit down behind the computer and write the program you turn in yourself. If you copy a section of code from any source (e.g. part of an example from class, or from the course textbook) you must include an appropriate citation in a comment above the code segment that you copied. You may not copy code from the internet or from your peers – this is plagiarism. Your peers may not dictate code to you, to write in your assignment. It is in your interest to make sure that you do the programming yourself, but to reinforce this, the instructor may call on you at any time to explain and defend the code you have written.

Reading email
We will send you important information by email from time to time. We expect you to check email at least once a day during the week, and at least once on weekends. We will put the prefix "[CP4E]" in the subject to indicate that it is an email related to the class. Not reading your email will not be accepted as an excuse for missing important information.

Evaluation Criteria
Your base grade in the course will be determined according to the following criteria:

Attendance & Participation	5%
Class Preparation Assignments	10%
Quizzes:	15%
Mid-semester exams (2):	20%
Semester project:	10%
Final exam:	40%

Like all classes at Ashesi, this class gives a lot of weight to continuous assessment. However, note that a failing grade in the exams (mid-semester exams and final exam) may result in an automatic failing grade in the course, regardless of your overall weighted grade. For example, if you do excellently on the assignments, but fail the exams, your overall grade will be a failing grade. Thus, you must pay attention to both assignments and exams.

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Breakdown of Evaluation Criteria:
Attendance & Participation: You are required to come to class, and to arrive on time. A record of poor or chronically late attendance will result in a penalty against your course grade. You should be prepared to discuss and answer questions on readings assigned for that day. Your active participation enriches the course experience for everyone. This includes asking and answering questions in class, and participating in any discussions.

Class Preparation Assignments and Quizzes: There will be class preparation assignments and weekly quizzes on the assigned reading. They are due when stated and no make-ups will be due for any reason.
Lab: You are required to attend all lab sessions. Be engaged in the class and prepared for hands-on exercises in lab or in class whenever assigned.
Exams: There will be two exams during the class, as well as a final exam at the end of the class.
Final Project: You are required to implement a final software project to solve a scientific problem.

Late Policy
All assignments are due when stated. You will lose 25% of your grade for each day your assignment is handed in late. After two days past the due date, the assignment will not be accepted since you would have already lost 50% of the grade by then.

Schedule
Below is a tentative schedule. The schedule is subject to adjustment at the instructors' discretion, and will be updated on Courseware. Updated reading assignments will also be posted on Courseware.

Week	Section & Topics	Reading (to be done *before* class)	Assignments & Assessments
Wk 1 Jan 07	**M:** National Holiday – No class **W:** Introduction **F:** Discussion	**M:** — **W:** — **F:** —	**M:** — **W:** — **F:** —
Wk 2 Jan 14	**M:** Problem-solving and Python Fundamentals **W:** Functions and Loops **F:** Discussion	**M:** 1.1—1.5.2 **W:** 1.5.3—1.6 **F:** —	**M:** — **W:** Quiz 1 **F:** CPA 1 due
Wk 3 Jan 21	**M:** More about functions and loops **W:** Functions versus scripts, Solving quadratic equations **F:** Discussion	**M:** 1.6—2.3 **W:** 2.4—2.5.3 **F:** —	**M:** — **W:** Quiz 2 **F:** CPA 2 due
Wk 4 Jan 28	**M:** More on the math module, Algorithms & flowcharts, solving the problem of approximating π. **W:** The accumulator pattern. **F:** Discussion	**M:** 2.1—2.4 **W:** 2.5 **F:** —	**M:** — **W:** Quiz 3 **F:** CPA 3 due
Wk 5 Feb 04	**M:** Boolean expressions and selection **W:** Strings and string operations. Solving problems related to cryptography **F:** Discussion	**M:** 2.6 **W:** 3.1—3.4 **F:** —	**M:** **W:** Quiz 4 **F:** CPA 4 due
Wk 6 Feb 11	**M:** More on string operations **W:** Lists. Solving problems related to statistics. **F:** Discussion	**M:** 3.5—3.8 **W:** 4.1—4.4 **F:** —	**M:** — **W:** — **F:** —
Wk 7 Feb 18	**M:** Lists, Dictionaries and Tuples **W:** Working with text files **F:** Discussion	**M:** 4.5—4.8 **W:** 5.1—5.2 **F:** —	**M:** — **W:** Project Report 1 **F:** —

Week	Section & Topics	Reading (to be done *before* class)	Assignments & Assessments
Wk 8 Feb 25	**M:** While loop and data process **W:** Mid-Semester Exam 1 **F:** Exams Discussion	**M:** 5.3 **W:** — **F:** —	**M:** — **W:** — **F:** —
Wk 9 Mar 04	SEMESTER BREAK		
Wk 10 Mar 11	**M:** Understanding function parameters **W:** Introduction to object-oriented programming **F:** Discussion	**M:** 6.4 **W:** 10.1—10.3 **F:** —	**M:** — **W:** — **F:** —
Wk 11 Mar 18	**M:** More about object-oriented programming **W:** Classes and Object in Java **F:** Discussion	**M:** 10.4—10.5 **W:** 1.1—1.3 **F:** —	**M:** — **W:** Quiz 5 **F:** —
Wk 12 Mar 25	**M:** Concept Mapping: Expressions, Control Flow, Simple Input and Output **W:** Concept Mapping: Packages and Imports, Software Development **F:** Discussion	**M:** 1.4—1.6 **W:** 1.7—1.9 **F:** —	**M:** — **W:** Project report 2 **F:** —
Wk 13 Apr 01	**M:** Goals, Principles, and Patterns **W:** Inheritance in Java **F:** Discussion	**M:** 2.1 **W:** 2.2 **F:** —	**M:** — **W:** — **F:** CPA 5 due
Wk 14 Apr 08	**M:** Interfaces and Abstract Classes **W:** Exceptions in Java **F:** Discussion	**M:** 2.3 **W:** 2.4 **F:** —	**M:** — **W:** Quiz 6 **F:** —
Wk 15 Apr 15	**M:** Casting and Generics **W:** Mid-Semester Exam 2 **F:** Easter Holiday – No class	**M:** 2.5 **W:** — **F:** —	**M:** — **W:** — **F:** —
Wk 16 Apr 22	**M:** Easter Holiday – No class **W:** Nested Classes in Java **F:** Exam Discussion	**M:** — **W:** 2.6 **F:** —	**M:** — **W:** Quiz 7 **F:** CPA 6 due

Week	**Section & Topics**	**Reading (to be done *before* class)**	**Assignments & Assessments**
Wk 17 Apr 29	REVISION WEEK		
Wk 18 Apr 06	FINAL EXAMS		