

ICS 111  
Introduction to  
Computer Science I

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## ICS 111 - Introduction to Computer Science I

### Instructor Information

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Office hours: Online

### Windward Community College Mission Statement

Windward Community College offers innovative programs in the arts and sciences and opportunities to gain knowledge and understanding of Hawai'i and its unique heritage. With a special commitment to support the access and educational needs of Native Hawaiians, we provide O'ahu's Ko'olau region and beyond with liberal arts, career and lifelong learning in a supportive and challenging environment — inspiring students to excellence.

### Catalog Description

Intended for Computer Science majors and all others interested in a first course in programming. An overview of the fundamentals of computer science emphasizing problem solving, algorithm development, implementation, and debugging/testing using an object-oriented programming language.

### Student Learning Outcomes

The Student Learning Outcomes for this course are:

- Use an appropriate programming environment to design, code, compile, run and debug computer programs.
- Demonstrate basic problem solving skills: analyzing problems, modeling a problem as a system of objects, creating algorithms, and implementing models and algorithms in an object-oriented computer language (classes, objects, methods with parameters, abstract classes, interfaces, inheritance and polymorphism).
- Illustrate basic programming concepts such as program flow and syntax of a high-level general purpose language.
- Identify relationships between computer systems programming and programming languages.
- Demonstrate working with primitive data types, strings and arrays.

## Student Learning Outcomes Alignment

Student Learning Outcome	Lessons and Assessments
Use an appropriate programming environment to design, code, compile, run, and debug computer programs.	Modules 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14 Assignments 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15
Demonstrate basic problem solving skills: analyzing problems, modeling a problem as a system of objects, creating algorithms, and implementing models and algorithms in an object-oriented computer language	Modules 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14 Assignments 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15
Illustrate basic programming concepts such as program flow and syntax of a high-level general purpose language.	Modules 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14 Assignments 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15
Identify relationships between computer systems programming and programming languages.	Module 2 Quiz 1
Demonstrate working with primitive data types, strings, and arrays.	Modules 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14 Assignments 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15

## Course Content

Concepts	Skills
<ol style="list-style-type: none"> <li>1. Use an appropriate programming environment to design, code, compile, run and debug computer programs.               <ol style="list-style-type: none"> <li>a. Programming-tools.                   <ol style="list-style-type: none"> <li>1) Integrated Development Environment (IDE) or a text editor and command line-based compilation and execution.</li> </ol> </li> <li>b. Coding a solution.                   <ol style="list-style-type: none"> <li>1) Self-documenting programs.</li> <li>2) Good formatting.</li> </ol> </li> <li>c. Compile and run programs.</li> <li>a. Debug programs.</li> </ol> </li> </ol>	<ol style="list-style-type: none"> <li>1. Use an appropriate programming environment to design, code, compile, run and debug computer programs.               <ol style="list-style-type: none"> <li>a. Use programming tools to model a problem and design algorithms that express its solution.</li> <li>b. Formulate models and algorithms in the syntax of an object-oriented programming language using either an Integrated Development Environment (IDE) or a text editor.</li> <li>c. Utilize either an IDE or a command prompt to compile and run programs.</li> <li>d. Test and debug programs to produce code that runs and generates the correct results.</li> </ol> </li> </ol>

2. Demonstrate basic problem solving skills: analyzing problems, modeling a problem as a system of objects, creating algorithms, and implementing models and algorithms in an object-oriented computer language (classes, objects, methods with parameters, abstract classes, interfaces, inheritance and polymorphism).
- a. Analysis of a problem by identifying objects and classifying them.
  - b. Design a solution to the problem by defining the messages objects send each other, the parameters the messages carry and the inheritance among object classes.
  - c. Classes, objects, and methods.
    - 1) Classes objects, and methods described.
      - a) Classes.
      - b) Objects.
      - c) Method declarations and method calls
      - d) Overloaded methods.
    - 2) Incorporate parameter passing.
      - a) Formal and actual parameters.
      - b) Returning values from methods
      - c) Parameter passing by value and by reference.
    - 3) Write simple classes and objects.
      - a) Classes.
      - b) Objects.
      - c) Method declaration/implementation and method calls.
      - d) Constructors.
      - e) Encapsulation through visibility modifiers (public, private)
      - f) Class and instance methods and fields (static)
    - 4) Inheritance and Polymorphism
      - a) Extending classes, subclasses
      - b) Overriding methods
      - c) Polymorphism
    - 5) Interfaces
      - a) Interfaces as types
      - b) Implementing by classes
    - 6) Program Development
      - a) Algorithm design and representation using pseudocode, flowcharts, etc.
      - b) Evaluate algorithm efficiency.
      - c) Stepwise refinement.
      - d) Program lifecycle.

2. Demonstrate basic problem solving skills: analyzing problems, modeling a problem as a system of objects, creating algorithms, and implementing models and algorithms in an object-oriented computer language (classes, objects, methods with parameters, abstract classes, interfaces, inheritance and polymorphism).
- a. Classes, objects, and methods
    - 1) Use API classes, objects, and methods, citing examples.
    - 2) Write simple classes and create objects that interact between multiple classes.
    - 3) Understand parameter passing and methods returning values
    - 4) Inheritance and Polymorphism
      - a) Model a problem as a hierarchy of classes
      - b) Differentiate between overloading and overriding.
    - 5) Define Interfaces and implement them with classes
  - b. Apply problem-solving techniques such as stepwise refinement and object-oriented analysis
  - c. Incorporate the concept of software life cycle into program development.
  - d. Determine and design an algorithm to solve a specific problem.
  - e. Evaluate algorithm performance.

<p>3. Illustrate basic programming concepts such as program flow and syntax of a high-level general purpose language.</p> <ol style="list-style-type: none"> <li>a. Sequence.</li> <li>b. Selection.</li> <li>c. Repetition.</li> </ol>	<p>3. Illustrate basic programming concepts such as program flow and syntax of a high-level general purpose language.</p> <ol style="list-style-type: none"> <li>a. Describe sequential, branching, and repetitive concepts.</li> <li>b. Use flowcharting to capture sequential, branching, and repetitive concepts.</li> </ol> <p>Incorporate good programming practices</p>
<p>4. Identify relationships between computer systems, programming and programming languages.</p> <ol style="list-style-type: none"> <li>a. Computer organization and architecture (memory, arithmetic-logic unit, control unit).</li> <li>b. Binary representation of data (range of data type, precision and round-off, image representation).</li> <li>c. Operating system concepts.</li> <li>d. Programming language assembler/compiler.</li> </ol>	<p>4. Identify relationships between computer systems, programming and programming languages.</p> <ol style="list-style-type: none"> <li>a. Examine the hardware (binary numbers, character encoding, Boolean logic) and basic computer system architecture concepts.</li> <li>b. Examine system software and virtual machine concepts.</li> <li>c. Describe the concept of program compilation and translation to machine code.</li> </ol>
<p>5. Demonstrate working with primitive data types, strings and arrays.</p> <ol style="list-style-type: none"> <li>a. Primitives Types       <ol style="list-style-type: none"> <li>1. Numeric, character and boolean types.</li> <li>2. Numeric accuracy.</li> <li>3. Memory requirements.</li> <li>4. Declaration.</li> <li>5. Initialization.</li> </ol> </li> <li>b. Integer Arithmetic       <ol style="list-style-type: none"> <li>1. Addition and subtraction, increment and decrement</li> <li>2. Multiplication, division, and modulo.</li> <li>3. Truncation.</li> </ol> </li> <li>c. Casting       <ol style="list-style-type: none"> <li>1. Type assignment.</li> <li>2. Implicit and explicit casting.</li> </ol> </li> <li>d. Strings       <ol style="list-style-type: none"> <li>1. Constants</li> <li>2. Concatenation.</li> </ol> </li> <li>e. Arrays       <ol style="list-style-type: none"> <li>1. Declaration</li> <li>2. Access to array vs. access to an element</li> <li>3. Multidimensional arrays</li> </ol> </li> </ol>	<p>5. Demonstrate working with primitive data types, strings and arrays.</p> <ol style="list-style-type: none"> <li>a. Primitive types       <ol style="list-style-type: none"> <li>1) Utilize and understand primitive types, their accuracy, memory requirements</li> <li>2) Declarations and initialization of primitive types.</li> <li>3) Demonstrate integral arithmetic including mod.</li> <li>4) Explain casting and differentiate between implicit and explicit casting.</li> </ol> </li> <li>b. Strings</li> <li>c. Arrays</li> </ol>

## Course Tasks

In this class, you must show mastery of each concept through a series of quizzes and projects. Every assignment is worth 4 points except the final project, which is worth 16 points.

To get the full amount of points for your projects your work must not contain any errors. If there are errors, I will specify what they are and return it to you. Note that I will not tell you how to fix it, but I will tell you where the error is. You should then correct the assignment and resubmit it.

If you have problems completing an assignment and need help, or have questions about the instructions or subjects, send me a private message in Laulima (not my UH email, private message in Laulima). I will be happy to answer all questions and offer any help that I can. I won't write your code for you but I will do my best to offer hints and clarification with your code.

I will use the command line to evaluate all projects. Before turning in a project make sure it compiles from the command line. If you turn in a project that does not compile you will not be able to get more than 3 points for it.

To get the full amount of points for your quizzes you must get a 100% on it. If you get less than 100% you will be allowed to retake it.

## Assignment Tasks and Grading

Your letter grade will be determined by the number of points you earn. There are 10 projects, 11 quizzes and the final project for a total of 100 points:

- A: 90 - 100 points
- B: 80 - 89 points
- C: 70 - 79 points
- D: 60 - 69 points
- F: 0 -59 points

You may turn in projects or take quizzes after the due date but there will be a penalty of 2 points. If you turn in a project or take a quiz by the due date it must show a good faith effort to complete the assignment. In other words, if you miss most of the questions on a quiz or turn in a project that does not meet the minimum requirements for the assignment it will not be considered a good faith effort.

## Learning Resources

We will be using *Imagine! Java: Programming Concepts in Context* by Frank M. Carrano as our textbook.

We will use Laulima for submitting and returning all assignments. All grades will be posted in Laulima and you will be able to track your progress by utilizing the grade book. You will be able to post and read questions and comments on the discussion boards. Use the private message tool in Laulima to contact the instructor.

We will be using the Java programming language to develop our programs. Go to the [Java Download Page](http://www.oracle.com/technetwork/java/javase/downloads/jdk8-downloads-2133151.html) (<http://www.oracle.com/technetwork/java/javase/downloads/jdk8-downloads-2133151.html>) to download the latest SE JDK. It is vital that you install it correctly, including setting the correct path environment.

Although it isn't necessary, I also recommend you use an Integrated Development Environment such as [jGrasp](http://jgrasp.org) (<http://jgrasp.org>). I do not recommend using NetBeans or Eclipse at this time. Both insert code in your projects that could keep it from compiling from the command line.

As an alternative, you can use the uhunix (type `ssh username@uhunix.hawaii.edu` at the command line. Replace username with your UH username) or an online development site such as [Cloud9 IDE](https://c9.io) (<https://c9.io>).

## Other resources

Tutoring may be available from the TRIO office in the Library Learning Commons on the WCC campus.

## Policies

### Disabilities Accommodation Statement

If you have a physical, sensory, health, cognitive, or mental health disability that could limit your ability to fully participate in this class, you are encouraged to contact the Disability Specialist Counselor to discuss reasonable accommodations that will help you succeed. Ann Lemke can be reached by phone at 235-7448, by email at [lemke@hawaii.edu](mailto:lemke@hawaii.edu), or by stopping by her office in Hale 'Akoakoa 213 for more information.

### Academic Dishonesty - Cheating and Plagiarism

You are responsible for the content and integrity of all work you submit. The guiding principle of academic integrity will be that all files, work, reports, and projects that you submit are your own work.

You will be guilty of cheating if you:

- Represent the work of others as your own (plagiarism).
- User or obtain unauthorized assistance in any academic work.
- Give unauthorized assistance to other students.
- Modify, without instructor approval, an examination, paper, record, or report for the purpose of obtaining additional credit.
- Misrepresent the content of submitted work.

### Netiquette

Whenever you post something to the discussion board or other online forums, you are expected to follow proper netiquette. Be respectful at all times. Do not use obscene language or make disparaging comments, even if it is meant as a joke. Remember that others cannot see your facial expression nor hear your tone of voice, so they will not know you are trying to be witty. Do not use all caps. Using all caps is normally interpreted to be shouting.

### Discussion Boards

Discussion boards are to be used for class work only. Do not post political or other comments or statements, nor solicit sales for any type of product. Your instructor will be monitoring all communication in Lulima and will take appropriate action when necessary

## **A Final Thought**

All programming languages use the same basic concepts. By learning the concepts and writing your initial program in pseudocode, you should be able to use any programming language to code your software. It is vital that you understand these concepts. You will use them throughout your studies in Computer Science and as a programmer or Software Engineer afterward. The best way to learn them is to use them. Try designing and creating programs that you will find useful. Good luck!

# Schedule

Week	Day	Subject	Date	Quiz	Project
1	1	<ul style="list-style-type: none"> <li>• Introduction</li> </ul>	Jul 7		
	2	<ul style="list-style-type: none"> <li>• Relationship between hardware and software</li> <li>• Number Systems</li> </ul>	Jul 8	1	
	3	<ul style="list-style-type: none"> <li>• Algorithms</li> </ul>	Jul 9	2	
	4	<ul style="list-style-type: none"> <li>• Syntax and Semantics</li> <li>• Java Programming Language</li> </ul>	Jul 10	3	1
2	1	<ul style="list-style-type: none"> <li>• Variables and Primitive Types</li> <li>• Expressions and assignments</li> </ul>	Jul 14	4	2
	2	<ul style="list-style-type: none"> <li>• Mathematical Operators</li> </ul>	Jul 15	5	
	3	<ul style="list-style-type: none"> <li>• Strings and string processing</li> </ul>	Jul 16	6	
	4	<ul style="list-style-type: none"> <li>• Input and Output</li> </ul>	Jul 17		3
3	1	<ul style="list-style-type: none"> <li>• Logical Operators</li> </ul>	Jul 21	7	
	2	<ul style="list-style-type: none"> <li>• Conditional Statements</li> <li>• If else statement</li> <li>• Switch statement</li> </ul>	Jul 22		4
	3	<ul style="list-style-type: none"> <li>• Iterative Statements</li> <li>• while and do while statements</li> </ul>	Jul 23		5
	4	<ul style="list-style-type: none"> <li>• for statement</li> </ul>	Jul 24		6
4	1	<ul style="list-style-type: none"> <li>• Functions and parameter passing</li> </ul>	Jul 28	8	
	2	<ul style="list-style-type: none"> <li>• Methods that return a value</li> <li>• Methods that don't return a value</li> </ul>	Jul 29		7
	3	<ul style="list-style-type: none"> <li>• Reference Data types</li> </ul>	Jul 30	9	
	4	<ul style="list-style-type: none"> <li>• Arrays</li> </ul>	Jul 31		8
5	1	<ul style="list-style-type: none"> <li>• OOP</li> </ul>	Aug 4	10	
	2	<ul style="list-style-type: none"> <li>• Defining Classes</li> </ul>	Aug 5	11	
	3	<ul style="list-style-type: none"> <li>• Constructors</li> </ul>	Aug 6		9
	4	<ul style="list-style-type: none"> <li>• Objects</li> </ul>	Aug 7		10
6	-	<ul style="list-style-type: none"> <li>• Final Project</li> </ul>	Aug 11		11