CodeHS

Intro to Computer Science in Python 3 Syllabus
Rainforest: 1 year for High School (175 contact hours)

Course Overview and Goals

The CodeHS introduction to Computer Science in Python 3 curriculum teaches the foundations of computer science and basic programming, with an emphasis on helping students develop logical thinking and problem solving skills. Once students complete the CodeHS Introduction to Computer Science in Python course, they will have learned material equivalent to a semester college introductory course in Computer Science and be able to program using Python 3.

Learning Environment: The course utilizes a blended classroom approach. The content is fully web-based, with students writing and running code in the browser. Teachers utilize tools and resources provided by CodeHS to leverage time in the classroom and give focused 1-on-1 attention to students. Each unit of the course is broken down into lessons. Lessons consist of video tutorials, short quizzes, example programs to explore, and written programming exercises, adding up to over 100 hours of hands-on programming practice in total. Each unit ends with a comprehensive unit test that assesses a student's mastery of the material from that unit.

Programming Environment: Students write and run Python programs in the browser using the CodeHS editor.

More information: Browse the content of this course at https://codehs.com/course/5657

Prerequisites: The Intro to Computer Science in Python course is designed for complete beginners with no previous background in computer science. The course is highly visual, dynamic, and interactive, making it engaging for new coders.

Course Breakdown

Unit 1: Welcome (1 day/.5 hours)

Browse the full content of this unit at https://codehs.com/library/course/5657/module/7887

Objectives / Topics Covered	• Course Overview • Goal Setting
Example Assignments / Labs	N/A In this module, students are introduced to the course and set goals for themselves.

Unit 2: Intro to Programming with Turtle Graphics (6 weeks/30 hours)

Browse the full content of this unit at https://codehs.com/library/course/5657/module/7887

Objectives / Topics Covered	• What is a Command? • Moving Tracy • Tracy's Coordinate System • For Loops • Functions and Parameters

	• Top Down Design • Variables • User Input • If/else Statements • While Loops

Example Assignments / Labs	• 34 exercises total
	• Example exercises:
	  ○ Row of Circles
	  ■ In this program, Tracy should draw a row of circles across the width of the canvas using a for loop.
	  ○ Circle Pyramid
	  ■ Write a program that directs Tracy to draw a pyramid with 3 circles on the bottom row, 2 in the middle, and 1 on top.
	  ○ Bubble Wrap 2.0
	  ■ In this program, you should have Tracy add highlights to each bubble from our Bubble Wrap example program. Use top down design to break this large problem into smaller pieces!
	  ○ Rating
	  ■ Write a program that shows a graphical representation of a user's rating value. If the value is between 1 and 4, draw a red X. If it is between 5 and 7, draw a yellow horizontal line. If it is an 8 or above, draw a green checkmark.

Unit 3: Basic Python and Console Interaction (3 weeks/15 hours)

Browse the full content of this unit at https://codehs.com/library/course/5657/module/13467

Objectives / Topics Covered	• Printing • Variables • Types • User Input • Converting Input Types • Arithmetic Expressions • String Operators • Comments • Graphics in Python

Example Assignments / Labs	• 18 exercises in total
	• Example exercises:
	  ○ Printing
	  ■ Print messages to the console
	  ○ Variables
	  ■ Create variables of different types, and print them to the console.
	  ○ Types
	  ■ Investigate the types of different variables
	  ■ Convert between types
	  ○ Arithmetic Expressions & Converting Input Types
	  ■ Age in One Year - Ask the user how old they are, and tell them how old they will be in one year
	  ■ Rectangle, part 1 - Make variables for length and width and compute area and perimeter

	■ Rectangle, part 2 - Ask the user for length and width and compute area and perimeter

Unit 4: Conditionals (2 weeks/10 hours)

Browse the full content of this unit at https://codehs.com/library/course/5657/module/7889

Objectives / Topics Covered	● If Statements ● Boolean Values ● Logical Operators ● Comparison Operators ● Floating Point Numbers and “Equality”
Example Assignments / Labs	● 10 exercises in total ● Example exercises: ○ If statements and boolean values ■ Is it raining? - Write a program that uses a boolean variable to determine whether or not it is raining ○ Boolean operators, and expressions ■ Boolean variable - Take a variable and use it in an if statement ■ Legally allowed to vote - User reports age and program tells them whether or not they can vote in the US ■ Transaction - User reports balance and deposit/withdrawal, and program prints new balance or error ■ Recipe - Ask the user for ingredients, amounts per serving, and number of servings, and report the total amount of each ingredient needed

Unit 5: Looping (2 weeks/10 hours)

Browse the full content of this unit at https://codehs.com/library/course/5657/module/7890

Objectives / Topics Covered	● While Loops ● For Loops ● Break and Continue ● Nested Control Structures
Example Assignments / Labs	● 11 exercises total ● Example exercises: ○ While Loops ■ Divisibility - Ask the user to enter a numerator and denominator, and re-prompt until the denominator is non-zero ○ For Loops ■ Average test score - Compute the average of several test scores ○ Break and Continue ■ Higher/ Lower - Ask the user to guess a particular number between 1 and 100. If the user’s guess was too high or too low, they should be notified ○ Nested Control Structures ■ Rolling Dice - Print out all combinations that can be made when 2 dice are rolled

Unit 6: Functions and Exceptions (3 weeks/15 hours)

Browse the full content of this unit at https://codehs.com/library/course/5657/module/7891

Objectives / Topics Covered	• Functions • Namespaces • Parameters • Return Values • Exceptions

Example Assignments / Labs	• 16 exercises total
	• Example exercises:
	  ○ Functions
	  ■ Raining cats and dogs - Write functions to print text art of a cat and a dog
	  ■ Temperature converter - write functions to convert from Fahrenheit to Celsius and vise versa
	  ○ Exceptions
	  ■ Temperature converter, part 2 - Add exception handling to your temperature conversion program
	  ○ Putting it all together
	  ■ Enter a positive number - Make a function to repeatedly ask the user to enter a number until they enter a positive number

Unit 7: Strings (3 weeks/15 hours)

Browse the full content of this unit at https://codehs.com/library/course/5657/module/7892

Objectives / Topics Covered	• Indexing and Slicing • Math Operators on Strings • For Loops Over a String • String Methods

Example Assignments / Labs	• 14 exercises in total
	• Example exercises:
	  ○ Indexing
	  ■ First character - write a function that takes a string and returns the first character
	  ■ All but the first character - write a function that takes a string and returns everything but the first character
	  ○ Math operators and strings
	  ■ Full name - write a function that takes two strings (a first name and a last name) and returns a full name as a single string
	  ■ Replace a letter - write a function that takes a string and returns a copy with the character at a particular index replaced with a dash
	  ○ For loops on strings
	  ■ Count occurrences - write a function that takes two strings and returns the number of times the second string appears in the first string
	  ○ String methods
	  ■ Add enthusiasm - write a function that takes a string and returns that string in all upper case

	■ Remove all from string - write a function that takes two strings and returns a string that consists of the first string with all instances of the second string removed

Unit 8: Creating and Altering Data Structures (2 weeks/10 hours)

Browse the full content of this unit at https://codehs.com/library/course/5657/module/7893

Objectives / Topics Covered	● Tuples ● Lists ● For Loops and Lists ● List Methods
Example Assignments / Labs	● 12 exercises in total ● Example exercises: ○ Tuples ■ Cookout Orders - Given a tuple of food orders, add up the number of burgers and number of hotdogs and print the total sums. ○ Lists ■ Listed Greeting - Ask a user to enter their name, age, and favorite sport, then split their response into list elements and use index values to greet them by name and respond that you enjoy that sport as well! ■ Exclamat!on Po!nts - Ask the user for a string and then print the same string with every lowercase i replaced with an exclamation point. ■ Librarian - Ask the user for the last names of the authors of the five books they are returning. Print a list of those names in sorted order.

Unit 9: Extending Data Structures (3 weeks/15 hours)

Browse the full content of this unit at https://codehs.com/library/course/5657/module/7894

Objectives / Topics Covered	● Dictionaries ● 2d lists ● List comprehensions ● Packing and unpacking ● Mutable vs. immutable ● Equivalence vs. identity
Example Assignments / Labs	● 13 exercises in total ● Example exercises: ○ Dictionaries ■ Phone book - user repeatedly enters name, and program either asks for the person's phone number or reports the phone number already provided ○ 2d lists ■ Checkerboard - write a program that prints the initial setup of a checkerboard, with a 1 where a piece would be and a 0 where a blank square would be

Unit 10: Project: Guess the Word (3 weeks/15 hours)

Browse the full content of this unit at https://codehs.com/library/course/5657/module/13469

Objectives / Topics Covered	• Allow students to combine a variety of topics (strings, loops, booleans, user input, etc.) in a single program • Introduce students to incremental development • Strengthen debugging skills by having students develop a larger project • Testing
Example Assignments / Labs	• Part 1 - store a secret word in a variable, ask the user for a guess, and report whether or not it is correct • Part 2 - refine fetching guesses to check for invalid guesses and repeatedly ask until guess is valid • Part 3 - allow the user to guess 10 times, and print a combination of dashes and correct guesses before each guess • Part 4 - only penalize the user for incorrect guesses

Unit 11: Final (.5 weeks/2-3 hours)

Browse the full content of this unit at https://codehs.com/library/course/5657/module/7896

Objectives / Topics Covered	• Students will be tested on all topics included in the course • Multiple choice, fill-in-the-blank, short answer, and coding questions included
Example Assignments / Labs	• Part 1- Multiple Choice: Can be taken online or on paper (Paper version found in resources • Parts 2, 3 & 4- Fill-in-the-blank, short answer, coding: Paper versions available in resources

Intro to Computer Science in Python 3 Supplemental Materials

Supplementary Units	**Prerequisite/Recommended Unit(s)**	**# of items**
Classes and Objects - Methods - Operator Overloading - Class Variables vs. Instance Variables - Inheritance - Hidden Attributes - Namespaces - Modules	Complete all units in main course	60
Advanced Tracy Challenges	Introduction to Programming with Turtle Graphics	4
Midterm	Introduction to Programming with Turtle Graphics, Basic Python and Console Interaction, Conditionals	1 (offline materials found in resources)
Additional Topics - Abstraction - Short Circuit Evaluation - DeMorgan's Laws - Adding Text	Abstraction: Can be placed in Introduction to Programming with Turtle Graphics module, preferably following 'Top Down Design' lesson. Short Circuit Evaluation & DeMorgan's Laws: Can both be placed into Conditionals module, preferably after 'Logical Operators' lesson Adding Text: Can be placed in Introduction to Programming with Turtle Graphics module, preferably following 'Parameters' lesson	6 (Abstraction) 5 (Short Circuit Evaluation) 5 (DeMorgan's Laws) 5 (Adding Text)
Project: Mastermind	Complete all units in main course; can be used in place of 'Project: Guess the Word'	7
Categorizing Triangles	Introduction to Programming with Turtle Graphics; students should have some knowledge of basic geometry concepts	13
Python Graphics (Tkinter **or** Brython) Tkinter and Brython versions cover the same material, but Brython may be more accessible for students	Introduction to Programming with Turtle Graphics, Basic Python and Console Interaction, Conditionals, Looping, Functions and Exceptions	30 (Tkinter) 32 (Brython)
Project: Who Said it?	Complete all units in main course	8