CodeHS

Utah Introduction to Python Course Syllabus

1 Year for Middle School, 120 hours

Course Overview and Goals

The Utah Introduction to Python course teaches students the basics of programming in Python. Students begin with Python commands, functions, control structures, and user interaction by solving puzzles and writing creative programs for Tracy to follow. Students then learn how to use lists, manipulate strings, and work with files by solving puzzles and writing creative programs for Tracy.

Learning Environment: The course utilizes a blended classroom approach. The content is a mix of web-based and physical activities. Students will write and run code in the browser and engage in in-person collaborative exercises with classmates. Teachers utilize tools and resources provided by CodeHS to leverage time in the classroom and give focused 1-on-1 attention to students.

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

Prerequisites: The Utah Introduction to 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 those new to computer science.

More information: Browse the content of this course at https://codehs.com/course/21072.

Course Content

Quizzes: Each lesson includes at least one formative short multiple choice quiz. At the end of each module, a summative quiz is included.

Challenges & Projects: Three different types of projects can be found in this course:

- At the end of each module, students will add on to an *Etch a Sketch* project, applying new concepts they've learned to expand on the project they've been creating.
- Throughout the course, after learning new content, students will reach project modules where they will complete a larger project from start to finish. These projects are a bit more open-ended and allow students to be more creative in applying their knowledge. These projects are:
    - Design a Mural
    - Cycle Depiction
    - On-Screen Calculator
    - Ticketing System
    - Timeline
    - Poetry Remixer
    - Python in the Real World
- Students will have a chance to complete projects with a partner in the second half of the course to practice with pair programming and learn how to program with others. These projects include:
    - Digital Art Platform
    - Interactive To-Do List
    - 2023 Stanley Cup Final

Course Breakdown

Unit 1: Tracy's World (1 week/ 5 hours)

Browse the full content of this unit at https://codehs.com/library/course/21072/module/28288

Objectives / Topics Covered	• What is a command? • How do we communicate with computers? • Moving Tracy • Drawing circles • History of programming languages • Why is Python such a popular language? • Tracy's coordinate system

Example Assignments / Labs	• 11 exercises total
	• Commands
	  ○ Drawing simple graphics
	  ■ Example Exercise: Caterpillar
	  Combine multiple commands to write a program that has Tracy draw 5 circles in a row
	• Programming Languages
	  ○ Learn about characteristics of programming languages
	  ■ Example Exercise: Programming Language Hierarchy
	  Drag and drop programming languages into a hierarchy based on characteristics of the language

Unit 2: Moving Tracy (1 week/ 5 hours)

Browse the full content of this unit at https://codehs.com/library/course/21072/module/28289

Objectives / Topics Covered	• Testing your own Tracy programs • Turning Tracy at right angles • For loops • Using coordinates and angles to move Tracy's position

Example Assignments / Labs	• 13 exercises total
	• Turning Tracy at Right Angles
	  ○ Learn how to use the left and right commands to let Tracy explore more of her world
	  ■ Example Exercise: 4 Columns
	  Write a program that will have Tracy split her world into 4 columns by drawing 3 vertical lines 100 pixels apart
	• For Loops
	  ○ For loops execute the code inside the loop a set number of times.
	  ■ Example Exercise: Row of Circles
	  In this program, Tracy should draw a row of circles across the width of the canvas using a for loop.
	• Using Coordinates and Angles to Move Tracy's Position
	  ○ Any angle can be used to have Tracy draw shapes with diagonal lines.
	  ■ Example Exercise: Hexagon
	  Write a program, using for loops, that has Tracy draw a hexagon on the canvas.

Unit 3: Designing and Communicating Solutions (1.5 weeks/ 8 hours)

Browse the full content of this unit at https://codehs.com/library/course/21072/module/28290

Objectives / Topics Covered	• Commenting your code • Naming rules in Python • Functions • Artistic commands • Adding text • Top down design

Example Assignments / Labs	• 13 exercises total
	• Commenting Your Code
	  ○ Commenting is important to make sure your code is understandable to yourself and others.
	  ■ Example Exercise: Circle Pyramid with Comments
	  Take your Circle Pyramid program from earlier and add comments to explain what your program is doing.
	• Functions
	  ○ Teach Tracy new commands by grouping a set of commands that can be called with one line of code.
	  ■ Example Exercise: Shape Stack
	  Give Tracy instructions to draw a tower of squares and circles from the bottom to the top of the canvas.
	• Artistic Commands
	  ○ There are many ways to get creative with the graphics Tracy draws, such as using color, filling in shapes, and leaving trails with varying thicknesses.
	  ■ Example Exercise: Kid's Shapes Toy
	  Write a program to have Tracy draw a representation of a popular toy used to teach children shapes and colors. There should be 4 different shapes with 4 different colors.
	• Adding Text
	  ○ Text can be added to the canvas using the **`write`** command
	  ■ Example Exercise: Baseball Diagram
	  Label the parts of the baseball field.
	• Top Down Design
	  ○ Solve large Tracy problems by breaking them down into smaller, more manageable problems.
	  ■ Example Exercise: Bubble Wrap 2.0
	  In this program, Tracy will add highlights to each bubble from our Bubble Wrap example program. Use top down design to break this large problem into smaller pieces!

Unit 4: [Project] Design a Mural (1 week/5 hours)

Browse the full content of this unit at https://codehs.com/library/course/21072/module/28718

Objectives / Topics Covered	• Review all concepts through this point
Example Assignments / Labs	• 2 exercises total • Design a Mural ○ Research and design a mural or piece of artwork using the Tracy commands you've learned so far!

Unit 5: Controlling Tracy with Variables (3 weeks/ 15 hours)

Browse the full content of this unit at https://codehs.com/library/course/21072/module/28291

Objectives / Topics Covered	• Variables • Data types • Strings • User input • Parameters • Clickable interaction • Debugging • The value of i in for loops

Example Assignments / Labs	• 33 exercises total
	• Variables
	  ○ Variables are used to store and manipulate values in our programs.
	  ■ Example Exercise: Dart Board
	  Write a program that uses variables to draw a dart board which consists of 4 concentric circles that each increase in radius by 25 pixels.
	• Data Types
	  ○ In this course, we will look at 4 data types: Strings, Integers, Floating Point Numbers, and Booleans
	  ■ Example Exercise: Categorizing Variables
	  Write variable values in their correct data type category.
	• Strings
	  ○ Strings can be manipulated using string methods.
	  ■ Example Exercise: Text Messaging
	  Edit the contents of a text conversation between you and a friend using string methods.
	• User Input
	  ○ We can use input from a user to control certain commands in our code and make our programs more personalized.
	  ■ Example Exercise: Four Corners
	  User input will dictate the length of the sides of a square. Squares of the indicated size will be drawn in each corner of the canvas.
	• Parameters
	  ○ Parameters can be used to customize functions to make them more reusable.
	  ■ Example Exercise: Colorful Caterpillar
	  Use parameters to draw a caterpillar with 8 body circles of 4 different colors.
	• Clickable Interaction
	  ○ Users can interact with Tracy programs using their mouse.
	  ■ Example Exercise: Click Counter
	  Each time the user clicks the canvas, update and display the number of times the screen has been clicked.
	• The Value of i in For Loops
	  ○ The value of i in a for loop is actually a variable! It can be altered and used to control commands in our code.
	  ■ Example Exercise: Dart Board Using i
	  Alter your previous Dart Board program to use the value of i to control the circle's radius instead of a separate variable.

Unit 6: [Project] Cycle Depiction (1 week/ 5 hours)

Browse the full content of this unit at https://codehs.com/library/course/21072/module/28733

Objectives / Topics Covered	• Review all concepts through this point
Example Assignments / Labs	• 2 exercises total • Cycle Depiction ○ Research and design a visual display of a common cycle, including user interaction in some way.

Unit 7: Making Decisions (1.5 weeks/ 8 hours)

Browse the full content of this unit at https://codehs.com/library/course/21072/module/28292

Objectives / Topics Covered	• If statements • If/else statements • Returning values from functions • While loops

Example Assignments / Labs	• 18 exercises total
	• If Statements
	  ○ If statements will execute code only if certain conditions are met
	  ■ Example Exercise: Happy Face
	  Write a program that will draw a happy face on the screen if the user answers that they are happy.
	• If/Else Statements
	  ○ The if/else statement executes a block of code if a specified condition is true. If the condition is false, another block of code can be executed.
	  ■ Example Exercise: 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.
	• Returning Values from Functions
	  ○ Functions can return values back to the main program using the **`return`** keyword.
	  ■ Example Exercise: Apple Watch Messages
	  Display a message to the user based on the random time of day that is generated.
	• While Loops
	  ○ A while loop allows code to be executed repeatedly based on a given Boolean condition.
	  ■ Example Exercise: Increasing Squares
	  Write a program that has Tracy draw concentric squares form the center of the canvas until the length variable reaches 400 pixels.

Unit 8: Putting It All Together (0.5 weeks/ 2 hours)

Browse the full content of this unit at https://codehs.com/library/course/21072/module/28293

Objectives / Topics Covered	• Control Structures • Commands • Defining versus Calling Functions • Control flow • Looping • Conditionals • Commenting code • Top Down Design

Example Assignments / Labs	• Challenges
	  ○ Students use all of the skills learned in the course to solve complex puzzles and challenges.
	  ■ Example Exercise: Guess a Number 2.0
	  Write a program that allows the user to guess a secret number. If their number is too high, draw a down arrow. If their number is too low, draw an up arrow. If they guess the number, draw a checkmark and end the program.

Unit 9: [Project] On-Screen Calculator (1.5 weeks/ 7 hours)

Browse the full content of this unit at https://codehs.com/library/course/21072/module/28734

Objectives / Topics Covered	• Review all concepts through this point
Example Assignments / Labs	• 4 exercises total • On-Screen Calculator ○ Design a calculator that can be used to perform simple mathematical expressions.

Unit 10: Refresher: Challenges with Tracy (1 week/ 4 hours)

Browse the full content of this unit at https://codehs.com/library/course/21072/module/29294

Objectives / Topics Covered	• Review of all concepts that should be known at this point

Example Assignments / Labs	• 9 exercises total
	• Review
	  ○ Nested Control Structures
	  ■ Example Exercise: Grid
	  Write a program that will have Tracy draw a grid on the canvas at each 20-pixel interval.
	  ○ Clickable Interaction
	  ■ Example Exercise: Digital Art Platform
	  With a partner, create a Digital Art Platform that can be used to create digital artwork!

Unit 11: Lists (2 weeks/ 10 hours)

Browse the full content of this unit at https://codehs.com/library/course/21072/module/28299

Objectives / Topics Covered	• Creating lists • Indexing • Updating, adding, and removing elements • List methods

Example Assignments / Labs	• 16 exercises total
	• Indexing
	  ○ Each value in a list is assigned an index value which can be used to access the item.
	  ■ Example Exercise: Label Shapes
	  Label each shape using the given list of shapes.
	• Updating, Adding and Removing Elements
	  ○ The number of items as well as the items themselves can be altered in a list.
	  ■ Example Exercise: Shopping List
	  In this program is a shopping list. As you make your way through the store, update the list by removing the items you've already grabbed.
	• List Methods
	  ○ The **`reverse`** and **`sort`** methods can be used to organize items in a list.
	  ■ Example Exercise: Alphabetical Class Roster
	  This program will ask the user for student names and will return the names in alphabetical order.

Unit 12: Lists and Loops (1.5 weeks/ 7 hours)

Browse the full content of this unit at https://codehs.com/library/course/21072/module/28302

Objectives / Topics Covered	• List length • Looping over lists by index and by item

Example Assignments / Labs	• 10 exercises total
	• List Length
	  ○ The length of a list can be accessed using the **`len`** function.
	  ■ Example Exercise: Disney Princesses Pre 2000's
	  In this program is a list with 3 Disney Princesses. Follow the directions in the program to add the additional 5 Disney Pre-2000 Disney Princesses to the list chronologically and print the list length as it is altered.
	• Looping Over Lists by Index and Item
	  ○ A loop can be used to access items in a list one by one.
	  ■ Example Exercise: Field Trip
	  This program will be used to see which students can attend a field trip. Only teenagers are allowed to go on the field trip.
	  ■ Example Exercise: Bar Chart of Pets in Household
	  In this program, you will create a bar graph to display data about how many pets the students in a sample class have.

Unit 13: [Project] Ticketing System (1 week/5 hours)

Browse the full content of this unit at https://codehs.com/library/course/21072/module/28307

Objectives / Topics Covered	● Review of all concepts through this point
Example Assignments / Labs	● 2 exercises total ● Ticketing System ○ Research and design a system that simulates the order of patrons in line.

Unit 14: Strings (2 weeks/ 10 hours)

Browse the full content of this unit at https://codehs.com/library/course/21072/module/28294

Objectives / Topics Covered	● Accessing characters and substrings ● Strings and lists ● String methods ● Looping over characters in a string
Example Assignments / Labs	● 17 exercises total ● Accessing Characters and Substrings ○ Individual characters in a string have index values and can be accessed individually or in groups, or substrings. ■ Example Exercise: Acrostic Name Poem In this program, create an acrostic poem on the canvas using your name! ● Strings and Lists ○ Strings can be converted into lists of characters or words and lists can be converted into strings. ■ Example Exercise: French Cities In this program, you will find a list of 3 cities in France, though one of them is spelled incorrectly. Your job is to update this value. ● String Methods ○ Various string methods are available to manipulate strings in different ways. ■ Example Exercise: CIA Witness Protection In this program, you will find a list of 3 encounters that have been entered into the CIA database. Your job is to keep the identity of Veronica Oshie safe by replacing her name in each encounter to her undercover name, Sam Smith. ● Looping Over Characters in a String ○ A loop can be used to access characters in a string one by one. ■ Example Exercise: Creating User Names In this program, the user will enter names of students and usernames will be created for them.

Unit 15: [Project] Timeline (1 week/ 5 hours)

Browse the full content of this unit at https://codehs.com/library/course/21072/module/28308

Objectives / Topics Covered	● Review of all concepts through this point
Example Assignments / Labs	● 2 exercises total ● Timeline ○ Research and design an interactive timeline based on the topic of your choosing.

Unit 16: File I/O: Reading From Files (1.5 weeks/ 7 hours)

Browse the full content of this unit at https://codehs.com/library/course/21072/module/28305

Objectives / Topics Covered	● What is file I/O? ● Reading characters, lines, and all lines from a file
Example Assignments / Labs	● 10 exercises total ● What is File I/O? ○ Data can be provided to programs in various formats and used in different ways. ■ Example Exercise: Choosing a File Format: TXT vs CSV Explain when you would choose to use a TXT file instead of a CSV file, or vice versa, to store data. ● Reading Characters, Lines, and All Lines From a File ○ We can read information from files in various ways. ■ Example Exercise: Turtle Path In this program, your goal is to guide Tracy along the correct path based on the instructions provided on separate lines in a file called `instructions.txt`. ■ Example Exercise: Bar Chart Let's create a program that uses Tracy to create a vibrant bar chart, allowing you to visualize data in a graphical format!

Unit 17: File I/O: Writing to Files (0.5 weeks/ 2 hours)

Browse the full content of this unit at https://codehs.com/library/course/21072/module/28306

Objectives / Topics Covered	● Writing to different locations in a file
Example Assignments / Labs	● 4 exercises total ● Writing to Different Locations in a File ○ We can use different methods to write information to a file in various locations. ■ Example Exercise: Secret Message You have come across a mysterious file called `secret.txt` that contains a hidden message. Your task is to decode the secret message by following a specific pattern.

Unit 18: [Project] Poetry Remixer (1 week/ 5 hours)

Browse the full content of this unit at https://codehs.com/library/course/21072/module/28309

Objectives / Topics Covered	● Review of all concepts through this point
Example Assignments / Labs	● 3 exercises total ● Poetry Remixer ○ Embark on a creative journey to modify an existing poem using file I/O, list manipulation, and string methods.

Unit 19: Python in the Real World (1 week/ 5 hours)

Browse the full content of this unit at https://codehs.com/library/course/21072/module/28310

Objectives / Topics Covered	● Python in research, big data, and for creatives ● Jupyter Notebooks
Example Assignments / Labs	● 4 exercises total ● Python in Research, Big Data, and For Creatives ○ Explore how Python is used in various industries.