CompSci 101
Introduction

CompSci 101, Spring 2023
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CompSci 101: Introduction to Computer Science

Course Description

Introduction to practices and principles of computer science and programming and their impact on and potential to change the world. Algorithmic, problem-solving, and programming techniques in domains such as art, data visualization, mathematics, natural and social sciences. Programming using high-level languages and design techniques emphasizing abstraction, encapsulation, and problem decomposition. Design, implementation, testing, and analysis of algorithms and programs. No previous programming experience required. For this version of the course, you will learn the programming language Python 3.

Due Dates

- Labs: weekly on Fridays, finish and submit by Sunday night - see labs page
- APTs and APT Quizzes: see APT page
- Assignments: See assignment page

Course Announcements

- January 10, 2023
  • First lecture is Thursday, January 12.
Every lecture:
DO NOT SIT IN THE
LAST 5 FULL ROWS

or the small 2 seater row at the top!
About Prof Rodger
A long time ago, back in 1979....
B.S. Computer Science and Mathematics

- My first semester, my first course in programming - PL/I

```plaintext
Hello2: proc options(main);
  put list ('Hello, world!');
end Hello2;
```
Decisions? Industry? Grad School?

- **Systems Programmer**
  - NCSU, University Systems Control Center

- **Undergraduate Research**
  - Cleanup data from buoys in the water

- Last minute decision
  - IBM Summer job
  - Go to Grad School
• MS. 1985, P.h.D 1989

• New Data Structure
  Dynamic contour search tree
Assistant Professor

• Continued research in algorithms

• CAREER CHANGE...

• Got more interested in education
Started developing education tools
Changed area to Visualization Tools and CS Education

• Tool – NPDA - to experiment with pushdown automata
1994 – Moved to Duke University
Professor of the Practice

• Position focuses on Education in the Discipline

• Focused on designing educational software
  • JFLAP – tool for experimenting with theoretical CS concepts
How I Keep my Sanity

How do you keep your sanity?
Prof. Yesenia Velasco

• Handles logistics, substitute lectures, and much more!
• Will teach some lectures, teaching this course next semester
• Handles accommodations
  • Email her your accommodation letter
  • yvelasco@cs.duke.edu
Learn the CS Alphabet
A is for ...

• Algorithm
  • Step-by-step instructions realized in a program

• Abstraction
  • Hiding things is powerful
  • “What” vs “How”

• APT
  • Algorithmic Problem-solving Testing

• API
  • Application Programming Interface - using Libraries
Feature someone related to CS in every lecture
Fred

The New York Times

Frederick P. Brooks Jr., Computer Design Innovator, Dies at 91

He was a lead designer of the computers that cemented IBM’s dominance for decades. He later wrote a book on software engineering that became a quirky classic.

Duke Alum
BS ‘53

Founded
UNC
Dept of
Computer Science

Wrote Software engineering books on his experience

Turing Award – Highest Honor in CS

1975

1995
Brooks – Technical Leader of IBM's 360 computer project

• 1964 – 360 was a family of six compatible computers
Duke Connection: Fred Brooks '53

• What Would FB Say?
"The most important single decision I ever made was to change the IBM 360 series from a 6-bit byte to an 8-bit byte, thereby enabling the use of lowercase letters. That change propagated everywhere."

• "Fred Brooks" by Copyright owned by SD&M (www.sdm.de) - Request for picture sent by email to Fred Brooks by uploader (Mark Pellegrini; user:Raul654) Fred sent this photo back, along with contact information for Carola Lauber at SD&M, who gave copyright permission.. Licensed under CC BY-SA 3.0 via Wikimedia Commons - https://commons.wikimedia.org/wiki/File:Fred_Brooks.jpg#/media/File:Fred_Brooks.jpg
Why is programming fun?

Fred Brooks

• First is the sheer joy of making things
• Second is the pleasure of making things that are useful
• Third is the fascination of fashioning complex puzzle-like objects of interlocking moving parts
• Fourth is the joy of always learning
• Finally, there is the delight of working in such a tractable medium. The programmer, like the poet, works only slightly removed from pure thought-stuff.
Go over CompSci 101 webpages

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Due Dates

- **Sakai Quizzes on Prework (reading in textbook)**: due 10:15am on Lecture days. Take quizzes in Duke Sakai.
- **Labs**: weekly on Fridays, finish and submit by Sunday night - see labs page
- **APTs and APT Quizzes**: see APT page
- **Assignments**: See assignment page

Course Announcements

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Announcements

• Check out the calendar on the course website
  • PRE-WORK – what you must do before the lecture
  • LECT/LAB – will put notes/videos here from the live lecture or for the lab
  • DUE – what is due each week.

• What has been updated?

• Assignment 0 is already out!
• Lab 0 on Friday
• Prelab for Lab1 (install Python)
• You will see a link to this video!
Course overview, logistics
www.cs.duke.edu/courses/spring23/compsci101

• Programming assignments: APTs and Assignments
  • Acknowledge assistance, to learn to program ...
  • Be aware of late policy

• Labs
  • Attend each Friday

• Lecture - Classwork
  • Attend the live lecture - participate
  • If you can’t attend you must watch it and participate within 24 hours

• Exams: 3 exams and final
  • All old exams available
Questions?

• Don’t send us email!!!!!!!!!!!!

• Post your questions on Ed Discussion
  • We will answer them there!
  • You should try to answer them too
    • Want to be a UTA one day? Answer questions!

• Post Questions during lecture!
What's in Compsci 101?

• Learning about computing, computer science, and programming
  • Vocabulary of Python and programming
  • *Power of automation, repetition, scale*
  • Understanding and changing the world

• Programming using Python
  • Tools: PyCharm, Libraries, ...
  • Using mathematical and scientific techniques
  • Art and science of programming
Discuss with others, then everyone fills out their own form.

What is Computer Science?
How it started

How it’s going
Computers speak in 0’s and 1’s

• In old computers
  • Control electric current using the vacuum

• Nowadays, use switches
  • A switch that is "on" or "closed" represents 1
    • Passes electrical current through
  • A switch that is "off" or "open" represents 0
    • Blocks electrical current
  • Express 0's and 1's, called bits
  • 8 bits are a byte and represent a symbol

• What letter is 01000001 ?
Computers speak in 0’s and 1’s

• In old computers
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  • A switch that is "off" or "open" represents 0
    • Blocks electrical current
  • Express 0's and 1's, called bits
  • 8 bits are a byte and represent a symbol

• What letter is 01000001 ?    A
What is Computer Science now?

• Artificial Intelligence

Self-driving car

Perseverence Mars Rover

Roomba

Personal Robot
What is Computer Science?

- Medicine, Genomics
What is Computer Science?

- Animation
What is Computer Science?

• The Organization of Data, Sharing, and Searching
Prerequisites for Compsci 101
After taking this course you will be able to ....

• Write a program for Wordle
• Write a word finder to help someone solve Wordle
Wordle
**Wordle**

**Wordle Solver**
is simple to use tool will help you solve any Wordle answer you are having trouble with.

Enter in the letters that you have gotten in the right spot into the same spot in the
Correct Letters section. Add any letters that are in the puzzle but not in the right spot to
Misplaced Letters area. Finally, enter anything you've guessed that isn't right at all into
Incorrect Letters section. The potential answers will populate as you enter in letters,
etually giving you the solution!

**Correct Letters**

**Misplaced Letters**

**Incorrect Letters**

**Potential Answers (10)**
cheek cher chess chide chief chime choke
chore chose niche

**Recommended Guesses**
CHIDE CHIEF CHIME NICHE

**Common Letters**
E (12) C (10) H (10) I (4) S (3) O (3) K (2)
R (2) M (1) F (1)
Wordle Solver

This simple to use tool will help you solve any Wordle answer you are having trouble with. Just enter in the letters that you have gotten in the right spot into the same spot in the Correct Letters section. Add any letters that are in the puzzle but not in the right spot to the Misplaced Letters area. Finally, enter anything you’ve guessed that isn’t right at all into the Incorrect Letters section. The potential answers will populate as you enter in letters, eventually giving you the solution!

Correct Letters

C H I

Misplaced Letters

E

Incorrect Letters

T A M

Potential Answers (1)

chief

Recommended Guess

CHIEF

Common Letters

C (1)  H (1)  I (1)  E (1)  F (1)
Wordle

You will be able to write

Wordle Solver

This simple to use tool will help you solve any Wordle answer you are having trouble with. Just enter in the letters that you have gotten in the right spot into the same spot in the Correct Letters section. Add any letters that are in the puzzle but not in the right spot to the Misplaced Letters area. Finally, enter anything you’ve guessed that isn’t right at all into the Incorrect Letters section. The potential answers will populate as you enter in letters, eventually giving you the solution.

Correct Letters

CHI

Misplaced Letters

E

Incorrect Letters

TAM

Potential Answers (1)

chief

Recommended Guess

CHIEF

Common Letters

C (1) H (1) I (1) E (1) F (1)
Who has taken CompSci 101?
Who are you?

• Let’s look at survey to see who is taking Compsci 101 in Spring 2023
  • Do you recognize yourself?
  • Is there a stereotypical Compsci 101 student?
  • Is there a stereotypical computer scientist?

• Everyone can succeed! Ideally you won’t have lots of experience programming
From Survey

What year are you?
196 responses

- First year: 63.8%
- Sophomore: 17.9%
- Junior: 10.7%
- Senior: 10.7%
- Graduate Student: 2.6%
- Duke Employee: 2.6%
What's a possible or likely major?

196 responses

- Undecided: 41 (20.5%)
- Art: 4 (2%)
- Music: 0 (0%)
- Theater: 0 (0%)
- History: 1 (0.5%)
- English: 3 (1.5%)
- Computer Science: 39 (19.9%)
- Math: 15 (7.7%)
- Statistics: 17 (8.7%)
- Engineering: 1 (0.5%)
- Economics: 46 (23.5%)
- Biology: 21 (10.7%)
- Chemistry: 7 (3.6%)
- Physics: 4 (2%)
- Foreign Language: 5 (2.6%)
- Environmental: 4 (2%)
- Evanth: 1 (0.5%)
- Global Health: 2 (1%)
- Neuroscience: 40 (20.4%)
- Psychology: 17 (8.7%)
- Philosophy: 2 (1%)
- Political science: 11 (5.6%)
- Public Policy: 24 (12.2%)
- Sociology: 1 (0.5%)
- Religion: 0 (0%)
- Program II: 1 (0.5%)
- Doesn't apply, not a student: 0 (0%)
- Other: 10 (5.1%)
How much programming have you done before?
196 responses

- None at all: 49%
- A little, but not much: 38.8%
- A decent amount, but been a while: 5.2%
- Enough so that I think of myself as a beginner, somewhat competent: 2.6%
- I've written a lot of code: 0.4%

How do you feel about taking CompSci 101?
196 responses

- Really nervous: 16.3%
- A little nervous: 31.1%
- Ready to get started: 46.4%
- Somewhat confident: 0.5%
- Really confident: 0.5%
What does this program do?

- "Hello World"
- Scratch Program
- Colors
  - Duke blue: motion
  - Mustard: control
  - Light blue: sensing
  - Orange: data
  - Purple: looks
WOTO: WOrking TOgether

Analyze this Scratch Program?
WOTO: WOrking TOgether

Analyze this Scratch Program?
Scratch Program

- If you want to experiment with this scratch program, here is the link:
  
  https://scratch.mit.edu/projects/94064630/

You don’t have to understand this yet!!
What language will we learn?

- [http://www.python.org/](http://www.python.org/)
- Python is a *multi-paradigm* language
  - Procedural
  - Functional
  - Object-Oriented
- Simple, libraries, widely used
- Guido von Rossom
Why is it called Python?
Why is it called Python?
Python code

```python
# Created on 1/6/2022

@author: Susan H. Rodger

if __name__ == '__main__':
    print("Hello CompSci 101!")
```

OUTPUT:
Python code
hello.py

```
""
Created on 1/6/2022

@author: Susan H. Rodger
""

if __name__ == '__main__':
    print("Hello CompSci 101!")
```

OUTPUT:
```
C:\Users\Susan\AppData\Local\Programs\Python\Python310\python.exe hello.py
Hello CompSci 101!
Process finished with exit code 0
```
```python
def greeting(name):
    print("Hello " + name)

if __name__ == '__main__':
    greeting("CompSci 101!")
    greeting("Beenie, Keeah and Moe")
```

**OUTPUT:**
Python Code, second program

```python
def greeting(name):
    print("Hello " + name)

if __name__ == '__main__':
    greeting("CompSci 101!")
    greeting("Beenie, Keeah and Moe")
```

OUTPUT:

```
Hello CompSci 101
Hello Beenie, Keeah and Moe
```