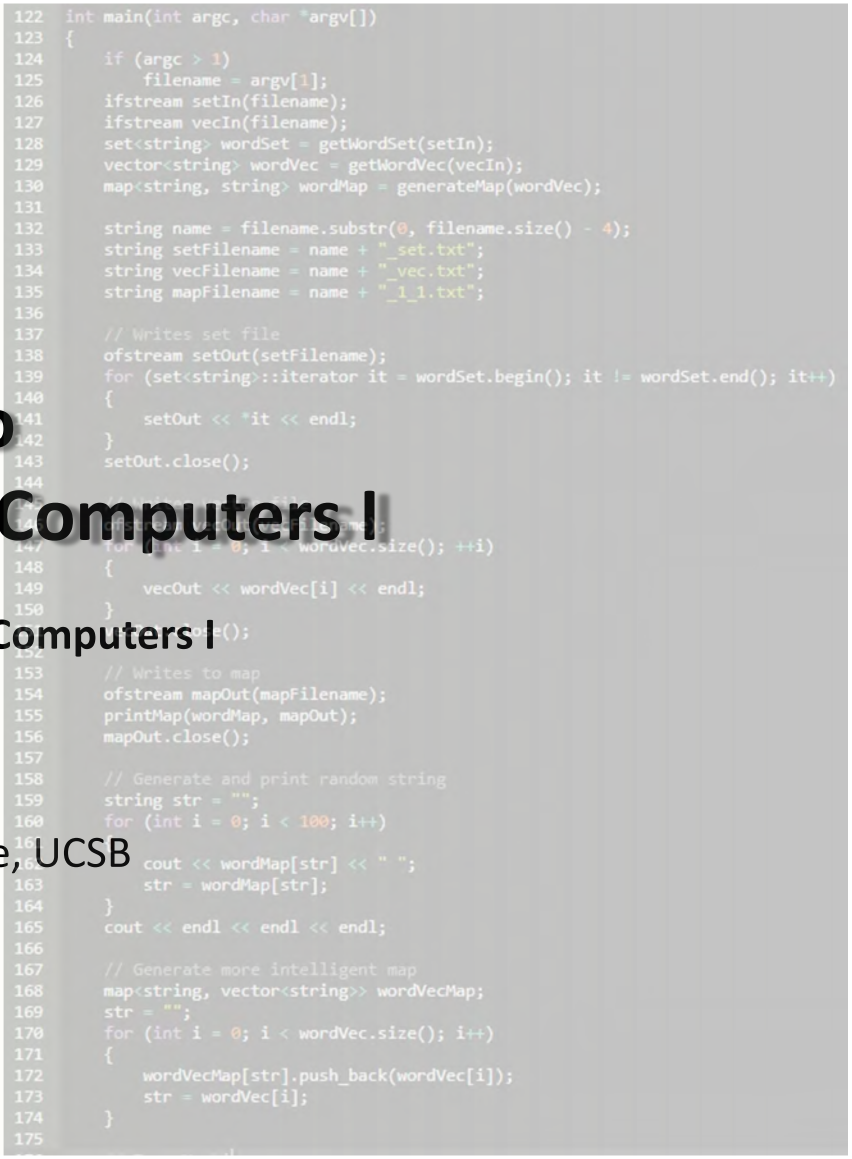
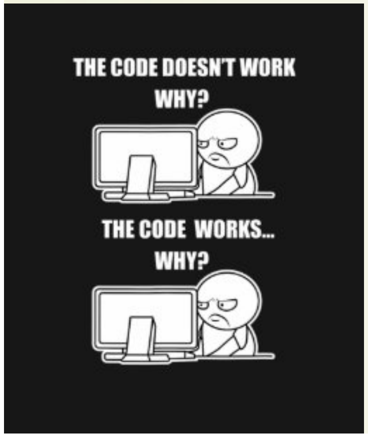
Welcome to
Solving Problems with Computers I

CS 16: Solving Problems with Computers I
Lecture #1

Ziad Matni
Dept. of Computer Science, UCSB



```
int main(int argc, char *argv[])
{
    if (argc > 1)
        filename = argv[1];
    ifstream setIn(filename);
    ifstream vecIn(filename);
    set<string> wordSet = getWordSet(setIn);
    vector<string> wordVec = getWordVec(vecIn);
    map<string, string> wordMap = generateMap(wordVec);

    string name = filename.substr(0, filename.size() - 4);
    string setFilename = name + "_set.txt";
    string vecFilename = name + "_vec.txt";
    string mapFilename = name + "_1_1.txt";

    // Writes set file
    ofstream setOut(setFilename);
    for (set<string>::iterator it = wordSet.begin(); it != wordSet.end(); it++)
    {
        setOut << *it << endl;
    }
    setOut.close();

    // Writes vec to file
    ofstream vecOut(vecFilename);
    for (int i = 0; i < wordVec.size(); ++i)
    {
        vecOut << wordVec[i] << endl;
    }
    vecOut.close();

    // Writes to map
    ofstream mapOut(mapFilename);
    printMap(wordMap, mapOut);
    mapOut.close();

    // Generate and print random string
    string str = "";
    for (int i = 0; i < 100; i++)
    {
        cout << wordMap[str] << " ";
        str = wordMap[str];
    }
    cout << endl << endl << endl;

    // Generate more intelligent map
    map<string, vector<string>> wordVecMap;
    str = "";
    for (int i = 0; i < wordVec.size(); i++)
    {
        wordVecMap[str].push_back(wordVec[i]);
        str = wordVec[i];
    }

```



Your Instructor

Your instructor: **Ziad Matni, Ph.D.**

(zee-ahd   mat-knee)

Email: ***ziad.matni@ucsb.edu***

Please put CS16 at the start of the subject header in email!!

(because I teach other classes this quarter, so it helps me…)

Your TAs!

Run labs, grading, have office hours

- Subra Shankar
- Jingxuan Cao
- Abtin Bateni
- Xinlu Zhang

Your ULAs! *Undergraduate Learning Assistants*

- Regina Weinreb

- Zechen Ma

Undergrad Students who are Peer Mentors

Help in Lectures, Labs, Run "Open Lab" Sessions

How About You?!

Zoom poll

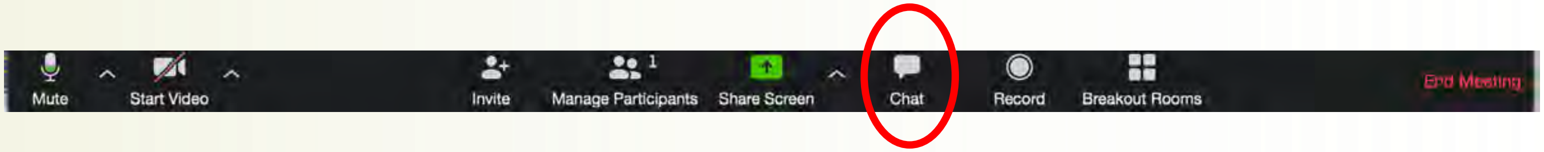
About this Zoom Meeting

- Zoom meetings for lectures default to “no video; no audio”
  - Video eats up bandwidth (slows down some connections)
  - You won’t need to use audio (you can ask questions in **chat**)

- You CAN, but you don’t have to turn those on ☺

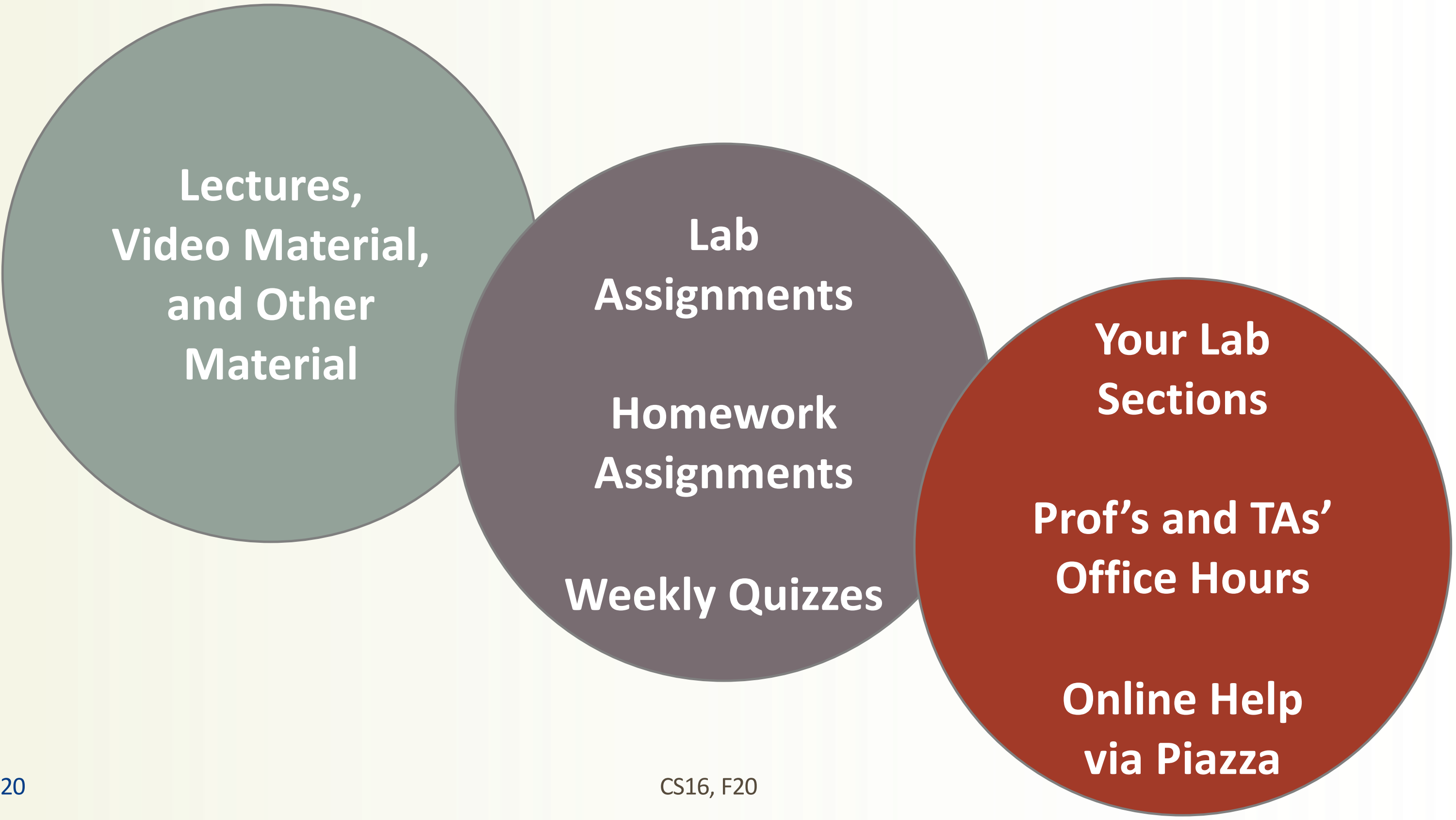
About this Zoom Meeting

- If you want to ask questions, either:
  - Type out your question in the Zoom Chat feature
  - **OR** Wait until I give an ”OK” to do so (then turn on audio)



- I will be recording our ”Live” Zoom Lectures
  - Then putting them up on GauchoSpace
  - Not office hours or labs, though

The Trifecta of Success in this Class!



Lectures,
Video Material,
and Other
Material

Lab
Assignments

Homework
Assignments

Weekly Quizzes

Your Lab
Sections

Prof’s and TAs’
Office Hours

Online Help
via Piazza

New Section Added

- Did you ALL get access to **GauchoSpace**?
- Did you ALL register on **Piazza**?
- Did you ALL register on **Gradescope**?
  - Class entry code was given in intro email (it’s **96BE5Y**)
- **Please resolve these TODAY!!!**

Format of **Lectures**

- We will get together and discuss on **Tuesdays**
  - On **Zoom** at the usual class time (**11:00 AM PDT**)
  - I will record these sessions and upload them

SYNCHRONOUS

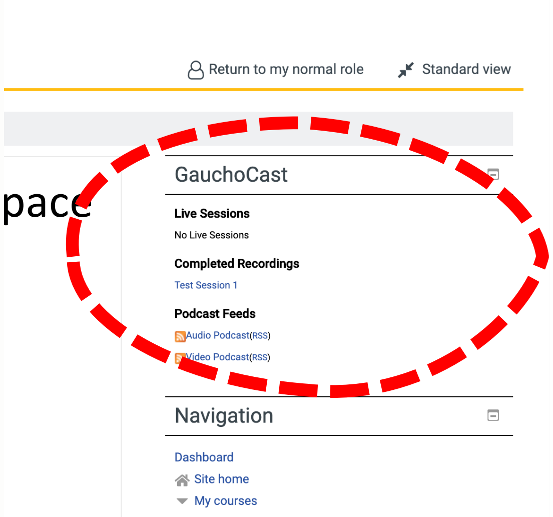
- I will put up **pre-recorded videos, lecture slides** on **Thursday**
  - On **GauchoSpace**

ASYNCHRONOUS

- We will also have **weekly** homework/labs/quizzes associated with this material
  - Put up on **GauchoSpace / Gradescope**

Format of **Lectures**

- Pre-recorded videos on **Thursdays**
  - I will have multiple 15-20 minute videos
  - Look for **GauchoCast** block in upper right-hand side of GauchoSpace



Return to my normal role

Standard view

GauchoCast

Live Sessions

No Live Sessions

Completed Recordings

Test Session 1

Podcast Feeds

Audio Podcast(RSS)

Video Podcast(RSS)

Navigation

Dashboard

Site home

My courses

- When we get together "live" on **Tuesdays**
  - Make sure you have viewed the videos **before** this
  - Make sure you have read the readings **before** this
  - **I'll do a high-level review of the material & introduce new material**
  - We'll do exercises together & you can **live chat** your Qs

Attendance & Participation

Attendance

- I expect you to attend all live lectures
- I will take attendance in class in the form of Poll Questions on Zoom
- I'll excuse no more than 2 absences, then the points start coming off…

Participation

- I will not "cold call" people during lecture
- I will ask for your participation voluntarily, of course! ☺
- The Poll Questions will count for participation
  - 100% if you get them right, 80% for simply attempting to answer!

The easiest 5% of the class grade!!

Format of **Lab Sections**

YOU HAVE A LAB NEXT WEEK!

- Lab description will be posted on GauchoSpace *(typically on Monday afternoon)*
  - Due typically 1 week later on Monday by 11:59 pm
- Labs are on **Tuesdays (1, 2, 3, 4 PM)**
  - Go to the ones you're registered for!
- T.As will use some of the time to **explain lab** and **demo some things**
- *Both T.As and ULAs will be there to help!*

ONE MORE IMPORTANT THING!!!

- You have to use the **Computer Science Instructional Lab (CSIL)** computers for your lab assignments.
  - You will log into them remotely (1st lab will have you doing this)

- Before your first lab section on Tuesday, **PLEASE visit this website and create your College of Engineering account (unless you already have one).**
  - https://accounts.engr.ucsb.edu/create

- **You CANNOT do your labs WITHOUT a CoE ACCOUNT**
- **You must ensure that your labs run on our CoE Computers at CSIL!**

Format of **Homework Assignments**

YOU HAVE HW NEXT WEEK!

- This class will have weekly homework assignments
  - Posted online via **GauchoSpace** *(typically on Tuesdays after lecture)*
  - You will turn them into **Gradescope** by the due date *(typically on Mondays)*

- Process:
  - I'll post a PDF with questions and spaces for the answers
  - You either:
    - EDIT the PDF by adding your answers ***or***
    - You print the PDF, write your answers, scan it as new PDF
  - You upload your edited PDF onto **Gradescope**

Format of **Quizzes / Exams**

YOU HAVE QUIZ 1 NEXT WEEK!

- No Midterm Exams
- This class will have weekly quizzes instead
  - Posted online via **Gradescope**
  - **Time-limited to 24 hours and timed when you start to take it**
  - Takes place every **Friday – starts at 9 am, Pacific Time** (Closes Sat @ 9 am)
  - No make ups whatsoever
  - DSP student?
    Make sure the system has your request processed *at least 1 week before* quizzes/exams (for next week's quiz, email me)
  - Quizzes are open-book, open-notes and **TIMED**

- Cumulative Final Exam will be on **Wednesday, December 16th**

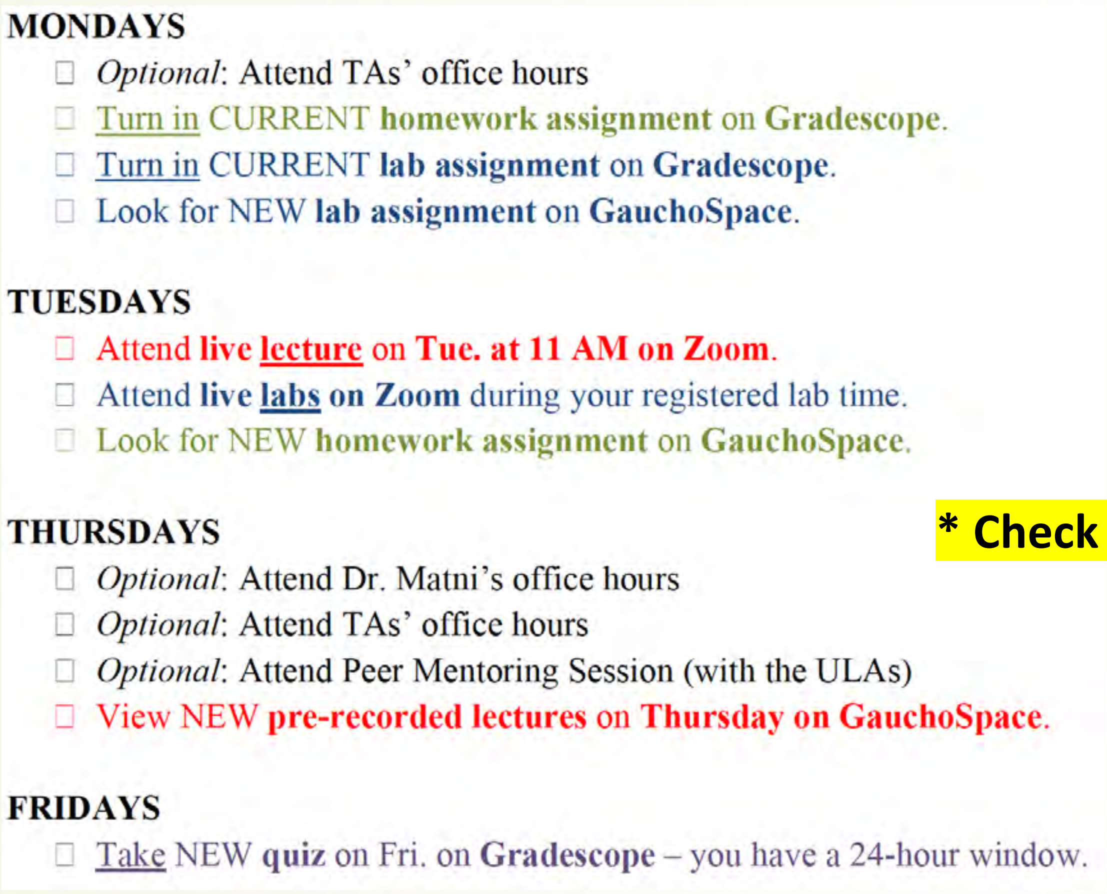
Getting Help from Us

- Prof and TA have **synchronous** Office Hours
  - Connect via **Zoom**
  - **All dates/times and links are listed on GauchoSpace**

- The ULAs have **synchronous** Peer Mentoring Sessions (“open labs”)
  - Connect via **Zoom**
  - **All dates/times and links are listed on GauchoSpace**

- We will also help **asynchronously**
  - Connect via **Piazza**
  - Email is ok too for personal questions

Summary of What You Need to Do Weekly



MONDAYS

- ☐ *Optional*: Attend TAs’ office hours
- ☐ Turn in CURRENT **homework assignment** on **Gradescope**.
- ☐ Turn in CURRENT **lab assignment** on **Gradescope**.
- ☐ Look for NEW **lab assignment** on **GauchoSpace**.

TUESDAYS

- ☐ Attend **live lecture** on **Tue. at 11 AM on Zoom**.
- ☐ Attend **live labs on Zoom** during your registered lab time.
- ☐ Look for NEW **homework assignment** on **GauchoSpace**.

THURSDAYS

- ☐ *Optional*: Attend Dr. Matni’s office hours
- ☐ *Optional*: Attend TAs’ office hours
- ☐ *Optional*: Attend Peer Mentoring Session (with the ULAs)
- ☐ View NEW **pre-recorded lectures** on **Thursday on GauchoSpace**.

FRIDAYS

- ☐ Take NEW **quiz** on Fri. on **Gradescope** – you have a 24-hour window.

*** Check Piazza every day! ☺**

This Class

- An **intermediate** (not a beginner’s) class in computer science
  - You WILL need to have taken a beginner’s class somewhere

- Covers the **basic building blocks for solving problems** using computers, in general, and using **C++ programming** specifically

- Enables you to go on to take other exciting classes in CS!!!!!!!

Why Are We Using C++ in this Course?

- ***C++ is one of the most widely used and in-demand computer programming languages***
  - For a list of commercial applications written in C++, see http://www.stroustrup.com/applications.html
- If you can learn C++, you can more easily learn (or even teach yourself) other popular P.L.s
  - Like Python, Java, etc…
- It looks great on your resume!
  - Actually, it's a must-have on any "decent" CS major's resume…

How Is This Class Taught?

- Every class has a lecture based on the readings:

  YOU MUST DO THE READINGS BEFORE CLASS!!!

- You will be in a lab on Tuesdays:

  YOU MUST READ YOUR LAB ASSIGNMENT BEFORE YOU GO TO LAB!!!

- You have to do a lot of homework and lab assignments

BECAUSE PRACTICE MAKES PERFECT!!!
(and also, it's actually fun)

Main Class Website…

…will be on **GAUCHOSPACE**

On there, I will keep:

- **Recorded Videos for Lecture Material**
- **Recorded Zoom Videos of Lecture**
- Latest syllabus (incl. schedule)
- Class and lab assignments
- Important handouts and articles

There's A LOT OF ~~actual~~ "work" to do…

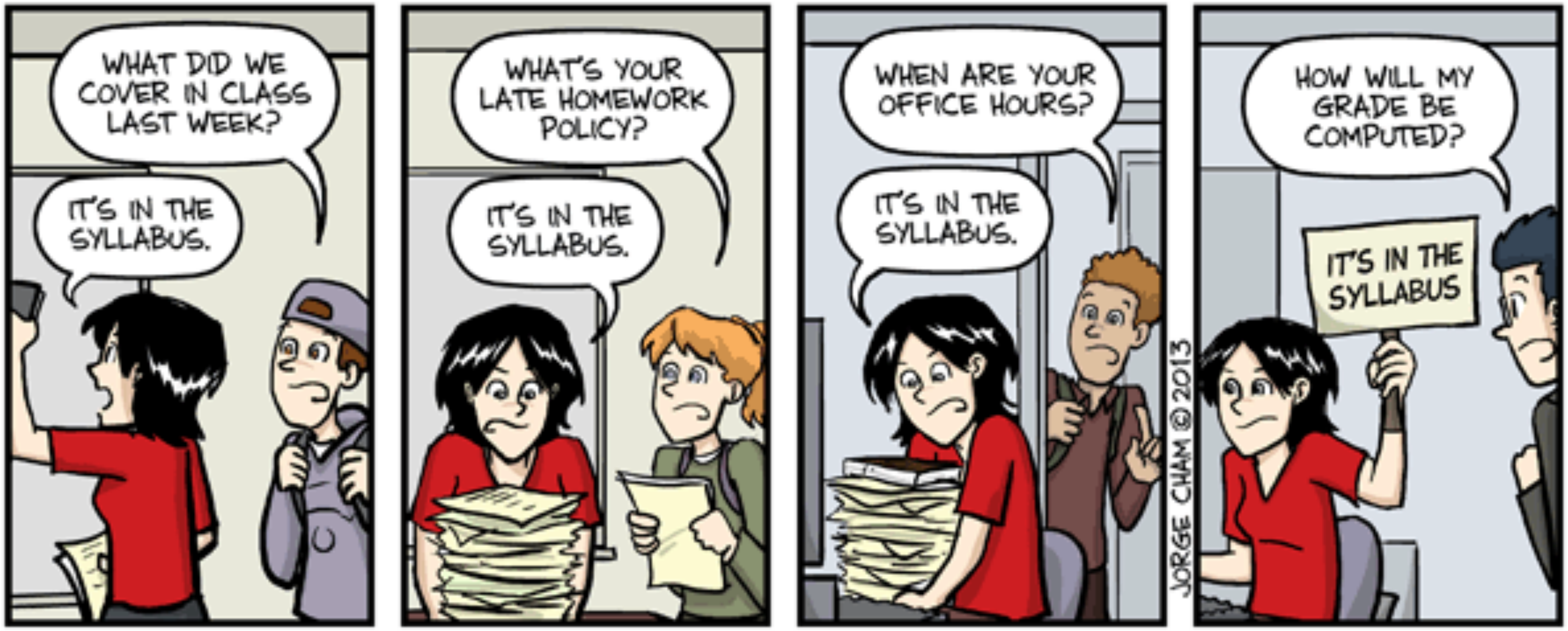
• 8-9 Homework Assignments	1x a week
• 8-9 Lab Assignments	1x a week
• 8-9 Quizzes	1x a week
• 1 Final Exam	

… and a partridge in a pear tree…

Why so much work??

Because Programming is a <u>Skill</u>…

If You Have Questions... Ask!   But First, Check...


WHAT DID WE COVER IN CLASS LAST WEEK?
IT'S IN THE SYLLABUS.
WHAT'S YOUR LATE HOMEWORK POLICY?
IT'S IN THE SYLLABUS.
WHEN ARE YOUR OFFICE HOURS?
IT'S IN THE SYLLABUS.
JORGE CHAM © 2013
HOW WILL MY GRADE BE COMPUTED?
IT'S IN THE SYLLABUS

IT'S IN THE SYLLABUS

This message brought to you by every instructor that ever lived.

WWW.PHDCOMICS.COM

So… Where is That Syllabus…??

Electronic version found on **GauchoSpace**

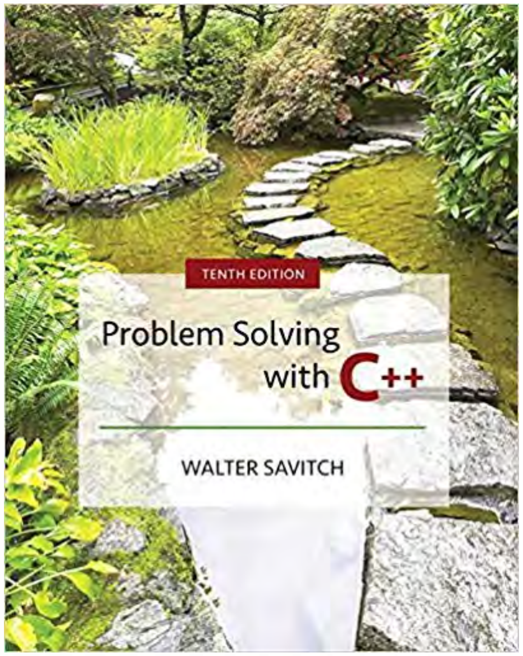
You are responsible for reading it (yes, the whole thing!)

- Instructor & T.A.s’ vital info
- Class websites’ info
- Textbook info
- Class organization info
- Grading info
- Labs & assignments
- My policies (absences, make ups, my copyrights, academic integrity)
- Class schedule
- Extra resources for students

Required Textbook

Problem Solving with C++ (10th Edition)
by Walter Savitch

(9th ed. is ok, but references may be different)

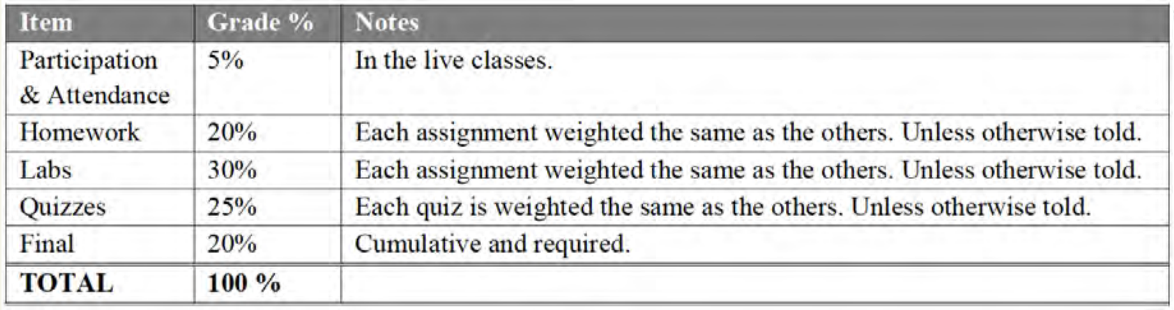


My Policies (Detailed in Syllabus)

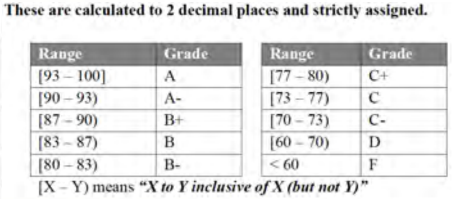
- I expect you to do your OWN work at ALL times
- **I take Cheating and Plagiarism VERY seriously**
  - What happens if you work with someone on an assignment?
  - What happens if you find a solution online somewhere?
- Using services like Chubb, etc… are **not allowed** at all
- UCSB's Academic Integrity and Honesty Policy **=** My Policy
- You are not allowed to distribute the class material (any of it) at all
  - Per UCSB policy, the Prof. is the legal copyright holder

My Policies (Detailed in Syllabus)

- Grading



Item	Grade %	Notes
Participation & Attendance	5%	In the live classes.
Homework	20%	Each assignment weighted the same as the others. Unless otherwise told.
Labs	30%	Each assignment weighted the same as the others. Unless otherwise told.
Quizzes	25%	Each quiz is weighted the same as the others. Unless otherwise told.
Final	20%	Cumulative and required.
TOTAL	**100 %**	



These are calculated to 2 decimal places and strictly assigned.

Range	Grade	Range	Grade
[93 – 100]	A	[77 – 80)	C+
[90 – 93)	A-	[73 – 77)	C
[87 – 90)	B+	[70 – 73)	C-
[83 – 87)	B	[60 – 70)	D
[80 – 83)	B-	< 60	F

[X – Y) means ***"X to Y inclusive of X (but not Y)"***

- Late Policy
  - Assignments turned in after due time, within 24 hrs: Lose 20%
  - **No late assignments accepted after 24 hrs: zero grade**

- Make-up Policy
  - No make-up *at all*

Class Schedule

- We’ll be covering a lot of basic / intermediate concepts in C++
  - See schedule in syllabus
- Week 8 is off for Thanksgiving
  - No lectures planned for that week
  - May have assignment(s) to turn in during this time
- Class schedule and topics are subject to change
  - I will communicate those to you, if they occur, on time
- Schedule for Final Exam is **fixed**

Your Questions

I will now answer your questions! ☺

Should I Buy/Download a C++ Programming Environment/Suite??

- There are a few GUI-based IDEs out there for C++
  - You are NOT REQUIRED to get them for this class!!!!! (so, no)
- Regardless, you **ARE REQUIRED** to become proficient on UCSB's UNIX/Linux **CSIL** machines' C++ compiler and environment
  - "g++" and "makefile", etc…
- *Real programmers use command-lines…!* ☺

What do YOU Have to do **THIS** Week?

- Make sure you:
  - Are registered on Gradescope and on Piazza
  - Have access to GauchoSpace
  - Have the textbook or have access to it
  - Have a CoE account so that you can use the CSIL machines

- Relax and Avoid The Corona
  - Aaaaand don’t watch the news… ☹

What do YOU Have to do **NEXT** Week?

- On Monday, look for the new lab description
- On Tuesday, ATTEND LECTURE
- On Tuesday, also, look for the new homework
- On Thursday, look for the pre-recorded videos
- On Friday, take the quiz

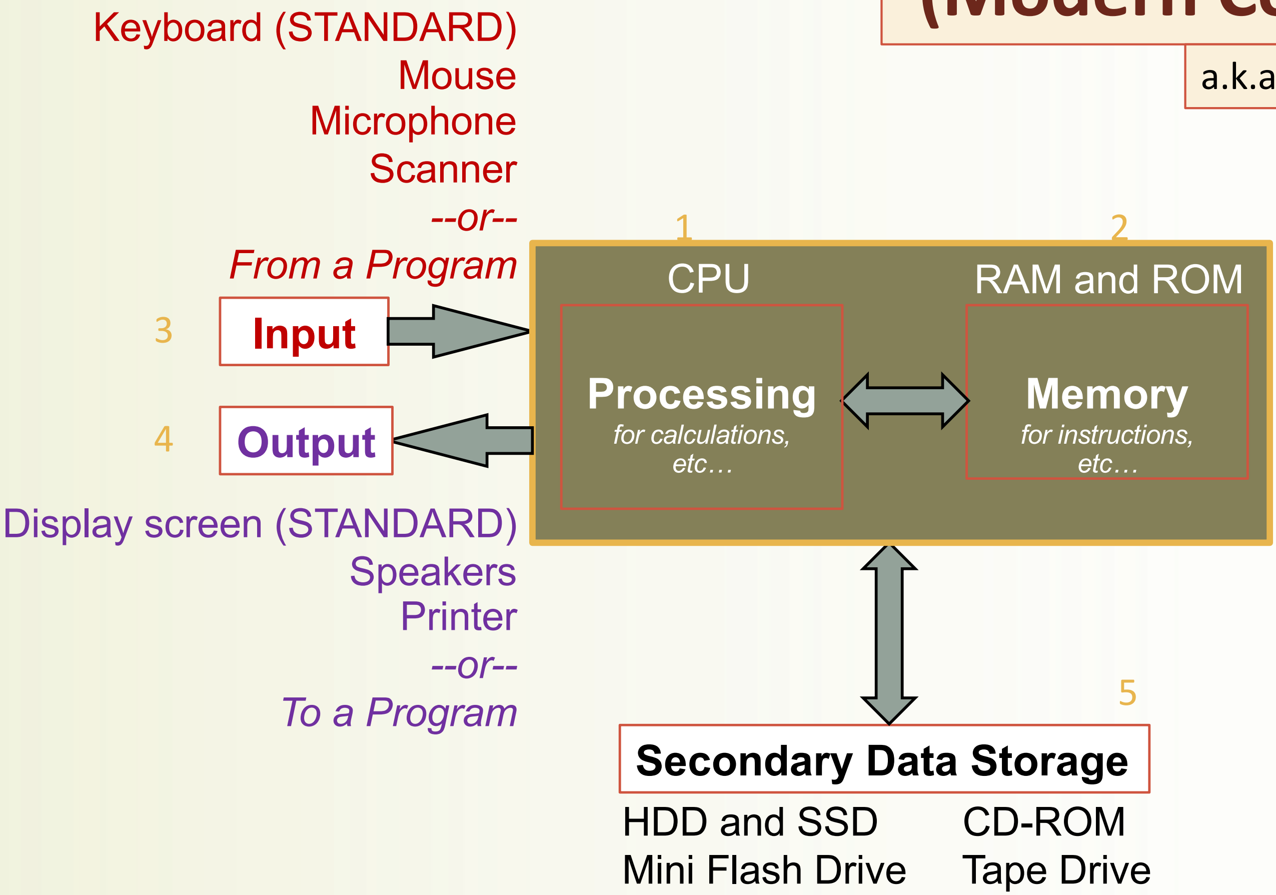
A Refresher on Computers

Computer Systems

- **Hardware**
  - The physical
    - CPU and Memory ICs
    - Printed circuit boards
    - Plastic housing, cables, etc…
- **Software**
  - The instructions and the data
    - Programs and applications
    - Operating systems

A Map of Computer Components (Modern Computer Architecture)

a.k.a. von Neumann Architecture



Keyboard (STANDARD)
Mouse
Microphone
Scanner
--or--
From a Program

3 **Input**

4 **Output**

Display screen (STANDARD)
Speakers
Printer
--or--
To a Program

1 CPU

Processing
for calculations, etc…

2 RAM and ROM

Memory
for instructions, etc…

5 **Secondary Data Storage**

HDD and SSD
Mini Flash Drive
CD-ROM
Tape Drive

CPU = Central Processing Unit
RAM = Random-Access Memory
ROM = Read-Only Memory
HDD = Hard Disk Drive
SSD = Solid State Drive
OS = Operating System

5 Main Components to Computers

1. Processor
2. Main memory
   - Usually inside the computer, volatile
3. Inputs
4. Outputs
5. Secondary memory
   - More permanent (non-volatile) memory for mass storage of data

Computer Memory

- Usually organized in two parts:
  - Address
    - ***Where*** can I find my data?
  - Data (payload)
    - ***What*** is my data?

- The smallest representation of the data
  - A binary *bit* (“0”s and “1”s)
  - A common collection of bits is a byte (8 bits = 1 byte)
  - **What information can one store in 1 byte?**

    A number? A letter? A program? A book? A picture? A movie?

Scales of a Byte…

1B	*(byte)*
1 kB	*(kilobyte)*
1 MB	*(megabyte)*
1 GB	*(gigabyte)*
1 TB	*(terabyte)*
???	

What is the Most Basic Form of Computer Language?

- Binary *a.k.a* Base-2

- Expressing data AND instructions in either “1” or “0”
  - So,

    “01010101 01000011 01010011 01000010 00100001 00100001”

    could mean an *instruction* to “calculate 2 + 3”

    Or it could mean a *number* (856,783,663,333)

    Or it could mean a *string of 6 characters* (“UCSB!!”)

Computer Software

- All the data
- All the programs
- All the applications
- The operating system(s)

Algorithm vs. Program

Complete this:

"Computer Science is about studying how to
use ___________ to solve problems"

- **Algorithms**
  - Sequences of precise instructions that leads to a solution
- **Programs**
  - Algorithms expressed in a language the computer can understand

</LECTURE>