COMP1511 PROGRAMMING FUNDAMENTALS

LECTURE 1

```
printf("Hello World! Welcome to the best
course of your degree :P!\n");
```

IN THIS LECTURE

TODAY....

- Welcome and Introductions
- Course Administration
- How COMP1511 works
- How to get help and the best ways to approach learning Programming
- What is programming?
- What is Linux and working in Linux
- A first look at C

WHO AM I?

DR SASHA VASSAR

Lecturer in Charge/Course Convenor

Loves dogs, teaching, solving complex problems and having a good yarn...

DR HENRY HICKMAN

Lecturer - disruptor of the queen squad and lecturer first two weeks

Moonlights as a comedian - try and heckle him...

THE ADMIN TEAM/QUEEN SQUAD

HOLLY FIELDS

Admin Extraordinaire

Volleyball queen, took 3 years doing a CS degree before investing in a monitor and a keyboard, probably has to have glasses now

GRACE MURRAY

Admin Extraordinaire

Language queen, tech wizard. Most importantly represented the country for Beach Handball (yes that is a thing)

SOFIA DE BELLIS

Admin Extraordinaire

Loves random ideas from me that have to be implemented, was living her best summer (ask her about the Australian Open!)

THE LECTURE MODS

LIAM PHILLIPS

Camera, Mics, Tech Issues

Master camera man, apparently he skateboards

SOPHIE MOESKOPS

Moderator Extraordinaire

We got another Swiftie in the house (not me, but Sofia is a tragic)

ISABELLA BYWATER

Moderator Extraordinaire

Better at naming country flags than Grace - we shall test her later in the term. Can rubiks cube!

THE WONDERFUL TUTORING TEAM

https://cgi.cse.unsw.edu.au/~cs1511/26T1/team/

COURSE WEBPAGE

All course information can be found HERE (not Moodle!)

https://cgi.cse.unsw.edu.au/~cs1511/26T1/

COMMUNICATION

ADMIN RELATED

ADMIN RELATED ISSUES:

Email the course email for all admin related enquiries: cs1511@unsw.edu.au

FOR ANY ENROLMENT ISSUES:

UNSW Nucleus Student Hub
https://nucleus.unsw.edu.au/en/contact-us

ELP PLANS

Please make sure that your plans are in place for the term
https://www.student.unsw.edu.au/equitable-learning

COMMUNICATION

COURSE CONTENT RELATED

FORUM

Post all your questions here and feel free to answer other's questions

http://discourse02.cse.unsw.edu.au/26T1/COMP1511

ASK QUESTIONS IN TUT/LABS

HELP SESSIONS

Schedule will be announced shortly

Good place to get one-on-one help outside of normal lab/tutorial times

SO WHAT IS COMP1511?

- It is your intro to programming
- This is where the journey starts :)

- Computers can only follow instructions that we give them to solve problems
- Writing a program is providing the computer with a set of instructions
- Problem solving is a very important skill, can only be built up with practice!

COURSE FORMAT

- We assume no prior knowledge & zero previous programming experience
- We teach you the fundamentals of programming, how to approach and solve problems, and how to talk to computers in a common language

LECTURES

TWO HOUR SESSION TWICE A WEEK

- On Monday we are live and in person, on Tuesday we are chillin'online
  - Monday 11am-1pm (AEDT) J17 G03 and streamed online via YouTube Live
  - Tuesday 2pm-4pm (AEDT) Online only via YouTube Live
- Recordings will be available
- Week 6 is Flex Week, so no formal lectures!
- If you have a question, feel free to ask in live chat
- Please be respectful of others at all times - everyone is here to learn.
- Week 1 and 2 you will have the lovely Henry lecturing

LECTURE CONTENT

- Theory - What are we trying to understand?
- Demonstrations - Some live coding to show you how some things work
- Problem Solving - How do we decide what to code?
- Other stuff - Outside of programming, what's important?
- Lecture slides (and other materials) are available from the Course Website https://cgi.cse.unsw.edu.au/~cs1511/26T1/
- Lecture recordings will be in the YouTube playlist and linked via the Course Website

TUTORIALS

ONE HOUR CLASSROOM ENVIRONMENT

- Go further in-depth into the topics we're teaching
- Actual practical working of tasks and problems we've given you
- Learning how to solve problems before you write the code!
- Tutorial Questions will be available in advance of the tutorials on the course website:
  https://cgi.cse.unsw.edu.au/~cs1511/26T1/

TUTORIALS

ONE HOUR CLASSROOM ENVIRONMENT

”Tutorials are a good place for interactive learning. You’ll have time to discuss and work through problems there.”

- Online and face-to-face: please check your timetable for your enrolment details
  - For online classes, use Teams
  - Please turn on your cameras if you can
  - We love seeing pets make an appearance (if it were up to me, I would like them to be in person too)
- Sample answers released after the last tutorial for the week

LABS

TWO HOUR SESSION COMES DIRECTLY AFTER TUTORIAL

- Practical coding including working in small groups
- Time to have one-on-one conversations with your tutors
- Problem sets will be marked automatically and count towards your final marks (15% total over the term)
- There are challenge exercises for earning bonus marks (not necessary and some are hard enough that they'll eat up a lot of time)
- Tutorials and Labs do NOT run in Week 6

LABS

TWO HOUR SESSION COMES DIRECTLY AFTER TUTORIAL

- You will have one problem that will be available in class only - this problem must be completed during class time and shown to your lab assistant for the rest of your lab assignments to count towards marks

ASSIGNMENTS

LARGER SCALE PROJECTS

”Start the assignments early, so that you have time to chip away and get help as needed.”

- Individual work
- These will take you a few weeks and will test how well you can apply the theory you've learnt
- There are two Assignments due:
  - Assignment 1 - 20% (Monday 5pm Week 7)
  - Assignment 2 - 25% (Friday 5pm Week 10)
- Late penalties of 5% per day late apply off the ceiling (maximum lateness is five days, after which time it is zero marks)

HELP SESSIONS

OPTIONAL SESSIONS SCHEDULED DURING THE WEEK

”A great place to ask questions and get help to fill any gaps.”

- Held both in-person and some online, using Teams
- Face-to-face help sessions will have lab spaces allocated
- Some one-on-one consultation with tutors
- Time for you to ask individual questions or get help with specific problems
- Schedule will be up on the Course Website soon
- These are particularly busy around Assignment deadlines

FINAL EXAM

INVIGILATED IN-PERSON

- INVIGILATED, IN-PERSON LAB EXAM
- 3 hours total
- You'll be given a series of problems to solve in C
- You will also be expected to read some C and show you understand it
- There will also be some questions covering programming ideas

Exam Hurdles

- Parts of the exam are competency hurdles
- These questions must be answered correctly to pass the course

TOTAL ASSESSMENT

Labs = 15%

Assignment 1 = 20%

Assignment 2 = 25%

Final Exam = 40%

To pass the course you must:

- Score at least 50/100 overall
- Solve problems using arrays in the final exam
- Solve problems using linked lists in the final exam

SPECIAL CONSIDERATION

Special Consideration:

- Support for any issues that make it difficult for you to study
- https://student.unsw.edu.au/special-consideration
- You can apply now if you have existing reasons (or later if something comes up)

EQUITABLE LEARNING PLANS

Please make sure to have your ELP plans sorted, so we can support you in the best possible way this term.

For more info, please visit:
https://www.student.unsw.edu.au/equitable-learning

SUPPLEMENTARY ASSESSMENT

A Supplementary exam can be offered to students granted Special Consideration for the exam

- Fit-to-Sit rule
- Identical in format to the main exam
- Held sometime in May (will update this as soon as dates are released, so you must make yourself available if you have been granted a supplementary exam)

CODE OF CONDUCT

This course and this University allows all students to learn, regardless of background or situation
Remember the one rule . . . you will not hinder anyone else's learning!

Anything connected to COMP1511, including social media, will follow respectful behaviour

- No discrimination of any kind
- No inappropriate behaviour
    - No harassment, bullying, aggression or sexual harassment
- Full respect for the privacy of others

PLAGIARISM

”If you don’t spend the time to learn and practice the content, the only person who loses is you.”

- Plagiarism is the presentation of someone else’s work or ideas as if they were your own.
- Any kind of cheating on your work for this course will incur penalties (see the course outline for details)
- Collaboration on individual assessments like Assignments is considered plagiarism

COLLABORATION VS PLAGIARISM

”Discussion of work and algorithms is fine (and encouraged).”

- The internet has a lot of resources you should learn to use, just make sure you credit your sources
- No collaboration at all on individual assignments
- Your submissions are entirely your own work
- Don't use other people's code
- Don't ask someone else to solve problems for you (even verbally)
- Don't provide your code to other people
- Don't form an overreliane on AI - before you even understand what the code does! Remember no AI in your final exam...

COLLABORATION VS PLAGIARISM

- At best, you'll lose the marks for the particular assignment
- At worst, you'll be asked to leave UNSW
- And even worse . . . you won't learn what you paid all this money and time to learn

USE OF AI

Leaning on AI in an introductory course is a bit like using a scooter to train for a marathon (gets you to the finish line, but your muscles don’t get any stronger!)

Here are a few reasons why we recommend keeping the AI tucked away for now:

- Your exams are invigilated and conducted without external aids. If you rely on a chatbot to structure your logic during the semester, you'll find yourself unable to code without that crutch!

USE OF AI

- Intro courses are about developing how you think and approach problems. Using AI creates a learning offset where you might understand the output but skip the critical struggle of debugging and syntax mastery.
- Programming is cumulative (hours and hours and hours - sorry!). Missing out on the ”why” behind basic loops and logic now will make more advanced concepts in later years feel twice as difficult.

IF YOU WANT MORE INFO . . .

- Course webpage
- Course forum
- Recorded Lectures (replay YouTube Streams or via Moodle)
- One on One
  - Ask your tutor during lab sessions
  - Help Sessions
- Serious Issues
  - Email: cs1511@unsw.edu.au
  - The Nucleus: nucleus.unsw.edu.au
  - CSE Help Desk: https://www.unsw.edu.au/engineering/our-schools/computer-science-and-engineering/student-life/cse-it-helpdesk

Student Support | I Need Help With...

My Feelings and Mental Health
Managing Low Mood, Unusual Feelings & Depression

Mental Health Connect — student.unsw.edu.au/**counselling** — Telehealth

Mind HUB — student.unsw.edu.au/**mind-hub** — Online Self-Help Resources

In Australia Call Afterhours
UNSW Mental Health Support Line — 1300 787 026 — 5pm-9am

Outside Australia Afterhours
24-hour Medibank Hotline — +61 (2) 8905 0307

Uni and Life Pressures
Stress, Financial, Visas, Accommodation & More

Student Support — student.unsw.edu.au/**advisors**
Indigenous Student Support — nura-gili-centre-indigenous-programs

Reporting Sexual Assault/Harassment

Equity Diversity and Inclusion (EDI) — edi.unsw.edu.au/**sexual-misconduct**

Educational Adjustments
To Manage my Studies and Disability / Health Condition

Equitable Learning Services (ELS) — student.unsw.edu.au/**els**

Academic and Study Skills

Academic Skills — student.unsw.edu.au/**skills**

Special Consideration
Because Life Impacts our Studies and Exams

Special Consideration — student.unsw.edu.au/**special-consideration**

LEARNING
IS HARD...

"Learning programming is a secondary skill (like many others!) — it is not intuitive like learning how to speak..."

Secondary skills are learnt slowly and with conscious and deliberate effort. It is not magic and it will not happen overnight, you have to keep practising and building up your knowledge base. Don't feel disheartened if you do not understand something first go - try and try again, get help, let us know if there is something that is just not making sense. Make sure to attempt all your labs questions and assignments, working through these problems will help you build an understanding of how to solve similar problems, and how to use code to solve these.

WHAT IS A COMPUTER?

A TOOL . . . A MACHINE . . . THE LOVE OF MY LIFE...

The ultimate tool in its ability to be reconfigured for different purposes.

The key elements:

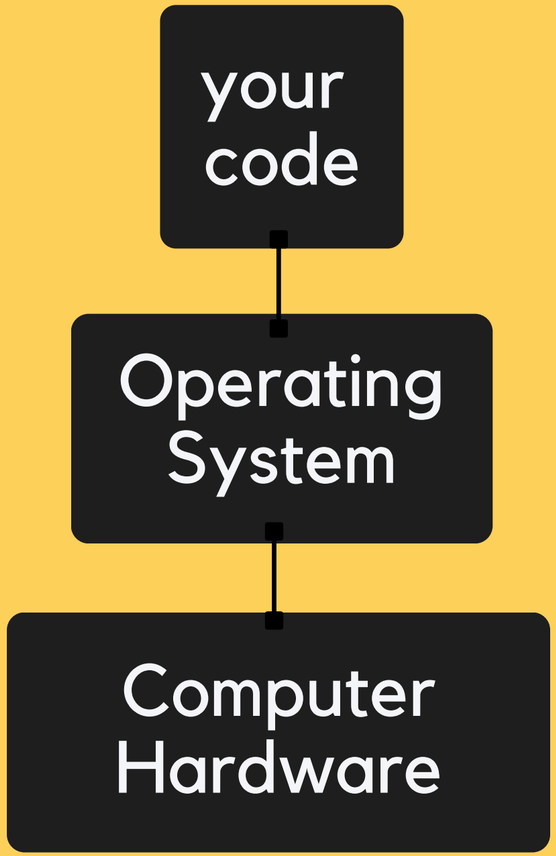
- A processor to execute commands
- Memory to store information

WHAT IS PROGRAMMING?

- Providing a computer with specific instructions to solve various problems
  - Using specific languages to write those instructions (code)

- At the core of it - problem solving!
  - You may go through many iterations before you get it right - mistakes are good!

WHAT IS AN OPERATING SYSTEM?



- An Operating System is the interface between the user and the computer hardware
- Operating Systems:
  - Execute user programs and make solving problems easier
  - Make the computer system convenient to use
- Basically, an Operating System sits between our code and the computer, providing essential services

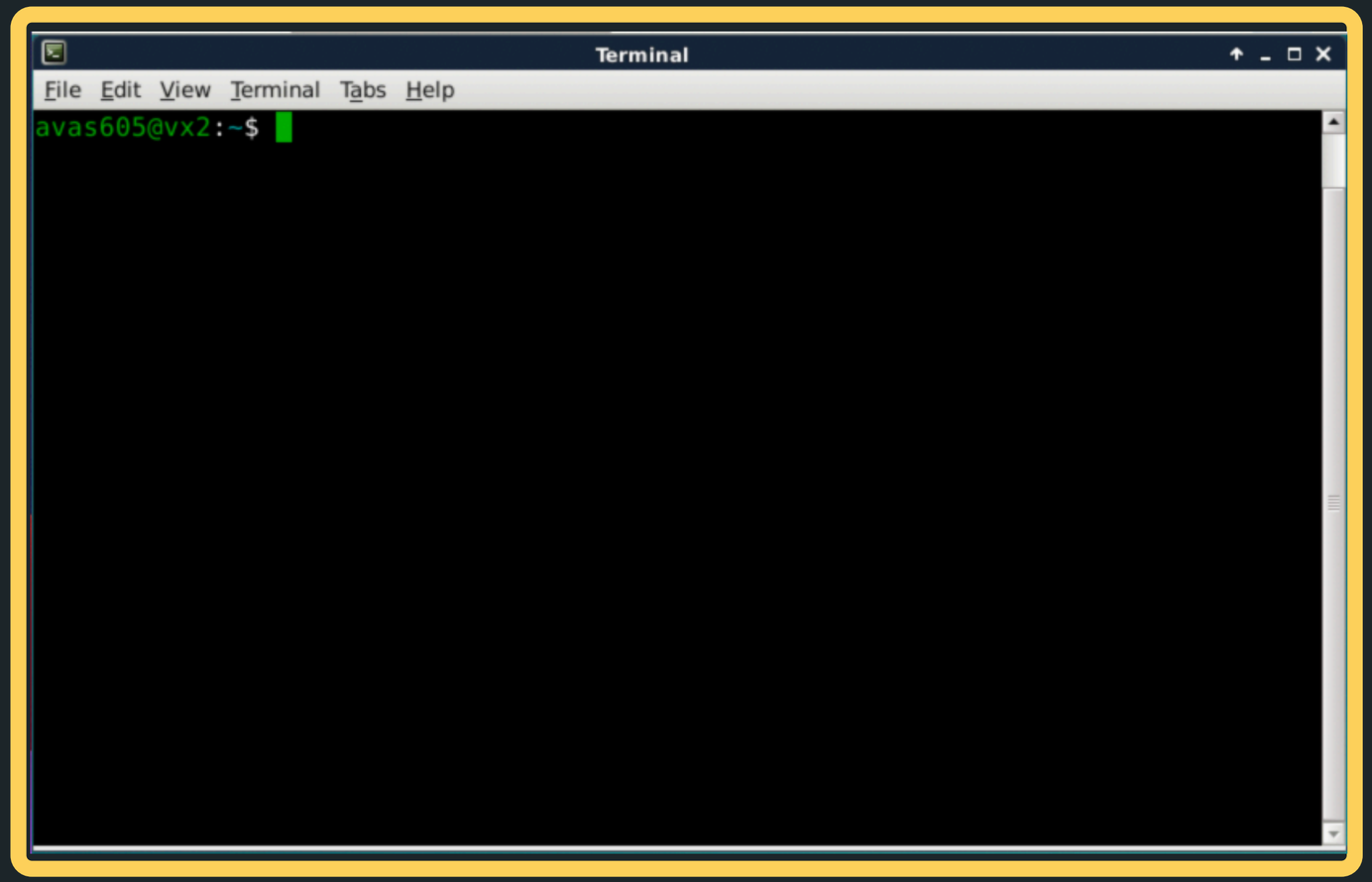
WHAT IS LINUX?

- Linux is a Unix-based operating system:
  - Open source
  - More reliable
  - Lightweight
  - Faster, and
  - More secure

TERMINAL

A GRAPHICAL APPLICATION THAT READS/DISPLAYS INFORMATION

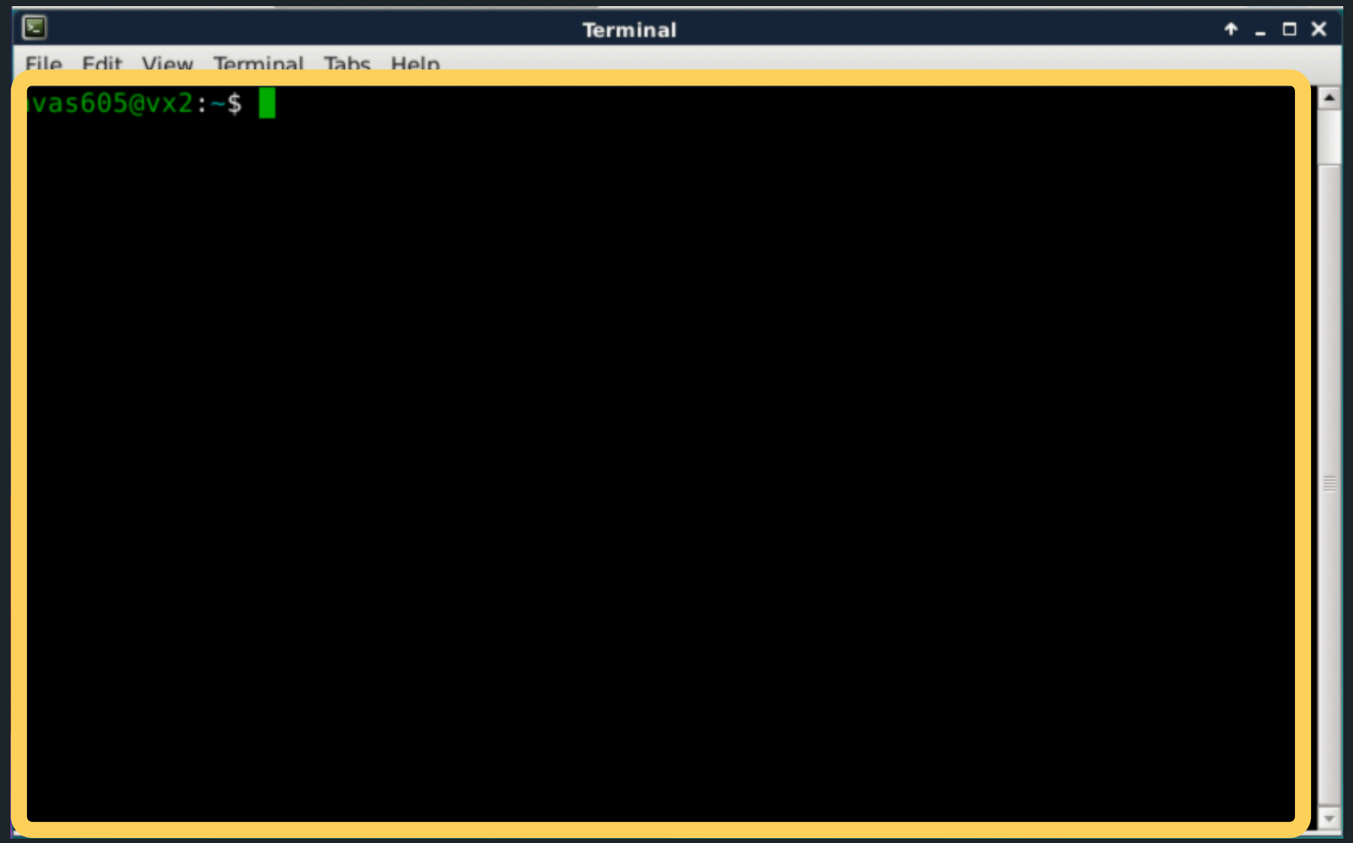
- Terminal (command line driven) allow us to send simple text commands to our shell. It handles things like user input, displaying shell output.



SHELL

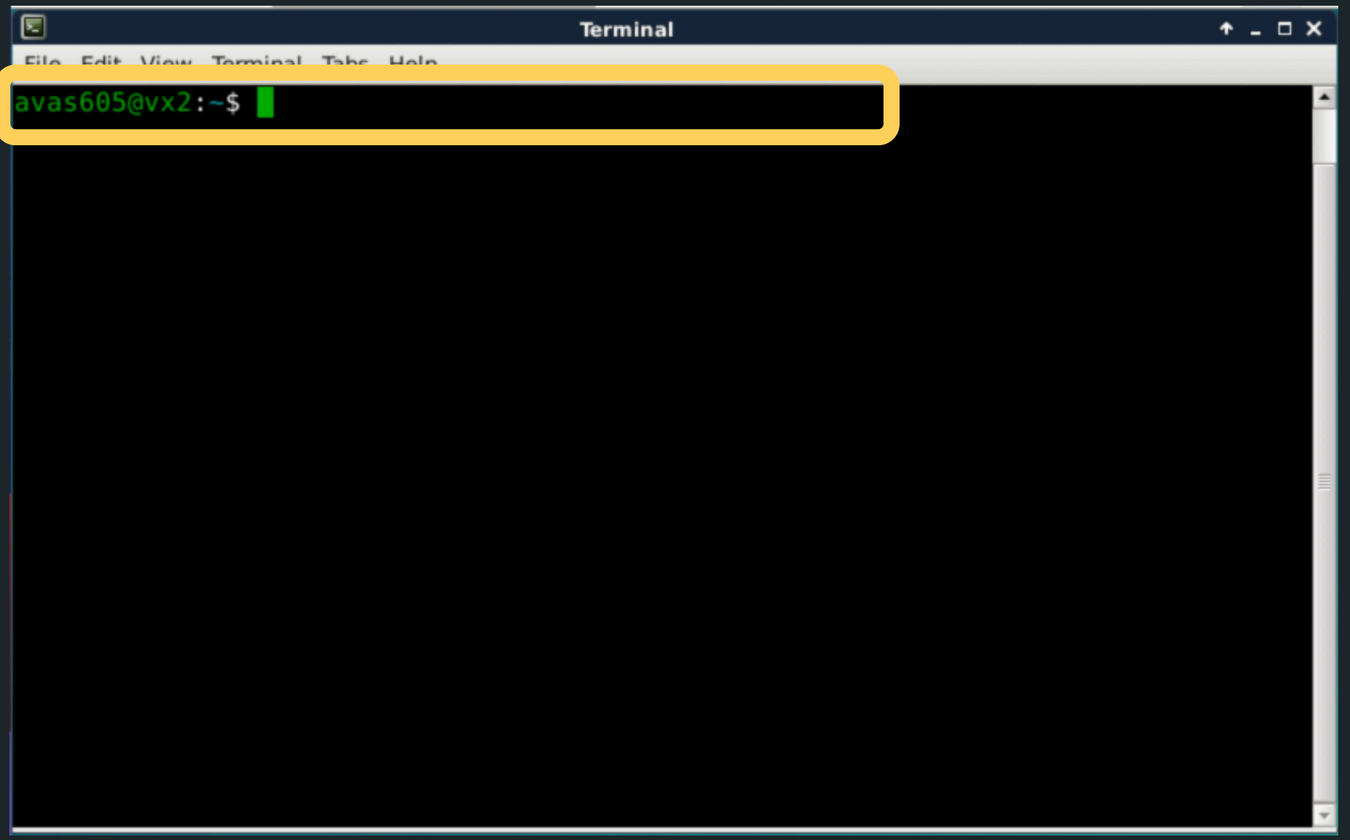
PRIMARY INTERFACE WITH THE COMPUTER

- The shell, (bash, zsh) is a program that executes commands, and has its own syntax. It returns output which the terminal can display, or can launch other applications



PROMPT

- The prompt is controlled by the shell, and is the line of text which displays some information



SOME IMPORTANT TERMINAL COMMANDS

- Lists all the files in the current directory:

```
ls
```

- Makes a new directory called directoryName:

```
mkdir directoryName
```

- Changes the current directory to directoryName:

```
cd directoryName
```

- Moves up one level of directories (one folder level):

```
cd ..
```

- Tells you where you are in the directory structure at the moment:

```
pwd
```

COMMAND LINE AND FILE OPERATIONS

File operations on the command line

- Copy a file from the source to the destination

```
cp source destination
```

- Move a file from the source to the destination (can also be used to rename)

```
mv source destination
```

- Remove a file (delete)

```
rm filename
```

The -r tag can be added to cp or rm commands to recursively go through a directory and perform the command on all the files

```
cp -r COMP1511 COMP1511_backup
```

(will copy all files from my COMP1511 directory to my COMP1511_backup directory)

USING CSE'S COMPUTING RESOURCES

Our labs are running Linux with the basic tools necessary to get started

You will definitely want to get your own computer ready to code with:

- VLAB allows you to remotely use CSE's resources - instructions on setting this up available in the first laboratory
- There are other more advanced options that we can help you with also - check the Home Computing site or the guides on our course website

WHAT THE BASICS LOOK LIKE

For COMP1511 we need:

- A development environment (we will use a minimal version of VSCode)
  - Run `1511 setup` to get everything ready (you will do this in your first Lab)
- A compiler (we use dcc)
  - A translator that takes our formal human readable C and turns it into the actual machine readable program
  - The result of the compiler is a program we can ”run”
- You can use VLAB to access CSE’s editor and compiler

PROGRAMMING IN C

PROGRAMMING IS LIKE TALKING TO YOUR COMPUTER

- We need a shared language to be able to have this conversation
- Well be looking at one particular language, C and learning how to write it. C is:
  - A clear language with defined rules so that nothing we write in it is ambiguous
  - Many modern programming languages are based on C
  - A good starting point for learning how to control a computer from its roots

LET'S C SOME C

SORRY CAN'T HELP MYSELF!

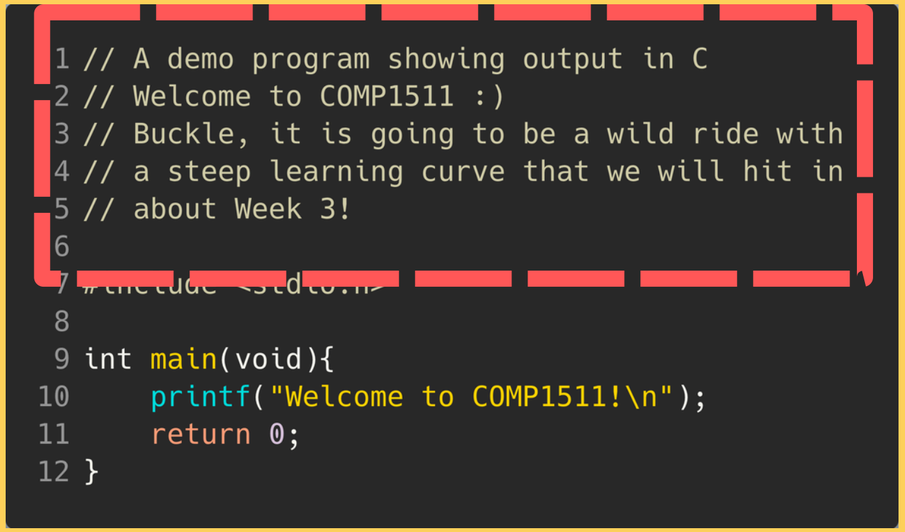
```c
// A demo program showing output in C
// Welcome to COMP1511 :)
// Buckle, it is going to be a wild ride with
// a steep learning curve that we will hit in
// about Week 3!

#include <stdio.h>

int main(void){
    printf("Welcome to COMP1511!\n");
    return 0;
}
```

BREAKING IT DOWN INTO PARTS

HEADER (LINES 1-5)



```
1 // A demo program showing output in C
2 // Welcome to COMP1511 :)
3 // Buckle, it is going to be a wild ride with
4 // a steep learning curve that we will hit in
5 // about Week 3!
6
7 #include <stdio.h>
8
9 int main(void){
10     printf("Welcome to COMP1511!\n");
11     return 0;
12 }
```

- Words for humans
- Half our code is for the machine, the other half is for humans! (roughly)
- We put “comments” in to describe to our future selves or our colleagues what we intended for this code
- // in front of a line makes it a comment
- If we use /* and */ everything between them will be comments
- The compiler will ignore comments, so they don't have to be proper code

BREAKING IT DOWN INTO PARTS

#INCLUDE IS A SPECIAL TAG FOR OUR COMPILER (LINE 7)

```
1 // A demo program showing output in C
2 // Welcome to COMP1511 :)
3 // Buckle, it is going to be a wild ride with
4 // a steep learning curve that we will hit in
5 // about Week 3!
6
7 #include <stdio.h>
8
9 int main(void){
10     printf("Welcome to COMP1511!\n");
11     return 0;
12 }
```

- It asks the compiler to grab another file of code and add it to ours
- In this case, it's the Standard Input Output Library, allowing us to make text appear on the screen (as well as other things)
- Almost every C program you will write in this course will have this line

BREAKING IT DOWN INTO PARTS

THE "MAIN" FUNCTION (LINES 9-12)

```
1 // A demo program showing output in C
2 // Welcome to COMP1511 :)
3 // Buckle, it is going to be a wild ride with
4 // a steep learning curve that we will hit in
5 // about Week 3!
6
7 #include <stdio.h>
8
9 int main(void){
10     printf("Welcome to COMP1511!\n");
11     return 0;
12 }
```

- A function is a block of code that is a set of instructions that returns something
- Our computer will run this code line by line, executing our instructions
- The first line has details that we'll cover in later lectures
    - int is the output (return) type - this stands for integer, which is a whole number
    - main is the name of the function
    - (void) means that this function doesn't take any input

BREAKING IT DOWN INTO PARTS

THE "MAIN" FUNCTION

```c
// A demo program showing output in C
// Welcome to COMP1511 :)
// Buckle, it is going to be a wild ride with
// a steep learning curve that we will hit in
// about Week 3!

#include <stdio.h>

int main(void){
    printf("Welcome to COMP1511!\n");
    return 0;
}
```

- Between the { and } are a set of program instructions

  {}

- printf() makes text appear on the screen. It is actually another function from stdio.h which we included.

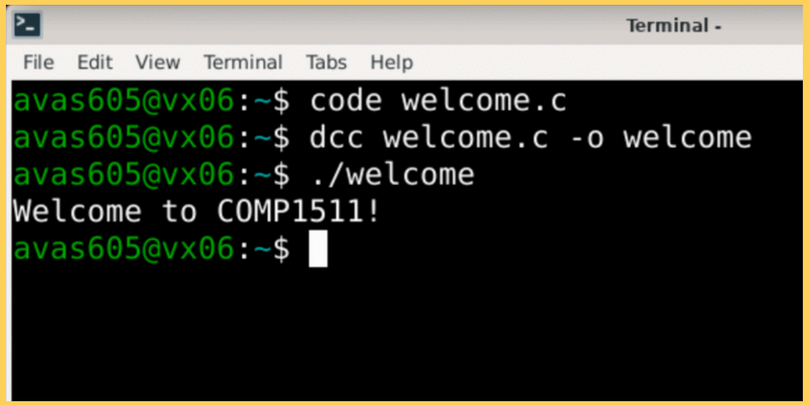
  printf("Hey!\n");

- return is a C keyword that says we are now delivering the output of the function. A main that returns 0 is signifying a correct outcome of the program

  return 0;

EDITING AND COMPILATION

LET'S TRY THIS IN OUR EDITOR AND COMPILE IT



- In the linux terminal we will open the file to edit

  `code hey.c`

- Once we're happy with the code we've written, we'll compile it

  `dcc hey.c -o hey`

  - The -o part tells our compiler to write out a file called "hello" that we can then run

- The ./ lets us run the program "hello" that is in our current directory

`./hey`

AND WE ARE OFF!

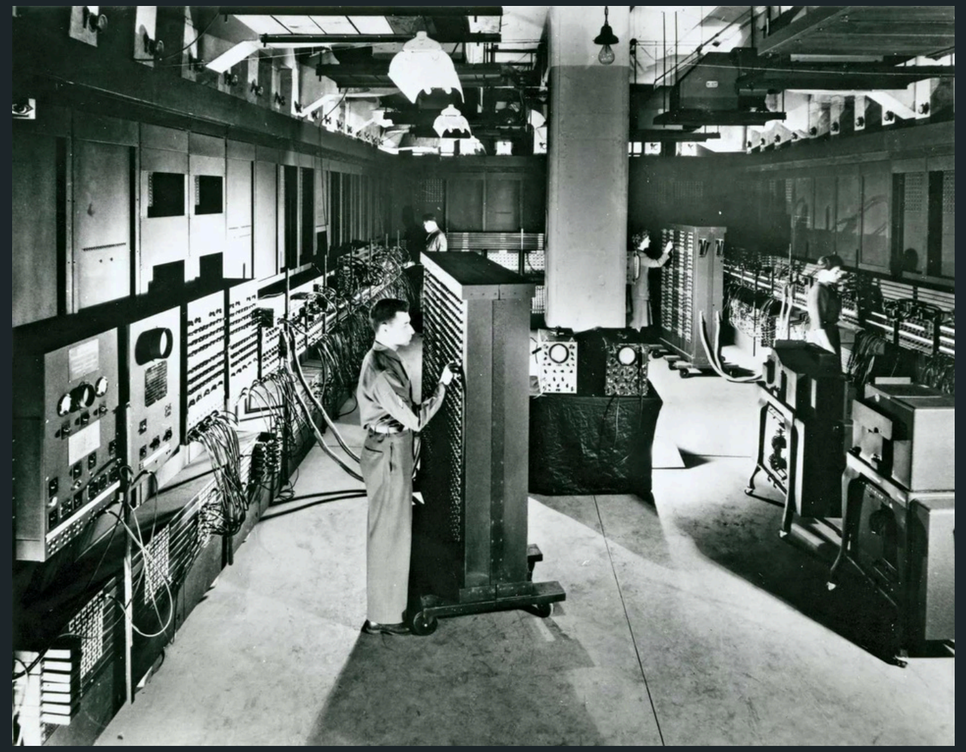
WE NOW HAVE OUR FIRST WORKING PROGRAM...

- Try this yourself!
- Try it using VLAB via your own computer
- Try setting up a programming environment on your own computer (differing levels of difficulty depending on your operating system)

SOME INTERESTING FACTS/TRIVIA

Did you know that the first computer in the world, ENIAC, weighed more than 27 tonnes and covered an area of about 1800 square feet?

Designing the correct configuration for each new problem, and then connecting the wires and setting the switches, took many days.



https://www.computerhistory.org/revolution/birth-of-the-computer/4/78

WHAT DID WE LEARN TODAY?

ADMIN

How COMP1511 is run

RESOURCES

Where to find resources (course webpage and forum)

HELP!

How to get help and best ways to approach learning programming

WHAT IS ...?

What is programming?
What is an Operatirng System?
What is Linux?

LINUX

Some basic Linux commands to get you started

C

Hello World!\n

REACH OUT

CONTENT RELATED QUESTIONS

Check out the forum

ADMIN QUESTIONS

cs1511@unsw.edu.au