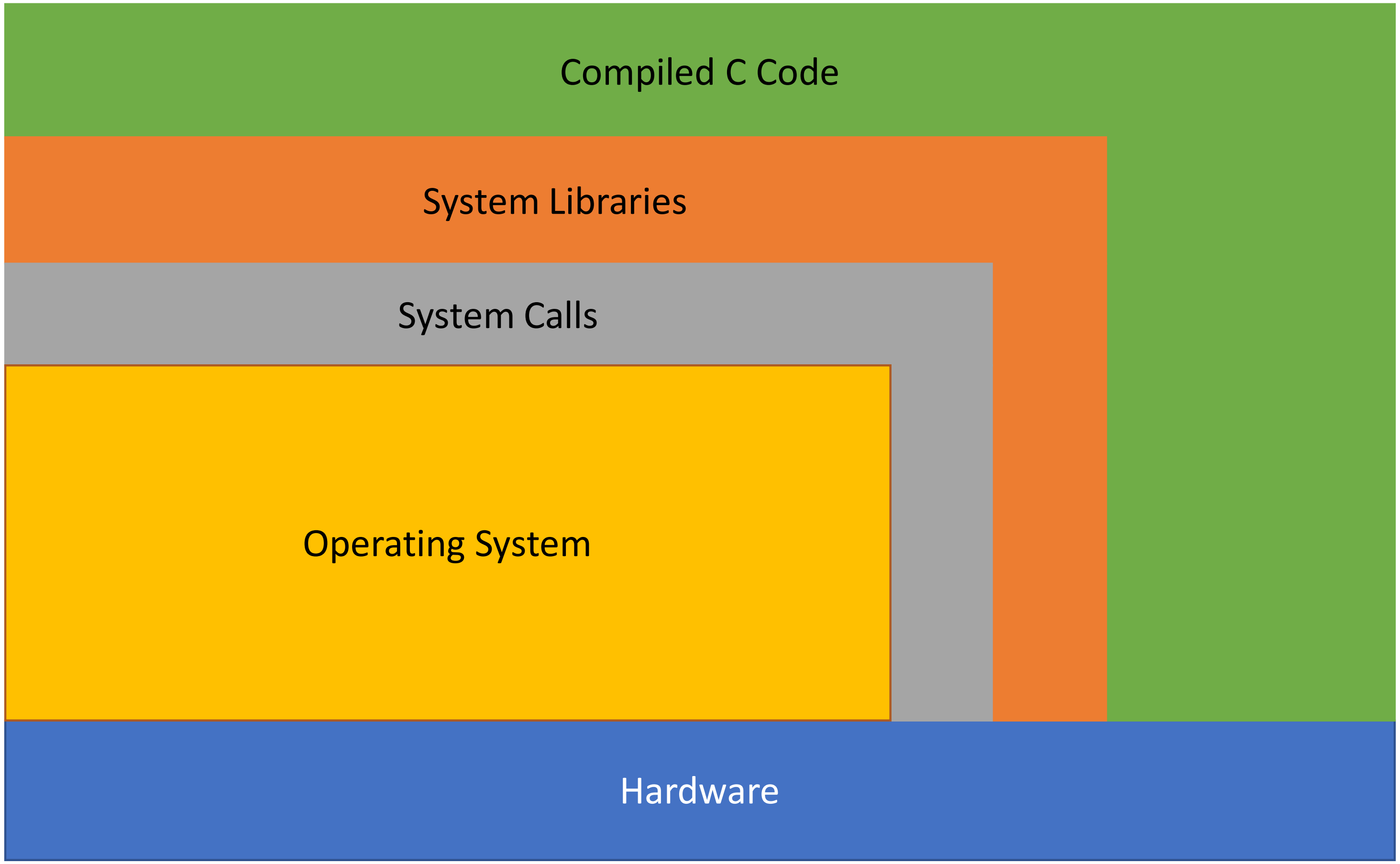
Welcome to OS @ UNSW

COMP3231/9201/3891/9283

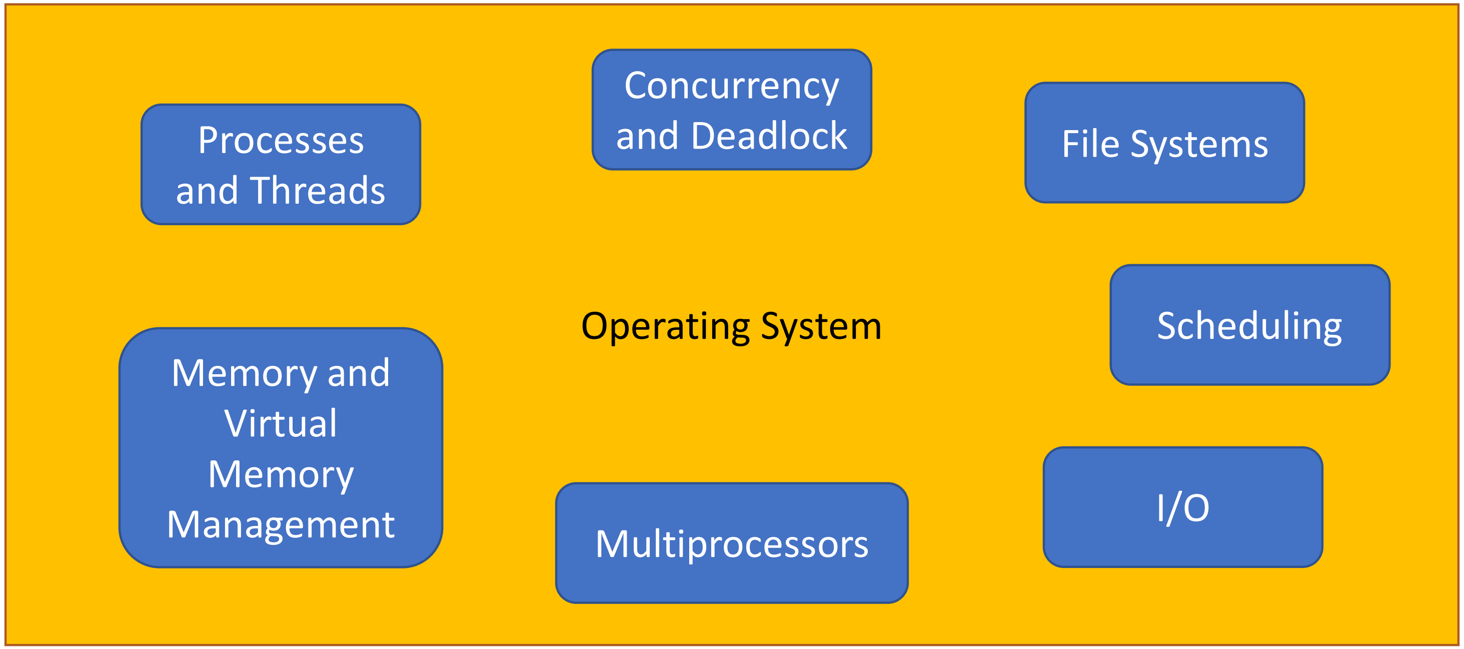
(Extended) Operating Systems

Dr. Kevin Elphinstone

System Software Structure



Major OS Topics



Processes and Threads

Concurrency and Deadlock

File Systems

Operating System

Scheduling

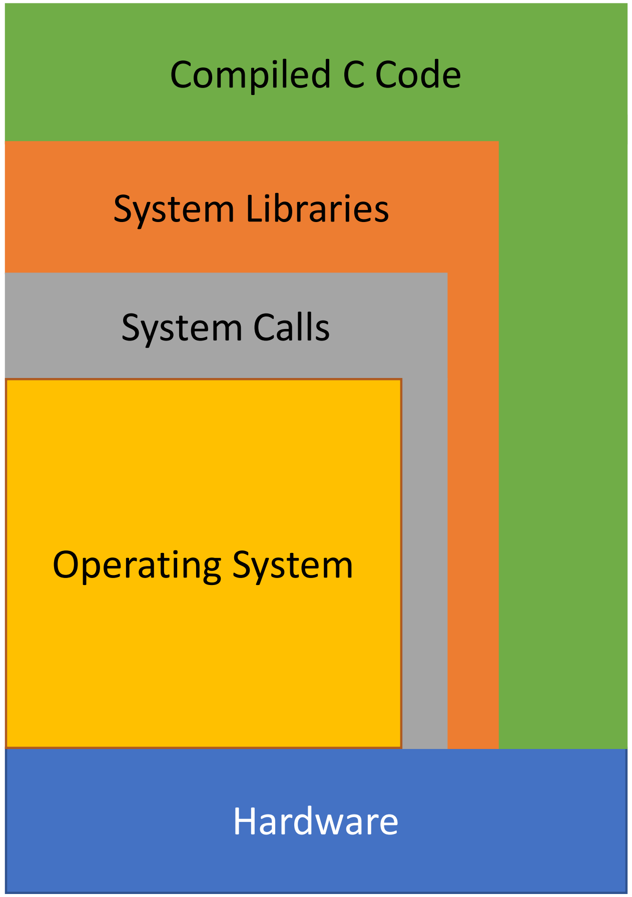
Memory and Virtual Memory Management

Multiprocessors

I/O

Why Learn Operating Systems?

- Understand the whole software stack
- Develop OS code
- Develop concurrent code
- Application performance
  - Understand operating system behaviour and how best to interface with it.
  - Diagnose system performance issues.



Overview of Course

Lectures

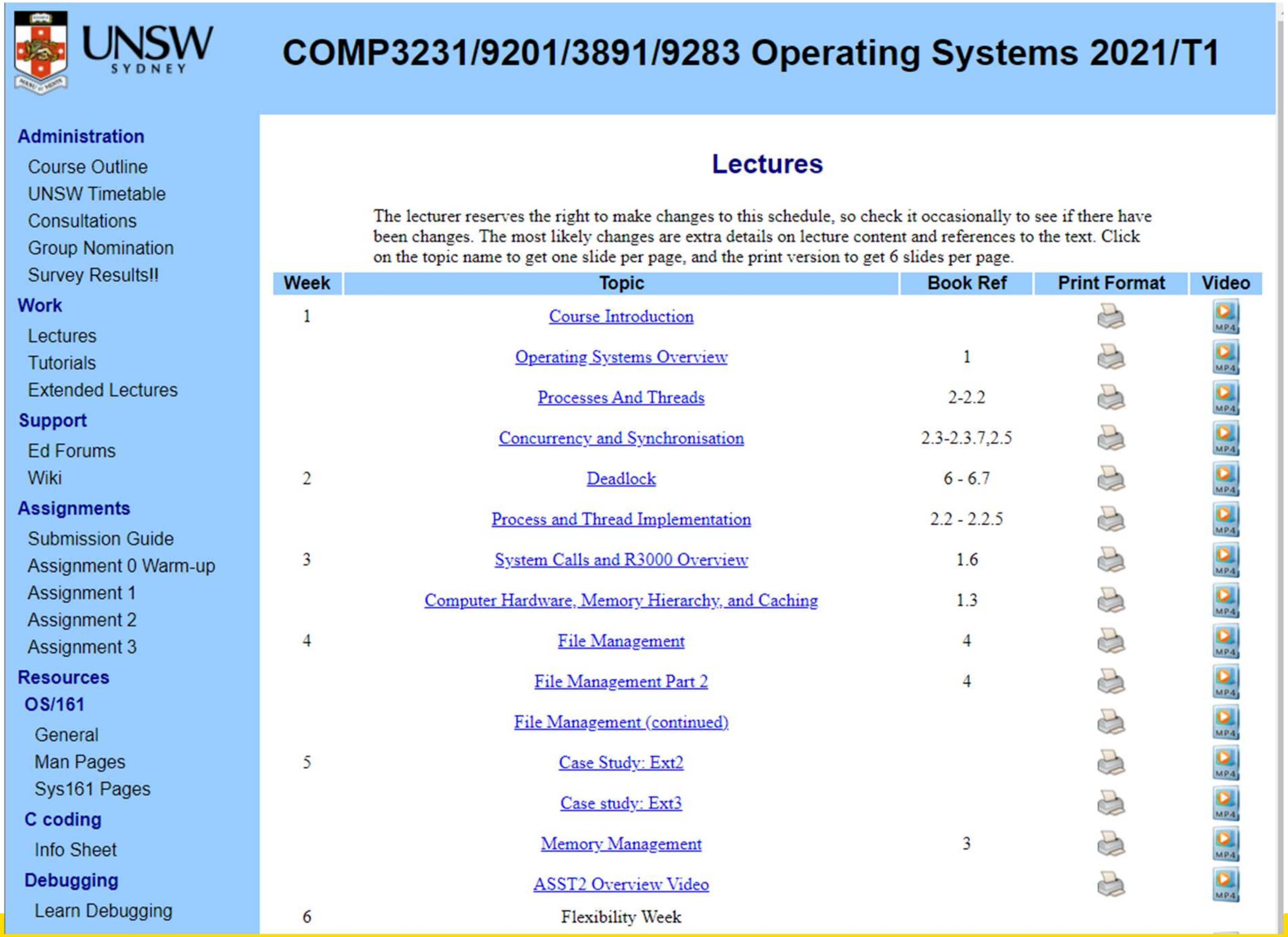
- Introduce OS theory and case studies

Tutorials

- Re-enforce theory
- Provide guidance on the assignments

Assignments

- Opportunity to write real OS code
  - OS/161 is a simplified UNIX-clone intended for teaching
- Consist of the following
  - Warm-up exercise
  - Concurrency and synchronisation
  - OS Structure involving system calls and file system
  - Memory management



UNSW SYDNEY

COMP3231/9201/3891/9283 Operating Systems 2021/T1

Administration
- Course Outline
- UNSW Timetable
- Consultations
- Group Nomination
- Survey Results!!

Work
- Lectures
- Tutorials
- Extended Lectures

Support
- Ed Forums
- Wiki

Assignments
- Submission Guide
- Assignment 0 Warm-up
- Assignment 1
- Assignment 2
- Assignment 3

Resources

OS/161
- General
- Man Pages
- Sys161 Pages

C coding
- Info Sheet

Debugging
- Learn Debugging

Lectures

The lecturer reserves the right to make changes to this schedule, so check it occasionally to see if there have been changes. The most likely changes are extra details on lecture content and references to the text. Click on the topic name to get one slide per page, and the print version to get 6 slides per page.

Week	Topic	Book Ref	Print Format	Video
1	Course Introduction		🖨	MP4
	Operating Systems Overview	1	🖨	MP4
	Processes And Threads	2-2.2	🖨	MP4
	Concurrency and Synchronisation	2.3-2.3.7,2.5	🖨	MP4
2	Deadlock	6 - 6.7	🖨	MP4
	Process and Thread Implementation	2.2 - 2.2.5	🖨	MP4
3	System Calls and R3000 Overview	1.6	🖨	MP4
	Computer Hardware, Memory Hierarchy, and Caching	1.3	🖨	MP4
4	File Management	4	🖨	MP4
	File Management Part 2	4	🖨	MP4
	File Management (continued)		🖨	MP4
5	Case Study: Ext2		🖨	MP4
	Case study: Ext3		🖨	MP4
	Memory Management	3	🖨	MP4
	ASST2 Overview Video		🖨	MP4
6	Flexibility Week			

Assumed Knowledge

- Computing Theory and Background
  - Basic computer architecture
    - CPUs, memory, buses, registers, machine instructions, interrupts/exceptions.
  - Common CS algorithms and data structures
    - Links lists, arrays, hashing, trees, sorting, searching…
  - Ability to read assembly language
  - Exposure to programming using low-level systems calls (e.g. reading and writing files)
- Practical computing background
  - Capable UNIX command line users
  - Familiar with the git revision control system
  - Competent C programmers
    - Understand pointers, pointer arithmetic, function pointers, memory allocation (malloc())
    - The dominant language for OS (and embedded systems) implementation.
  - Comfortable navigating around a large-ish existing code base.
  - Able to debug an implementation.

Lectures

- Common for all courses (3231/3891/9201/9283)
- 2 * 2 hrs each week
- The lecture slides will be available on the course web site
    - http://www.cse.unsw.edu.au/~cs3231
        - Available prior to lectures, when possible.
        - Slide numbers for note taking, when not.
- Lectures will be face-to-face and recorded
    - Uses Echo360
    - Recording will be available afterwards as per usual.

Extended OS Comp3891/9283

Starts in week 1

- A combination of:
  - Examination of topics in more depth
  - Looking at research in areas (past/present)
  - OS/161 internals in more depth
- Separate Assessment
  - 80%-ish of final exam common with base course
  - 20%-ish targeted to extended students
- Assumes the tutorials are not challenging enough
  - Effectively replaces the tutorial with extra interactive lecture.

Tutorials

- Start in week 2
- A mix of online and f2f
  - Depends on tutorial you enrolled in
- Attendance is strongly recommended
  - but not marked.
- Tutorial questions cover a broad range of examples
  - Answers available online the week after.
  - Use the tutorial to focus where needed
    - There is intentionally more questions than can be covered
    - Review the questions beforehand

Assignments

- Assignments form a substantial component of your assessment.
- They are challenging!!!!
  - Because operating systems are challenging
- We will be using OS/161,
  - an educational operating system
  - developed by the Systems Group At Harvard
    - With local changes.
  - It contains roughly 20,000 lines of code and comments
    - Comments are part of the documentation

Assignments

- Don’t underestimate the time needed to do the assignments.
    - 80% is understanding
    - 20% programming
- Avoid
    - 1% understanding
    - 9% programming
    - 90% debugging
- If you start a couple days before they are due, you will be late.

Assignments

Assignment	Due
ASST1	Week 4
ASST2	Week 7
ASST3	Week 10

- Warmup exercise
  - Done individually
  - Available NOW!!!!
- ASST1 done as individual
- ASST2 and ASST3 can optionally be done in pairs
  - Info on how to pair up available soon
- Additionally, advanced versions of the assignment 2 & 3
  - Available bonus marks are small compared to amount of effort required.
  - Student should do it for the challenge, not the marks.
  - Attempting the advanced component is not a valid excuse for failure to complete the normal component of the assignment

Group Work Policy

- Groups of two
- Group members do not have to be in the same tutorial
- Group assignments will be marked as a group
  - Including ‘groups’ of one.
- Group members are expected to contribute equally to each assignment.
  - No “I’ll do the 2nd if you do the 3rd assignment”
  - We accept statements of unequal contributions and do adjust marks of the lessor contributor down.
- Submissions are required to have significant contributions attributable to individual group members.
    - E.g. verifiable using the git revision control system

Exams

- There is NO mid-session
- The final exam is 2 hours, open book, online
    - A Moodle quiz to be precise
- Supplementary exam are available according to UNSW & school policy, not as a second chance.
    - Medical or other special consideration only

Assessment

Assessment Item	Assessment Weight
ASST1	20%
ASST2	20%
ASST3	20%
Final Exam	40%

- Additionally, a hurdle (minimum mark) of 40% is required in final exam to pass.

Support

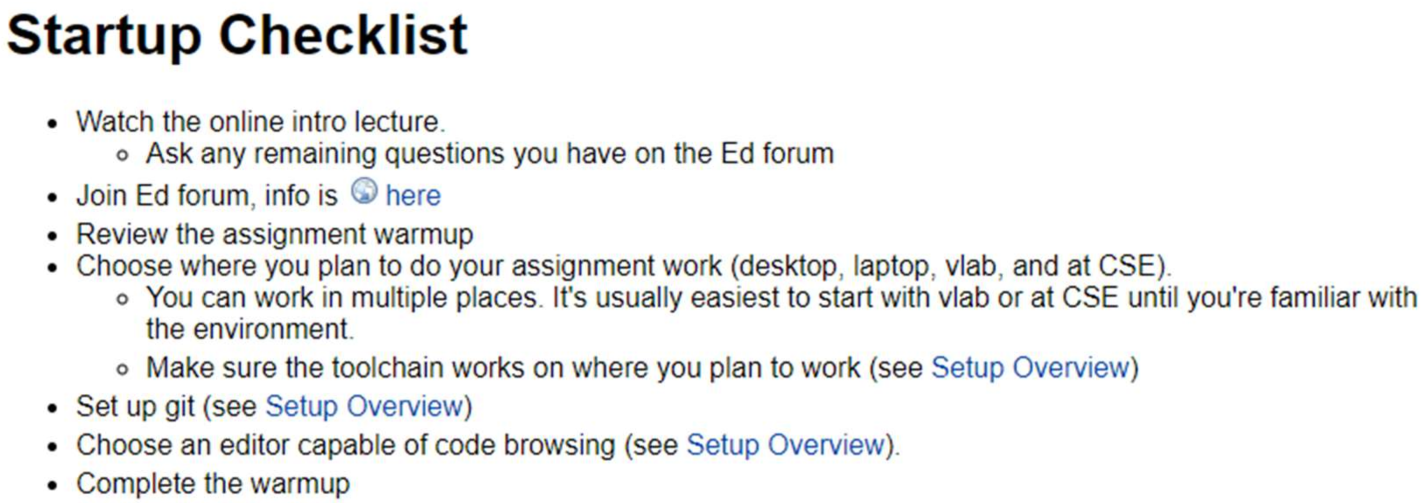
- Ed Forum
  - Where announcements are posted!!
  - Forum for Q/A about assignments and course
    - Ask questions there for the benefit of everybody
    - Share your knowledge for the benefit of your peers
  - You need to join to follow the course.
- Help Sessions
  - One-on-one help with assignments and course
  - Available every day, see course web site for timetable
  - Seek help early to avoid missing out.
- Admin and Personal queries can be directed to the class account cs3231@cse.unsw.edu.au
  - Don’t email me directly

Ed Forums

Search first!	You are probably not the first to experience the problem, so see if the question is answered before asking again.
Add to an existing post if directly related	If you are experiencing a variant of the same issue, add to an existing post.
Start a new post for a separate issue	Try to have an accurate title Avoid adding an unrelated question to a hot topic because you just happen to be there when you had the thought. It makes it hard to find for others.
Avoid bitmaps (screenshots)	Bitmaps are not searchable so you limit the chances of fellow students finding your post, and indirectly make us less enthusiastic about providing a detailed answer to your non-searchable post.
Provide some context	Cut-n-paste the error if appropriate, and include the preceding output to provide a chance for others to understand what is going on. Mention the OS/machine/environment your using if it's not clear from the cut-n-paste.
Mark questions resolved if they are!	Don't leave follow-ups unresolved if you have fixed your issue.
Leave questions unresolved if they are!	I filter using 'unresolved' to find outstanding issues, I won't find them unless they are marked unresolved.
You're very welcome to post if you know the answer to an issue.	The course staff do not have a monopoly on answers, nor do we monitor the forum 24hrs a day. A quick answer can make somebody's day (or at least avoid wasting it). A responsive forum can be an awesome resource for the entire course.

What next?

https://wiki.cse.unsw.edu.au/cs3231cgi/Checklist



Startup Checklist

- Watch the online intro lecture.
  - Ask any remaining questions you have on the Ed forum
- Join Ed forum, info is here
- Review the assignment warmup
- Choose where you plan to do your assignment work (desktop, laptop, vlab, and at CSE).
  - You can work in multiple places. It's usually easiest to start with vlab or at CSE until you're familiar with the environment.
  - Make sure the toolchain works on where you plan to work (see Setup Overview)
- Set up git (see Setup Overview)
- Choose an editor capable of code browsing (see Setup Overview).
- Complete the warmup