

CS2100

COMPUTER ORGANISATION

<http://www.comp.nus.edu.sg/~cs2100/>

Welcome to CS2100

(AY2024/25 Semester 2)



QnA website



NUS
National University
of Singapore

School of
Computing

Welcome to CS2100

1. Lecturers
2. Course Materials
3. Course Description
4. Assessments
5. Textbooks
6. Admin Matters
7. Schedule
8. Plagiarism Policy
9. Reminder: Important Dates

1. Lecturers (1/2)



A/P Tan Tuck Choy, **Aaron**

Office: COM1-03-12

Email: tantc@comp.nus.edu.sg

Admin appointment:

Assistant Dean
(Undergraduate Studies)

Running



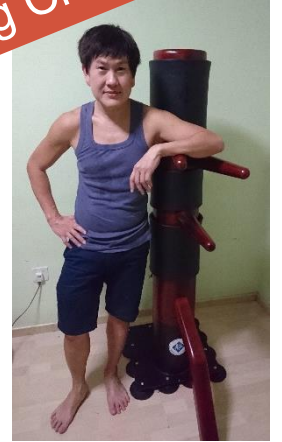
Used to have weekly runs with students every week (pre-Covid days)

Cantonese opera



Sep 2019

Wing Chun



Singing

SoC Gala Dinner 2018



SoC 25th Anniversary
July 2023

Choir



Sep 2022

Winter Daydreams
Joy Chorale Choir
Dec 2024

1. Lecturers (2/2)



Prabhu Natarajan

Senior Lecturer

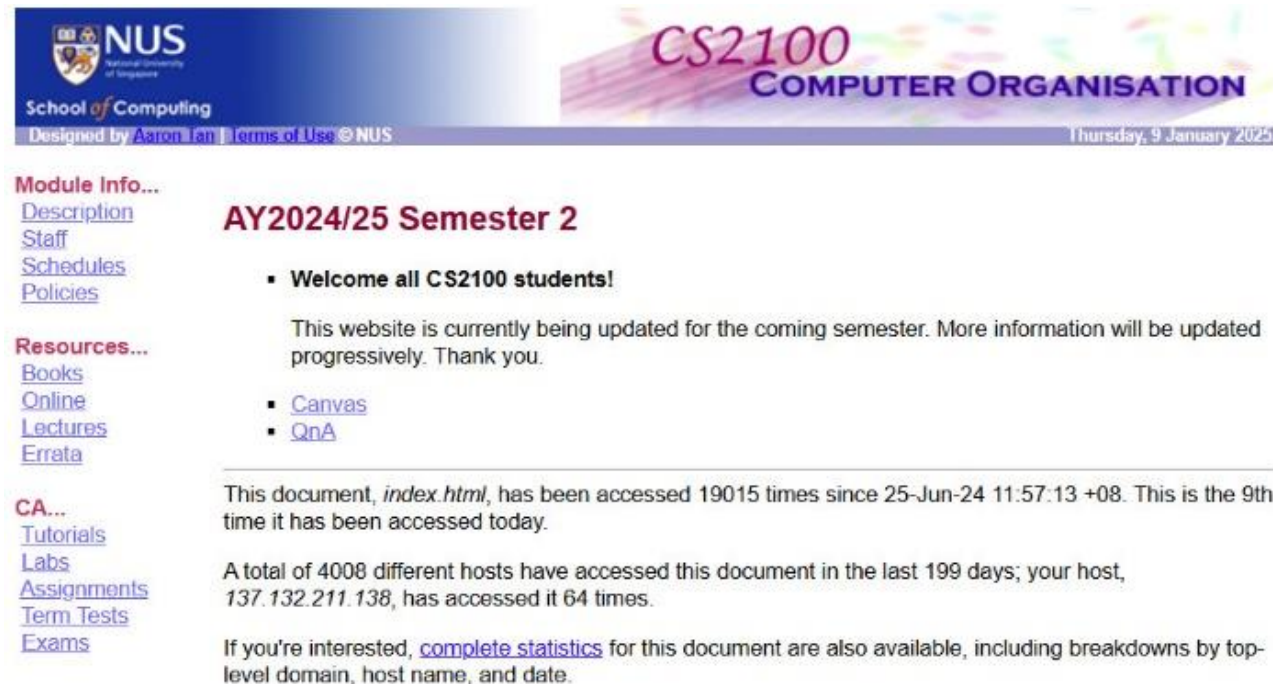
Office: COM3 – 02 – 34

Email: prabhu@comp.nus.edu.sg

- Ph.D. from School of Computing, NUS
- Joined as a lecturer in SoC in 2021, promoted to Senior Lecturer in 2024
- **Modules taught in SoC:** IT1244, CS2103 & CS2106
- **Director for CCSGP Center**
- Before joining NUS, I was teaching in DigiPen Institute of Technology Singapore
- **Annual Teaching Excellence Award (ATEA) in 2023 and 2024**

2. Course Materials

- Canvas <https://canvas.nus.edu.sg>
- CS2100 website (in case Canvas is down)
 - <https://www.comp.nus.edu.sg/~cs2100>



The screenshot shows the CS2100 website header with the NUS logo, School of Computing, and CS2100 COMPUTER ORGANISATION. The main content area is titled 'AY2024/25 Semester 2' and includes a welcome message, a notice about website updates, and links to Canvas and QnA. A sidebar on the left contains links for Module Info, Resources, and CA. A footer section provides document statistics and access information.

NUS
National University of Singapore
School of Computing
Designed by Aaron Tan | Terms of Use © NUS

CS2100
COMPUTER ORGANISATION

Thursday, 9 January 2025

Module Info...
[Description](#)
[Staff](#)
[Schedules](#)
[Policies](#)

Resources...
[Books](#)
[Online](#)
[Lectures](#)
[Errata](#)

CA...
[Tutorials](#)
[Labs](#)
[Assignments](#)
[Term Tests](#)
[Exams](#)

AY2024/25 Semester 2

- **Welcome all CS2100 students!**

This website is currently being updated for the coming semester. More information will be updated progressively. Thank you.

- [Canvas](#)
- [QnA](#)

This document, *index.html*, has been accessed 19015 times since 25-Jun-24 11:57:13 +08. This is the 9th time it has been accessed today.

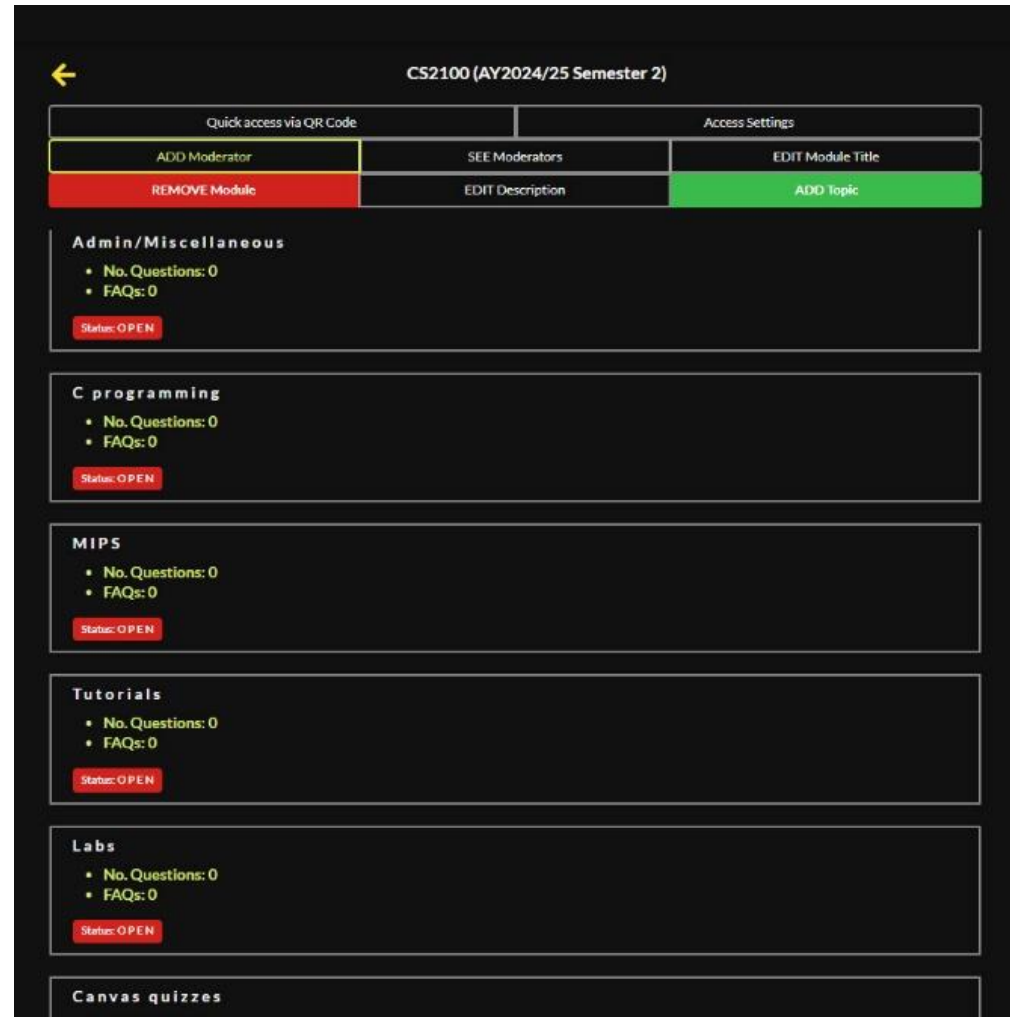
A total of 4008 different hosts have accessed this document in the last 199 days; your host, 137.132.211.138, has accessed it 64 times.

If you're interested, [complete statistics](#) for this document are also available, including breakdowns by top-level domain, host name, and date.

- Credit for Lecture Materials
 - All materials used in this course are from A/P Aaron Tan

2. Course Materials

- SeTs.netlify QnA website <https://sets.netlify.app/module/676ca3a07d7f5ffc1741dc65>
 - For students to post queries
 - Divided into topics

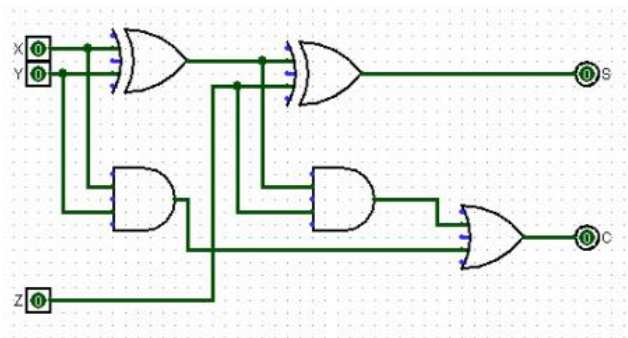
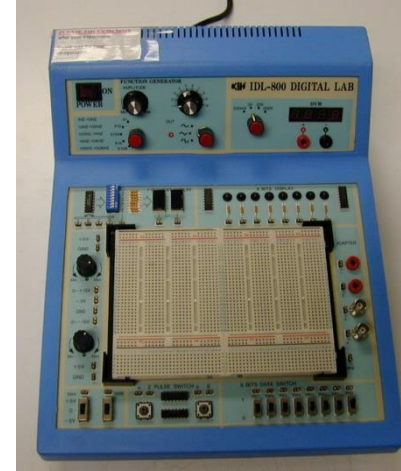


3. Course Description (1/5)

- The objective of this module is to familiarise students with the fundamentals of computing devices
 - The basics of data representation
 - How the various parts of a computer work, separately and with each other
- Topics
 - C programming language
 - Data representation and number systems
 - Assembly language
 - Processor datapath and control
 - Pipelining
 - Cache
 - Combinational and sequential circuit design

3. Course Description (2/5)

- Practical aspects
 - C debugger
 - QTSpim software
 - Logic design experiments
 - Logisim software



```
PCSpim
File Simulator Window Help
PC = 00000000 EPC = 00000000 Cause = 00000000 BadVAddr = 00000000
Status = 3000ff10 HI = 00000000 LO = 00000000
General Registers
R0 (r0) = 00000000 R8 (t0) = 00000000 R16 (s0) = 00000000 R24 (t8) = 00000000
R1 (at) = 00000000 R9 (t1) = 00000000 R17 (s1) = 00000000 R25 (t9) = 00000000
R2 (v0) = 00000000 R10 (t2) = 00000000 R18 (s2) = 00000000 R26 (k0) = 00000000
R3 (v1) = 00000000 R11 (t3) = 00000000 R19 (s3) = 00000000 R27 (k1) = 00000000
R4 (a0) = 00000000 R12 (t4) = 00000000 R20 (s4) = 00000000 R28 (gp) = 10008000

[0x00400000] 0x8fa40000 lw $4, 0($29) ; 174: lw $a0 0($29) # ar:
[0x00400004] 0x27a50004 addiu $5, $29, 4 ; 175: addiu $a1 $a0 4 # ar:
[0x00400008] 0x24a60004 addiu $6, $5, 4 ; 176: addiu $a2 $a1 4 # ar:
[0x0040000c] 0x00041080 sll $2, $4, 2 ; 177: sll $v0 $a0 2 # ar:
[0x00400010] 0x00c23021 addu $6, $6, $2 ; 178: addu $a2 $a2 $v0 # ar:
[0x00400014] 0x0c000000 jal 0x00000000 [main] ; 179: jal main # ar:
[0x00400018] 0x00000000 nop ; 180: nop # ar:
[0x0040001c] 0x3402000a ori $2, $0, 10 ; 182: li $v0 10 # ar:

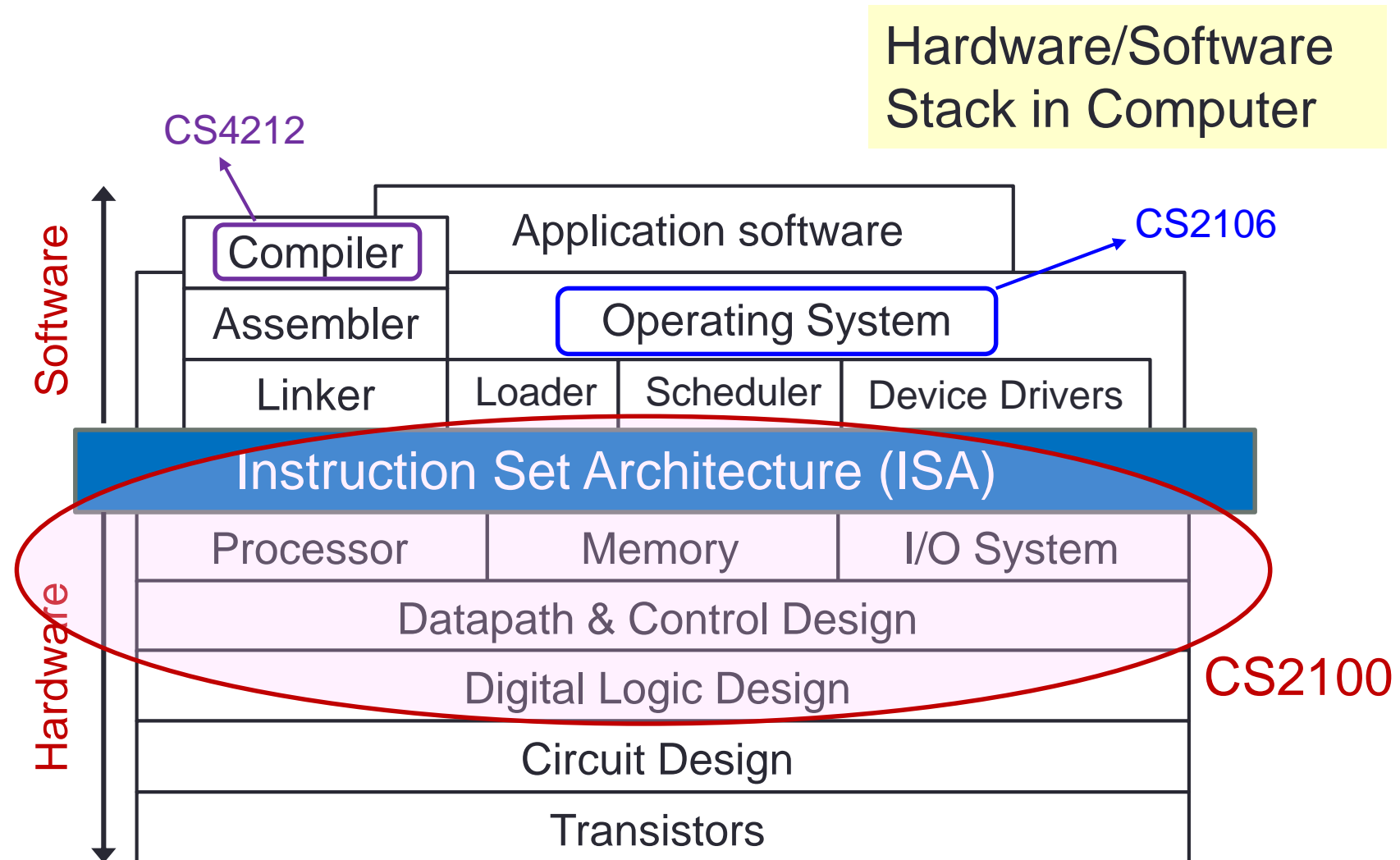
DATA
[0x10000000]...[0x10040000] 0x00000000

STACK
[0x7ffffeffc] 0x00000000

KERNEL DATA
[0x90000000] 0x78452020 0x74706563 0x206e6f69 0x636f2000

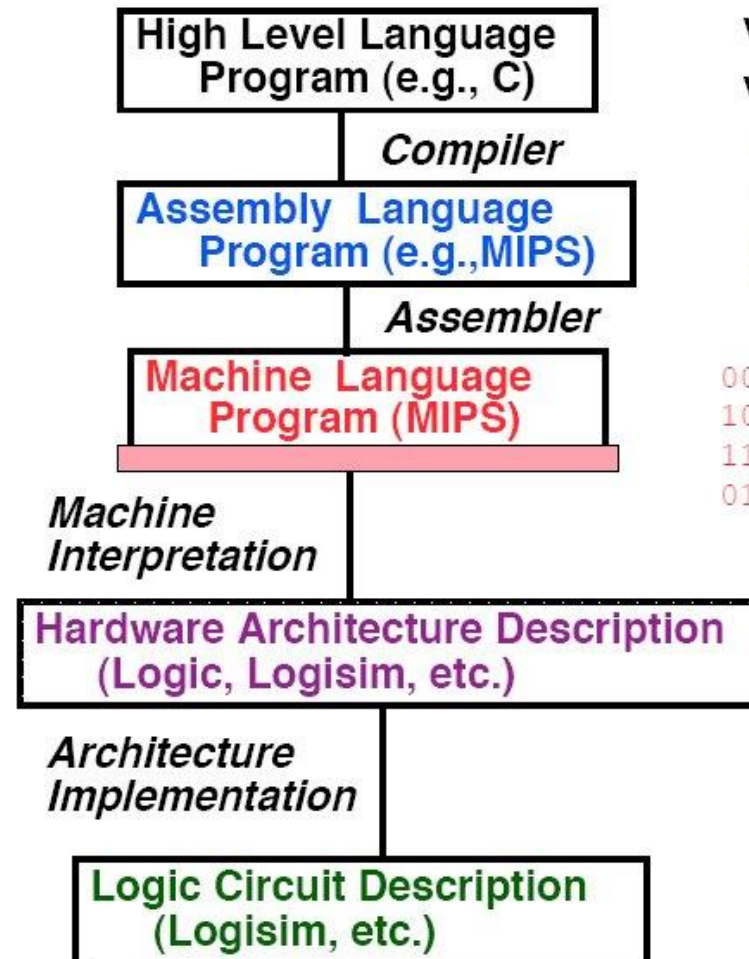
SPIM Version Version 7.0 of July 7, 2004
Copyright 1990-2004 by James R. Larus (larus@cs.wisc.edu).
All Rights Reserved.
DOS and Windows ports by David A. Carley (dac@cs.wisc.edu).
Copyright 1997 by Morgan Kaufmann Publishers, Inc.
See the file README for a full copyright notice.
Loaded: C:\Program Files\PCSpim7\exceptions.s
For Help, press F1 PC=0x00000000 EPC=0x00000000 Cause=0x00000000
```


3. Course Description (3/5)



3. Course Description (4/5)

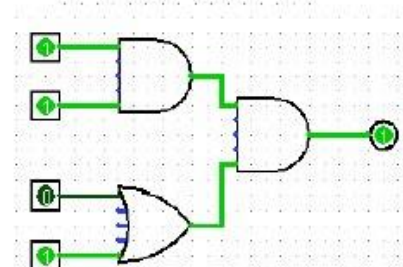
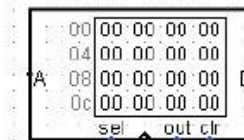
Level of Representation



```
temp = v[k];  
v[k] = v[k+1];  
v[k+1] = temp;
```

```
lw $t0, 0($2)  
lw $t1, 4($2)  
sw $t1, 0($2)  
sw $t0, 4($2)
```

```
0000 1001 1100 0110 1010 1111 0101 1000  
1010 1111 0101 1000 0000 1001 1100 0110  
1100 0110 1010 1111 0101 1000 0000 1001  
0101 1000 0000 1001 1100 0110 1010 1111
```



3. Course Description (5/5)

- CS2100 is not difficult 😊
- CS2100 is more on the breadth rather than depth, hence there are many topics → giving the **impression** that the course is tough.
- Theory + practice.
- All topics are somewhat linked, so **good understanding of earlier topics (especially the fundamentals)** is important for later topics.

4. Assessments

CA component	Weightage
Tutorial attendance	5%
Canvas quizzes	3%
Three Assignments	12%
Labs	10%
Mid-term test *	20%
Final exam *	50%

- * **Open-book:** pen-and-paper. All printed and written materials allowed. Calculators allowed. Electronic devices (apart from calculators) not allowed. More details will be given later.

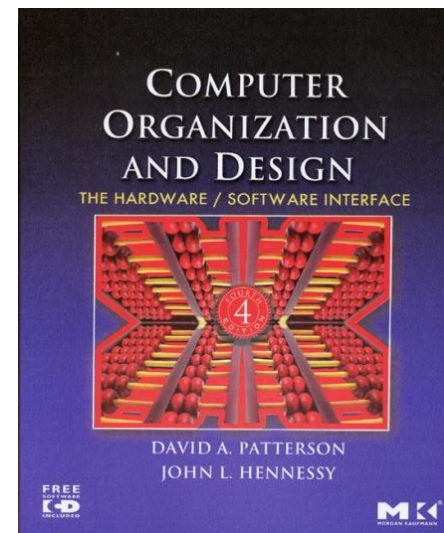
5. Textbooks

- **Digital Logic Design (DLD), 2nd edition**
by Aaron Tan, McGraw-Hill
- Physical book (NUS co-op, \$20+)
- ebook available (Validity period for special price \$17 excl. GST: 15 Jan – 28 Feb 2025)
<https://www.mheducation.com.sg/digital-logic-design-2e-9780071327442-asia-group>

- **Computer Organization and Design (COD), 4th edition**
by David A. Patterson and John L. Hennessy, 4th ed, Elsevier



Please refer to module website “[Errata](#)” page for errors in the book.

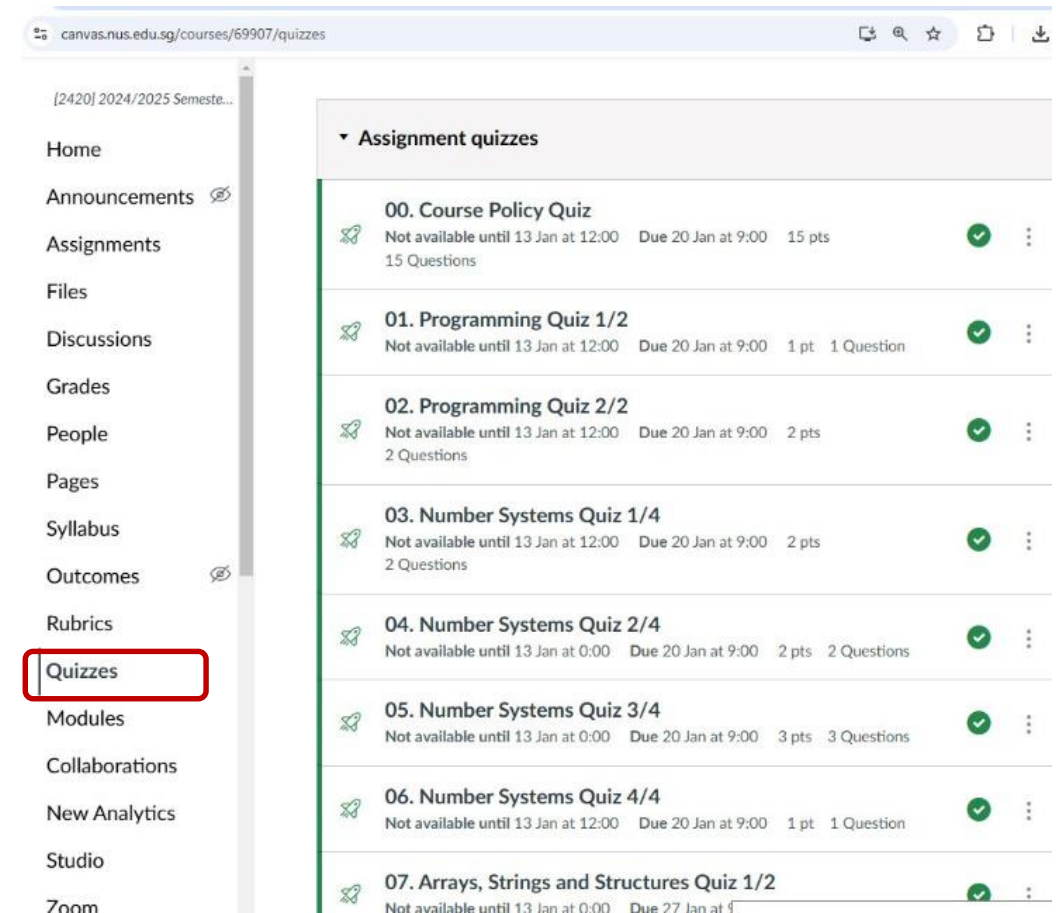


6. Admin Matters (1/4)

- CS2100 is taught in **Blended Learning** mode.
 - All course materials (lecture slides, recordings, tutorial questions, lab questions, etc.) will be uploaded on Canvas week-by-week
- Tutorials and labs start in Week 3 (27 January 2025)
 - Physical attendance is compulsory. MC required for absence.
- **Mid-term test**
 - **12 March 2025, Wednesday, 7 – 8:30pm.**
 - Let us know by mid-February if it clashes with your other courses.
- Please post your queries on Canvas forums or QnA website.
 - Everybody can help answer and everybody can read the answers
 - Only for personal matters: Email us at tantc@comp.nus.edu.sg (Aaron), or prabhu@comp.nus.edu.sg (Dr Prabhu).

6. Admin Matters (2/4)

- CS2100 is taught in **Blended Learning** mode.
 - Sequence of lectures and quizzes for the week are shown in the CS2100 “Home” screen on Canvas.
 - Follow the sequence of notes and do the quizzes (see left picture)
 - Lecture recordings are in the Videos/Panopto tool on the left of the screen.
 - Please view all lecture recordings and do all the quizzes for Week n before the start of Week $n+1$.
 - i.e. view all the lectures and do the quizzes for Week 2 before the start of Week 3.



6. Admin Matters (3/4)

- We will have Recitation Sessions every **Monday 10am to 12nn**
- Venue: **LT8 and Zoom** (zoom link on Canvas)
- First Recitation on **13 January 2025**.
- What do we do at Recitation?
 - Every set of Lecture Notes has a **QR code and a link** to ask questions.
 - As you view the slides if you don't understand something, you may post on QnA.
 - We will **answer these questions** during recitation.
- Setlify QnA website:
 - <https://sets.netlify.app/module/676ca3a07d7f5ffc1741dc65>



6. Admin Matters (4/4)

- Online tutorial/lab registration – through CourseReg.
 - Lab group and tutorial group are independent.
 - Appeal through CourseReg, please do NOT email us!
 - Priority will be given to those without a group, instead of those who already have a group but wish to change.
 - Do not worry if your lab/tutorial is back to back with the lecture. We will be punctual in starting our lesson and CS2100 recitations/tutorials/labs should end 15 minutes before the hour.
 - After you get your assigned group, please stick with it.
 - If you need to attend another group for just one week, please send an email to Aaron at tantc@comp.nus.edu.sg (at least a few days in advance) with your reason or attendance will not be taken by your tutor/labTA.

7. Schedule

- Lecture slides and videos for week i will be released at the start of week i
 - Quiz for week i will be on Canvas at the start of week i
 - Canvas quizzes will be autograded
 - The quiz for week i will close at the start of week $i + 1$
- Tutorials and labs for week i will be released at the start of week $i - 1$
- The recitation for week i will cover the material as well as quiz of week $i - 1$
- Assignments will generally be launched one week before the deadline.
 - Advice:** Start working on it as soon as it is launched

Lesson Plan

Recitation schedule:

- Monday, 10-12nn, LT8 (hybrid)

Week	Topics	Tutorial	Lab	Notes/Special Events
1 (13/1 - 17/1)	Lect#1: Introduction Lect#2: Overview of C Programming Lect#3: Data Representation and Number Systems			
2 (20/1 - 24/1)	Lect#4: Pointers and Functions Lect#5: Arrays, Strings and Structures			
3 (27/1 - 31/1)	Lect#7: MIPS I: Introduction Lect#8: MIPS II: More Instructions	Tut#1	Lab#0	
4 (3/2 - 7/2)	Lect#9: MIPS III: Instruction Formats and Encoding Lect#10: Instruction Set Architecture	Tut#2	Lab#1	
5 (10/2 - 14/2)	Lect#11: Processor: Datapath	Tut#3	Lab#2	
6 (17/2 - 21/2)	Lect#12: Processor: Control	Tut#4	Lab#3	Assignment #1 Due: 17 Feb 1pm
22/2 - 2/3	Recess			
7 (3/3 - 7/3)	Lect#13: Boolean Algebra Lect#14: Logic Circuits Lect#15: Simplification	Tut#5	Lab#4	
8 (10/3 - 14/3)	Lect#15: Simplification (continue) Lect#17: Combinational Circuits	Tut#6	Lab#5	Midterm test on 12 March. See Term Tests page .
9 (17/3 - 21/3)	Lect#18: MSI Components	Tut#7	Lab#6	Assignment #2 Due: 17 Mar, 1pm
10 (24/3 - 28/3)	Lect#19: Sequential Logic	Tut#8	Lab#7	
11 (31/3 - 4/4)	Lect#20: Pipelining I: Introduction Lect#21: Pipelining II: Hazards	Tut#9	Lab#8	

Schedule and recitation plan are on CS2100 website:
https://www.comp.nus.edu.sg/~cs2100/1_course_info/sched.html

8. Plagiarism Policy

- **NUS takes plagiarism very seriously**
 - Serious cases could result in expulsion from the university
- **Why so serious?**
 - The reputation of NUS is at stake
 - Your learning outcomes are at stake
- **SoC is very good at detecting plagiarism**
 - We have the tools and experience to check
- **Do not share your code or any solution** with others even if you discuss
 - **All** quizzes, assignments, and labs are individual
 - When discussing, be mindful of “crossing the line”
- **Use of AI is strictly prohibited in this class**
 - You need to learn the basics first “by hand”

9. Reminder: Important Dates

- **CS2100 MIDTERM TEST**

12 March 2025, Wednesday, 7 – 8:30pm. Venue TBA.

- **CS2100 FINAL EXAM**

3 May 2025, Saturday, 9 – 11am. Venue TBA.

Schedule and recitation plan are on CS2100 website:

https://www.comp.nus.edu.sg/~cs2100/1_course_info/sched.html

End of File



There are 10 types of people in this world.

Those who understand binary and those who don't.