

# IT5002

## Computer Systems and Applications

### Welcome to IT5002

[colintan@nus.edu.sg](mailto:colintan@nus.edu.sg)



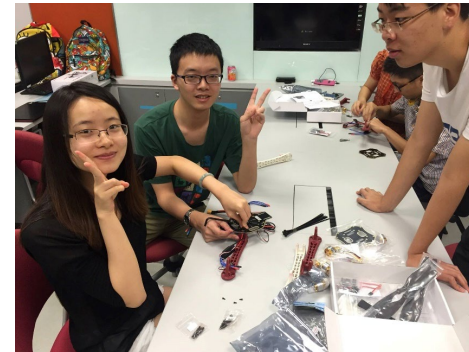
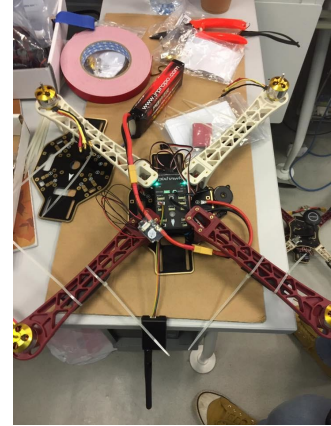


**Colin Tan**

Consultation:  
Zoom only.

Email: [colintan@nus.edu.sg](mailto:colintan@nus.edu.sg)

*Admin appointment:*  
Chief Randomness  
Generator,  
Makers@SoC



# IT5002 Computer Systems and Applications

## Course Objective

- **The objective of this module is to familiarise students with the fundamentals of computing devices and applications**
  - This is a fast paced, intense course.
  - But you will learn a lot.
- **Topics**
  - Part 1: Processor Organization
    - ✓ **Interfacing High Level Programming Languages to Hardware.**
    - ✓ **Data representation and number systems**
    - ✓ **Assembly language**
    - ✓ **Processor datapath and control**
    - ✓ **Pipelining (Brief)**
    - ✓ **Cache (Brief)**
  - Part 2: Operating Systems
  - Part 3: Applications - The Web, Databases and Blockchains

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- **Topics**
  - Part 1: Processor Organization
  - Part 2: Operating Systems
    - ✓ **OS Architecture.**
    - ✓ **Process Management**
    - ✓ **Process Coordination**
    - ✓ **Memory Management**
    - ✓ **File Management**
  - Part 3: Applications - The Web, Databases and Blockchains

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- **Topics**
  - Part 1: Processor Organization
  - Part 2: Operating Systems
  - Part 3: Applications - The Web, Databases and Blockchains
    - ✓ Basics of the Web – HTTP, HTML, MIME Types, RESTful Servers
    - ✓ Relational Databases
    - ✓ Document Oriented Databases
    - ✓ Blockchains: Principles, Cryptographic Hashes, Chain Structure, Proof of work, Chain Resolution, 51% Attacks, Proof of Authority, Proof of Stake.

# Lectures

- **Lectures are F2F and over Zoom. You should attend the F2F lectures.**

<https://nus-sg.zoom.us/j/99638418357?pwd=SXNiSm4zVm5NSThmaDRITnVGZTU1QT09>

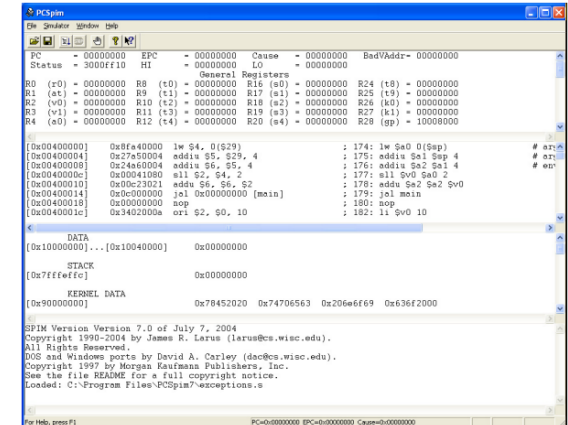
Meeting ID: 996 3841 8357

Passcode: 941586



# Practical Aspects

- Tutorials / Labs most Saturdays, 2-3 pm or 3-4 pm from Week 3 onwards
  - QTSpm (MIPS Assembly)
  - Creation and coordinating processes and threads (Python)
  - MySQL and MongoDB Programming (Python)



The screenshot shows the QTSpm MIPS simulator interface. It displays the following information:

- PC (Program Counter):** 00000000, **EPC (Exception Program Counter):** 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 (a0) = 00000000, R9 (t1) = 00000000, R17 (a1) = 00000000, R25 (t9) = 00000000
  - R2 (v0) = 00000000, R10 (t2) = 00000000, R18 (a2) = 00000000, R26 (k0) = 00000000
  - R3 (v1) = 00000000, R11 (t3) = 00000000, R19 (a3) = 00000000, R27 (k1) = 00000000
  - R4 (a0) = 00000000, R12 (t4) = 00000000, R20 (a4) = 00000000, R28 (gp) = 10000000
- Assembly Code:**

```

0x00400000: 0x8fa40000 lw $a0, 0($29)          ; 174: lw $a0, 0($29)          # str
0x00400004: 0x27a50004 addiu $5, $29, 4        ; 175: addiu $a1 $a1 $29, 4      # str
0x00400008: 0x24a60004 addiu $6, $5, 4         ; 176: addiu $a2 $a1 4          # str
0x0040000c: 0x00041080 sll $2, $4, 2          ; 177: sll $v0 $a0 2            # str
0x00400010: 0x00c20021 addu $6, $6, $2         ; 178: addu $a2 $a2 $v0 $v0
0x00400014: 0x8c000000 jal 0x00000000 [main]   ; 179: jal main
0x00400018: 0x00000000 nop                    ; 180: nop
0x0040001c: 0x3402000a ori $2, $0, 10         ; 182: li $v0 10

```
- DATA:**

```

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

```
- STACK:**

```

[0x7fffffc0] 0x00000000

```
- KERNEL DATA:**

```

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

```

SPIM 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

# Assessment

CA component	Weightage
Tutorials / Labs	5%
Assignment	15%
Mid-Term Test*	25%
Final Exam*	55%

\* Face-to-Face Electronic Assessments (Examsoft). Four-page cheat-sheet (2 A4 sheets)



## Admin Matters

- **Lectures are 3 hours long, every Tuesday 6.30 pm to 9.30 pm**
- **All course materials will be uploaded on Canvas.**
- **Tutorials/Labs start in week 3 (29<sup>th</sup> August 2023)**
- **Mid-term test**
  - **Saturday 21 October 2023, 2.00 pm – 3.30 pm (during tutorial slot)**
  - Please check Canvas announcements for updates
- **Please post your queries on Canvas forums**
  - Everybody can help answer and everybody can read the answers
  - Email me at [colintan@nus.edu.sg](mailto:colintan@nus.edu.sg) only for personal matters