UNIVERSITY OF APPLIED SCIENCES

BASIC CONTROL SYSTEMS

COURSE INTRODUCTION

HANSHU YU

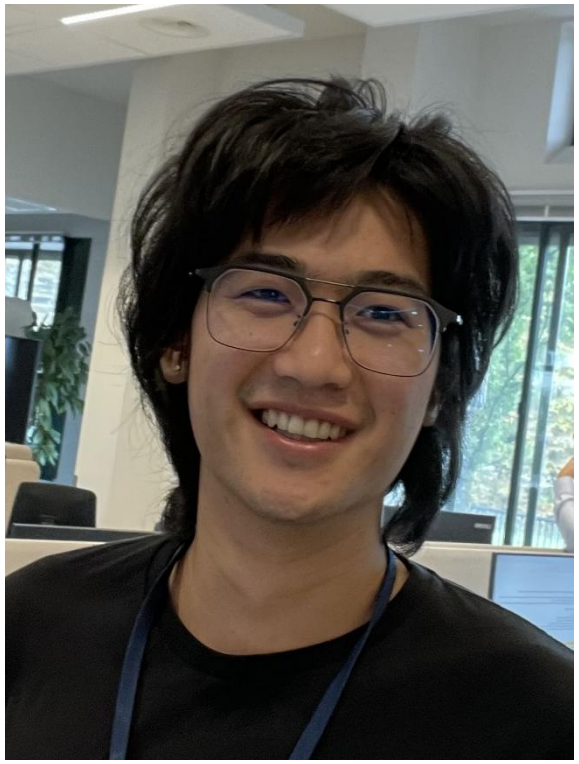
NOV 2025

WHERE STUDENTS MATTER

CONTENTS

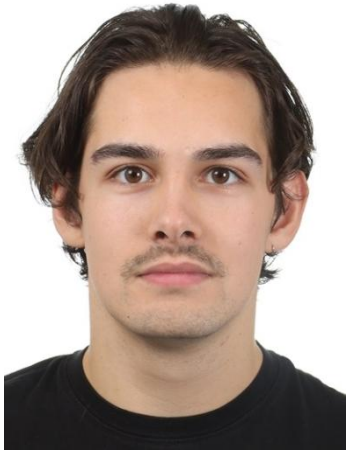
- Teaching team introduction
- Learning objectives
- Course material & structure
- Preliminary knowledge
- Potential job opportunities
- Introduction Assignment (Today!)

MEET THE TEAM:



Lecturer:
Hanshu Yu

MEET THE TEAM:



Student assistant:
Rik

Student assistant:
Quirren

Student assistant:
Job

Student assistant:
Stefan

Student assistant:
Thijn

Student assistant:
Kyan

LEARNING OBJECTIVES - KNOWLEDGE

- Modelling physical systems using the correct mathematical tool
- Have a basic understanding about simple control systems
- Know about how to design and tune a simple controller
- Understand classical analysis and design tools for stable control of simple systems.

LEARNING OBJECTIVES - KNOWLEDGE

- **Have a basic understanding of the fundamentals of classical control theory.**
- **Apply the theory into engineering practice.**

Control theory?

A branch of applied mathematics.

LEARNING OBJECTIVES - SOFT SKILLS

Lab Skills

Report writing

Presenting

Collaboration

- We want you to learn from each other!
- Ask questions in your group, study together, help each other with assignments

COURSE MATERIAL

Notes, lecture slides, companion exercises, old exams:

https://hanshuyu.com/material/LN-CCS.html

Other recommended reading material:

Feedback Systems: An Introduction for Scientists and Engineers,
1st edition, Karl J. Åström and Richard M. Murray

Modern Control Engineering,
any edition, Katsuhiko Ogata

PRELIMINARY KNOWLEDGE

- **Some understanding & computational skills in:**
  - Calculus
  - Complex analysis
  - Integral transforms
  - High school level physics and algebra
- **Some experience in:**
  - Working in a team
  - Writing reports
  - Making presentations

COURSE STRUCTURE - DAILY ACTIVITIES

3 weeks

10	lectures	(~1.5h * 10)	
2	presentations	(1+1)	17.5%*2
3	experiments	(2+1)	15%
1	written exam		50%

WARNING

Theoretical course

But very practical if you understand the principles

Higher workload

Involves a lot of self-study

Encourages a lot of group-study

Extremely useful

WARNING - STATISTICS

Historical passing rate 1st exam:

57% ~ 65%

Written exam raw score number <u>>60%:</u>

40% ~ 50%

WARNING -

BEHAVIOURS CORRELATED WITH (ALMOST) EXAM FAILURE

- I can just skip the lecture and self-study at home with some book I found in the library/internet.
  (63, 60, 71, 54, 53, 47, 20, 32, 78, 92)

- I do not have to participate in the group work.
  (66, 40, 41, 20, 48, 55, 41, 34, 54, 60, 60)

- I am afraid to ask questions.
  (50, 40, 68)

- Cheating in the exam
  (caught 2 last year)

HOW TO STUDY? (RECOMMENDATIONS)

Think, communicate, and interact with me in lectures.

Do the homework assignments in sync with the lecture.

Try solve a few extra problems provided.

Read the reading material if you have time.

Discuss and collaborate with your peers.

Do the experiments & simulations while you can.

HOW TO STUDY? (WARNING)

Treat online material like (video tutorials) with care.

They could be wrong.

COURSE COMPONENTS

2 assignments:

Assignment ONE consists of presenting a control system model and solving 10 problems.

Submission deadline: week 2 Tuesday morning 9 am.

Assignment TWO consists of designing filters and use those filters to modify their favorite song and present your design. While you still need to solve 10 problems.

Submission deadline: week 3 Thursday morning 9 am.

2 Lab experiments:

1. Circuit modelling
2. Water-level control using PID controller

2 Peer review assessments:

- Your teammates will assess your performance.

3-hours Exam! *(Will be arranged by SMU)*

COURSE STRUCTURE - DAILY ACTIVITIES

		Default lecture hall	*Discussion rooms*	Room 306	Room 308	Room 204
		College building 124		Groups 1-9	Groups 10,11,12,13,14	Groups 15,16,17,18
LAB	Nothing	Lecture	Workshop	Group work & self study	**Presentation**	***Submission Timewindow***
Lab rooms		Large lecture halls	discussion rooms	discussion rooms	Large lecture halls/ discussion rooms	Large lecture halls

→ Always bring your laptop and notebook/pens to class, changes can still be made last minute!

→ **No gaming in the classroom at anytime!** If you would like to game, do that in the dormitory or internet café.

COURSE SCHEDULE

Week 1

	Monday	Tuesday	Wednesday	Thursday	Friday
8:20 -9:55		**Lecture (Logistics 124)** Intro + Fundamentals	**Lecture (2B103)** Laplace	**Lecture (Logistics 124)** TF	Workshop: Presentation Group work & self study
10:15-11:50		Group work & self study	Group work & self study	Group work & self study	Group work & self study **Presentation** *in discussion rooms*
	Lunch Break				
13:10-13:55		Group work & self study	Group work & self study	Group work & self study	
15:05-16:40		**Presentation** *(in discussion rooms)*	**Lecture (3D106)** Block + data	**Lecture (Logistics 124)** PID	
		Introduce the assignments			

COURSE SCHEDULE

Week 2

	Monday	Tuesday	Wednesday		Thursday		Friday
8:20 -9:55	**Lecture (Logistics 124)** Root Locus 1	***Submission 8:30-9:00*** **Presentation**	Group work & self study				**Lecture (Logistics 124)** Frequency doamin 2
10:15-11:50	Group work & self study		Group work & self study	**LAB 1 M&EE**	**LAB 1 EE&IC**	**LAB 2 M&EE**	Workshop Report writing
	Lunch Break						
13:10-13:55	Group work & self study		Group work & self study				
15:05-16:40	Group work & self study		**Lecture (Logistics 124)** Root Locus 2		**Lecture (Logistics 124)** Frequency doamin 1		
		Assignment 1 & peer review 1					

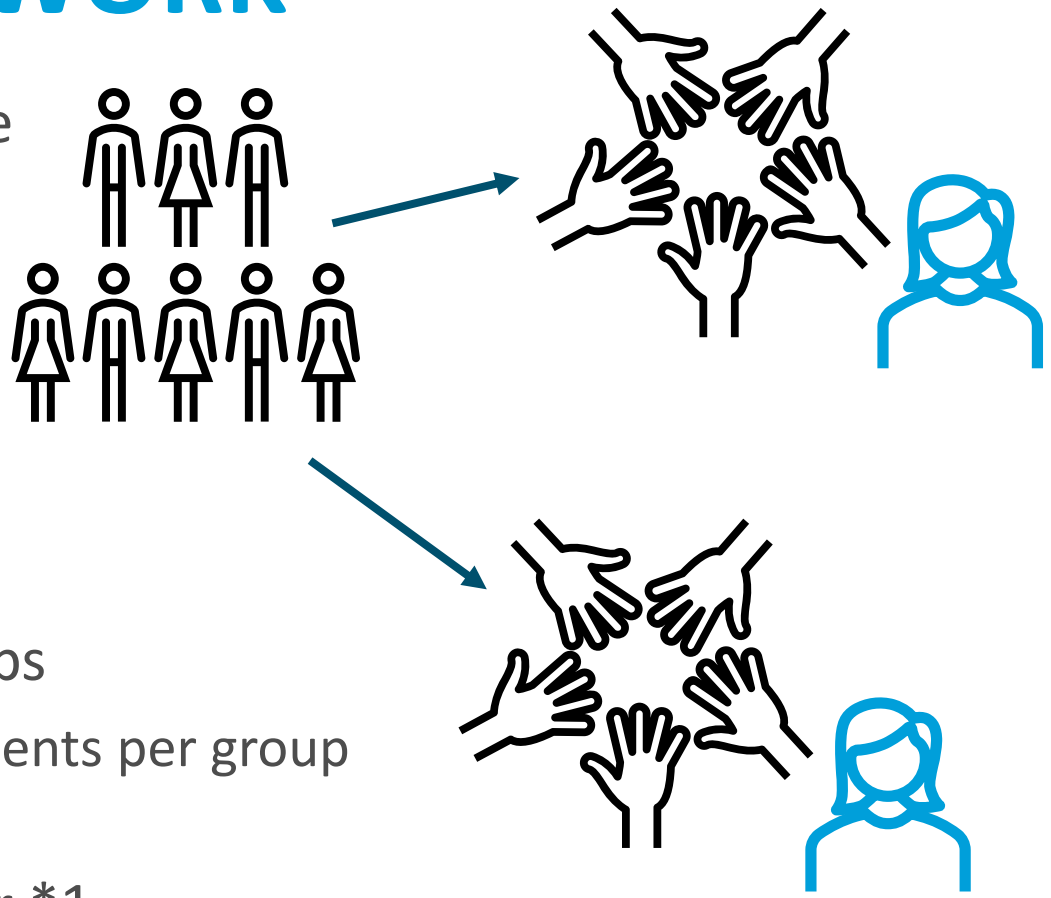
COURSE SCHEDULE

Week 3

	Monday		Tuesday	Wednesday	Thursday	Friday
8:20 -9:55	LAB 2 EE&IC	Group work & self study	**Lecture (Logistics 124)** Frequency doamin 4	**Lecture (Logistics 124)** Recap 2	***Submission 8:30-9:00*** **Presentation**	Grading time
10:15-11:50		Group work & self study	Group work & self study	Group work & self study		
		Lunch Break				
13:10-13:55		Group work & self study	**Lecture (Logistics 124)** Recap 1	Group work & self study		
15:05-16:40	**Lecture (Logistics 124)** Frequency doamin 3		Group work & self study	Group work & self study	**Photos at the end!**	
					Assignment 2 Peer review 2& Lab reports	

COURSE STRUCTURE - GROUP WORK

Group structure



→ Project groups

7 ~ 8 students per group

→ Group leader *1

Responsible for **homework hand-in** and **communications** with the teaching staff

HANDING-IN YOUR HOMEWORK

File name format:

A1GroupX.pdf
A2GroupX.pdf
LABGroupX.pdf
PRGroupXname.pdf

You upload your pdf to the server using a local area network within a **fixed time-window**!
You can only access the server when you connect to the following wifi:

Wifi name: Course_admin

Wifi password: 37582968

Each group will receive a server ipv4 address to hand-in your pdf, this will be announced by the teaching assistant.

GRADING AND EXAMINATION

Presentation:

- **17.5%** Presentation for assignment 1 (group score)
- **17.5%** Presentation for assignment 2 (group score)

Report:

- **15%** Experiment report (group score)

Peer Assessment factor: **f** (individual)

In-course raw score:

- sum of raw presentation and experiment scores.
- The raw scores should be the same for every student in the same group.

In-course final score for each student:

- **50%** raw score * **f** (max 50)

3 weeks in-course contents

Final Exam (3 hours):

- **50%** Exam is organised by SMU after our 3-week course

GRADING AND EXAMINATION

3 weeks in-course contents

Presentation:

- **17.5%** Presentation for assignment 1 (group score) - ***75***
- **17.5%** Presentation for assignment 2 (group score) - ***80***

Report:

- **15%** Experiment report (group score) - ***70***

Peer Assessment factor: **f** (individual) - ***1.1***

In-course raw score: *75*0.175+80*0.175+70*0.15 = 37.625*

- sum of raw presentation and experiment scores.
- The raw scores should be the same for every student in the same group.

In-course final score for each student: *37.625*1.1=~~41.3875~~*

- **50%** raw score * **f** (max 50) ***41.4***

Final Exam (3 hours): ***75***0.5 = **37.5***

- **50%** Exam is organised by SMU after our 3-week course

GRADING AND EXAMINATION

3 weeks in-course contents

Presentation:

- **17.5%** Presentation for assignment 1 (group score) - ***75***
- **17.5%** Presentation for assignment 2 (group score) - ***80***

Report:

- (group score) - ***70***

Peer Ass (individual) - ***1.1***

In-course 0*0.15 = 37.625

- nt scores.
- every student in the same group.

In-course final score for each student: *37.625*1.1=~~41.3875~~*

- **50%** raw score * **f** (max 50) ***41.4***

TOTAL

~~*78.9*~~ ***79***

≡ ***3.0***

Final Exam (3 hours): ***75**0.5 = **37.5***

- **50%** Exam is organised by SMU after our 3-week course

PEER REVIEW

Honestly reflect on how your peers perform.

You submit the peer review **yourself** through the ipv4 address you receive for the group.

You will evaluate and be evaluated in the follow dimensions:

1. Information gathering
2. Knowledge sharing
3. Participation in discussion
4. Picking up tasks
5. Cooperation and communication
6. Delivering result

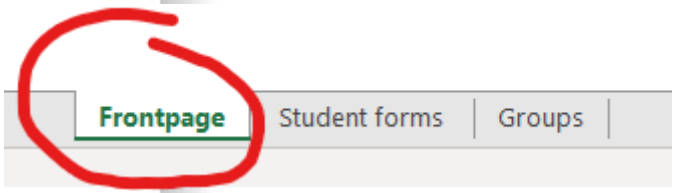
PEER REVIEW – STEP 1

Select your group number in this drop-down list

Group Number	Group 1
Base score	

Performance Levels	Scores
Above group average	13
Group average	10
Below group average	7
Almost no contribution	2
Obstacle in group work	0

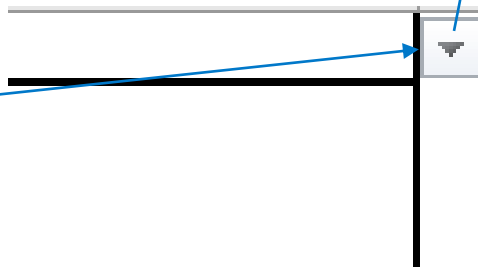
Assessment items	Weights
Information gathering	0,17
Knowledge sharing	0,17
Participation in discussion	0,17
Picking up tasks	0,17
Cooperation and communication	0,17
Delivering result	0,17

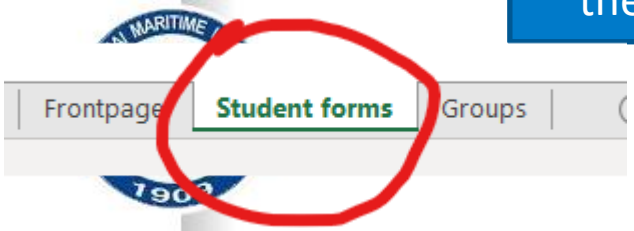


PEER REVIEW – STEP 2

Reviewer	Student 3					
Items -> Members | V	Information gathering	Knowledge sharing	Participation in discussion	Picking up tasks	Cooperation and communication	Delivering result
Student 1						
Student 2						
Student 3						
Student 4						
Student 5						
Student 6						
Student 7						
Student 8						
Student 9						

Select your name in this drop-down list to indicate the reviewer

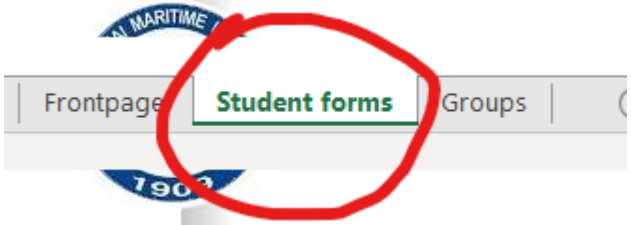




PEER REVIEW – STEP 3

Reviewer	
Items -> Members | V	Information gathering
Student 1	
Student 2	

In the drop down list select the level of performance of the corresponding teammate



After filling in all fields, save your file and upload to the server during the submission window.

JOB OPPORTUNITIES(INDUSTRY)

They know & use control theory:

- Aerospace Engineer
- Mechanical Engineer
- Systems Engineer
- Biotechnical Engineer
- Robotics Engineer
- Power Electronics Engineer
- Integrated Circuit Designer
- ……

Industries these people in:

- Robots & Vehicles
- Manufacturing factories
- Microelectronics & semiconductors
- Energy
- Chemical plants
- Smart infrastructure
- Bio-medical instruments
- Modern technology farming
- Consultancy
- Finance & banking
- High Frequency Trading
- IT & network
- Aerospace ……

INTRODUCTION ASSIGNMENT

Take a group photo
Put it in a presentation (ppt)
Include everyone's English & Chinese name
+ a special skill (Good at drawing, can do a backflip, great at KTV??)
Make clear who is the group leader

Tell us a little about yourselves in a presentation this afternoon!

~10 minutes

QUESTIONS ?

If you have questions, ask them through during the lectures or work sessions.

GOOD LUCK AND HAVE FUN WITH THE BCS COURSE!