UNIVERSITY OF APPLIED SCIENCES

BASIC CONTROL SYSTEMS

COURSE INTRODUCTION

HANSHU YU

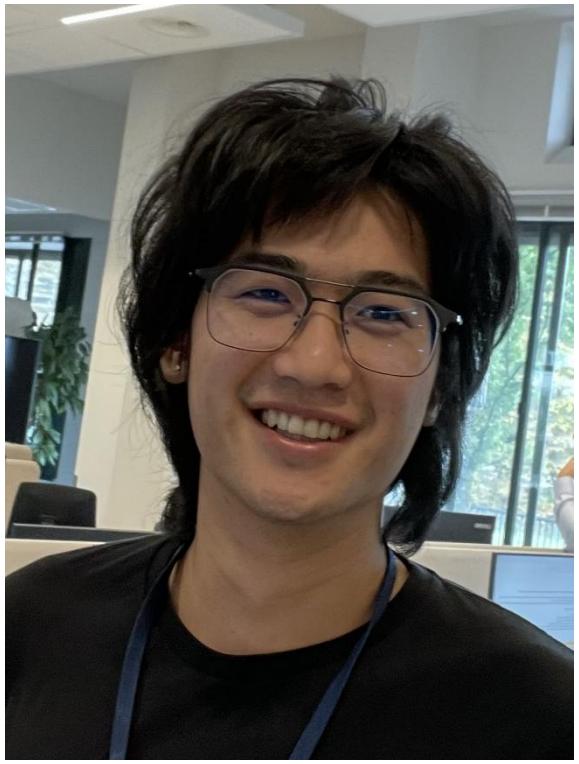
NOV 2025

WHERE STUDENTS MATTER

CONTENTS

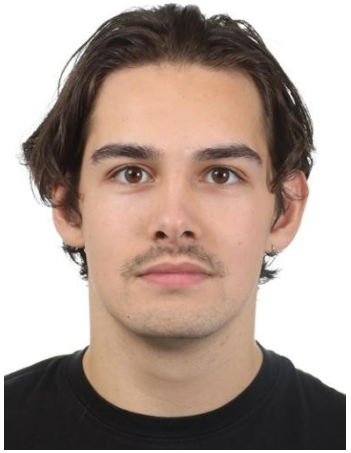
- Teaching team introduction
- Learning objectives
- Course material & structure
- Preliminary knowledge
- Potential job opportunities
- Introduction Assignment (Today!)

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 STRUCTURE - DAILY ACTIVITIES

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** Intro + Fundamentals	**Lecture** Laplace	**Lecture** 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** Block + data	**Lecture** PID	
		Introduce the assignments			

COURSE SCHEDULE

Week 2

	Monday	Tuesday	Wednesday		Thursday		Friday
8:20 -9:55	**Lecture** Root Locus 1	***Submission 8:30-9:00*** **Presentation**	Group work & self study	**LAB 1 M&EE**	**LAB 1 EE&IC**	**LAB 2 M&EE**	**Lecture** Frequency doamin 2
10:15-11:50	Group work & self study		Group work & self study				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** Root Locus 2		**Lecture** Frequency doamin 1		
		Assignment 1 & peer review 1					

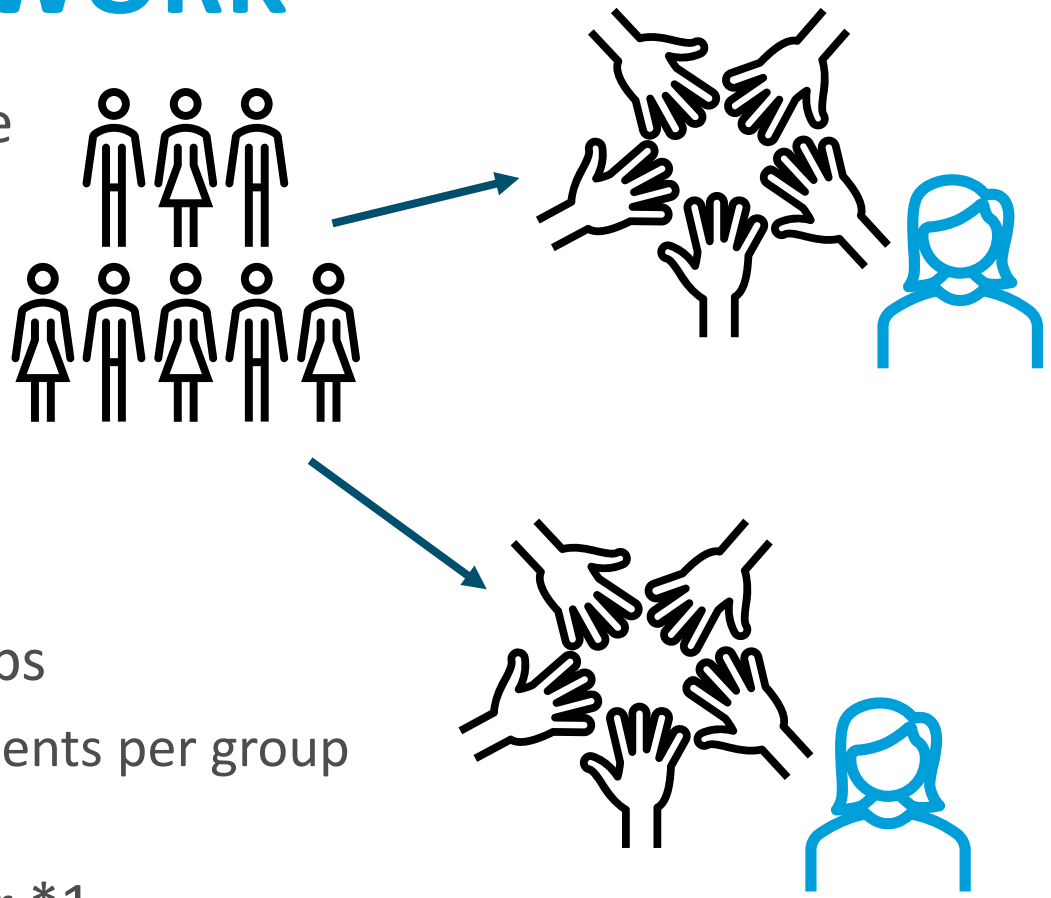
COURSE SCHEDULE

Week 3

	Monday		Tuesday	Wednesday	Thursday	Friday
8:20 -9:55	LAB 2 EE&IC	Group work & self study	**Lecture** Frequency doamin 4	**Lecture** 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** Recap 1	Group work & self study		
15:05-16:40	**Lecture** 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

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

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!