



UNIVERSITY
OF APPLIED SCIENCES

BASIC CONTROL SYSTEMS

COURSE INTRODUCTION

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HANSHU YU

NOV 2025



WHERE STUDENTS MATTER

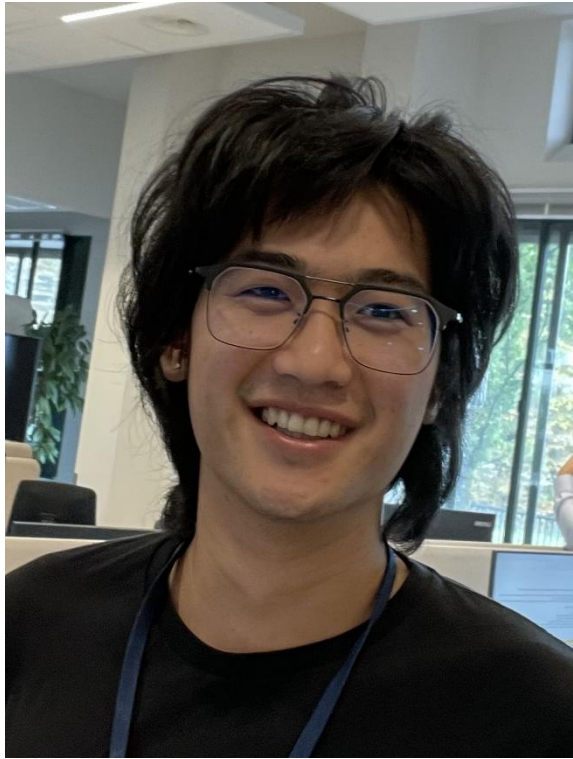
CONTENTS

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



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MEET THE TEAM:



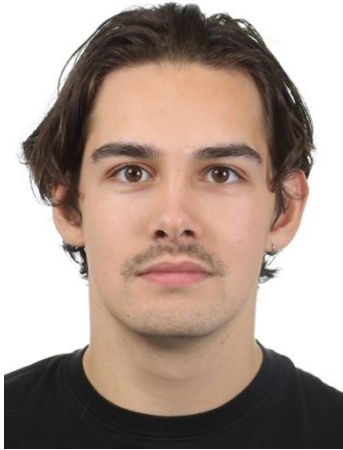
Lecturer:
Hanshu Yu





UNIVERSITY
OF APPLIED SCIENCES

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 >60%:

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

College building 124

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 <i>in discussion rooms</i>
	Lunch Break				
13:10-13:55		Group work & self study	Group work & self study	Group work & self study	
15:05-16:40		Presentation <i>(in discussion rooms)</i>	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	LAB 1 M&EE	LAB 1 EE&IC	LAB 2 M&EE	Lecture (Logistics 124) Frequency doamin 2
10:15-11:50	Group work & self study		Group work & self study				Workshop Report writing
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					



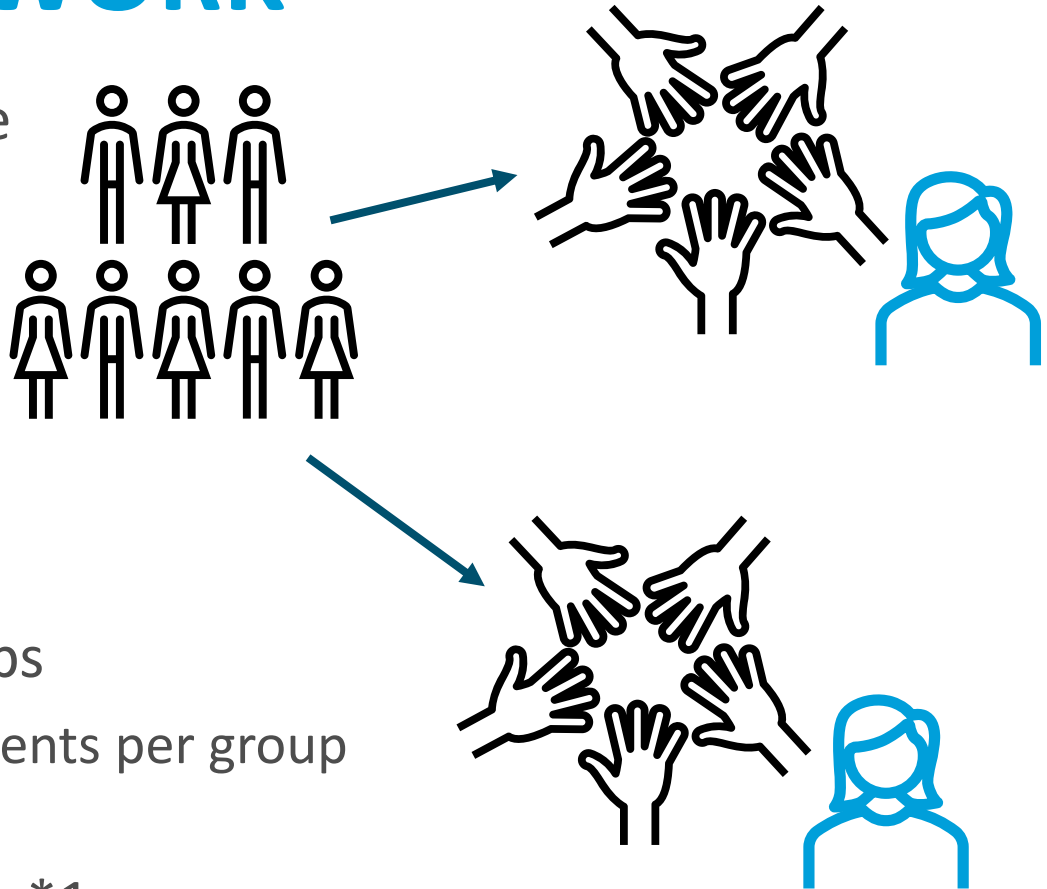
COURSE SCHEDULE

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	Grading time
					Presentation	
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!	

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 course²⁴





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 course²⁵



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 Assessment (individual) - **1.1**

In-course

- **TOTAL**
~~78.9~~ 79
 $70 * 0.15 = 37.625$
 $\equiv 3.0$
- 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**

Final Exam (**3 hours**):

$75 * 0.5 = 37.5$

- 50% Exam is organised by SMU after our 3-week course²⁶



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)

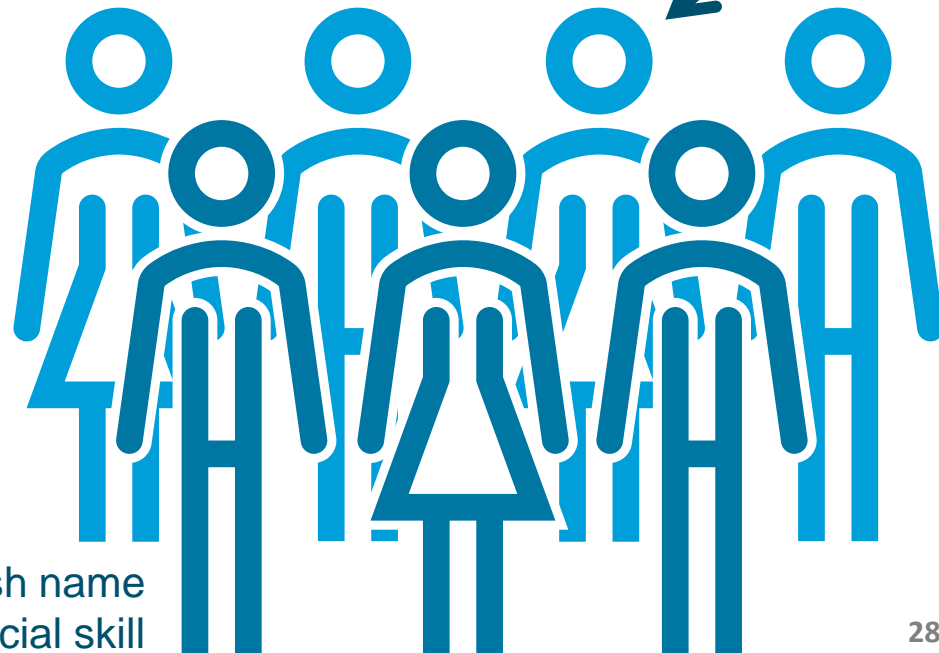
Include everyone's English & Chinese name
+ a special skill (Good at drawing, can do a
backflip, great at KTV??)

Make clear who is the group leader

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

~10 minutes

Group leader



English name
Special skill





QUESTIONS ?

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

**GOOD LUCK AND HAVE FUN
WITH THE BCS COURSE!**