

Applied Control System Design (SSY251)

Study period II, 2021 - 2022

Changfu Zou

Automatic Control

Division of Systems and Control

Department of Electrical Engineering

Chalmers University of Technology

Building E, Hörsalsv. 9, Floor 5 (Johanneberg)

Covid-19



Sources: Happiful Magazine

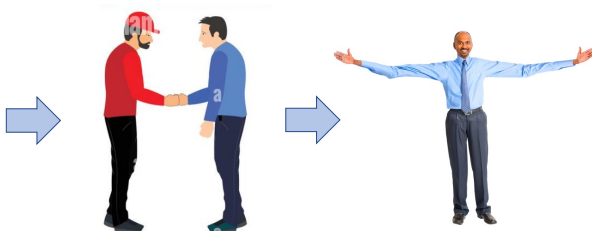


Sources: nytimes.com

Covid-19



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Advice:

- Please stay at home when you have Covid-19 symptoms
- If necessary, offline and online blended classroom will be offered for lectures and tutorial/exercise sessions
- If necessary, compensation tasks will be arranged for labs, scientific writing workshops, and library sessions

Welcome!

- **Lecturers (Control System Design):**

Changfu Zou (Examiner, State Space Model-based Design),

`changfu.zou@chalmers.se`

Yang Li (PID and Cascade Control), `yang.li@chalmers.se`

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- **Lecturer (Information Literacy):**

[Liza Nordfeldt](#), `liza.nordfeldt@chalmers.se`

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[Kathryn Strong Hansen](#) (strong@chalmers.se)

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- **Teaching Assistant and Lab Demonstrator:**

[Yao Cai](#), yao.cai@chalmers.se

- **Administrator at E2:**

[Christina Lidbeck](#), christina.lidbeck@chalmers.se

Student representatives

We have selected five student representatives for our course

- Ahmad Alkhshman
- Kevin Bielecki
- Hannes Hultergård
- Oskar Manfredi
- Somi Somi

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You represent yourself and the other students at

- start-up meeting/session to discuss the role of a student representative and how the course is structured
- mid-course meeting at about half-way through the course
- grateful if you remind participants about the importance to full our the course survey (after the exam week)

Intended learning outcomes (control techniques)

- 1 Become familiar with state-space terminology and be able to model linear and nonlinear processes as state-space models
- 2 Analyse properties of linear systems, e.g., stability, controllability, reachability, and observability

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- ➏ Use computer-based tools for simulation and design of dynamic feedback systems

Intended learning outcomes (general skills)

- 1 Search effectively for information in books, journals, and local databases
- 2 Evaluate information with regards to relevance and quality


Intended learning outcomes (general skills)

- ➊ Search effectively for information in books, journals, and local databases
- ➋ Evaluate information with regards to relevance and quality
- ➌ Use a process-oriented approach to writing, which includes giving and receiving constructive feedback
- ➍ Identify and analyze technical methods
- ➎ Use strategies to improve written proficiency in English

Course materials



- 1  **Feedback Systems: An Introduction for Scientists and Engineers.**

Karl Johan Åström and Richard M. Murray, Princeton University Press, 2008. (PDF available at [LINK](#))


-  **Optimal State Estimation: Kalman, H_∞ , and Nonlinear Approaches (Chapter 3 and 5).**


Dan Simon, John Wiley & Sons, 2006. (Find relevant part on Canvas)

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 - Exercises
 - Assignments
 - Lab materials
 - Previous exams

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- 4 Software: Matlab2020b (or later version)
 - Available at Chalmers Managed Software Center ([Link](#))
 - Install before 1 pm, November 2nd

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Tips:

- Check Canvas at least 1-2 times per week
- Very helpful to preview course materials and prepare each session
- Keep in mind the deadlines for assignment submission
 - Lab materials
 - Previous exams
- Software: Matlab2020b (or later version)
 - Available at Chalmers Managed Software Center ([Link](#))
 - Install before 1 pm, November 2nd

Course activities

Control techniques:

- 12 lectures (Changfu and Yang)
- 8 exercise/tutorial sessions (Yao and Changfu)
- 4 computer labs (Yao and Changfu)
- 1 hardware lab (Yang and Yao)
- Final exam

Course activities

Control techniques:

- 12 lectures (Changfu and Yang)
- 8 exercise/tutorial sessions (Yao and Changfu)
- 4 computer labs (Yao and Changfu)
- 1 hardware lab (Yang and Yao)
- Final exam

Scientific writing:

- 3 scientific writing workshops (Carina and Kathryn)
- 3 take-home assignments

Information literacy:

- 1 library session (Liza)

Course activities

Control techniques:

- 12 lectures (Changfu and Yang)
- 8 exercise/tutorial sessions (Yao and Changfu)
- 4 computer labs (Yao and Changfu)

Q&A:

- Feel free to ask questions
- Q&A about control techniques will be merged into exercise/tutorial and lab sessions

Information literacy:

- 1 library session (Liza)

Course activities

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- 12 lectures (Changfu and Yang)
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- Feel free to ask questions
- Q&A about control techniques will be merged into exercise/tutorial and lab sessions
- Make use of the discussion forum on Canvas
- Contact the course teachers via email

Information literacy:

- 1 library session (Liza)

Grouping for activities

- Scientific writing assignments: Students are to create teams with **3 persons**
- Hardware lab: 4 sessions will be organized. **2 students** form a team and each team selects one session to participate.
 - Try to book earlier sessions and leave room for re-sit lab session if someone misses or fails in the first time

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- Library session: all students will be divided into **2 groups**, each attending one session. Please select one of the groups.

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- Library session: all students will be divided into **2 groups**, each attending one session. Please select one of the groups.
- Self sign-up is enabled for all these groups on Canvas (SSY251 →People →Groups). Deadline to team up is **Friday 1 pm (week 44)**. Difficulty to group up? Contact course assistant in week 44.

Assessment

- ① (1) Attended library session and scientific writing workshops AND (2) submitted and approved writing assignments (Grading UG, pass/fail, [1.5 credits](#)).
- ② (1) Preparation and approval on the real-world lab session AND (2) submitted and approved results of computer labs (Grading UG, pass/fail, [1.5 credits](#)).

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- ➌ For assignments and labs, if the result is not approved, there is *one* occasion for correction.

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- ➌ For assignments and labs, if the result is not approved, there is *one* occasion for correction.
- ➍ Passed written examination (4.5 credits). Exam: 2022 January 8th, 8:00 am–12:00 pm.
 - Grade 3 collect 40% of points; grade 4 collect 60% of points; grade 5 collect 80% of points.
 - Grading TH+, 3, 4, 5
If points are larger than 18 \Rightarrow ☕ in 2022 April 11, 8:00 am–12:00 pm.

SSY251 on Canvas

How to use Canvas for SSY251

Canvas LMS interface for SSY251. The sidebar on the left contains navigation links: Account, Dashboard, Courses, Calendar, Inbox, History, and Help. The top navigation bar shows the course path: SSY251 > Modules. The main content area displays a list of modules. The 'Applied Control System Design' module is expanded, showing 'Lecture 4: State space modelling' and 'Lecture 5: Model-based simulation and analysis'. The 'Scientific Writing' module is also expanded, showing 'Writing Assignments Overview (PM)', 'Data commentary assignment' (23 Nov | 0 pts), and 'Peer review of comparison assignment draft' (15 Dec | 0 pts). On the right, there are buttons for 'View Course Stream', 'View Course Calendar', and 'View Course Notifications', and a 'To-do' list with items like 'Data commentary...', 'Peer review of com...', and 'Comparison assign...'.

Schedule for Lectures, Exercises and Labs

Content	Week	Lecture	Exercises	Labs
PM and Motivation	w44	L1	E1	
PID, Cascade Control, PLC	w44-47	L2-3	E2-3	HL
Modelling & Analysis	w46-47	L4-5	E4	CL1
System ID	w47-48	L6-7	E5	CL2
State Estimation	w48	L8-9	E6	CL3
State Feedback Control	w49-50	L10-12	E7,8	CL4

Computer lab: CL, Hardware laboration: HL, Lecture: L, Exercise Session: E

Schedule for Information Literacy

CHALMERS | BIBLIOTEK

SSY251 INFORMATION LITERACY

LIZA.NORDFELDT@CHALMERS.SE

2021



AGENDA

- Research process
 - Information seeking
 - Citations
 - Referencing (IEEE)
- Academic integrity
 - Avoid plagiarism
 - Copyright

- Workshops
 - 10/11 10:15-12:00 Gr A - Gamma
 - 11/11 08:15-10:00 Gr B – Svea130
 - Bring your laptop!
- Obligatory – bachelor thesis (working card)!
 - Extra assignment if you miss!

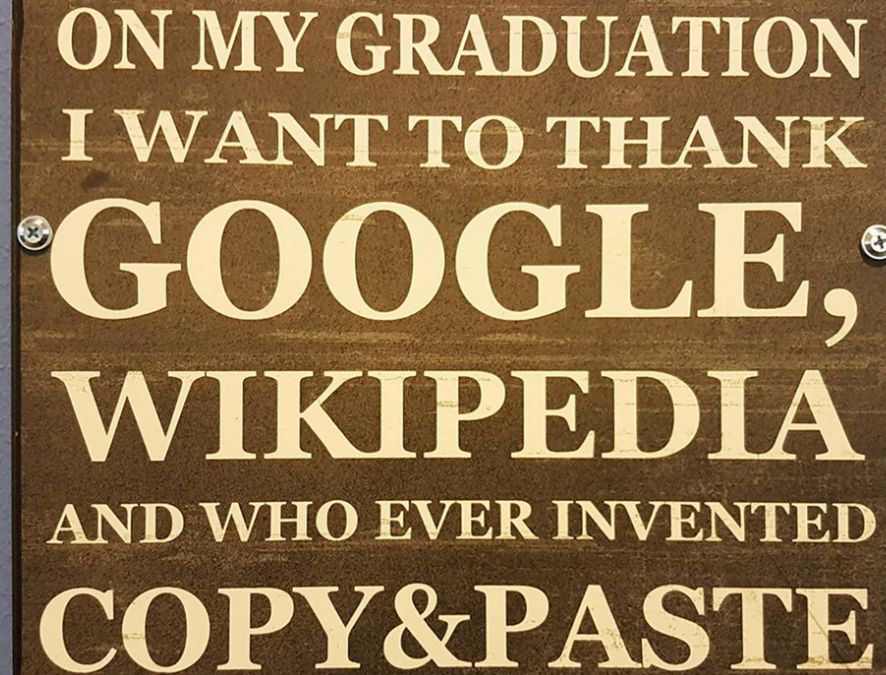
WORKSHOP

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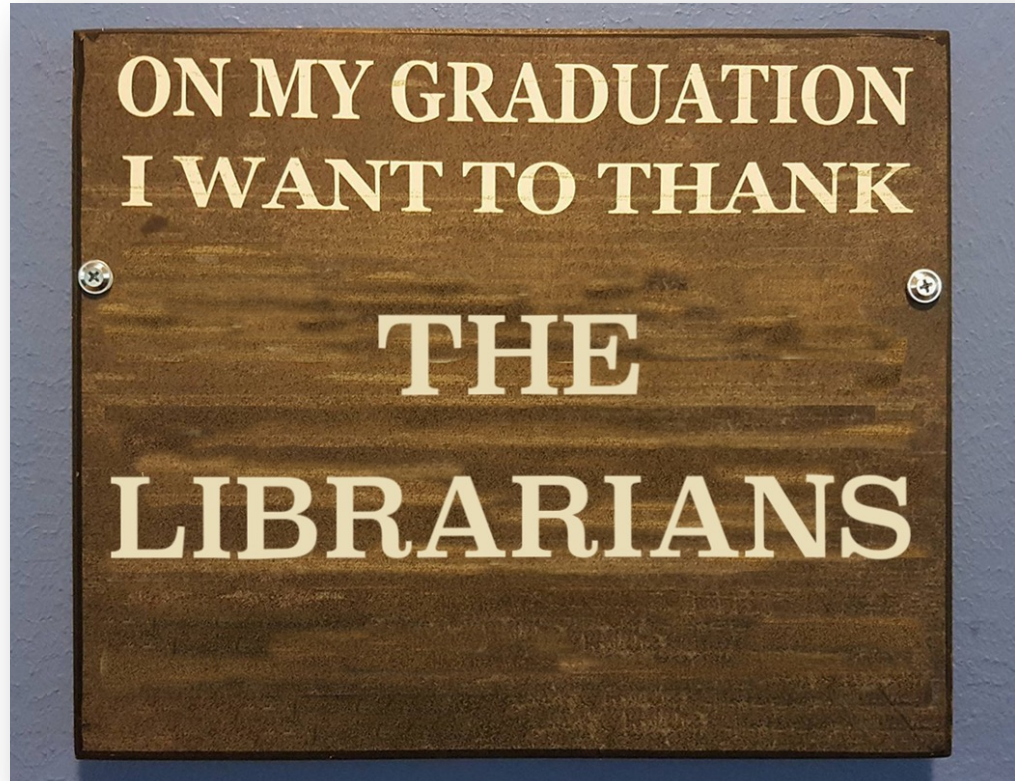
Groups i Canvas – self sign up

GOOD LUCK!

A rectangular wooden sign with a dark brown, textured surface. The sign is mounted on a light blue wall with two silver screws. The text is carved into the wood in a light-colored, serif font. The message is a humorous take on a graduation speech, thanking Google, Wikipedia, and the concept of copy and paste.

ON MY GRADUATION
I WANT TO THANK
GOOGLE,
WIKIPEDIA
AND WHO EVER INVENTED
COPY&PASTE

GOOD LUCK!



CHALMERS

BIBLIOTEK

Motivation & Schedule for Scientific Writing

Kathy



Who are we?

- We work in the Division for Language and Communication (DLC)
- DLC supports academic divisions across both campuses at Chalmers

Carina



Why are we on your course?

Kathy



Carina



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- Writing in English presents specific challenges, and we will help you with those, as well

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- Writing is difficult, and your programme wants to give you support for writing activities
- Writing in English presents specific challenges, and we will help you with those, as well
- We aid with key issues in writing that build upon previous writing instruction, including genre, structure, data commentary, and language issues specific to the course's writing tasks

What will we do on your course?

- We support and guide you in **writing your course assignments**

Technical and communication teachers are involved in reading both. There is specific technical criteria for the comparison.

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- a comparison of two methods of tuning a PID

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 - On the data commentary task
 - On a first draft of the comparison text
 - All information and material can be found in the **module Scientific Writing**