TKP4140 Process Control. Autumn 2022. Schedule / updated as we go along

Week	Week 2022	Topic lectures (my change) (book chapters from Seborg In parenthesis)	Exercise (out Wednesday, help next Wednesday 08-10, hand in Friday at 16:00, solution Monday)
1	34	Control fundamentals («crash course, part 1») NOTE: First lectures are 0915-1100 on Monday 22 August 2022 in room K5 (in building K5)	Ex.1 eactor control structure. "Shower process", Help session is the following Wednesday, so 31 Aug. 0815-1000 in K5.
2	35	Intro to dynamics and SIMC PID tuning («crash course, part 2») (Skogestad ch. 11)	Ex.2. Distillation. Modelling + control (Simulink) EXTRA::Tuesday 30 Aug 16-18 (K5): Introduction to Matlab and Simulink
3	36	Models: balances, state space form, linearization. Simulation (Ch.2, Skogestad ch. 11)	Ex.3 Linearization, Laplace
4	37	Laplace (App. A), Transfer functions, First-order system. Poles and zeros, responses, time delay,	Ex.4 Transfer functions Mon. Lecture project part 1 (Simulink). 16-18, K5
5	38	2nd order system (ch.4), block diagrams, Closed-loop response	Ex.5. 2nd order response (Simulink) Thu 9-10. Lecture about lab (K5)
6	39	Zeros, FOD approx, half rule (ch.5). Closed-loop response (ch.10), SIMC rules	Ex.6 (closed-loop TF, SIMC). Lab. In 2nd floor K4 (required for all students)
7	40	Derivation of SIMC PID tuning rules (ch. 11). PID tuning, ZN rule. PID implementation, windup, bumpless transfer, discrete control (7.6).	Ex.7. Closed-loop responses (Ex.1 revisit) Friday 07 Oct. 2022: Project part1 deadline
8	41	Stability, closed-loop poles, Routh Hurwitz, effect of feedback (root locus).	Ex.8: Tuning ZN+Shams Mon: Lecture project part 2: 16-18, (K5)
9	42	Frequency analysis (ch. 13), stability conditions, robustness,	Ex.9: Routh-Hurwitz, complex no.s
10	43	Freq. Analysis, continued. Advanced process control, cascade	Ex. 10: Bode diagrams. Friday: 28 Oct 2022 Project part 2 deadline
11	44	More advanced control, feedforward, selectors, split range control RGA, Cascade control, feedforward control (ch. 14, 15).	Ex. 11: Bode stabilité condition. GM, PM Mon: Lecture project part 3 16-18, (K5)
12	45	More examples. MIMO control. RGA, Decoupling	Ex.12: Feedforward, cascade
13	46	Industrial examples.	Ex.13: RGA, decoupling, feedforward Friday: 18 Nov 2022 Project deadline.
14	47	MPC (ch. 16), Controllability analysis, summary	

Instructor: Professor Sigurd Skogestad (room K4-211). Phone 91371669 (mob), 735 94154 (office). Email: skoge@ntnu.no

Lectures: Monday 09:15 – 11:00 (K5)

Thursday 08:15 – 09:00 (K5) *May move one hour later*

Exercises: Wednesday 08.15 – 10:00 (K5). *May have lectures instead some weeks.*

Project help sessions : 1-2 sessions each week (3x3 weeks), Tue and/or Wed 16-18

Instructors lab/project/excercises

vit.ass. Lucas Ferreira (main responsible)

vit.ass. Simen Bjorvand

vit.ass. Lucas Cammann

vit.ass. Rafael de Oliveira

Assistants exercises (Stud.ass)

Yoonsik Oh

Geir Arne Vassnes

Yasaman Hasjizadeh

Required exercises: 65% + required lab + required project

Grading: 100% final exam,

(Unfortunately, NTNU has changed its policy, so the old grading system cannot be used. Until 2021 it used to be 60% final, 20% midterm, 5% lab and 15% project 15%. With the current grading system the lab and the project are required activities where a grade of 70% is required to take the exam)

Until 2021: Midterm test (15 Oct. 2021, 10-12): 90 min written test. No notes or books allowed**.** Bring pen/pencil, allowed calculator and student ID card**.**

Final exam (09 Dec. 2022): 4 hour written exam. You may bring one (1) A4 double-sided piece of paper with your handwritten notes to the exam. No other books or help is allowed Standard calculator is allowed.

Course material:

- D.E. Seborg, T.F. Edgar, D.A. Mellichamp, F.J. Doyle: Process Dynamics and Control, Wiley, 4th ed. 2019.
- S. Skogestad: Chemical and Energy Process Engineering, CRC Press, 2009, Chapter 11 on “Process Dynamics” (available on course home page)

More information: http://www.ntnu.edu/studies/courses/TKP4140/2022