TKP4140 Process Control. Autumn 2017. Schedule / updated as we go along

Week	Week	Lectures (book chapters from Seborg In parenthesis)	Exercise (out Friday, help Thursday 8-10, hand in Tuesday next week at 16:00)
1	34	Control fundamentals («crash course, part 1») NOTE: First lecture is 1215-1400 on Monday 21 August 2017 in room F2 in the old physics building. http://s.mazemap.com/2tPCfkv	Ex.1 reactor control structure. “Shower process”, dynamics EXTRA: Wednesday 23 Aug 16-18 (K5): Introduction to Matlab and Simulink
2	35	Intro to dynamics and SIMC PID tuning («crash course, part 2») (Skogestad ch. 11)	Ex.2. Distillaton. Modelling + control (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, Poles and zeros, responses, time delay, response of first- and second-order systems, (ch. 3-5)	Ex.4 Transfer functions
5	38	Continue responses, 2nd order system (ch.4), block diagrams,	Lab. In 2nd floor K4 (required for all students) Ex.5. 2nd order response (Simulink) Thu: Lecture project (Simulink). 17-18 in K5
6	39	Zeros, FOD approx, half rule (ch.5). Closed-loop response (ch.10),	Ex.6 (closed-loop TF, SIMC).
7	40	Derivation of SIMC PID tuning rules (ch. 11). PID tuning, ZN rule. PID implementation, windup, bumpless transfer, discrete control (7.6).	Friday: Report1 (project) Ex.7. Closed-loop responses (Ex.1 revisit)
8	41	Midterm week. No lectures.	Thursday 8-10: **Midterm** (90 min.) in room S6 Thursday: Start2 (lecture Thu 17-18 in K5) Ex.8: Tuning ZN+Shams
9	42	Stability,closed-loop poles, Routh Hurwiz, effect of feedback (root locus). Start frequency analysis	Ex.9: Routh-Hurwitz, complex no.s
10	43	Frequency analysis (ch. 13), stability conditions, robustness	Friday: Report2 Ex. 10: Bode diagrams.
11	44	Freq. Analysis, continued.	Thursday: Start3 Ex. 11: Bode stability condition. GM, PM
12	45	RGA, Cascade control, feedforward control (ch. 14, 15). Industrial examples.	Ex.12: RGA
13	46	Multivar control, decoupling, MPC (ch. 16) Controllability analysis	Friday: Report3. Ex.13: Feedforward, cascade, decoupling
14	47	Summary	
		Exam. 2017: date not set	

Instructors: 1. Professor Sigurd Skogestad (room K4-211). Phone 91371669 (mob), 735 94154 (office). Email: skoge@ntnu.no

2. Associate Professor Nadav S. Bar

Lectures: Monday 12:15 – 14:00 (F2)

. Wednesday 10:15 – 11:00 (F2)

Exercises: Thursday 08:15 – 10:00 (F2)

Instructors exercises/lab/project

vit.ass. Tamal Das

vit.ass. Cristina Zotica

vit.ass. Adriaen Verheyleweghen

stud.ass. Julie Gjøby

stud.ass. Brittany Hall

stud.ass. Julie Rasmussen

Required exercises: 50% + required lab + required project

Grading: 60% final exam, 20% midterm, 20% lab/project (lab 5% and project 15%)

Note that the midterm will only count positive. If you do not take the midterm or if the midterm grade is lower than on the final exam, then the final exam will count 80% and the midterm 0%

Midterm test (October): 90 min written test. No notes or books allowed**.** Bring pen/pencil, allowed calculator and student ID card.

Final exam (December): 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, 3rd ed. 2011.
- 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/TKP4140/2017