TKP4140 Process Control. Autumn 2018. Schedule / updated as we go along

Week	Week 2018	Lectures (book chapters from Seborg In parenthesis)	Exercise (out Wednesday, help Monday 15-17, hand in Thursday at 16:00)
1	34	Control fundamentals («crash course, part 1») NOTE: First lecture is 1515-1700 on Monday 20 August 2018 in room EL2 in the electrical engineering building	Ex.1 reactor control structure. “Shower process”, dynamics EXTRA: Thursday 23 Aug 15-17 (EL2): 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 part 1 (Simulink). 17-19, 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 05 Oct. 2018: Report1 (project) Ex.7. Closed-loop responses (Ex.1 revisit)
8	41	Midterm week. No lectures.	Friday 12 Oct. 8-10: **Midterm** (90 min.) in room K5 Friday: Start2 (lecture Fri 12 Oct. 15-16 in S1) 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 (lecture Thu 16-17, S1) 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	

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: Wednesday 10:15 – 11:00 (F2)

. Friday 08:15 – 10:00 (K5)

Exercises: Monday 15:15 – 17:00 (EL2)

Instructors exercises/lab/project

vit.ass. Cristina Zotica

vit.ass. Adriaen Verheyleweghen

Vit.ass. Haakon Eng Holck

stud.ass. Eskild Aas

stud.ass. Zawadi Mdoe

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

Final exam (11 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/TKP4140/2018