Due to the Corona pandemic, this year’s course will differ in several ways from previous years of the course. We introduce Canvas to handle the contact between teachers and students. The lectures will, at least at the beginning of the course, be given in the form of pre-recorded videos that are posted in Canvas according to the schedule. The exercises will take place in classrooms, but teachers will not walk around in the room but stay at the board and teach from there. The labs will be carried out individually instead of in pairs and preparation tasks have to be handed in in advance via Canvas. More information will be given at the first lecture.

Canvas

All information about the course, and communication between teachers and students are handled using the Canvas page

https://canvas.education.lu.se/courses/5757

1. Lectures

Lectures (30 hours) are held at:

Mondays week 1–7 15.15–17.00
Tuesdays week 1–6 15.15–17.00
Thursdays week 1–2 15.15–17.00

Tore Hägglund is lecturer and course responsible.

2. Exercises

Exercises (30 hours) are held in four groups. Times and places are given below. Detailed program for exercises are given on the last page. Exercise 7 is a computer exercise that is not provided in classrooms this year. Support will be given using zoom at times presented in Canvas.

<table>
<thead>
<tr>
<th>Group</th>
<th>Days</th>
<th>Time</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1</td>
<td>Wed</td>
<td>15–17</td>
<td>KC:M-M2</td>
</tr>
<tr>
<td>D2</td>
<td>Thu</td>
<td>10–12</td>
<td>E:3308</td>
</tr>
<tr>
<td>E2</td>
<td>Thu</td>
<td>13–15</td>
<td>E:1144</td>
</tr>
</tbody>
</table>

1. Week 7, E:1147 replaced by E:1145
3. Lab Exercises

In the course there are three mandatory lab exercises. These labs are rather extensive and for them to be meaningful you need to prepare. Except for the first lab, there are mandatory home problems, which must be solved and handed in using Canvas at least 4 days before your lab session for you to be allowed to participate in the laboration. Note that you are not allowed to bring used lab manuals with notes from previous users. No laboratory reports need to be written.

The lab facilities are on the bottom floor in the KC4-building. You need to sign up to do the lab. Signup lists are available in Canvas.

The signup lists are open during the week before the lab starts. Note that you must sign up during this week. If you are unable to attend the lab you should report this to the lab responsible. Persons that have missed signing up in time or been absent from a lab without proper cause will have to do the lab the next time the course is given. This is however often already in the next study period, since the same labs are used for most other programs.

<table>
<thead>
<tr>
<th>Lab</th>
<th>When</th>
<th>Signup</th>
<th>Responsible</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>week 2–3</td>
<td>week 1</td>
<td>Christian Rosdahl</td>
</tr>
<tr>
<td>2</td>
<td>week 4–5</td>
<td>week 3</td>
<td>Felix Agner</td>
</tr>
<tr>
<td>3</td>
<td>week 6–7</td>
<td>week 5</td>
<td>Jonas Hansson</td>
</tr>
</tbody>
</table>

4. Interactive Computer Tools

In order to facilitate the learning and understanding of some of the concepts used in the course there are interactive computer tools available for free download from aero.ual.es/ilm/

The module Modeling is suitable for studying model descriptions. In Exercise 7, this model is used. This exercise is not given on campus, there will be zoom support at several occasions during the third course week.

5. Literature

The course is covered by 4 compendia sold by KF:

Reglerondek AK – Föreläsningar (Lectures)
Reglerondek AK – Exempelsamling (Exercises and solutions)
Reglerondek AK – Laborationer (Lab manual)
Reglerondek – Formelsamling (Collection of formulae)

The compendia are also available for free download in Canvas. You are allowed to use the 'Formelsamling' on the exam.


6. Exam

The written exam is 5 hours long. You may use 'Formelsamling', standard tables and calculators (not preprogrammed with e.g. Bode diagrams though). The grades are: fail, 3, 4, and 5.

The exam is on Monday October 26, 14–19, hopefully at Victoria stadion. However, due to the Corona pandemic, we may be forced to have a remote exam.
**Weekly Program**

Here is a weekly program with lectures=föreläsningar (F), exercises=övningar (Ö), and labs.

<table>
<thead>
<tr>
<th>Vecka</th>
<th>Datum</th>
<th>Aktivitet</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3 sep</td>
<td>F3: Impuls- och stegsvarsanalys.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ö1: Processmodeller. Linjärisering.</td>
</tr>
<tr>
<td>37</td>
<td>7 sep</td>
<td>F4: Frekvensanalys. Samman mellan modellbeskrivningar.</td>
</tr>
<tr>
<td></td>
<td>8 sep</td>
<td>F5: Återkoppling. Stabilitet.</td>
</tr>
<tr>
<td></td>
<td>10 sep</td>
<td>F6: Nyquistkriteriet. Stabilitetsmarginaler.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ö3: Poler, nollställen, steg- och impulsvar.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LABORATION 1: Empirisk undersökning av två enkla reglerrätts.</td>
</tr>
<tr>
<td>38</td>
<td>14 sep</td>
<td>F7: Känslighet. Stationära fel. Lab 2.</td>
</tr>
<tr>
<td></td>
<td>15 sep</td>
<td>F8: Tillståndsåterkoppling.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ö5: PID-reglering. Lab 2.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ö6: Nyquistkriteriet. Stabilitetsmarginaler.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ö7: Datorhjälpmedel.</td>
</tr>
<tr>
<td>39</td>
<td>21 sep</td>
<td>F9: Kalmanfiltering.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ö8: Stationära fel. Känslighet.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ö9: Tillståndsåterkoppling.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LABORATION 2: Modellbygge och beräkning av PID-inställning.</td>
</tr>
<tr>
<td>40</td>
<td>28 sep</td>
<td>F11: Kompensering i frekvensplanet.</td>
</tr>
<tr>
<td></td>
<td>29 sep</td>
<td>F12: PID-reglering.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ö10: Kalmanfiltering.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ö11: Kompensering i frekvensplanet.</td>
</tr>
<tr>
<td>41</td>
<td>5 okt</td>
<td>F13: Regulatorstrukturer. Implementering.</td>
</tr>
<tr>
<td></td>
<td>6 okt</td>
<td>F14: Syntesexempel.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ö12: PID-reglering.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ö13: Regulatorstrukturer.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LABORATION 3: Reglering av flexibelt servo.</td>
</tr>
<tr>
<td>42</td>
<td>12 okt</td>
<td>F15: Repetition.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ö14: Syntes.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ö15: Repetition.</td>
</tr>
<tr>
<td>44</td>
<td>26 okt</td>
<td>14–19 TENTAMEN</td>
</tr>
</tbody>
</table>
Department Offices

The Department offices are located in the KC4-building, on the third floor. The course lab is on the bottom floor northeast wing.

Phone and addresses

<table>
<thead>
<tr>
<th>Name</th>
<th>Phone</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
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</tr>
</tbody>
</table>

More information about the department are available on the home page

http://www.control.lth.se

Exercises

Ö = Done on exercise.  H = Suggested home exercises/repetition for exam

Ö1 Processmodeller. Linjärisering.
   Ö: 1.1, 1.2, 1.7
   H: 1.5a-c, 1.6, 1.9

Ö2 Systemrepresentationer. Blockschema.
   Ö: 2.1, 2.14ab, 2.15
   H: 2.2ab, 2.16ab

Ö3 Poler, nollställen, steg- och impulssvar.
   Ö: 2.5, 2.9, 2.11, 2.13
   H: 2.6

   Ö: 3.1, 3.2, 3.4bd, 3.5b, 3.7
   H: 3.4ac, 3.5a, 3.6

Ö5 PID-reglering. Lab 2.
   Ö: 4.1, Förberedelseuppgifter 3.1 och 3.6 i Lab 2, 4.9
   H: 6.3, 6.4

Ö6 Nyquistkriteriet. Stabilitetsmarginaler.
   Ö: 4.15, 4.13, 4.17, 4.18
   H: 4.12, 4.14, 4.19

Ö7 Datorhjälpmedel.
   Ö: 9.1, 9.2, 9.3

Ö8 Stationära fel. Känslighet.
   Ö: 4.11, 4.2, 4.6, 4.7, 4.4
   H: 4.3, 4.5

Ö9 Tillståndsförekomst. Styrbarhet.
   Ö: 5.5, 5.6, 5.8, 5.10, 5.11
   H: 5.2

Ö10 Kalmanfiltering. Observerbarhet.
   Ö: 5.3, 5.12, 5.9
   H: 5.13

Ö11 Kompensering i frekvensplanet.
   Ö: 6.11, 6.12, 6.13, 6.14
   H: 6.15

Ö12 PID-reglering.
   Ö: 6.5, 6.2, 6.7, 6.8
   H: 6.6, 6.9

Ö13 Regulatorstrukturer.
   Ö: 7.1, 7.6, 7.8, 7.9ab
   H: 7.2, 7.5, 7.9c

Ö14 Synthesis.
   Ö: 8.1
   H: 8.2

Ö15 gammal tenta.