



FRT041 SYSTEM IDENTIFICATION, SPRING 2014

Welcome to the course *System Identification (FRT 041)* at the Department of Automatic Control, Lund University (Internet <http://www.control.lth.se>).

Responsible academic staff

Lectures will be held by Rolf Johansson (Rolf.Johansson@control.lth.se, 046-222 8791). Tutorials will be held by Mahdi Ghazaei, (Mahdi@control.lth.se, 046-222 8795) and Jacob Antonsson (046-2224287, Jacob.Antonsson@control.lth.se). Laboratory sessions will be held by Mahdi Ghazaei and Meike Stemmann (Meike.Stemmann@control.lth.se, 046-222 8784). Office hours are Mondays 4-5pm (RJ), and Wednesdays 4-5pm (MG), and Fridays 1-2pm (JA).

Prior knowledge required

Control Theory (FRT 010), (Mathematical Statistics—Stochastic Processes (FMS 045)).

Reading list

- R. JOHANSSON, *System Modeling and Identification*, Englewood Cliffs, NJ: Prentice Hall, 1993. ISBN 0-13-482308-7 (hard cover) or ISBN 0-13-145889-2 (paperback) (The book is currently out of stock but a 2nd edition draft is available at KFS).

Other course material such as *Laboratory Exercises* and *System Modeling and Identification—Solutions Manual* are available via our home page <http://www.control.lth.se/course/FRT041/>.

Lectures

Lectures will be held in M:E on Tuesdays 13.15-15 and Thursdays at 8.15-10am; in the Seminar Room M2112B, Dept. Automatic Control, on Thursdays, Jan 23 and Jan 30, at 15.15-17; according to the following schedule:

Week & Date	N ^o	Contents
4 Jan 21	L1:	Introduction. Transient response analysis (RJ Chap. 1-2);
Jan 23	L2:	Frequency response analysis (RJ Chap. 2);
Jan 23	L3:	Spectrum analysis (RJ Chap. 3-4). Interactive software;
5 Jan 28	L4:	Linear regression. Least-squares method. (RJ Chap. 5);
Jan 30	L5:	Model parametrizations (RJ Chap. 6);
Jan 30	L6:	Maximum-likelihood methods (RJ Chap. 6);
6 Feb 4	L7:	Prediction error methods. Algorithms. (RJ Chap. 6);
Feb 6	L8:	Modeling (RJ Chap. 7);
7 Feb 11	L9:	The experimental procedure (RJ Chap. 8);
Feb 13	L10:	Model validation (RJ Chap. 9);
9 Feb 25	L11:	Model approximation (RJ Chap. 10);
Feb 27	L12:	State-space models. Subspace model identification. (RJ Chap. 13);
10 Mar 5	L13:	Real-time identification. Continuous-time models. (RJ Chap. 12);
Mar 7	L14:	Nonlinear system identification and 2D methods (RJ Chap. 14-15).

Tutorials

Tutorials will be held in M:L2 on Fridays at 10.15-1200. Exercises denoted 'x' are found on our web server.

Week	Date	Contents	Class	Home work
4	Jan 24	E1: Frequency response analysis	2.3, 2.4, 8.2,8.3	x1, 2.5, 8.4, x2
5	Jan 31	E2: Spectrum Analysis	2.6, 8.5, 8.6, x3	x4
6	Feb 7	E3: Linear regression	5.12, 6.3, 5.11	x5
7	Feb 14	E4: Time-Series Analysis	8.7, x6, x7	6.1, 6.10, x8
8	Feb 21	E5: Model validation Model reduction	x9, x10, 10.1, x11	10.2, x12
9	Feb 28	E6: Real-time identification Continuous-time models	x15, x16, x13 12.1	11.1
10	Mar 7	E7: Subspace-based identification	x18	

Information and course material is also available on www.control.lth.se

Homework Assignments

Homework assignments with mandatory hand-in of solutions will be requested during weeks 5, 7 and 8 with deadlines on February 2, February 16 and February 23.

Laboratory Exercises

Laboratory exercises will be held in the course laboratory in the ground floor of the M-building. Booking for the laboratory sessions are to be found via the home page and bookings are accepted two weeks before the first session will be held. Laboratory sessions will be made in groups of three students.

Lab	Time	Place	Responsible	Phone	Contents
Lab PI1	w.5	Lab A	Mahdi Ghazaei	222 8795	Frequency response analysis
Lab PI2	w.6-7	Lab A	Mahdi Ghazaei	222 8795	Interactive identification
Lab PI3	w.9	Lab A	Meike Stemmann	222 8784	Synthesis

Projects

Projects should be made in teams of three students and the subject of study should be chosen in cooperation with the instructor by **February 15**. The project should be finished and reported during the Spring semester 2014. Oral reports will take place on **Friday, April 25, 10.15 a.m.** – or at a time to be decided later. The project laboratory, with computers is available to the students. An entrance card to the laboratory and permissions will be issued at **Friday, January 24 at 10.30-11.30 a.m.**, at the office of Mr. Anders Blomdell, Level 2, southern wing, M-building. (Notice that a separate permission is required to enter the M-building. This should be acquired before visiting Mr. Blomdell.)

Exam and Exam Policy

The final exam is to be given on **Thursday, March 13 at 8.00-13.00 (8am-1pm)** in MA:MA08-A. Course literature (excluding old exams, exercises, and solutions) may be used during the exam. The grade of the exam (3, 4, or 5) will be posted on the notice board at the ground floor of the M-building. The final grade will be issued when the course project has been accepted. A well performed course project may increase the final grade by one unit as compared to the written exam.