

## **Analog Filters, TSEI10/TSTE14, 2017**

**<http://www.commsys.isy.liu.se/en/student/kurser/TSTE14> (TSEI10)**

### **Teachers**

Lectures, Lessons, and examination: Håkan Johansson (hakanj@isy.liu.se)

Labs: Trinh van Chien (trinh.van.chien@liu.se)

### **Course material**

Lars Wanhammar: *Analog Filters Using MATLAB*

Lars Wanhammar: *Tables and formulas for analog and digital filters*

Lab material

The course book can be purchased in the bookstore in Kårallen

The Tables&Formulas can be purchased in the A building (close to LiU-Tryck)

The lab material and solutions to the problems can be downloaded from the course homepage. The problems are included in the course book.

The **Aim of the Course** is to provide:

- The theoretical basis for analysis and design of analog filters
- Knowledge about practical realization and implementation of analog filters

After the course, you are **expected to be able to understand**:

- Basic concepts, analysis, and principles for the design of analog filters
- Synthesis of filters - standard approximations and frequency transformations
- Passive and active filter realizations and their sensitivity properties
- Filter implementation aspects

**Lectures and Lessons 20 h each (10 occasions each)**

**Laboratory exercises, 12 h (3 occasions)**

Basic Matlab functions, examples in the supplementary material. (Alternatively Analog Filter Toolbox, examples in the course book). Multisim, ELVIS board.

### **Examination**

A written exam (4 hours), 70 points, 30 points required to pass (seven problems, ten points each). Note that the laboratory exercises are mandatory and must be passed in order to pass the whole course. Exam aids: Tables and formulas for analog and digital filters, mathematical tables, and pocket calculator. ***Do not write in the Tables and Formulas!***

## Optional seminars (oral), two occasions

Gives max 10 p (5+5) on the written exam, corresponding to Problem 1.

## Registration

Please register for the course!

## Lecture schedule

Lecture 1: Introduction

Lecture 2: Filter synthesis - lowpass

Lecture 3: Filter synthesis - lowpass (cont'd)

Lecture 4: Filter synthesis - highpass, bandpass, bandstop

Lecture 5: Passive filter realizations - discrete elements

Lecture 6: Passive filter realizations - discrete elements (cont'd)

Lecture 7: Passive filter realizations - distributed elements

Lecture 8: Active filter realizations

Lecture 9: Active filter realizations (cont'd)

Lecture 10: Active filter realizations (cont'd)/Summary

## Lesson schedule

**Table 1: Recommended Problems**

Lesson	TSEI10 and TSTE14	TSTE14
1	1.2, 1.3, 1.4, 1.6, 1.14	1.10, 1.11
2	1.16, 1.17, 1.18, 1.19	1.12, 2.1
3	2.7, 2.8, 2.9, 2.10, 2.21	2.11, 2.12
4	2.27, 2.31, 2.34, 2.35, 2.36,	2.23, 2.33
5	3.2, 3.6, 3.7, 3.9, 3.10, 3.13	3.3, 3.4
6	3.14, 3.15, 3.17, 3.20, 3.24, 3.26	3.19, 3.25
7	4.1, 4.2, 4.3, 4.7, 4.9	4.10
8	5.3, 5.4, 5.8, 5.11, 5.16, 5.23	5.2, 5.27
9	6.1, 6.2, 6.3, 6.4, 6.19(a,b,c), 6.20	6.21
10	Problems from old exams	Problems from old exams