**Course syllabus**

**Matematik - System och transformer**  
**Mathematics - Systems and Transforms**

**FMAF05, 7 credits, G2 (First Cycle)**

Valid for: 2017/18  
Decided by: PLED F/Pi  
Date of Decision: 2017-04-06

**General Information**

Main field: Technology.  
Compulsory for: E2, F2, I2, Pi2  
Elective Compulsory for: D2  
Elective for: BME4, C4, M4, N3  
Language of instruction: The course will be given in English on demand

**Aim**

The aim of the course is to present mathematical concepts and methods from linear algebra and analysis which are important in systems theory (continuous and discrete), and for further studies within e.g. mathematics, economy, physics, mathematical statistics, mechanics, control theory, signal theory and for future professional work. The aim is also to develop the student’s ability to solve problems, to assimilate mathematical text and to communicate mathematics.

**Learning outcomes**

Knowledge and understanding

For a passing grade the student must

- be familiar with the significance of eigenvalues in the context of stability and resonance, in linear systems, with continuous as well as discrete time.  
- be able to describe and use the concepts of linearity, time and space invariance, stability, causality, impulse response and transfer function, in continuous as well as discrete time.  
- be able to describe the structure of an exponential matrix, and be able to compute exponential matrices in simple cases.  
- be able to characterize different types of quadratic forms using eigenvalue methods and via a completion of squares.
Competences and skills
For a passing grade the student must

- be able to define the concept of convolution, continuous and discrete, and to use convolutions both in the context of linear, time-invariant systems and in the description of certain types of integral equations.
- have some experience and understanding of mathematical and numerical software.

Contents
Linear algebra: Spectral theory, quadratic forms.


Input/output relations: Linearity, time and space invariance, stability, causality. Convolutions. Elementary distribution theory. Transfer and frequency functions. Discrete systems.


Examination details
Grading scale: TH - (U,3,4,5) - (Fail, Three, Four, Five)
Assessment: Written test comprising theory and problems. Assignments, requiring work with and without computer, which should be completed BEFORE the exam.

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

Parts
Credits: 7. Grading scale: TH.
Code: 0216. Name: Assignments.
Credits: 0. Grading scale: UG.
**Admission**

Admission requirements:

- FMAB20. At least 13 university credits, in total, of the courses FMAA05 and FMAB30. Started FMAB30.

**Required prior knowledge:** FMAF01 Analytic functions.

**The number of participants is limited to:** No

**The course overlaps following course/s:** FMA030, FMA036, FMA062, FMA450, FMAF10

**Reading list**

- Spanne, S: Övningar i Lineära system. KF-Sigma, 2009.

**Contact and other information**

**Course coordinator:** Studierektor Anders Holst, Studierektor@math.lth.se

**Course administrator:** Studerandeexpeditionen, expedition@math.lth.se

**Course homepage:** http://www.maths.lth.se/course/sot/

**Further information:** The written exams for this course may also be used as written exams on the earlier courses FMA450 and FMA036. In order for an exam to be graded it is necessary that the examinee has passed on the assignments before the exam.