Course syllabus

Tillämpad matematik - Linjära system
Applied Mathematics - Linear systems

FMAF10, 5 credits, G2 (First Cycle)

Valid for: 2020/21
Decided by: PLED F/Pi
Date of Decision: 2020-04-01

General Information

Main field: Technology.
Compulsory for: D2
Elective for: B4, BME4, C4, K4, L4-gi, M4, W4
Language of instruction: The course will be given in Swedish

Aim

The aim of the course is to treat some mathematical concepts and methods, above the basic level, that are important for further studies within e.g. machine learning, signal processing, control theory, electrical engineering and for further professional activities.

Learning outcomes

Knowledge and understanding
For a passing grade the student must

• be familiar with and be able to describe different properties of linear systems, and how they can be modelled in the time domain and in the frequency domain.
• be familiar with the Laplace transform and its significance in connection with input/output relations and differential equations, and be well versed in handling simple transform tables.
• have good knowledge of such matrix algebra that is the foundation of eigenvalue problems and of solving systems of differential equations.

Competences and skills
For a passing grade the student must

- be able to show capability to identify problems which can be modelled with the
  concepts introduced.
- be able to show ability to use the concepts in connection with problem solving.
- with proper terminology, suitable notation, and with clear logic be able to explain the
  solution to a problem in a well structured manner.

Contents

Linear systems: Mathematical models of linear, time invariant systems. Transfer function.
Step response and impulse response. The frequency function.

The Laplace transform: Step and impulse functions. Computational rules for the two-sided
Laplace transform. Inverse transforms, in particular of rational functions. Use of
transform tables. Convolution.

Matrix algebra: Eigenvalues and eigenvectors. Diagonalization, in particular of symmetric
matrices. Quadratic forms, diagonalization and classification. Systems of differential
equations: solution by diagonalization, solution using exponential matrix.

Examination details

Grading scale: TH - (U,3,4,5) - (Fail, Three, Four, Five)
Assessment: Written test. Computer sessions.

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: 5. Grading scale: TH.
Credits: 0. Grading scale: UG.

Admission

Admission requirements:

- At least 7 university credits from one of the courses FMAA01, FMAA05 or FMAA50

Assumed prior knowledge: Basic university courses in calculus and linear algebra.
The number of participants is limited to: No
The course overlaps following course/s: FMA030, FMA037, FMA062, FMA450, FMAF05

Reading list

- Spanne, S. & Sparr, A.: Föreläsningar i Tillämpad matematik, Lineära system. KF-
Sigma, 1996.


Contact and other information

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