



# FEM3220 Matrisalgebra 10,0 hp

## Matrix Algebra

När kurs inte längre ges har student möjlighet att examineras under ytterligare två läsår.

## Fastställande

.

## Betygsskala

P, F

## Utbildningsnivå

Forskarnivå

## Särskild behörighet

Doctoral students at the School of Electrical Engineering. External participation by admission of the examiner.

## Undervisningsspråk

Undervisningsspråk anges i kurstillfällesinformationen i kurs- och programkatalogen.

## Lärandemål

After the course, each student is expected to:

- Show a good working knowledge of some fundamental tools (specified by the course content) in matrix algebra.
- Use the acquired knowledge to more easily apprehend research papers in engineering.

- Identify research problems in which matrix algebra tools may be powerful.
- Apply the knowledge to solve the identified matrix algebra problems.
- Combine several sub problems and solutions to solve more complex problems.
- Show improved skills in problem solving and proof writing as well as in critical assessment of proofs and solutions.
- Show improved skills in oral presentation of technical contents.

## Kursinnehåll

1. Review of vector spaces, inner product, determinants, rank
2. Eigenvalues, eigenvectors, characteristic polynomial
3. Unitary equivalence, QR-factorization
4. Canonical forms, Jordan form, polynomials and matrices
5. Hermitian and symmetric matrices, variational characterization of eigenvalues, simultaneous diagonalization
6. Norms for vectors and matrices
7. Location and perturbation of eigenvalues
8. Positive definite matrices. Singular value decomposition
9. Nonnegative matrices, positive matrices, stochastic matrices
10. Stable matrices; Lyapunov's theorem
11. Matrix equations and the Kronecker product, Hadamard product
12. Matrices and functions square roots, differentiation

Additional topics selected for the student presentations

## Examination

- EXA1 - Examination, 10,0 hp, betygsskala: P, F

Examinator beslutar, baserat på rekommendation från KTH:s handläggare av stöd till studenter med funktionsnedsättning, om eventuell anpassad examination för studenter med dokumenterad, varaktig funktionsnedsättning.

Examinator får medge annan examinationsform vid omexamination av enstaka studenter.

## Övriga krav för slutbetyg

- Individual solutions to weekly written homework assignments, 80% of max score (Written exam if homework not satisfactorily solved)
- Peer-review grading of assigned problem sets
- Presentation of assigned topic and actively participating during other students presentations

## Etiskt förhållningssätt

- Vid grupparbete har alla i gruppen ansvar för gruppens arbete.
- Vid examination ska varje student ärligt redovisa hjälp som erhållits och källor som använts.
- Vid muntlig examination ska varje student kunna redogöra för hela uppgiften och hela lösningen.