EQ2820 Matrisalgebra, forskar-förberedande 7,5 hp

Matrix Algebra, Accelerated Program

Fastställande

Kursplan för EQ2820 gäller från och med VT19

Betygsskala

A, B, C, D, E, FX, F

Utbildningsnivå

Avancerad nivå

Huvudområden

Elektroteknik

Särskild behörighet

För fristående kursstuderande: 180hp samt engelska B eller motsvarande

Undervisningsspråk

Undervisningsspråk anges i kurstillfällesinformationen i kurs- och programkatalogen.

Lärandemål

The course is given every second year and is suitable as a first postgraduate (Ph.D) course or as an advanced course in the final year of the M.Sc. program (e.g., for students considering to join the PhD program).

We will refresh and extend the basic knowledge in linear algebra from previous courses in the undergraduate program. Matrix algebra is of fundamental importance for scientists and engineers in many disciplines. In this course we will focus on topics that are of particular interest in communications, signal processing and automatic control.

The course requires a large amount of self study and homework problems will be handed out every week and will be due the following week. It assumes some familiarity with basic concepts from linear algebra (as can be expected by good knowledge from undergraduate studies).

Learning outcomes:

After the course, each student is expected to be able 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.

Kursinnehåll

Main contents:

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; Lyapunovs theorem

11. Matrix equations and the Kronecker product, Hadamard product

12. Matrices and functions square roots, differentiation

Kurslitteratur

Will be reported on the course homepage four weeks before start.

Previously we have used the books “Matrix Analysis” and “Topics in Matrix Analysis” by R.A. Horn and C. R. Johnson.

Examination

- TEN1 - Tentamen, 7,5 hp, betygsskala: A, B, C, D, E, FX, 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.

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

Övriga krav för slutbetyg

Weekly homework assignments (TEN1, 7.5 ECTS credits, grading A-F)
Written exam if homework not solved satisfactorily.

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.