

**Syllabus: AE0B01LAA Linear Algebra and its Applications/
AE0B01LAG Linear Algebra**

Instructor: Paola Vivi, e-mail:vivi@math.feld.cvut.cz <http://math.feld.cvut.cz/vivi/>
Office:Zikova 4, 2nd floor, room n.14.

Text: P. Pták: Introduction to Linear Algebra. CVUT, Praha, 2005.

P. Pták: Introduction to Linear Algebra. CVUT, Praha, 1997.

<ftp://math.feld.cvut.cz/pub/krajnik/vyuka/ua/linalgeb.pdf>

<http://math.feld.cvut.cz/habala/teaching/veci-ODE/em2notes.pdf> (pages 1 to 12)

Course description: The course covers standard basics of matrix calculus (determinants, inverse matrix) and linear algebra (basis, dimension, inner product spaces, linear transformations) including eigenvalues and eigenvectors. Notions are illustrated in applications: Matrices are used when solving systems of linear equations, and eigenvalues are used for solving differential equations.

Lectures will cover all the material needed to pass the exam. Attendance is not obligatory but highly recommended.

Labs are devoted to develop the necessary technical skills for problem solving. During the labs of Week 6 and Week 11 a test (45 min., 3 questions) will also be handed out. **Attendance is obligatory:** In order to obtain the certificate of attendance (needed for the final exam), students are required to actively participate in the laboratory class, hand in the assigned homework and obtain a sufficient score during lab tests.

Exam. Students who obtain attendance certificate ("zapocet") are allowed to take the exam. The exam is composed of written and oral part. The written final exam will be in January-February, exact dates will be announced later, it will consist of several problems to be solved in 90 minutes for a total of 90 points. The oral final exam is optional, it is used to improve the grade up to ten points. Questions about theory will be asked (definitions, theorems, proofs). In order to pass the exam a minimum of 50 points in the written test is required, students with more than 60 points in the written part of the exam will be allowed to improve their grade with the oral part of the exam. **Grades** are assigned as follows: F(<49pts), E(50-59), D(60-69), C(70-79), B(80-89), A(90-100).

Content of lectures.

(week 1) Systems of linear equations, Gauss elimination method.

(week 2) Linear spaces, linear dependence and independence.

(week 3) Basis, dimension, coordinates of vectors.

(week 4) Rank of a matrix, the Frobenius theorem.

(week 5) Linear mappings. Matrix of a linear mapping.

(week 6) Matrix multiplication, inverse matrix. Determinants.

(week 7) Inner product. Expanding vector w.r.t. orthonormal basis. Fourier basis.

(week 8) Eigenvalues and eigenvectors of matrices and linear mappings.

(week 9) Differential equations. Method of separation of variables.

(week 10) Linear differential equations, homogeneous and non-homogeneous. Variation of parameter.

(week 11) Linear differential equations with constant coefficients. Basis of solutions. Solving non-homogeneous differential equations.

(week 12) Systems of linear differential equations with constant coefficients. Basis of solutions. Solving non-homogeneous systems.

(week 13) Applications. Numerical aspects.