



Engineering studies in IT - międzynarodowy program studiów
prowadzonych przez Wydział Matematyki i Informatyki UAM w Poznaniu
Nr projektu POWR.03.03.00-IP.08-00-MPK/16

LINEAR ALGEBRA AND GEOMETRY

Learning module description

GENERAL INFORMATION

1. Module title: Linear algebra and geometry
2. Module code: DALI LI0-E
3. Term: summer
4. Duration: 30h lectures + 30h exercises/laboratories
5. ECTS: 6
6. Module lecturer: William Mance
7. E-mail: mance@amu.edu.pl
8. Language: English

DETAILED INFORMATION

1. Module aim: familiarization with the basic concepts, theorems and applications of linear algebra.
2. Pre-requisites in terms of knowledge, skills and social competences (where relevant):
No requirements.

SYLLABUS:

- Week 1: Basic algebraic structures: groups, rings, fields.
- Week 2: Matrix algebra, a transposed matrix, a Hermitian matrix.
- Week 3: Elementary matrices, inverse matrices, the inverse matrix algorithm for a triangular matrix.
- Week 4: Determination of matrix echelon and reduced echelon form. The Kronecker-Capelli theorem.
- Week 5: Solving system of linear equations by means of the Gaussian elimination algorithm.
- Week 6: Solving system of linear equations by means of the Gaussian elimination algorithm (cont.).
Properties of determinants, minors, Laplace's and Cauchy's theorems, the calculation of the determinants by the matrix decomposition on the triangular factors product.
- Week 7: Properties of determinants, minors, Laplace's and Cauchy's theorems, the calculation of the determinants by the matrix decomposition on the triangular factors product (cont.).
- Week 8: The adjugate matrix of a matrix and determination of an inverse matrix of the nonsingular matrix. The Cramer's rule.
- Week 9: Linear spaces, vectors, linear independence of vectors, the basis and the dimension of a linear space, the change of basis matrix.
- Week 10: Linear map, a matrix of linear mapping, similarity of matrices.
- Week 11: Eigenvalues and eigenvectors, characteristic polynomial.
- Week 12: Eigenvalues and eigenvectors, characteristic polynomial (cont.). Diagonalization of matrices, Jordan form, the Rayleigh-Ritz theorem.
- Week 13: Diagonalization of matrices, Jordan form, the Rayleigh-Ritz theorem (cont.).
- Week 14: Inner product spaces, orthogonal transformations, unitary transformations, self-adjoint transformations.
- Week 15: Quadratic forms, Lagrange and Jacobi methods of matrices canonicalization, investigation of matrices definiteness.