



Università degli Studi della Basilicata
Dipartimento di Culture Europee e del Mediterraneo:
Architettura, Ambiente, Patrimoni Culturali
(DiCEM)

Course description

COURSE: Geometria (Geometry)

ACADEMIC YEAR: 2019/2020

TYPE OF EDUCATIONAL ACTIVITY: Basic

TEACHER: Angelo Sonnino

e-mail: angelo.sonnino@unibas.it

website: web.unibas.it/sonnino

phone: +39 0971 205849

mobile (optional):

Language: Italian

ECTS: 6

n. of hours: 60

Campus: Matera
Dipartimento di Culture
Europee e del Mediterraneo:
Architettura, Ambiente,
Patrimoni Culturali (DiCEM)
Program: Architettura
(Architecture)

Semester: I

EDUCATIONAL GOALS AND EXPECTED LEARNING OUTCOMES

- **Knowledge and understanding:**
basic notions of modern geometry methods.
- **Ability to apply knowledge and understanding:**
ability to solve the classical problems of linear algebra at university level.
- **Independence:**
ability to determine, for each problem, the method of optimal resolution among those described in class or in literature.
- **Communication skills:**
ability to describe the acquired notions in a simple and direct way.

PRE-REQUIREMENTS

Basic knowledge of modern geometry.



Università degli Studi della Basilicata
Dipartimento di Culture Europee e del Mediterraneo:
Architettura, Ambiente, Patrimoni Culturali
(DiCEM)

SYLLABUS

Vector spaces. Subspaces. Linear span of a set of vectors. Linear dependence. Basis. Dimension. Extension to a basis. Sum of subspaces. Grassmann theorem. Linear maps. Endomorphisms. Isomorphisms. Kernel and image of a linear map. Rank-nullity theorem. Matrix algebra. Transpose of a matrix. Special matrices. Inverse matrix. Determinant of a square matrix. Properties of determinants. Laplace expansion. Sarrus' scheme. Change of basis. Matrix associated to a linear map. Rank of a matrix and its properties. Elementary operations. Echelon form. Methods for computing the rank of a matrix. Systems of linear equations and their solutions. Homogeneous systems. Rouché-Capelli theorem. Inverse matrix method. Cramer's rule. Gaussian elimination. Systems of linear equations depending on a parameter. Eigenvalues and eigenvectors. Characteristic polynomial. Algebraic and geometric multiplicity of an eigenvalue. Diagonalizability of an endomorphism and of a matrix. Bilinear forms and scalar products. Matrix associated to a bilinear form. Orthogonality between vectors. Standard scalar product in a real vector space. Norm of a vector. Orthogonal basis. Orthonormal basis. Gram-Schmidt process. Cauchy-Schwarz inequality. Triangular inequality. Signature. Sylvester's law of inertia. Convex angle between vectors.

TEACHING METHODS

Classroom lessons.

EVALUATION METHODS

Written and oral exam.

TEXTBOOKS

Theory

- E. Sernesi, Geometria, Vol. 1. Bollati Boringhieri, 1989, ISBN 8833954471.

Exercises

- S. Lipschutz, Algebra lineare, Collana Schaum, McGraw-Hill, 2003, ISBN 8838650764.
- F. Ayres, Matrici, Collana Schaum, McGraw-Hill, 2003, ISBN 8838650225.

INTERACTION WITH STUDENTS

During lessons, office hours and by email.

EXAMINATION SESSIONS (FORECAST)

05/02/2020, 24/02/2020, 03/06/2020, 24/06/2020, 14/09/2020, 25/09/2020.

SEMINARS BY EXTERNAL EXPERTS YES ☐ NO ☒

FURTHER INFORMATION
