

LINEAR ALGEBRA, ANALYTIC AND DIFFERENTIAL GEOMETRY

(1st YEAR I, 1st SEMESTER)

Credit value (ECTS): 5

Course category: Mandatory

Course holder: Lecturer Ciprian CHIRUȚĂ PhD.

Discipline objectives (course and practical works)

The course offers knowledge base on techniques for calculating household environmental engineering, especially the elements of linear algebra (solving systems of linear equations, elements of spectral theory), analytical geometry and differential useful in mathematical modelling of specific phenomena change environmental.

Contents (syllabus)

Course (chapters/subchapters)
Linear algebra
Vector Spaces: Definition, linear dependence and independence, substitution lemma and its applications. Solving linear systems: the set of solutions, basic solutions, solutions degenerate. Applications of Lemma substitution.
Linear transformations: Definition, examples, properties. Linear transformation matrix. Core, image, application factor. Values and eigenvalues. Canonical forms: Diagonalization, Jordan forms. Linear forms, bilinear forms and quadratic forms.
Euclidean vector spaces: definitions, examples. Scalar product, vector product, mixed product for vectors in space. Orthonormal bases. Projections and Gram-Schmidt process. Complement orthogonal subspaces and projections.
Analytic geometry
Curves plane: Cartesian and polar coordinate systems in the plane. Curves plan: analytical representation. Points and righteous plan. Quadratic planar curves (reduced equation): circle, ellipse, parabola, hyperbole and sections in a cone. Plane curves in general equation: Orthogonal invariants of plane curves. Tangent and normal.
Curves and surfaces in space: Cartesian coordinate systems, polar and semipolar in space. Curves and surfaces in space: analytical representation. Points, lines and planes in space. Second-degree surfaces (reduced equation): sphere, ellipsoid, paraboloid, hyperboloid. Cones, cylinders and rotational surfaces. Tangent, normal and binormal a point of the curve. Tangent plane to a surface.
Differential geometry of curves in plane and in space

Elements of vector analysis. Rotor, gradient, divergence. Tangent and tangent plane, normal and normal plane, and the main plan osculator normal, binormal and plan rectifier in an ordinary point of the curve. Frenet landmark of a curve. Curvature and twisting in an ordinary point of the curve. Frenet's formulas. The fundamental theorem of the theory of curves

Practical works
Matrix calculation,
The lemma substitution Applications
Matrix of a linear operator. Eigenvalues and eigenvectors
Diagonalization and Jordan matrix forms a linear operator
Vector calculus in E3. Applications product vector dot product, mixed product.
Points and lines in plan
Quadratic planar curves
Points, lines and planes in space
Second-degree surfaces
Frenet landmark of the curve in space
Curvature and torsion of a curve
Tangent plane and normal in an ordinary surface

Bibliography

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2. Burdujan I.-*Elemente de matematici cu aplicații în Biologie*, Ed.Vasiliana'98, Iași 2001.
3. Burdujan I.-*Capitole de Matematici aplicate -pentru biologi*, Ed.Vasiliana'98, Iași 2001.
4. Burdujan I.-*Matematici cu aplicații în Biologie*, Ed. PIM, Iași, 2002.
5. Gheorghiev Gh., ș.a. *Geometrie analitică și diferențială*, I, II, EDP București, 1969.
6. Ion D. Ion, ș.a. - *Elemente de algebră liniară și programare liniară*, E.D.P. București, 1973.
7. Bunu I. coord. colectiv de autori, *Matematici economice*, Departamentul Editorial Poligrafic al Academiei de Studii Economice a Moldovei, Chișinău, 2012.
8. Donciu N., Flondor D., Simionescu, Gh., *Algebră și analiză matematică - culegere de probleme*, vol. 1, Ed. Didactică și Pedagogică, București, 1967.
9. Donciu N., Flondor D., Simionescu, Gh., *Algebră și analiză matematică - culegere de probleme*, vol. 2, Ed. Didactică și Pedagogică, București, 1965.
10. Ganga, M., *Elemente de analiză matematică pentru clasa a XI-a, partea întâi*, Editura Mathpress, Ploiești, 2000,
11. Ganga, M., *Elemente de analiza matematica pentru clasa a XI-a, partea a doua*, Editura Mathpress, Ploiești, 1999,

Evaluation

Evaluation form	Evaluation Methods	Percentage of the final grade
Exam	Oral and written examination	10%+60%
Appreciation of the activity during the semester	Oral assessment during the semester and written verification tests	30%

Contact

Lecturer Ciprian CHIRUȚĂ PhD

Faculty of Horticulture - USAMV Iași

Aleea Mihail Sadoveanu nr. 3, Iași, 700490, Romania

telefon: 0040 232 407437,

E-mail: kyru@uaiasi.ro