"POLITEHNICA" UNIVERSITY FROM TIMIŞOARA
"POLITEHNICA" INTERNATIONAL "Π"

SYLLABUS
for the course:

"LINEAR ALGEBRA AND GEOMETRY"

Year of study: I

Semester 2

Course coordinator: Lect.dr. Sorin LUGOJAN					
Colaborators: *Asist.Dr. Cătălin VASII*					
Number of hours/week/Verification/Credits					
Lectures	**Tutorials**	**Laboratories**	**Project**	**Examination**	**Credits**
2	**2**	**-**	**-**	**Exam**	**4**

A. COURSE OBJECTIVES

The goal of this course is to master the fundamentals of linear algebra, mainly the arithmetic vector space and its linear transformations.

B. COURSE TOPICS

Linear equations : *Consistency of linear equations; Cramer's rule; least square solution of a system of linear equations; homogeneous linear systems;*
Vector spaces *Linear dependence and independence; bases and dimension; linear subspaces;*
Linear maps *Linear maps and matrices; the kernel and image of a linear map*
Eigenvalues and eigenvectors *Characteristic polynomial, eigenvalues and eigenvectors of a squared matrix; diagonalization; application to systems of homogeneus linear differential equations;*
Inner product vector spaces *The inner product and the associated norm; unit vectors, angles, orthogonal vectors; Orthonormal bases; orthogonal matrices; Gramm-Schmidt orthogonalization method; Linear transformations of inner producr vector spaces Orthogonal diagonalization of symmetric matrices;*
Three dimensional geometry *The three dimensional space; geometric vectors; the dot product and cross product of two geometric vectors; orientation of three dimensional space; orthonormal frames; translation, rotation about a point in the plane, rotation about an axis in space; lines and planes in the three dimensional space; projections and distances;*
Differential Geometry of curves and surfaces*: the tangent and normals to a 3D curve. The curvature and torsion of a 3D curve. The tangent plan and the normal to a surface*

C. APPLICATIONS TOPICS (tutorial)

*Systems of linear equations**.** Cramer's rule, **l**east square solution of a system of linear equations; homogeneous linear systems.*

Linear dependence and independence of vectors in R^n. Bases and dimension, linear subspaces.

Linear maps, the matrix associated to fixed bases, kernel and image.

The algorithm for computation of eigenvalues and eigenspaces of a squared matrix. Algebraic and geometric multiplicity. Application: power matrix, systems of linear differential equations of first order.

Problems involving computation of the inner product of two vectors in R^n, the norm and the unit vector.

Orthonormal bases. Application of the Gramm-Schmidt orthogonalization method. Symmetric transformations.

Of R^n and orthogonal diagonalization. Problems involving operations with geometric vectors in the three dimensional space. The straight line and the plane in space. Problems related to the differential geometry of 3d curves and surfaces.

D. TEXTBOOKS/REFERENCES

1. S. Lugojan, Manuscript of the english version of the course**.**

E. EVALUATION PROCEDURE

Two in-class examinations 30%, two assignements 20%, and the final examination 50%. In-class and the final exams consist in five, respectively 8 written questions.

Date: September, 25, 2012

Head of Department,
Conf.univ.dr. Ioan GOLET

Course coordinator,
Lect.dr. Sorin LUGOJAN