Content

Course Code	Course Name	Semester	Theory	Practice	Lab	Credit	ECTS
ING252	Advanced Mathematics II	4	2	1	0	2.5	4

Prerequisites	
Admission Requirements	

Language of Instruction	French
Course Type	Compulsory
Course Level	Bachelor Degree
Objective	-Today, many branches of science—from operations research to statistics and economics—require the use of functions of several variables. Bilinear algebra is a fundamental tool in the analysis of these functions. Quadratic forms arise when one seeks an approximate representation of a multivariate function. In this context, determining whether a function has a minimum amounts to checking whether the quadratic form associated with the function is positive. Bilinear algebra also makes it possible to solve minimization problems by transforming them into problems of finding the shortest distance from a point to a set. Thus, when orthogonality is ensured, the minimum point is attained.
Content	- • Bilinear forms and inner product • Pre-Hilbert spaces and Euclidean spaces • Orthonormal bases for an inner product • Orthogonal complement of a vector subspace • Orthogonal projection theorem • Applications: least squares, approximation of a periodic function • Diagonalization of symmetric matrices • Midterm exam • Norms on a vector space, equivalence of norms in finite dimensions • Continuity of a function of several variables • Partial derivatives and the differential of a multivariable function • Curves and surfaces: level curves, gradient vector, and tangent plane • Minimum and maximum of a multivariable function • Final exam
References	Algèbre linéaire Joseph grifone ISBN : 9782383951346

Theory Topics

Week	Weekly Contents
1	Bilinear forms and inner product
2	Pre-Hilbert spaces and Euclidean spaces
3	Orthonormal bases for an inner product, Gram–Schmidt orthonormalization process
4	Orthogonal complement of a vector subspace and projection
5	Orthogonal projection theorem
6	Applications: least squares, approximation of a periodic function
7	Diagonalization of symmetric matrices
8	Midterm exam
9	Norms on a vector space, equivalence of norms in finite dimensions
10	Continuity of a function of several variables

Week	Weekly Contents
11	Partial derivatives and the differential of a multivariable function
12	Curves and surfaces: level curves, gradient vector, and tangent plane
13	Minimum and maximum of a multivariable function
14	Final exam