Content

Course Code	Course Name	Semester	Theory	Practice	Lab	Credit	ECTS
ING207	Linear Algebra	3	2	1	0	2.5	4

Prerequisites	
Admission Requirements	

Language of Instruction	French
Course Type	Compulsory
Course Level	Bachelor Degree
Objective	Mathematical problems such as solving systems linear differentials (which occur in many areas physics such as mechanics or electronics) or analysis in principal components in statistics use the diagonalization of square matrices. Determine if a matrix is ??diagonalizable, and in in this case, diagonalizing it is therefore the key to this course. In this context, the objectives of this course are: • Explain to students how the determinant of a matrix is defined using permutations and their signature, in particular in order to be able to define the characteristic polynomial. • Teach students to determine the specific elements of a matrix. • Demonstrate to the students the conditions of diagonalization of a matrix. • Explain to the students how to use diagonalization to solve linear systems.
Content	1. Symmetric group: decomposition into products and signature of a permutation 2. Determinants: definition, properties and calculation rules 3. Determinants: determinants of "small" dimensions, classical determinants 4. Diagonalization: Introduction and first examples 5. Classical determinant applications 6. Diagonalization: criterion of diagonalization (case of multiple eigenvalues) 7. Diagonalization: diagonalization of "small" dimension matrices 8. Partial Examination 9. Diagonalization: calculation of the nth powers of a diagonalizable matrix 10. Polynomials of matrices, canceling polynomials - Cayleigh Hamilton Theorem 11. Application to the calculation of the nth powers of a matrix (diagonalizable or not) 12. Application to linear recurrent sequences 13. Application to differential systems (diagonalizable case) 14. Practical studies
References	1. Lectures notes ans worksheets 2. http://braise.univ-rennes1.fr/braise.cgi 3. http://www.unisciel.fr

Theory Topics

Week	Weekly Contents
1	The grup of permutations.
2	Decomposition into disjoint cycles, decomposition into transposition and signature of a permutation.
3	Determinant : definition and basic propoerties
4	Some methods to compute determinant
5	Some examples of classic determinants.
6	eigenvalues of a determinant and some geometric examples.
7	Characteristic polynomial, eigenvalues and eigenvectors
8	Diagonalizable matrixs

Week	Weekly Contents
9	Midterm exam
10	The Cayley–Hamilton theorem
11	Different methods for computing the powers of a matrix.
12	Linear recurrence sequences of order 2 or 3.
13	Systems of homogeneous linear differential equations with constant coefficients.
14	Systems of nonhomogeneous linear differential equations with constant coefficients.