UCL Université catholique de Louvain

LINMA1170

2016-2017

Numerical analysis

5.0 credits	30.0 h + 22.5 h	1q

Teacher(s) :	Van Dooren Paul ;
Language :	Français
Place of the course	Louvain-la-Neuve
Inline resources:	The support documents of the course are available on iCampus at the following address : > http://icampus.uclouvain.be/claroline/course/index.php?cid=MATH2172 The web site contains the course notes, the transparencies and the course plan.
Prerequisites :	First cycle level in numerical calculus and programming (LFSAB1104) and in linear algebra (LFSAB1101).
Main themes :	-- Numerical methods for solving non-linear equations -- Numerical methods for solving linear systems : iterative methods -- Numerical methods for solving eigenvalue and eigenvector problems -- Numerical solution of ordinary differential equations : initial value problems
Aims :	With respect to the AA reference, this course contributes to the development, acquisition and evaluation of the following learning outcomes : AA1.1, AA1.2, AA1.3 AA2.1, AA2.4 AA5.2, AA5.3, AA5.5 More precisely, after completing this course, the student will have the ability to : -- Analyze in depth the various key methods and algorithms for the numerical solution of important classes of problems from science and industry, related to applied mathematics -- Better understand the numerical behavior of the various numerical algorithms for the solution of linear as well as nonlinear problems -- Implement these methods in a high level computer language and verify their numerical behavior on a practical problem Transversal learning outcomes : -- Collaborate in a small team to solve a mathematical problem using numerical methods *The contribution of this Teaching Unit to the development and command of the skills and learning outcomes of the programme(s) can be accessed at the end of this sheet, in the section entitled "Programmes/courses offering this Teaching Unit".*
Evaluation methods :	The students are evaluated for a large part on the basis of an exam organized following the EPL guidelines. The exam will be on the contents of the course notes, with the exception of the material specified on iCampus after the last course. Another part of the evaluation is on the homeworks and/or exercises done during the year. More detailed information of the evaluation criteria are provided in the course plan available on iCampus at the beginning of the semester.
Teaching methods :	-- Classes organized following the EPL guidelines. -- Exercises and/or homeworks done in small groups and supervised by an assistant -- A more detailed organization is specified each year in the course plan provided on iCampus.
Content :	-- Non-linear equations : location of the roots of a polynomial, various iterative methods and convergence theorems -- Iterative methods for linear systems : conjugate gradients, Jacobi and Gauss-Seidel methods, GMRES -- Eigenvalue and eigenvector problems : power method, subspace iteration, Krylov methods --

	Initial value problems for ordinary differential equations : Runge-Kutta, mutli-step methods, error estimation and discussion of numerical stability
Bibliography :	Support: many references are used and mentioned during the course. The only required support are the course notes provided on iCampus.
Faculty or entity in charge:	MAP

Programmes / formations proposant cette unité d'enseignement (UE)

Intitulé du programme	Sigle	Credits	Prerequis	Acquis d'apprentissage
Minor in Engineering Sciences: Applied Mathematics	LMAP100I	5	-	
Master [120] in Mathematics	MATH2M	5	-	
Master [120] in Physical Engineering	FYAP2M	5	-	