UCLouvain

lmeca2300

2021

Advanced Numerical Methods

5.00 credits	30.0 h + 30.0 h	Q2

Teacher(s)	Chatelain Philippe ;Craeye Christophe (coordinator) ;Legat Vincent ;Remacle Jean-François ;
Language :	English
Place of the course	Louvain-la-Neuve
Main themes	• Integral Methods • Finite elements • Spectral and pseudo-spectral Methods • Error estimation, adaptivity, mesh generation • Techniques of resolution of large (non-)linear systems • Implementation data-processing: parallel calculation, use of the specialized libraries, techniques of numerical programming.
Learning outcomes	**At the end of this learning unit, the student is able to :** In consideration of the reference table AA of the program"Masters degree in Mechanical Engineering", this course contributes to the development, to the acquisition and to the evaluation of the following experiences of learning: • AA1.1, AA1.2, AA1.3 • AA2.2, AA2.3, AA2.4 • AA3.1, AA3.3 • AA6.1, AA6.4 1 Advanced numerical methods The requirements for the students are the following: • To select and to apply the right method for a given problem. • To evaluate the algorithmic complexity of a method. • To efficiently use the numerical available libraries (Lapack) • To provide an estimate of the error. • To evaluate the quality of a mesh for a given method. • To perform a calculation on a parallel architecture. • To program a simple integral method. • To program a method finite elements. • To solve in an iterative way of the (non-)linear large systems
Evaluation methods	Exam. Homeworks are also graded and the obtained marks contribute to the final grade. Note that a pass grade (> 10) has to be obtained at the exam for the homework grades to be accounted for.
Teaching methods	In the pratical organisation, a great importance will be given to collaborative projets. Flexibility will be emphazed in order to focus on a problem solving approach.
Content	• Integral Methods. • Finite elements. • Spectral and pseudo-spectral Methods. • Error estimation, adaptivity, mesh generation. • Techniques of resolution of large (non-)linear systems. • Implementation data-processing: parallel calculation, use of the specialized libraries, techniques of numerical programming.
Inline resources	https://moodleucl.uclouvain.be/course/view.php?id=9491
Faculty or entity in charge	MECA

Programmes containing this learning unit (UE)

Program title	Acronym	Credits	Prerequisite	Learning outcomes
Master [120] in Mechanical Engineering	MECA2M	5		
Master [120] in Physical Engineering	FYAP2M	5		
Master [120] in Electrical Engineering	ELEC2M	5		
Master [120] in Electro-mechanical Engineering	ELME2M	5		
Master [120] in Biomedical Engineering	GBIO2M	5		
Master [120] in Mathematical Engineering	MAP2M	5		