







5.00 credits

30.0 h + 30.0 h

Q2

Teacher(s)	Chatelain Philippe ; Craeye Christophe (coordinator) ; Legat Vincent ; Remacle Jean-François ;
Language :	English > French-friendly
Place of the course	Louvain-la-Neuve
Main themes	<ul style="list-style-type: none"> • 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	<p>At the end of this learning unit, the student is able to :</p> <p>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:</p> <ul style="list-style-type: none"> • AA1.1, AA1.2, AA1.3 • AA2.2, AA2.3, AA2.4 • AA3.1, AA3.3 • AA6.1, AA6.4 <p>1 Advanced numerical methods The requirements for the students are the following:</p> <ul style="list-style-type: none"> • 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	<p>Open book examination.</p> <p>Practical work is graded, and this plays a major role in the final assessment.</p> <p>It is not possible to submit a new version of the assignment after the deadline.</p> <p>However, passing both the exam and the assignment is required to obtain a final pass mark.</p>
Teaching methods	In the practical organisation, a great importance will be given to collaborative projects. Flexibility will be emphasized in order to focus on a problem solving approach.
Content	<ul style="list-style-type: none"> • 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://perso.uclouvain.be/vincent.legat/zouLab/meca2300.php
Faculty or entity in charge	MECA

Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Learning outcomes
Master [120] in Biomedical Engineering	GBIO2M	5		
Master [120] in Mechanical Engineering	MECA2M	5		
Master [120] in Electrical Engineering	ELEC2M	5		
Master [120] in Physical Engineering	FYAP2M	5		
Master [120] in Electro-mechanical Engineering	ELME2M	5		
Master [120] in Mathematical Engineering	MAP2M	5		
Master [120] in Energy Engineering	NRGY2M	5		