







5.00 credits

30.0 h + 30.0 h

Q2

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| Teacher(s) | Chatelain Philippe ; Craeye Christophe (coordinator) ; Legat Vincent ; Remacle Jean-François ; |
| Language : | English |
| 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>Exam.</p> <p>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.</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://moodleucl.uclouvain.be/course/view.php?id=9491 |
| Faculty or entity in charge | MECA |

| Programmes containing this learning unit (UE) | | | | |
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| 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 | |  |