UCLouvain

lmeca2520

2025

Calculation of planar structures

The version you're consulting is not final. This course description may change. The final version will be published on 1st June.

5.00 credits	30.0 h + 30.0 h	Q2

Teacher(s)	Doghri Issam ;
Language :	English > French-friendly
Place of the course	Louvain-la-Neuve
Main themes	• The objective of the course is to show analytically -in simple cases- and numerically how to model and solve an important class of so-called planar structures, i.e. such that their mechanical problem is reduced to two space dimensions. • The problems involve " long " solids under plane strain, " thin " solids under plane stress and thin or thick plates under bending loads. • For each class of problems, appropriate formulations will be developed, together with their finite element discretization, in view of their numerical resolution using a specialized software. Some rather simple problems will also be solved analytically in order to better understand the theory.
Learning outcomes	**At the end of this learning unit, the student is able to :** 1 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 • AA2.1, AA2.2, AA2.3 • AA3.1, AA3.2 • AA5.1, AA5.2, AA5.3 • AA6.1, AA6.2 Analytical and numerical modeling of two-dimensional problems in linear elasticity: • plane strain; • plane stress; • bending of plates.
Evaluation methods	Written exam: 50%. Project: 50%.
Teaching methods	Travaux pratiques : • Project (e.g., a realistic plate problem) using (semi)analytical models and a finite element numerical software, in order to master different models and methods and compare their predictions. A report needs to be written. • In the classroom or at home: solve several relatively simple problems dealing usually with direct applications of the theory (e.g., tube under inner and outer pressures, stress concentration in a plate with a small circular hole, force on the straight edge of a semi-infinite plate, bending of a circular plate under axisymmetric loading, etc.)
Content	Chapitre 1 : Plane strain and plane stress in Cartesian coordinates. Chapitre 2 : Plane strain and plane stress in cylindrical coordinates. Chapitre 3 : Kirchhoff-Love plate theory in Cartesian coordinates. Chapitre 4 : Kirchhoff-Love plate theory in cylindrical coordinates. Chapitre 5 : Reissner-Mindlin plate theory. Chapitre 6 : Finite element formulations of plate theories.
Inline resources	http://icampus.uclouvain.be/claroline/course/index.php?cid=LMECA2520
Faculty or entity in charge	MECA

Programmes containing this learning unit (UE)

Program title	Acronym	Credits	Prerequisite	Learning outcomes
Master [120] in Chemical and Materials Engineering	KIMA2M	5		
Master [120] in Civil Engineering	GCE2M	5		
Master [120] in Mechanical Engineering	MECA2M	5		
Master [120] in Architecture and Engineering	ARCH2M	5		
Master [120] in Electro-mechanical Engineering	ELME2M	5		
Master [120] in Energy Engineering	NRGY2M	5		