lmeca2520
2022

Calculation of planar structures

5.00 credits	30.0 h + 30.0 h	Q2

Teacher(s)	Doghri Issam ;
Language :	English
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.

Teaching methods	Travaux pratiques : • Resolution of 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.) • Use of a finite element numerical software, in order to understand the main steps of the method (geometry definition, input of material data and other problem parameters, space and time discretization, solver algorithms, post-processing and visualization of computation results).
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		🔍