



Faculty of Applied Sciences

MECA1100 Deformable solid mechanics.

[30h+30h exercises] 5 credits

This course is taught in the 2nd semester

Teacher(s): Issam Doghri
Language: French
Level: First cycle

Aims

Analytical solutions of several problems of solid mechanics with the theory of isotropic linear elasticity. Use the theory of strength of materials to solve statically determinate or indeterminate beam problems.

Main themes

The objective of this course is to show how the theory of isotropic linear elasticity enables to solve a large class of problems stemming from the design of structures and equipments. Although the majority of industrial problems are solved nowadays with numerical software, it is essential that the student first learns how to solve analytically a number of simple problems and understands their physics. This is why the course will develop solutions related to bending, torsion, thermal stresses, buckling, etc. The theory of beams, commonly known as strength of materials, is a simplified theory which represents a very important particular case. Some methods for computing statically determinate or indeterminate beam structures are presented and several examples are studied.

Content and teaching methods

Complete version: chapters 1 to 10.

Reduced version: chapters 1 to 4, 9 and 10.

Chap. 1 Mechanics of deformable solids and isotropic linear elasticity.

Chap. 2 Variational formulations, work and energy theorems.

Chap. 3 Theory of beams (strength of materials).

Chap. 4 Torsion of beams.

Chap. 5 Theory of thin plates.

Chap. 6 bending of thin plates in polar coordinates.

Chap. 7 Two-dimensional problems in Cartesian coordinates.

Chap. 8 Two-dimensional problems in polar coordinates.

Chap. 9 Thermo-elasticity

Chap. 10 Elastic stability

Other information (prerequisite, evaluation (assessment methods), course materials recommended readings, ...)

-Pre-requisite (recommended, not compulsory): a course on Continuum Mechanics.

-Sessions of hands-on problem solving take place in parallel with the course.

-Written examination.

-Book (suggested, not compulsory): I. Doghri, "Mechanics of Deformable Solids- Linear, nonlinear, analytical and computational aspects", Springer, Berlin, 2000.

Other credits in programs

ARCH13BA	Troisième année de bachelier en sciences de l'ingénieur, orientation ingénieur civil architecte	(5 credits)
ELME22/M	Deuxième année du programme conduisant au grade d'ingénieur civil électro-mécanicien (mécatronique)	(5 credits)
FSA12BA	Deuxième année de bachelier en sciences de l'ingénieur, orientation ingénieur civil	(5 credits)
FSA13BA	Troisième année de bachelier en sciences de l'ingénieur, orientation ingénieur civil	(5 credits)
GC22	Deuxième année du programme conduisant au grade d'ingénieur civil des constructions	(5 credits)
MAP22	Deuxième année du programme conduisant au grade d'ingénieur civil en mathématiques appliquées	(5 credits)
MECA22	Deuxième année du programme conduisant au grade d'ingénieur civil mécanicien	(5 credits)