



# Faculté des sciences appliquées

## FSA

MECA2100 Mécanique des solides déformables

[45h+45h exercices] 7 credits

This course is taught in the 2nd semester

**Teacher(s):** Issam Doghri  
**Language:** french  
**Level:** 2nd cycle course

### 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**

<b>GC21</b>	Première année du programme conduisant au grade d'ingénieur (7 credits) civil des constructions	Mandatory
<b>MAP21</b>	Première année du programme conduisant au grade d'ingénieur (7 credits) civil en mathématiques appliquées	
<b>MAP22</b>	Deuxième année du programme conduisant au grade (7 credits) d'ingénieur civil en mathématiques appliquées	
<b>MATR21</b>	Première année du programme conduisant au grade d'ingénieur (7 credits) civil en science des matériaux	Mandatory
<b>MATR22</b>	Deuxième année du programme conduisant au grade (7 credits) d'ingénieur civil en science des matériaux	
<b>MECA21</b>	Première année du programme conduisant au grade d'ingénieur (7 credits) civil mécanicien	Mandatory
<b>MECA22</b>	Deuxième année du programme conduisant au grade (7 credits) d'ingénieur civil mécanicien	