

<b>Faculty</b>	Ingegneria
<b>Bachelor</b>	Mechanical Engineering (La Spezia)
<b>Year/Semester</b>	1/II

<b>Course Title</b>	Mechanics of materials
<b>ID Course Code</b>	56952
<b>Course Credits (CFU)</b>	9
<b>Scientific-Disciplinary Sector</b>	ING-IND/16
<b>Course Type</b>	mono-disciplinary course
<b>Lecturer-in-charge</b>	LONARDO Pietro

### Learning Outcomes:

The aim of the course is to provide the fundamental knowledge of the response of materials to forces. After an introduction on solid mechanics, where the relationships between stress and strain are discussed for an ideal body, the crystalline aspects of deformation, strength and failure are presented. Other topics covered are: metal alloys, with a special regard to steel, plastic forming, casting processes and materials testing.

### Course Organisation Details

Basic principles of mechanics of solids: tensor of stress, principal stresses, tensor of strain, angular and volumetric strain, natural strain. Elastic state and linear elastic relationships. Viscoelastic states. Elastoplastic state: models, deformation diagrams, plasticity criteria, equivalent stress and strain. Crystal structure: lattices, defects, dislocations. Plastic properties of crystals: mechanisms of deformation, theoretical strength, strength of polycrystals, yield strength, strain hardening, recovery and recrystallisation. Brittle fracture and fatigue failure. Metal alloys and phase diagrams, Fe-C alloys, TTT diagrams, thermal treatments of steel, other structural materials. Metal forming: rolling, forging, extrusion, wire drawing, sheet metal forming. Basic casting processes: techniques, models, molds. Standard materials testing: tension test, hardness test, impact test, fatigue test. Non-destructive controls.

Assessment	hours
Lectures	75.0
Practice	20.0
Laboratory	0.0
Integrative activities	0.0

### References

P.M. Lonardo, *Dispense del Corso*, 2009;  
P.M. Lonardo, *Lezioni di Tecnologie Generali dei Materiali*, DIPTTEM, 2001;  
P.M. Lonardo, *Le deformazioni dei solidi, Stati elastici, anelatici, elastoplastici*, ECIG, 1981  
P.M. Lonardo, E. Barlocco, *Esercizi di tecnologie generali dei materiali*, ECIG, 1997;  
N.E. Dowling, *Mechanical Behavior of Materials*, Pearson, 2007.

### Organization and examinations

Written and oral examinations. Written tests are provided during the term.

### Pre-requisites

None