

Biomechanics



In brief

➤ **Course language:** English

Presentation

Prerequisites

Fluid and solid biomechanics; basics of anatomy (heart, arterial tree, bone,...); Physics

Learning objectives

- § Understand and apply principles of fluid mechanics to analyze blood flow in the heart and aorta
- § Analyze the mechanical behavior of biological tissues, with a focus on bone, using solid mechanics concepts
- § Design and carry out an independent modeling project addressing a biomechanical problem
- § Critically read and evaluate scientific literature

Description of the programme

The course in biomechanics aims to provide students with an in-depth understanding of mechanical phenomena applied to biological systems. It includes a fluid biomechanics course focused on analyzing blood flow within the heart and aorta, as well as a solid biomechanics course dedicated to understanding the multiscale mechanical behavior of biological tissues with a focus on bone.

These theoretical foundations are reinforced through problem-solving sessions designed to apply key concepts. A guided practical session using Comsol introduces students to modeling techniques in biomechanics, while an independent project allows them to explore a specific biomechanical problem in greater depth using the same tool. Finally, a scientific paper review assignment develops students' ability to critically assess research challenges and methodologies in biomechanics.

The evaluation is based on various scores:

Multiple-choice questions (direct applications of courses) : 10%

Introductory tutorial report : 20%

Applied tutorial report : 35%

Literature review analysis report + defense : 35 %

Bibliography

- An introduction to biomechanics - J.D. Humphrey et al, Springer 2nd Edition, 2015

<https://link.springer.com/book/10.1007/978-1-4939-2623-7>

- Fundamentals of Biomechanics - D. Knudson, Elsevier 2nd Springer, 2007

<https://link.springer.com/book/10.1007/978-0-387-49312-1>

- Cardiovascular biomechanics - P.R. Hoskins et al , Springer 1st Edition, 2017

<https://link.springer.com/book/10.1007/978-3-319-46407-7>

Teaching team

Cécile BARON (cecile.baron@univ-amu.fr)

Valérie DEPLANO (valerie.deplano@univ-amu.fr)

Carine GUIVIER-CURIEN (carine.guivier@univ-amu.fr)

Total des heures

CM	Master class	24h
TD	Directed work	16h
		8h

Useful info

Name responsible for EU

Lead Instructor

Valérie Deplano

✉ vdeplano@intervenants.centrale-marseille.fr