

## 69310 - Biomechanical modeling of the cardiovascular system

### Información del Plan Docente

Academic Year	2017/18
Faculty / School	110 - Escuela de Ingeniería y Arquitectura
Degree	547 - Master's in Biomedical Engineering
ECTS	3.0
Year	1
Semester	Second semester
Subject Type	Optional
Module	---

### **1.General information**

#### **1.1.Introduction**

#### **1.2.Recommendations to take this course**

#### **1.3.Context and importance of this course in the degree**

#### **1.4.Activities and key dates**

### **2.Learning goals**

#### **2.1.Learning goals**

#### **2.2.Importance of learning goals**

### **3.Aims of the course and competences**

#### **3.1.Aims of the course**

#### **3.2.Competences**

### **4.Assessment (1st and 2nd call)**

#### **4.1.Assessment tasks (description of tasks, marking system and assessment criteria)**

### **5.Methodology, learning tasks, syllabus and resources**

#### **5.1.Methodological overview**

The methodology followed in this course is oriented towards achievement of the learning objectives. It promotes the continuous development of the matter and the relationship between the different parts of this course. A wide range of teaching and learning tasks are implemented, such as lectures where the main contents are presented and discussed; computer lab sessions, laboratory sessions to carry out mechanical characterization of tissue, practical tasks, homework, and specific research activities.

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Students are expected to participate actively in the class throughout the semester.

### 5.2. Learning tasks

The course includes the following learning tasks:

- **A01** Lectures (20 hours). The main course contents are presented and student participation is encouraged.
- **A03** Computer and experimental laboratory sessions (6 hours). Different lab sessions are carried out. Notes for each lab session where the different activities are planned will be available before the session. In the following days after the lab session, the student should hand in a report of the corresponding lab session.
- **A05** Assignments. Different activities/tasks are proposed related to theoretical contents or the research in this field.
- **A06** Tutorials. Students may ask any questions they might have about unclear contents of the course.
- **A08** Assessment (2 hours). The student will take an exam and submit several reports derived from the computer lab sessions and the assignments.
- Autonomous work and study.

Activities A05 Assignments, A08 Assessment and autonomous work will account for 48 hours.

### 5.3. Syllabus

The course will address the following topics:

1. Introduction
2. Composition, structure and functionality of the tissues of the cardiovascular system.
3. Elastic behaviour models for the cardiovascular tissue.
4. Inelastic behaviour models for the cardiovascular tissue.
5. Modelling of the blood flow.
6. Modelling of adaptive and degenerative processes in the cardiovascular pathologies.
7. Interaction of intravascular devices and prostheses in the cardiovascular system.

### 5.4. Course planning and calendar

Further information concerning the timetable, classroom, office hours, assessment dates and other details regarding this course, will be provided on the first day of class or please refer to the EINA website.

### 5.5. Bibliography and recommended resources

<b>BB</b>	Advanced School on "Biomechanics of Soft Tissue" . Biomechanics of soft tissue in cardiovascular systems / edited by Gerhard A. Holzapfel, Ray W. Ogden Wien [etc.] : Springer, cop. 2003
<b>BB</b>	Fung, Yuan Cheng . Biomechanics: Mechanical properties of living tissues / Fung Y.C . Springer-Verlag, 1993
<b>BB</b>	Fung, Yuan Cheng . Biomechanics: Motion, Flow, Stress and Growth / Fung Y.C Springer Verlag. 1990
<b>BB</b>	Fung, Yuan Cheng. Biomechanics : circulation / Y. C. Fung . - 2nd ed. New York : Springer, cop. 1997
<b>BB</b>	Humphrey, Jay D.. Cardiovascular solid mechanics : cells, tissues, and organs / Jay D. Humphrey New York : Springer,

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cop. 2002

Different research papers in specialized journals. These papers will be referred during the course development.