

Course Unit	Biofluid Mechanics	Field of study	Physics
Bachelor in	Biomedical Technology	School	School of Technology and Management
Academic Year	2023/2024	Year of study	3
Type	Semestral	Semester	2
Level	1-3	ECTS credits	6.0
Code	9600-752-3202-00-23		
Workload (hours)	162	Contact hours	T - TP 60 PL - TC - S - E - OT - O -

T - Lectures; TP - Lectures and problem-solving; PL - Problem-solving, project or laboratory; TC - Fieldwork; S - Seminar; E - Placement; OT - Tutorial; O - Other

Name(s) of lecturer(s) Sérgio Manuel de Sousa Rosa

Learning outcomes and competences

At the end of the course unit the learner is expected to be able to:

1. Show a good understanding of the basic concepts of fluid mechanics (static and dynamic).
2. Apply the knowledge of fluid mechanics to the circulation of blood in the heart, lungs, and kidneys.
3. Recognize the rheological properties of different fluids, namely biofluids in their natural state and in various pathological situations.
4. Demonstrate knowledge related the development of cardiovascular diseases and their treatments.

Prerequisites

Not applicable

Course contents

1 – Fluid hydrostatic 2 – Fluid Dynamics 3 – Rheology 4 – Blood flow 5 – Diseases and devices

Course contents (extended version)

1. Fluid hydrostatic
 - Physics fluid properties;
 - Hydrostatic equation;
 - Pressure measurements.
2. Fluid Dynamics:
 - Fundamental equations;
 - Energy losses;
 - Viscous flow;
 - Pipe networks.
3. Rheology
 - Non-Newtonian fluid;
 - Viscoelasticity;
 - Rheology of blood;
 - Other biofluids.
4. Blood flow
 - Human circulation;
 - Pulmonary system and gas exchange.
5. Diseases and devices
 - Atherosclerosis;
 - Angioplasty;
 - Cardiovascular implants.

Recommended reading

1. F. M. White, "Fluid Mechanics", McGraw-Hill, 8th Ed. , 2016
2. A. Ostadfar, " Biofluid Mechanics", Academic Press, 2016
3. K. B. Chandran, S. E. Rittgers, A. P. Yoganathan, "Biofluid Mechanics", Taylor & Francis Group, 2nd Ed. , 2012
4. 4 – K. Walter, "An introduction to rheology", Elsevier Science, 1st Ed. , 1989

Teaching and learning methods

Theoretical lessons: Theoretical presentation of fundamental concepts followed by practical applications. Practical lessons: Resolution of exercises. Laboratory classes: Rheology lessons with experiments on the rheometer.

Assessment methods

1. Intermediate - (Regular, Student Worker) (Final)
 - Intermediate Written Test - 30% (1st Intermediate written test)
 - Intermediate Written Test - 30% (2nd Intermediate Written test)
 - Laboratory Work - 40% (Two laboratorial works)
2. Final Written Exam - (Regular, Student Worker) (Supplementary)
 - Final Written Exam - 100% (Written Exame)
3. Special Exam - (Regular, Student Worker) (Special)
 - Final Written Exam - 100% (Written Exame)

Language of instruction

Portuguese, with additional English support for foreign students.

Electronic validation

Sérgio Manuel de Sousa Rosa	Debora Rodrigues de Sousa Macanjo Ferreira	Joana Andrea Soares Amaral	José Carlos Rufino Amaro
25-03-2024	25-03-2024	25-03-2024	25-03-2024