
Academic Year: (2023 / 2024)**Review date: 15-01-2024**

Department assigned to the subject: Mechanical Engineering Department**Coordinating teacher: MENESES ALONSO, JESUS****Type: Electives ECTS Credits : 3.0****Year : 1 Semester : 2**

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Basic knowledge of mechanism mechanics and some use of computer-aided design and engineering programs are recommended.

OBJECTIVES

This course aims to provide students with a level of development in the multidisciplinary field of biomedical and clinical devices design. Specifically, by the end of the course, the students should be able to:

- Know the different types and particularities of biomedical and clinical devices
- Understand and apply the regulations to the design of biomedical and clinical devices
- Know the development methodologies of biomedical and clinical devices
- Know and manage computer-aided design and engineering programs, and use them for the analysis, design and improvement of biomedical and clinical devices
- Know biomedical materials and additive manufacturing techniques
- Develop teamwork, manage information sources, prepare a technical report and present results

DESCRIPTION OF CONTENTS: PROGRAMME

1. Introduction to biomedical and clinical devices.
2. Regulations on biomedical and clinical devices.
3. Biomedical and clinical device development methodologies.
4. Protection of intellectual property.
5. Biomaterials and additive manufacturing.
6. Concepts of kinematics and dynamics of mechanisms oriented to the design of biomedical and clinical devices.
7. Control systems and activation of special mechanisms
8. Functional blocks of clinical systems

LEARNING ACTIVITIES AND METHODOLOGY

The subject includes the teaching, in training sessions (lectures, problems, group tutorials, seminars), of basic introductory knowledge on key aspects in the design of biomedical devices.

With these foundations, the course focuses on project-based learning, proposing different group work in which students will participate in some of the development phases of a specific medical device (medical necessity, conceptual design, improvement proposals, construction of prototypes, detailed engineering...).

As a starting point for the work, the analysis of a patent for a biomedical or clinical device is proposed, using computer design and simulation tools, complementing it with a bibliographic search of its scientific and technological foundations, of similar or related patents, etc.

The culmination of the work consists in the writing of a technical report and the oral presentation.

During the development of the work, tutorial sessions will be given, both to general students and to the working group.

ASSESSMENT SYSTEM

% end-of-term-examination:	30
% of continuous assessment (assignments, laboratory, practicals...):	70

The assessment of the subject is made up of an individual final exam, with a percentage of 30% and a continuous assessment of group work, which accounts for the remaining 70%. In the group work, the quality of the technical memory, the results achieved, and the oral presentation will be rated separately.

BASIC BIBLIOGRAPHY

- A. Ahluwalia, C. de Maria, A.D. Lantada Engineering Open-Source Medical Devices A Reliable Approach for Safe, Sustainable and Accessible Healthcare, springer, 2022
- A.D. Lantada Handbook on Advanced Design and Manufacturing Technologies for Biomedical Devices, Springer, 2013
- R.H.W. Lam, W. Chen Biomedical Devices, Springer, 2019

ADDITIONAL BIBLIOGRAPHY

- Giuseppe Andreoni, Massimo Barbieri, Barbara Colombo Developing Biomedical Devices. Design, Innovation and Protection, Springer, 2014

BASIC ELECTRONIC RESOURCES

- European Patent Office . Espacenet Patent Search: <http://https://worldwide.espacenet.com/>
- FPO IP Research & Communities . Free Patents On Line: <http://https://www.freepatentsonline.com/>
- Oficina Española de Patentes y Marcas . OEPM: <http://https://www.oepm.es/es/index.html>
- WIPO - World Intellectual Property Organization . WIPO: <https://www.wipo.int/portal/en/index.html>