Robotics

Academic Year: (2023 / 2024) **Review date: 19/12/2023 13:57:23**

Department assigned to the subject: Systems Engineering and Automation Department

Coordinating teacher: MORENO LORENTE, LUIS ENRIQUE

Type: Compulsory ECTS Credits : 3.0

Year : 4 Semester :

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Students should have basic knowledge in mathematics, mechanics, electronics, electrical engineing, programming and systems engineering.

LEARNING OUTCOMES

RA3: Be able to carry out conceptual designs for bioengineering applications according to their level of knowledge and understanding, working in a team. Design encompasses devices, processes, protocols, strategies, objects and specifications broader than strictly technical, including social awareness, health and safety, environmental and commercial considerations.
RA4: Be able to use appropriate methods to carry out studies and solve problems in the biomedical field, commensurate with their level of knowledge. Research involves conducting literature searches, designing and carrying out experimental practices, interpreting data, selecting the best approach and communicating knowledge, ideas and solutions within their field of study. May require consultation of databases, safety standards and procedures.
CB1: Students have demonstrated possession and understanding of knowledge in an area of study that builds on the foundation of general secondary education, and is usually at a level that, while relying on advanced textbooks, also includes some aspects that involve knowledge from the cutting edge of their field of study.
CB2: Students are able to apply their knowledge to their work or vocation in a professional manner and possess the competences usually demonstrated through the development and defence of arguments and problem solving within their field of study.
CB3: Students have the ability to gather and interpret relevant data (usually within their field of study) in order to make judgements which include reflection on relevant social, scientific or ethical issues.
CB4: Students should be able to communicate information, ideas, problems and solutions to both specialist and non-specialist audiences.
CG2: Ability to design, draft and develop scientific-technical projects in the field of biomedical engineering.
CG4: Ability to solve problems with initiative, decision-making, creativity, and to communicate and transmit knowledge, skills and abilities, understanding the ethical, social and professional responsibility of the biomedical engineer's activity. Capacity for leadership, innovation and entrepreneurial spirit.
CG7: Drafting, representing and interpreting scientific-technical documentation.
CG9: Ability to analyse and conceptually design electronic devices to solve problems in biology and medicine.
ECRT16: Knowledge of the problems associated with the development of robots, the current state and future trends.
CT1: Ability to communicate knowledge orally and in writing to both specialised and non-specialised audiences.
CT2: Ability to establish good interpersonal communication and to work in multidisciplinary and international teams.
CT3: Ability to organise and plan their work, making the right decisions based on the information available, gathering and interpreting relevant data in order to make judgements within their area of study.

OBJECTIVES

Students acquire basic knowledge about robotics and biomedical applications deepens.

Introduction to robotics and robot types.
Morphology.
Robot Control and Programming
Surgery robots
Diagnostic robots
Exoskeletons and prosthesis.

DESCRIPTION OF CONTENTS: PROGRAMME

1. Introduction
2. Robot morphology
3. Robot control
4. Robot programming
5. Medical robotics I
- Surgical robotics
6. Medical robotics II
- Robotics medical instrumentation
- Body exploratory robotics
7. Biomedical applications
- Hexosqueletons
- Bionics hands
8. Assistive robotics
- Personal assistance
- Therapy robotics

LEARNING ACTIVITIES AND METHODOLOGY

Training activities are divided into 4 parts: theory, practice, laboratories (with real robots and systems) and personal tutorials.

ASSESSMENT SYSTEM

% end-of-term-examination/test:	0
% of continuous assessment (assigments, laboratory, practicals…):	100

Evaluation criteria (ordinary)

A - continuous evaluation

	%	Minimum thresholds
1st evaluation	50%	3/10
2nd evaluation	50%	3/10
Overall necessary threshold		5/10

Practices assistance is mandatory

B - final exam (for whom not pass A or want to rise the mark)

Final exam	100%	5/10

Practices assistance is mandatory

Evaluation criteria (extraordinary exam)

	Minimum thresholds
Exam	5/10

BASIC BIBLIOGRAPHY

- A. Barrientods, L.F. Peñin, C. Balaguer, R. Aracil Fundamentos de Robótica, McGraw Hill, 2007

- J. P. Desai, S. Agrawal, A. Ferreira, R. V. Patel (Editors) The Encyclopedia of Medical Robotics 4 Volumes, World Scientific, 2019

ADDITIONAL BIBLIOGRAPHY

- J.F. Engelberger Robotics in Service, MIT Press, 1989

- R. P. Paul Robot Manipulators. Mathematics, Programming and Control, MIT Press, 1981