

Academic Year: ( 2023 / 2024 )

Review date: 31-01-2024

Department assigned to the subject: Systems Engineering and Automation Department

Coordinating teacher: MARTINEZ DE LA CASA DIAZ, SANTIAGO

Type: Electives ECTS Credits : 3.0

Year : 1 Semester : 2

## OBJECTIVES

The objective of the course is to transmit to students knowledge about robotics and automation in construction, a sector that generates 5.5% of GDP in the European Union (EU). In the EU there are more than 3M companies, most of them in the building sector. It has relatively low level of robotics, automation and digitalization in the sector, so the advances in this field will lead to a great economic and social impact. Spain is one of the leading countries in digitization in construction, so the demand for experts in the field is very high.

The subject will focus on the robotization and automation of building construction and is divided into two fundamental parts: 1) robot in construction, where emphasis is placed on the new technologies of modular and industrialized construction and robots are described in the different phases of the building construction covering the complete cycle from its erection to its completion and demolition (if necessary), and 2) automation and digitization of the construction that includes, among others, the concepts of BIM (Building Information Model), Lean construction, intelligent and eco-sustainable buildings, LIDAR modeling of the heritage of European buildings and the new security systems on site.

## DESCRIPTION OF CONTENTS: PROGRAMME

1. Introduction
2. Robotics in construction
  - 2.1 Concept of modular and industrialized construction
  - 2.2 Robots for the prefabrication of buildings
  - 2.3 Robotization of construction machinery
  - 2.4 Robotics for building erection
  - 2.5 "Masonry" robots
  - 2.6 Robotic 3D printing of buildings
  - 2.7 Building demolition robots
3. Automation and digitization of construction
  - 3.1 BIM (Building Information Model) concept
  - 3.2 Virtual and Augmented Reality in building design
  - 3.3 Lean construction and intelligent construction management
  - 3.4 Smart buildings (in service and maintenance)
  - 3.5 Sustainable and environmentally friendly buildings
  - 3.6 Scanning and 3D modeling of buildings
  - 3.7 Automatic safety systems on site

## LEARNING ACTIVITIES AND METHODOLOGY

Master classes  
Application examples  
Presentations of papers in seminars  
Simulation work

## ASSESSMENT SYSTEM

- 1) Minimum class attendance of 70% to be able to pass
- 2) Class attendance - 10% of the grade
- 3) Quality of presentation of the work - 30% of the grade
- 4) Simulation work - 30% of the mark
- 5) Final test - 30% of the mark

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

#### BASIC BIBLIOGRAPHY

- C. Balaguer et al. Robotics and Automation in Construction, Intechopen, 1986
- IAARC Proceedings of the ISARCs (<https://www.iaarc.org/publications>), IAARC, Varios años