Universidad Zaragoza

**Academic Year/course: 2021/22**

# 29842 - Simulation of Dynamic Systems

## Syllabus Information

**Academic Year:** 2021/22
**Subject:** 29842 - Simulation of Dynamic Systems
**Faculty / School:** 110 - Escuela de Ingeniería y Arquitectura
326 - Escuela Universitaria Politécnica de Teruel
**Degree:** 440 - Bachelor's Degree in Electronic and Automatic Engineering
444 - Bachelor's Degree in Electronic and Automatic Engineering
**ECTS:** 6.0
**Year:** 4
**Semester:** 440-First semester o Second semester
107-First semester o Second semester
444-First semester
**Subject Type:** Optional
**Module:**

# 1. General information

## 1.1. Aims of the course

- Deepening into the modeling and simulation tools for analysis and design of systems.
- Knowing the grounds on which simulation is based.

## 1.2. Context and importance of this course in the degree

Modeling and simulation tools are extensively used in engineering, and in particular have been used throughout the degree.This course provides understanding of the foundations of simulation, which has been used in other subjects. Being an elective course in fourth year, it offers students a global perspective of simulation environments used during the degree, and reinforces the knowledge about modeling, analysis and design acquired in other subjects.

## 1.3. Recommendations to take this course

(Knowledge of Automatic Systems and Programming is required.)
This course is recommended for students interested in modeling and simulation of dynamic systems. These issues are fundamental and transversal in the formation of any engineer and more for automation specialists, because simulation is always an essential part of their projects. This course provides a global perspective of simulation environments used during the degree and reinforcement of knowledge about modeling, analysis and design, acquired in other subjects of the degree.

# 2. Learning goals

## 2.2. Learning goals

Knows how to model and simulate dynamic technical systems to analyze their performance and design/test their automatic control.

## 2.3. Importance of learning goals

Today, because of its versatility and low cost, modeling and computer simulation is the main tool to assist in the design of complex systems (particularly technical automated systems), and for better understanding of existing systems, training and analysis tasks.In any project, analysis and verification through simulation allows to perform a safer, faster and more efficient development, and a better selection and comparison of alternatives, before moving on to the implementation of prototypes or the actual system, and testing.
In summary, knowledge about simulation is essential and transversa lto the education of any engineer.

# 3. Assessment (1st and 2nd call)

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

A team work will be presented at the end of the course, and it is required to pass the course. Proposing a work based on specific interests will be promoted.

During the course, it shall be valued: preparation for practices, performance during the sessions, technical quality of the results, and the demonstrated ability to understand concepts and methods. This can be evaluated together with the team work, particularly for students whom couldn't be evaluated during the course.

# 4. Methodology, learning tasks, syllabus and resources

## 4.1. Methodological overview

The process of teaching and learning will take place through:

- Lectures (presentation of content),
- Problem-solving sessions (examples and practical case es with active participation of students, and active work of students with professional simulation tools, supervised by teachers) and a final assignment (for example:
    - (1) modeling and simulation of a dynamic system of some complexity, collecting the required information, designing and conducting experiments, and suggesting improvements - the system can be proposed by students based on their specific interests, with the approval of the teacher, starting from scratch or
    - (2) expanding / improving a case previously developed, or
    - (3) analyzing/comparing or developing parts of professional modeling and simulation tools).

## 4.2. Learning tasks

The course includes the following learning tasks:

1) Lectures (30 classroom hours)
2) Classes of problems and resolution of cases (30 classroom hours)
3) Final assignment (60 hours, including the necessary tutorials)
4) Study (30 hours, including tutorials)

## 4.3. Syllabus

The course will address the following topics:

1) General concepts of modelling and simulation of dynamic systems.
2) Simulation of discrete event systems. With particular emphasis on automated production systems and logistics. Using JaamSim.
3) Simulation of continuous and hybrid systems. With particular emphasis on automated technical systems. Using (Open) Modelica.

## 4.4. Course planning and calendar

Lectures and problem classes and practice sessions are held according to schedules set by the center (available on their website). Other activities will be planned depending on the number of students and will be announced well in advance. It will be available on http://moodle.unizar.es