29842 - Simulation of Dynamic Systems

Información del Plan Docente

Academic Year	2016/17
Academic center	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
Course	4
Period	Half-yearly
Subject Type	Optional
Module	---

1.Basic info

1.1.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.

1.2.Activities and key dates for the course

2.Initiation

2.1.Learning outcomes that define the subject

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

2.2.Introduction

Simulation of Dynamic Systems is an elective course of 6 credits, equivalent to 150 hours of work, corresponding to 60 classroom hours (lectures, problems, laboratory) and 90 autonomous hours (solving exercises, studying, practical work). During the course the basis for the development and use of simulation environments of dynamic systems and the correct understanding and verification of the results obtained with a simulator will be explained.

3.Context and competences

3.1.Goals

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

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3.2.Context and meaning of the subject 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.

3.3.Competences

3.4.Importance of learning outcomes

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.

4.Evaluation

Continuous assessment (60%)
Preparation for practices, performance during the sessions, and the demonstrated ability to understand the results and propose improvements will be particularly valued. Submission of optional homework will also be assessed throughout the course.
Final work (40%)
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.
Official calls
If a student has not evaluated any of the activities in the above (or if you want to improve the grade obtained during the course), each official announcement will consider individualized exams to assess the aforementioned activities.

5.Activities and resources

5.1.General methodological presentation

The process of teaching and learning will take place through: lectures (presentation of content), classes of problems (examples and practical cases with active participation of students), laboratory practice (in small groups, with professional simulation tools) 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) to analyze/compare or develop parts of professional modeling and simulation tools).

5.2.Learning activities

1) Lectures (30 classroom hours)
2) Classes of problems and resolution of cases (15 classroom hours)
3) Laboratory practice (15 classroom hours)
4) Personal study plus evaluation (50 hours, including tutorials)
5) Final assignment (40 hours, including the necessary tutorials).

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5.3.Program

1) General concepts of modeling and simulation of dynamic systems.
2) Simulation of discrete event systems. With particular emphasis on automated production systems and logistics. Using JaamSim or Arena.
3) Simulation of continuous and hybrid systems. With particular emphasis on automated technical systems. Using (Open) Modelica or SciLab / Xcos or MatLab / Simulink.

5.4.Planning and scheduling

Lectures and problem classes and practice sessions are held according to schedules set by the center (available on their website).Each teacher will publish tutoring hours.The 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

5.5.Bibliography and recomended resources

1. Slides, notes, exercises, practice scripts and software manuals and tutorials in http://moodle.unizar.es .

2. Basic bibliography:

- P. Fritzson, 2011. Introduction to Modeling and Simulation of Technical and Physical Systems with Modelica. Spanish translation (2015) available at http://urn.kb.se/resolve?urn=urn:nbn:se:liu:diva-121342
- T. Altiok, B.Melamed, 2007. Simulation Modeling and Analysis with Arena. e-version available at BUZ: http://www.sciencedirect.com/science/book/9780123705235

3. Complementary bibliography:

- W. D. Kelton et al., 2006, Simulation with Arena.
- A. M. Law, W. D. Kelton, 2006, Simulation Modeling and Analysis.
- B. S. Bennet, 1995, Simulation Fundamentals.
- M. M. Tiller, 2014, Modelica by example. On line http://book.xogeny.com/

- V. M. Alfaro, 2015, Sistemas dinámicos heterogéneos - Modelado, simulación y optimización con Modelica. In Spanish, available at https://pidplanet.wordpress.com/modelica