Course guides
205116 - 205116 - Simulation of Industrial and Logistic Systems

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Unit in charge: Terrassa School of Industrial, Aerospace and Audiovisual Engineering
Teaching unit: 707 - ESAII - Department of Automatic Control.

Degree: MASTER'S DEGREE IN TECHNOLOGY AND ENGINEERING MANAGEMENT (Syllabus 2016). (Optional subject).

Academic year: 2021 **ECTS Credits:** 7.5 **Languages:** English

LECTURER

Coordinating lecturer: Antoni Guasch Petit

Others: Jaume Figueras Jové

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
CE02-MEM. The ability to analyse data for pattern recognition.
CE03-MEM. The ability to optimise problems and systems using mathematical models and make decisions in conditions of uncertainty.
CE04-MEM. The ability to apply theoretical and fundamental principles of technology and engineering business management in conditions of uncertainty.
CE07-MEM. The ability to manage processes and projects in technological settings subject to levels of uncertainty.

Transversal:
CT1a. ENTREPRENEURSHIP AND INNOVATION: Being aware of and understanding how companies are organised and the principles that govern their activity, and being able to understand employment regulations and the relationships between planning, industrial and commercial strategies, quality and profit.

CT2. SUSTAINABILITY AND SOCIAL COMMITMENT: Being aware of and understanding the complexity of the economic and social phenomena typical of a welfare society, and being able to relate social welfare to globalisation and sustainability and to use technique, technology, economics and sustainability in a balanced and compatible manner.

CT3. TEAMWORK: Being able to work in an interdisciplinary team, whether as a member or as a leader, with the aim of contributing to projects pragmatically and responsibly and making commitments in view of the resources that are available.

CT4. EFFECTIVE USE OF INFORMATION RESOURCES: Managing the acquisition, structuring, analysis and display of data and information in the chosen area of specialisation and critically assessing the results obtained.

Basic:
CB6. Knowledge and understanding that provides a basis or opportunity for originality in the development and/or application of ideas, often in a research context.
CB7. METMF_The ability to apply the knowledge and problem-solving skills acquired in new or unfamiliar environments within wider (or multidisciplinary) contexts related to the area of study.
CB8. METMF_The ability to integrate knowledge and deal with the complexity of making judgements on the basis of information that, albeit incomplete or limited, includes thoughts on the role played by social and ethical responsibility in the application of knowledge and judgement.
CB9. METMF_The ability to communicate conclusions, and the knowledge and reasons that ultimately sustain these conclusions, to specialised and lay audiences in a clear and unambiguous way.
CB10-METP. Learning abilities that will enable students to keep studying in a largely self-directed or independent manner.

TEACHING METHODOLOGY

Lecture: Lecturers present concepts, principles and techniques, with the active participation of students.
Problem Based Learning: Lecturers and students resolve exercises and standard problems through specific techniques related to the theoretical contents and principles of the course.
Project Based Learning: Students resolve complex problems through specific techniques related to the theoretical contents and principles of the course.
Self-study: Students diagnose their learning needs, in collaboration with the lecturers, and plan their own learning process.

LEARNING OBJECTIVES OF THE SUBJECT

The Simulation of industrial and logistic systems course introduces students to the area of discrete event simulation of stochastic processes as an aid in the decision making process in production and logistic environments. The modeling of manufacturing or logistic processes in a simulator allows the analysis, the study, the improvement, and the evaluation of different solutions without interfering with the real system.

STUDY LOAD

Type	Hours	Percentage
Hours medium group	30,0	16.00
Self study	127,5	68.00
Hours large group	30,0	16.00

Total learning time: 187.5 h

CONTENTS

Module 1: Discrete-event systems modeling

Description:
The goal of this module is to introduce queue theory, discrete event simulation and to model discrete event simulation systems using timed and colored timed petri nets. Petri nets have proved to be a successful tool for modeling manufacturing and logistics systems due to several advantages such as the conciseness of embodying the static structure and the dynamics, the availability of the mathematical analysis techniques, and its graphical nature.

Related activities:
Distance and in-class activities
Group project
Final exam
Online self-Assessment

Full-or-part-time: 67h 30m
Theory classes: 10h
Practical classes: 10h
Self study : 47h 30m

Module 2: Statistics models for simulation

Description:
This module is focused in the statistical analysis of data needed for input modelling and random number generation which is the heart of the discrete event simulations.

Related activities:
Distance and in-class activities
Group project
Final exam
Online self-Assessment

Full-or-part-time: 60h
Theory classes: 10h
Practical classes: 10h
Self study : 40h

Module 3: Design of experiments and analysis of results

Description:
This module is focused in the statistical analysis of the results of the simulations and the design of experiments which allows for multiple input factors to be manipulated determining their effect on a desired output response.

Related activities:
Distance and in-class activities
Group project
Final exam
Online self-Assessment

Full-or-part-time: 60h
Theory classes: 10h
Practical classes: 10h
Self study : 40h

GRADING SYSTEM

The final grade depends on the following three elements:

* 30%, Distance and in-class activities
* 40%, Group project (report and possible dissertation)
* 30%, Final exam

BIBLIOGRAPHY

Basic:
- Guasch, A. [et al.]. Modelado y simulación: aplicación a procesos logísticos de fabricación y servicios [on line]. 2ª ed. Barcelona: Edicions UPC, 2003 [Consultation: 10/07/2017]. Available on: http://hdl.handle.net/2099.3/36767. ISBN 8483017040.
- Banks, Jerry. Discrete-event system simulation. 5th ed. Upper Saddle River, NJ: Prentice Hall, 2010. ISBN 9780138150372.