



Course guide

390220 - CAG1 - Control and Automation Systems

Last modified: 06/06/2023

Unit in charge: Barcelona School of Agri-Food and Biosystems Engineering
Teaching unit: 707 - ESAII - Department of Automatic Control.

Degree: MASTER'S DEGREE IN ENABLING TECHNOLOGIES FOR THE FOOD AND BIOPROCESSING INDUSTRY (Syllabus 2014). (Compulsory subject).
MASTER'S DEGREE IN ENABLING TECHNOLOGIES FOR THE FOOD AND BIOPROCESSING INDUSTRY (Syllabus 2020). (Compulsory subject).

Academic year: 2023 **ECTS Credits:** 5.0 **Languages:** Spanish, English

LECTURER

Coordinating lecturer: ALICIA CASALS GELPI

Others:

PRIOR SKILLS

Scientific and technical degrees: graduates in agricultural engineering, food science and biosystems engineering (or related fields) with degrees of a duration equal to or greater than 240 ETCS.

REQUIREMENTS

Presentiality

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

1. Developing of criteria for selection and integration of robots and automatization systems in the food sector.
2. Ability to determine the communication and processing technologies appropriate for the control, production and distribution of food and bioproducts.
3. Designing the implementation of monitoring, control and automatization for food and biotechnological industries. Ability to detect the points of the productive chain susceptible of automatization.

Generical:

4. Ability to apply the language and techniques of industrial management in the agrifood and biotechnological sector
5. Applying of comercialization systems and logistics to the agri-food and bioprocesses sector.
6. Identification of the industrial techonologies with larger future impact and develop new applications of such technologies in the food and biotechnological industry.
7. Ability to indentify and use monitoring systems in quality control of food products.
8. Ability to assess and improve the design of processes and products considering social and environmental impacts.

Transversal:

9. 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.

TEACHING METHODOLOGY

We indicate here the repertoire of teaching methods to be applied in the different training activities according to the teaching plans of the subject.

Lecture or conference: presentation of knowledge by university professors or by external specialists.

Participatory classes: collective solving exercises, conducted group discussions with the lecturer and other students in the classroom; classroom presentation of an activity individually or in small groups.

Lab / Workshop: realization of designs, measurements, verifications, etc.; and presentation of results in oral or written form individually or in small groups.

Theoretical and practical works: conducted classroom activity or exercise, individually or in small groups, with the advice of the lecturer.

Project or short works: based on the realization, individually or in groups, of a work of reduced complexity or scope.

Information search: Information search by students, it allows the acquisition of knowledge, skills and attitudes related to obtaining information.

Simulation: Activity related to a case or problem, each student or each group is assigned a role under which they must intervene in the development of the situation.

Evaluation activities.

LEARNING OBJECTIVES OF THE SUBJECT

This course allows the student to get the tools and knowledge necessary to monitor, control and manage the different processes involved in a product transformation throughout the various stages, from receipt of the raw material to shipment.

STUDY LOAD

Type	Hours	Percentage
Self study	90,0	72.00
Hours large group	35,0	28.00

Total learning time: 125 h

CONTENTS

Chapter 1

Description:

Control of continuous processes.

Maintaining the stability of a process. Dynamic behavior of systems of first order, second order and other systems. Dynamic response. Feedback control. Classification of feedback controllers: proportional controller (P), proportional-integral (PI) controller , proportional-integral-derivative controller (PID) . Two-position controller (on / off) .

Control of discrete processes.

Justification of automation. Combinational logic system, sequential logic system. Pneumatic automation. Programmable logic controllers, GRAFCET programming, Ladder programming. Scada systems.

Full-or-part-time: 20h

Theory classes: 20h



Chapter 2

Description:

Robotics. Basics of handling robots and autonomous robots. Control and monitoring systems. Application of autonomous aerial vehicles in agricultural and forest management. Robotics in handling and packaging. Safety standards and food hygiene. Identification systems and product tracking. Applications in handling, quality control. Mobile robotics. Automated warehouse management. Robotics as a guarantee of traceability.

Full-or-part-time: 20h

Theory classes: 20h

GRADING SYSTEM

Score course= 0,5 Score Control +0,5 Score Robotics

Score Control = 0,2 Partial exam + 0,45 Final exam + 0,35 Work

Score Robotics = 0,2 Partial exam + 0,45 Final exam + 0,35 Work

EXAMINATION RULES.

Presentiality. Continuous monitoring. Three deliveries and oral defenses.

BIBLIOGRAPHY

Basic:

- Creus Solé, Antonio. Instrumentación industrial [on line]. 7ª ed. Barcelona: Marcombo, 2005 [Consultation: 23/07/2022]. Available on: https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=9767. ISBN 8426713610.

- Bateson, Robert N. Introduction to control system technology. 7th ed. Upper Saddle River ; Columbus: Prentice Hall, 2001. ISBN 0130306886.

Complementary:

- Medina, José Luis; Guadayol Cunill, Josep Maria. La Automatización en la industria química [on line]. Barcelona: Edicions UPC, 2010 [Consultation: 15/04/2020]. Available on: <http://hdl.handle.net/2099.3/36842>. ISBN 9788498803983.

- Stephanopoulos, George. Chemical process control : an introduction to theory and practice. Wilmington, [etc.]: Prentice-Hall, 1984. ISBN 0131285963.

- Roberts, Nancy. Introduction to computer simulation : the system dynamics approach. Reading, Mass. [etc.]: Addison-Wesley, 1983. ISBN 0201064146.

- Smith, Carlos A.; Corripio, Armando B. Control automático de procesos : teoría y práctica. Mexico: Limusa, 1991. ISBN 9789681837914.

- Shinskey, F. Greg. Process control systems : application, design and tuning. 4th ed. New York [etc.]: McGraw-Hill, 1996. ISBN 0070571015.

- Ollero de Castro, Pedro; Fernández Camacho, Eduardo. Control e instrumentación de procesos químicos. Madrid: Síntesis, DL 1997. ISBN 8477385173.