PERSONA CIÈNCIA EMPRESA
UNIVERSITAT RAMON LLULL

COURSE: INSTRUMENTATION AND PROCESS CONTROL

SUBJECT MATTER: Simulation and Process Control
MODULE: Specific technology
STUDIES: Degree on Chemical Engineering

GENERAL CHARACTERISTICS

Type: ☐ Basic Formation, ☑ Compulsory, ☐ Elective

☐ Final Degree Project, ☐ Internship

Duration: Semestral **Semester/s**: 7
Number of ECTS credits: 6
Language/s: Spanish

DESCRIPTION

SHORT DESCRIPTION AND JUSTIFICATION

Process control is the technique which deals with methods and procedures aimed at maintaining processes in operation so as to reach the best productivity and remain within margins of safety. So the process control main objectives are: ensure the stability of the process, eliminate the influence of disturbances and optimize performance.

COMPETENCIES

- Be able to understand and apply knowledge of Chemistry and Engineering for application in the field of Chemical Engineering. (CB1, E2)
- Be able to use systems, components or processes to achieve the requirements established in the activity to be carried out in the field of Chemical Engineering. (CB2, E6)
- Be able to identify, formulate and solve problems in the fields of Chemical Engineering and Chemistry. (CB2, E7)
- Ability to design, manage and operate chemical process instrumentation, simulation and control. (TE4)

PREREQUISITES

According to current academic teaching planning and regulations.

CONTENTS

5.7. - Proximity and displacement sensors
5.8. - Other sensors

6. - SIGNAL TRANSMISSION
6.1. - Types of signals
6.2. - Analog to digital and digital to analog conversion
6.3. - The digital signal transmission
6.4. - Industrial communications

7. - ACTUATORS
7.1. - On-off actuators
7.2. - Continuous actuators
7.3. – Time and frequency modulation
7.4. - The computer - actuator connection

8. - IMPLEMENTATION OF CONTROL SYSTEMS
8.1. - Design of control systems
8.2. - Control Equipment
8.3. - PLC architecture. Functional modules
8.4. - Types of Languages
8.5. - Programming of PLCs with TIA Portal (Siemens)

METODOLOGY

LEARNING ACTIVITIES*

Learning activities	**Hours**	**ECTS Credits**	**Competences**
Lectures	41	1.5	CB1, E2, CB2, E6, TE4
Case and Problem-Solving Sessions	19	0.7	CB2, E7, TE4
Seminars			
Practical & Lab Work	14	0.5	CB2, E7, TE4
Presentations			
Personal study	81	3	CB1, E2, CB2, E6, E7, TE4
Assessment Tasks (Exams, Continuous Assessment...)	8	0.3	CB1, E2, CB2, E6, E7, TE4
TOTAL	**163**	**6**	

TEACHING METHODOLOGY

The teaching methods used in the course are based on a combination of lectures, which introduces the concepts and their application for solving problems.

The combination of theory and practice facilitates the understanding of the subject, taking into account the three phases of learning, first knowledge (language), then understand (concepts) and third applicate (problem and case solving), this process is not linear but iterative.

PLC programming theory is applied to mini-projects.

Students have the material support suitable for facilitate attention in class and its personal work, collections of problems, documentation and bibliographical resources.

For problem solving it will be used the necessary software as a standard tool.

ASSESSMENT

ASSESSMENT METHODS

Assessment Methods	Weight	Competences
Final Exam	40%	CB1, E2, CB2, E7, TE4
Midterm Exam/s	-	
Follow-up Activities	40%	CB1, E2, CB2, E7, TE4
Reports and Presentations	-	
Lab or Field Work	15%	CB2, E6
Projects	-	
Host Student Evaluation	-	
Participation	5%	CB1, E2, CB2, E6, E7, TE4

LEARNING OUTCOMES

- • The student must demonstrate proficiency in knowledge of the nomenclature used in the control of chemical processes (CB1, E2, CB2, E7, TE4).
- The student must demonstrate an understanding of the concepts, algorithms and other tools commonly used in the control of chemical processes (CB1, E2, CB2, E6, E7, TE4).
- The student must demonstrate proficiency in the application of the concepts, algorithms and other tools to solve problems and cases related to the control of chemical processes (CB1, E2, CB2, E6, E7, TE4).

QUALIFICATION

The evaluation of the course will consider all the aspects that appear in the evaluation table, with their corresponding weight.

To pass the course the student must have a minimum grade of 5.0 points. For computing average score, a minimum grade of 5.0 points is required in the final term exam (January / July).

Attendance to all laboratory sessions is mandatory. Failure to comply with this rule, without an acceptable reason for absence, will mean to fail the course. The exams may include theory and laboratory.

ASSESSMENT OF THE COMPETENCES

- Competency CB1/E2: Average of the final test result and follow-up activities.
- Competency CB2/E7: Final exam problem part.
- Competency CB2/E6: 60% of the final exam problem part and 40% of the experimental work.
- Competency TE4: Final course grade

BIBLIOGRAPHY

- E. Barberà, Instrumentación y control de procesos químicos y biotecnológicos, Institut Químic de Sarrià, Barcelona, 2010
- J.J. Molins; E. Barberà: “Autómatas programables: Step7® y UnityPro®”, IQS, 2012

Classical books

- K. Ogata, Ingeniería de Control Moderna, Prentice Hall
- F.G. Shinskey, Process-Control Systems, McGraw-Hill
- P. Harriott, Process Control, McGraw-Hill

Modern books

- G. Stephanopoulos, Chemical Process Control: An Introduction to Theory and Practice, Prentice Hall
- C.L. Phillips and H.Troy Nagle Jr., Digital Control System Analysis and Design, Prentice Hall
- K. Ogata, Sistemas de control en tiempo discreto, Prentice Hall
- P.H. Lewis, C. Yang, Sistemas de control en ingeniería, Prentice Hall
- J. Dorsey, Sistemas de control continuos y discretos, McGraw Hill

Siemens Manuals (Internet)

DOCUMENT RECORD

PREVIOUS CHANGES

16th March 2015,	Dr. Eduard Barberà
5th February 2014,	Dr. Eduard Barberà
13th February 2013,	Dr. Eduard Barberà
11th July 2012,	Dr. Eduard Barberà
7th June 2010,	Dr. Eduard Barberà

CURRENT REVISION

16th August 2018	Sr. Sauro J Yague