

Development and Introduction of Control Systems in the Chemical Industry

Code: 106066

Credits: 6

2026/2027

Degree programme	Type	Course
Chemical Engineering	OP	4

Contact lecturer

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Group languages

You can consult this information at the [end](#) of the document.

Prerequisites

Experience in automatic process control, instrumentation, automation and programming languages.

Objectives

The overall objective of this course is to introduce in a practical way the steps needed to design and implement an automatic control system in the chemical industry.

Specific objectives.

- Implement a data acquisition system applicable to an industrial system.
- Program a data and metadata recording system.
- Design and implement an online monitoring system.
- Program and implement automatic control loops.
- Tune a controller with real inputs and outputs.
- Implement some characteristics of a SCADA.
- Program a control system in a programmable logic controller.

Learning outcomes

1. Develop critical thinking and reasoning
2. Apply IT resources to the simulation and control of processes.
3. Develop a capacity for analysis, synthesis and prospection.
4. Work autonomously.
5. Work cooperatively.

Contents

1. Introduction
2. Data acquisition. Digital inputs and outputs. Analog inputs and outputs. Communication protocols.
3. Data storage

4. Metadata. Data annotation
5. On-line monitoring
6. Digital control loops
7. Implementation of control loops. On-off and PID feedback control. Feedforward control.
8. SCADA systems
9. Programmable logic controllers

Learning activities and methodology

Title	Hours	ECTS	Learning outcomes
03) Online monitoring	4	0.16	1, 2, 3, 5
05) SCADA systems	4	0.16	1, 2, 3, 5
03) Online monitoring	2	0.08	1, 2, 3, 5
06) Programmable logic controllers	4	0.16	1, 2, 3, 5
05) SCADA systems	2	0.08	1, 2, 3, 5
00) Introduction	2	0.08	1, 3
01) Data acquisition. Digital inputs and outputs. Analogic inputs and outputs. Communication protocols.	6	0.24	1, 2, 3, 5
00) Introduction	1	0.04	1, 3
02) Data storage. Metadata	4	0.16	1, 2, 3, 5
04) Digital control loops	6	0.24	1, 2, 3, 5
04) Digital control loops	3	0.12	1, 2, 3, 5
Software development and individual study	92	3.68	1, 2, 3, 4, 5
06) Programmable logic controllers	2	0.08	1, 2, 3, 5
02) Data storage	2	0.08	1, 2, 3, 5
01) Data acquisition. Digital inputs and outputs. Analogic inputs and outputs. Communication protocols.	3	0.12	1, 2, 3, 5

Three-hour classes with a theoretical introduction of the basic elements for each activity, followed by practical work by the students.

The virtual platform used for communication with students will be the UAB Moodle Virtual Campus.

Own laptop is required.

The use of artificial intelligence (AI) technologies is permitted in this course as an integral part of the work, provided the final result demonstrates a substantial contribution from the student in terms of analysis and personal reflection. Students must clearly identify which parts have been generated using AI technologies, specify the tools used and provide a critical reflection on the influence of these technologies on the process and final outcome of the activity. Failure to be transparent about the use of AI will be considered academic dishonesty and may result in a penalty to the mark awarded for the activity, or more severe sanctions in more serious cases.

Annotation: within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Assessment

Continuous assessment activities

Title	Weight	Hours	ECTS	Learning outcomes
Activity 1. Implementation of a data acquisition system	10%	2	0.08	1, 2, 3, 4, 5
Activity 6. Programmable logic controller	15%	2	0.08	1, 2, 3, 4, 5
Activity 7. Oral defence of the work done	30%	1	0.04	1, 2, 4
Activity 3. Online monitoring	10%	2	0.08	1, 2, 3, 4, 5
Activity 4. Control loop implementation	10%	2	0.08	1, 2, 3, 4, 5
Activity 2. Data recording system	10%	2	0.08	1, 2, 3, 4, 5
Activity 5. SCADA	15%	2	0.08	1, 2, 3, 4, 5

a) Planned assessment process and activities

The evaluation activities of the subject are detailed below, with their percentage of weight in the final grade:

- Activity 1 (10%). Implementation of a data acquisition system.
- Activity 2 (10%). Data recording system.
- Activity 3 (10%). Online monitoring.
- Activity 4 (10%). Control loop implementation.
- Activity 5 (15%). SCADA.
- Activity 6 (15%). Programmable logic controller.
- Activity 7 (30%). Oral defence of the work done.

To apply the calculation of the final mark, a minimum mark of 4 in activity 7 is required.

If this criterion is not met, the maximum final mark for the course will be 4.0.

Failure to attend class when taking assessment tests will result in a zero for the activity, with no possibility of recovery.

b) Scheduling of assessment activities

The schedule of assessment activities will be given on the first day of the course and will be published on the Virtual Campus.

c) Recovery process

Students may sit the resit provided they have submitted a set of assignments representing at least two-thirds of the module's total mark.

Assignments 1 to 6 that have been failed may be resubmitted, and Activity 7 must also be re-taken. A minimum mark of 4.0 is required for Activity 7. If this criterion is not met, the maximum final mark for the module will be 4.0.

In agreement with the coordination of the Degree and the management of the School of Engineering, the following activities cannot be recovered: evaluative activities of any kind in which the student has committed an

irregularity (copying, plagiarising, allowing copying).

d) Procedure for the revision of grades

For each assessment activity, a place, date and time of review will be indicated where students can review the activity with the teacher. In this context, claims may be made about the grade of the activity, which will be evaluated by the lecturer responsible for the subject. If the student does not attend this review, the activity will not be reviewed later.

e) Grades

Honours. It is the decision of the lecturers responsible for the subject to award an honours degree (MH). UAB regulations state that MH may only be awarded to students who have obtained a final grade of 9.00 or higher. Up to 5% of the total number of students enrolled may be awarded MH.

A student will be considered non-assessable (NA) if he/she has not appeared in a set of activities whose weight equals a minimum of two thirds of the total grade of the subject.

f) Irregularities on the part of students, copying and plagiarism

Without prejudice to other disciplinary measures that may be considered appropriate, irregularities committed by the student that may lead to a variation in the grade of an evaluation act will be graded with a zero. Therefore, copying, plagiarism, cheating, allowing copying, etc. in any of the assessment activities will result in a zero. Assessment activities graded in this way and by this procedure will not be recoverable.

g) Evaluation of repeating students

There are no changes with respect to new students.

h) Single assessment

This subject does not offer a single assessment.

Bibliography

- MATLAB. The MathWorks MATLAB® <http://es.mathworks.com/>
- Arduino. <https://www.arduino.cc/>

Software

Use of hardware based on Arduino PLCs.

Matlab and C programming for Arduino.

Siemens Step7 - Microwin for PLC programming.

Course groups and languages

The information provided is provisional until November 30. After this date, you will be able to consult the language of each group through this [link](#). To access the information, you will need to enter the course CODE

Type of teaching	Group	Language	Semester	Shift
(TE) Theory	1	English	second semester	morning-mixed
(PAUL) Classroom practices	1	English	second semester	morning-mixed

(SEM) Seminars	1	English	second semester	morning-mixed
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