Universidad del País Vasco Euskal Herriko Unibertsitatea

COURSE GUIDE 2025/26

Faculty 363 - Faculty of Engineering - Bilbao **Cycle** .

Degree GIEIAU30 - Bachelor's Degree in Industrial Electronics and Automation Engine **Year** Third year

COURSE

25991 - Automatic Regulation **Credits, ECTS:** 6

COURSE DESCRIPTION

The course on Automatic Control serves as a logical progression from the Automatisms and Control course offered in the second year of the degree program. It aims to enhance students' understanding and proficiency in both Automatic Control and control techniques, while also emphasizing the simulation of control systems.

The primary objective of this course is to build upon the foundational knowledge acquired in the preceding Automatisms and Control course, which covered essential concepts in Automatization (Programmable Logic Controllers - PLCs) and Automatic Control (Control Theory). By delving deeper into these areas, students will gain a more comprehensive understanding of the principles and applications of Automatic Control.

Furthermore, this course aims to equip students with the necessary skills to simulate control systems effectively. Simulation serves as a powerful tool for analyzing and optimizing the performance of control systems before their physical implementation. By emphasizing the control aspect, students will develop practical competence in using software and conducting virtual experiments to evaluate and improve the behavior of control systems.

Through this course, students will be exposed to advanced topics in Automatic Control, such as advanced control algorithms, multivariable systems, adaptive control, and robust control. They will also gain hands-on experience with various simulation techniques, including system modeling, controller design, and performance evaluation.

By the end of the course, students will have achieved a higher level of proficiency in both Automatic Control and control system simulation. They will be able to apply their knowledge to design, analyze, and optimize control systems in the context of Industrial Electronics and Automation Engineering. Additionally, they will have acquired practical skills in control systems, allowing them to efficiently evaluate and improve system performance in a virtual environment.

In summary, this course aims to enhance students' knowledge of Automatic Control and control techniques while emphasizing the simulation of control systems. It provides a solid foundation for students to tackle complex control challenges in the field of Industrial Electronics and Automation Engineering.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

The main goal is to achieve the following knowledge and skills:
Knowledge of principles and applications of control systems.
Ability to analyze and design control systems.
Skills for simulation and implementation of control systems.

Theoretical and Practical Contents

Topic 1. Introduction to control systems.
Topic 2. Laplace Transform.
Topic 3. External representation of Systems.
Topic 4. Steady state and transient modes.
Topic 5. Stability in terms of input-output.
Topic 6. PID Control.
Topic 7. Time response. The root locus.
Topic 8. Frequency response. Bode diagram.

TEACHING METHODS

MASTER LECTURES: Development of the list of topics through presentations and examples.
CLASSROOM PRACTICES: Practical development of the subject through exercises and problem/projects-based learning.
LABORATORY PRACTICES: Implementation of the knowledge to improve and expand the capabilities and skills acquired.

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	30		15	15					
Horas de Actividad No Presencial del Alumno/a	45		30	15					

Legend: M: Lecture-based | S: Seminar | GA: Applied classroom-based groups | GL: Applied laboratory-based groups | GO: Applied computer-based groups | GCL: Applied clinical-based groups | TA: Workshop | TI: Industrial workshop | GCA: Applied fieldwork groups

Evaluation methods

- Continuous evaluation
- End-of-course evaluation

Evaluation tools and percentages of final mark

- Written test, open questions 60%
- Exercises, cases or problem sets 20%
- Teamwork assignments (problem solving, Project design) 10%
- Oral presentation of assigned tasks, Reading¿ 10%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

70% class attendance is compulsory for continuous assessment. Else, a final assessment is automatically considered.
60% Examination (compulsory). The student must have 50% in this exam.
20% Laboratory works (optional):
The reports should be personal.
They should be delivered the same day of the laboratory.
If no report is delivered its corresponding score in the final grade will be lost.
Practices should be done in groups of 2 students always from the same Laboratory Group and they¿ll last all year. The members of the groups should be notified to the teacher within the first 4 weeks, otherwise the students will be grouped in alphabetical order.
20% Deliverables (optional):
The students will deliver an electronic portfolio (pdf, ppt, matlab files...) and will perform a public presentation. This work should be proposed individually. It will focus on the control of a given physical system. The system should be as realistic as possible. The controller will be developed and implemented to achieve the requirements of the proposed system.
The presentation of the project will take place in the last weeks of the year. It will consist of a 15 minutes lecture plus 5 minutes for questions and answers.
If no optional task is delivered its corresponding score will be lost in the final grade.

If the final examination is not made, the qualification will be NP. The student will not be able to refuse the call after that examination.

Future examination calls won¿t require to repeat already evaluated optional tasks. Students who have already made them should notify the teacher within the first 4 weeks of the year if they don¿t want to repeat them. Otherwise they will lose the qualification previously obtained.

The student has the right to a 100% examination evaluation upon request. The request should be addressed to the lecturer up to 4 weeks before the exam, and signed by both the lecturer and the student. The examination will consist of an oral and written exam, along with a public defence of a project, with a weight of 40/40/20 respectively.

In the event that health conditions prevent face-to-face teaching activity and / or assessment, a non-contact modality will be activated and the students will be duly informed.

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

The student has the right to a 100% examination evaluation upon request. The request should be addressed to the lecturer up to 4 weeks before the exam, and signed by both the lecturer and the student. The examination will consist of an oral and written exam, along with a public defense of a project, with a weight of 40/40/20 respectively.
Otherwise, the evaluation procedure will be analogous to that of the common call.

In the event that health conditions prevent face-to-face teaching activity and / or assessment, a non-contact modality will be activated and the students will be duly informed.

MANDATORY MATERIALS

Not Required

BIBLIOGRAPHY

Basic bibliography

- Theory notes and exercises available on the course's virtual platform (eGela).
- Katsuhito Ogata, Ingeniería de Control Moderna. Prentice-Hall
- Benjamin C, Kuo Automatic control Systems. Prentice-Hall
- Katsuhito Ogata, Problemas de Ingeniería de Control utilizando Matlab. Prentice-Hall
- Karl J. Åström and Richard M. Murray, Feedback Systems. Versión electrónica. Princeton Univ. Press. (Descargable de la web de Murray)

Detailed bibliography

"Sistemas de Control Moderno", 10ª Edición, Richard C. Dorf, Pearson. Prentice Hall
"Sistemas de Control Automático", 7ª Edición, Benjamin C. Kuo, Pearson. Prentice Hall
"Problemas de Ingeniería de Control utilizando Matlab", Katsuhiko Ogata, Pearson. Prentice Hall
"Sistemas de Control en Tiempo Discreto", 2ª Edición, Katsuhiko Ogata, Pearson. Prentice Hall

Journals

-Automatica
-International Journal of Control
-IEEE Transactions on Automatic Control
-IEEE Control Systems Magazine (divulgative)

Web sites of interest

http://www.ieeecss.org/
http://www.ifac-control.org/
http://www.isa.org/
http://www.euca-control.org/
http://www.ceautomatica.es/

OBSERVATIONS

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