

TITLE OF COURSE: CHEMICAL PROCESS CONTROL AND INSTRUMENTATION

PROGRAM TITLE: CHEMICAL ENGINEERING

NUMBER: 22036

DESIGNATION AS: T YEAR: 5th SEMESTER: 1st

CREDITS (hours/week): 6 (4)

PROFESSOR: Dr. Eduard Barberà Moral

PREREQUISITES: Calculus I, Linear Algebra, Differential Calculus, Applied Digital Calculus, Electrical Engineering, Electronics and Instrumentation, Unit Operations of Chemical Engineering

PREREQUISITES BY TOPIC: Complex variables, differential equations, the Laplace transformation, matrix algebra, electrical circuits, frequency response: Bode diagram, basic electronics, unitary processes, information processing

COREQUISITES:

COURSE DESCRIPTION:

Process Control is the technique that deals with the methods and procedures whose objective is the maintenance of processes in operation so that the best possible productivity is obtained and maintained within the margins of safety. The objectives of Process Control are thus to ensure the stability of the process, excluding the influence of perturbations and optimizing cost.

COURSE OBJECTIVES¹:

- 1.- To teach the practical principles of automatic control that can be applied in production in order to improve the efficiency and quality of the product [1]
- 2.- To facilitate the learning of the techniques of analysis and design of modern systems, both analogue and digital, for controlling continuous variables [2, 5]
- 3.- To present the most widely used instrumentation for the tracking and control of chemical processes [1, 7]
- 4.- To apply all of these concepts in laboratory practices [3, 6, 7]

¹ Numbers in brackets refer to outcomes

TOPICS COVERED:

- 1.- Introduction
- 2.- Lineal systems and time-domain analysis
- 3.- Controllers and tuning
- 4.- Stability and sensibility
- 5.- Frequency response methods
- 6.- Compensation networks
- 7.- Digital control systems
- 8.- Sensors and transducers
- 9.- Signal transmission
- 10.- Final control elements
- 11.- Control systems implementation

LABORATORY PRACTICALS:

Carried out on the Pilot Plant Laboratory

EVALUATION:

- A Exams
- C Room activities
- J Lab work
- K Lab rapport

The final exam comprises one part which is theory (consisting of 4 to 5 questions) and a second part which is problem-solving (2 to 4 problems), with it being impossible to pass either part separately. Each part value is 10 points.

Minimum of 5 points, in each part, is mandatory to get the final grade, calculated as follows:

Theory (A, C)	40%
Problems (A, C)	40%
Lab (J, K)	20%

During the course, there are obligatory monthly tests (C), the purpose of which is to ensure gradual learning on the course with an even distribution of effort over time.

The grade obtained on the test permits the student to decide (even on the day of the exam itself) whether or not to choose to take the final theory exam.

Where a test on problems has been taken, one of the problems on the final exam may be omitted.

PERFORMANCE CRITERIA²:**Objective 1**

- The student will demonstrate sufficient knowledge of the practical principles of automatic control that can be applied in production to improve the efficiency and quality of the product [A, C]

Objective 2

- The student will demonstrate the ability to read and interpret the formulation of the questions posed [A, C]

² Letters in brackets refer to evaluation methods used to assess student performance

- The student will demonstrate sufficient knowledge of techniques of analysis of modern systems, both analogue and digital, for controlling continuous variables [A, C, J, K]
- The student will demonstrate sufficient knowledge of the techniques of designing modern systems, both analogue and digital, for controlling continuous variables [A, C, J, K]

Objective 3

- The student will demonstrate sufficient knowledge of the most widely used instrumentation for chemical process monitoring and control [A]

TEXTBOOKS:

Class notes

OTHER REQUIRED MATERIAL:

Classic texts

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

Modern texts

- 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, Mc Graw Hill

PREPARED BY: Eduard Barberà Moral (October 2009)