Universidad Zaragoza

Year : 2019/20

60643 - Process and Product Control

Syllabus Information

Academic Year: 2019/20
Subject: 60643 - Process and Product Control
Faculty / School: 100 -

Degree: 540 - Master's in Industrial Chemistry

ECTS: 6.0
Year: 1
Semester: First semester
Subject Type: Compulsory
Module: ---

1.General information

1.1.Aims of the course

Students who successfully complete this course will acquire extensive knowdledge in the field of industrial chemistry.

Among other topics will study the main techniques used in the chemical industry for controlling processes and chemicals, as well as applications of various advanced methodologies in quality control. Special attention will be given to use of automatic sensors and biosensors in the chemical and biochecnological industry analyzers.

1.2.Context and importance of this course in the degree

The subject and its expected results respond to the following statements and objectives:

The subject of "Control of proccesses and products" is a compulsory subject taught within the Master degree in Industrial Chemistry. Its a subject taugh by Department of Analytical Chemistry that tries to offer a broadening and deepening of the knowledge imparted in degree in Chemistry related industrial process control.

From this course, students will be ready to select and properly use the methodology work solving real problems involving analytical determinations, characterizations and process control in the industry.

1.3.Recommendations to take this course

It is recommended to have passed the subjects of the degree of Chemistry. While they will be held introductions aspects basic and instrumental analytical techniques for all students, especially those who come from other degrees, will expand and deepen the knowledge imparted in the Degree in Chemistry related control industrial processes, automation, sensors and biosensors.

2.Learning goals

2.1.Competences

- Know and apply advanced methods and detailed procedures and process control products industrial scale.
- Identify, analyze and define the main elements of a problem to solve ith with rigor in the environment industrial chemistry.
- Mastering the techniques and management tools for research and development processes, products and services in the chemical and related industry, including management skills and knowledge ability to develop and implement original ideas and to lead projects.
- Knowledge and undestanding that provide a basis or oppotunity to be original in the developmentand/or applying ideas, often in a research content.
- That the students can apply their knowledge and ability to solven problems in chemical industry.
- That the students are able to integrate knowledge and face the complexity and formulating judgments based on formation that was incomplete or limited. includes refections on the social and ethical responsibilities linked to the application of their knowledge and judgments
- Students can communicate their conclusions and the knowledge and last reasons that support to specialist and non-specialist in a clear and unambiguous manner.
- Manage, discriminate and select sources of bibliographic information.

- Effectively use the information and communications technology as a tool.

- Know and apply concepts related to process control and product. Automation, analyzers, physical sensors, chemical sensors, biosensors, managements, quality and productivity.

- Identify analytical problems in the chemical industry to nominate and elect more analytical techniques suitables for resolution.

- Select integrated process control systems and products for simple problems and strategies that meet quality and productivility parameters.

2.2.Learning goals

1. Describe and apply analytical methods used in the control of proccesses and products in the industrial chemical.

2. Correctly use the concepts related to process control and products: automation, analyzers, physical sensors, chemical sensors, biosensors, management, quality, productivity.

3. Select integrated process control systems and products for simple problems and stategies that meet quality and productivity parameters.

4. Appreciate the importance of analytical chemistry and its contribution to the quality control chemical laboratory and productivity

2.3.Importance of learning goals

This course should enable students to acquire all the necessary criteria to decide which should be the design generally an instrumental method or choosing based on the principles of analytical chemistry, with the purpose of obtaining information for controlling processes and products in chemistry, biotechnology industry or another. Through the practices of this course the students will acquire the basic skills for experimental implementation and evaluation of the quality of instrumental analysis methods and their application to sensors and process control industrial.

3.Assessment (1st and 2nd call)

3.1.Assessment tasks (description of tasks, marking system and assessment criteria)

- Controls:60%

- Group work: 15%

Class assistance, report (laboratory practices, visits, conferences, problems and cases): 25%

Note: Laboratory practices are mandatory to overcome the subject.

4.Methodology, learning tasks, syllabus and resources

4.1.Methodological overview

The course,with compulsory attendance, will take place during one semester, and will be developed through lectures, seminars, papers to be presented in class, exercises, laboratory practice sessions, and visits to industries and laboratories.

4.2.Learning tasks

The course includes the following learning tasks:

- Lectures (30 hours).
- Solving problems (10 hours).
- Laboratory sessions (10 hours). The contents of these sessions will be related to the theoretical contents.
- Presentation of papers (5 hours).
- Study (85 hours).
- Visits (5 hours).
- Assessment (5 hours).

4.3.Syllabus

The course will address the following topics:

1. CONTROL OF INDUSTRIAL PROCESSES. Introduction to process control. Concepts and terminology. Definition and location of the elements of a control loop. Instrumentation and sensors. Differences between process analyzers and

laboratory analysis. Types of applications Sequential and continuous processes. Process automation.

2. THE ANALYTICAL LABORATORY IN THE INDUSTRY. Automation of the analytical method. Laboratory analyzers Stages to automate: sample taking, sample preparation, measurement. Forms and degrees of automation.

3. AUTOMATION OF THE STAGES OF THE ANALYTICAL PROCESS. Automation on-line, discontinuous, continuous. Segmented and non-segmented flow. Continuous and discontinuous on-line analyzers. Automatic valuation Comprehensive automated analyzers: examples in the industry.

4. PROCESS ANALYZERS. Total chemical analyzers Analyzers of industrial processes. Types of analyzers: continuous and discontinuous. Fundamentals and components. Classification. Sampling and sample conditioning systems. Types of analyzers based on physical-chemical properties. Examples of process analyzers in the industry.

5. SENSORS AND BIOSENSORS.Physical sensors in the control of industrial processes. Chemical sensors and biosensors in the control of industrial and biotechnological processes. of the (bio) sensors. Types of transduction and (bio) recognition reagents. Immobilization procedures. Applications of sensors and biosensors in the chemical, agri-food and biotechnology industries. Acoustic sensors in the chemical industry.

6. APPLICATIONS OF ANALYTICAL CHEMISTRY IN THE CONTROL OF INDUSTRIAL PROCESSES. Examples of process control in the chemical industry. Examples of process control in the agri-food, pharmaceutical and biotechnology industries. Examples of control of physical parameters and chemical composition. Trends in Analytical Chemistry in Process Control Technology. Emerging areas of process control applications.

4.4.Course planning and calendar

Further information concerning the timetable, classroom, assessment dates and other details regarding this course, will be provided on the first day of class or please refer to the Faculty of Science http://ciencias.unizar.es/

The begining and end of the course will be marked by the academic calendar of the Faculty of Science, being imparted during the first semester of the academic year. The specific dates on which the various controls and delivery of work throughout the course will place communicate to students in advance. Overal assessment tests will take place on dates determined in the calendar of the faculty of Sciences.

4.5.Bibliography and recommended resources

- Bakeev, K.A., *Process Analytical Technology Spectroscopy. Tools and Implementation Startegies for the Chemical and Pharmaceutical Industries*, 2nd. Ed., J.Willey, 2010.
- Mermet, J.M., *Analytical Chemistry: a Moderm Approach to Analytical Sciences*, 2nd Ed., J.Willey-Blackwell, 2014.
- Ollero, P., Fernández, E., *Control e instrumentación de procesos químicos*, Madrid, Síntesis, 1997.
- Valcárcel, M., Cárdenas, M.S., *Automatización y miniaturización en Química Analítica*, Barcelona, Springer, 2000.
- Eggins, B.R., *Chemical Sensors and Biosensors*, J. Willey, 2003.
- Banica, F.G., *Chemical Sensors and Biosensors: Fundamentals and Applications*, Willey-Blackwell, 2012.
- Rassoly, A., *Biosensors and Bidetection Methods and Protocols*, vol. 1. Optical Based Detectors, Springer, 2009.
- Werner, B., *Rapid Methods for Analysis of Food and Food Raw Materials*, Lancaster Tecnomic Pub., 1990.
- Oriol, J., *Manual de seguridad en los laboratorios*, Barcelona, Carl Roth, 2002.
- Shah, V., *Handbook of Plastic Testing and Failure Analysis*, J. Willey, 2007.