

## 60640 - Industrial Chemistry

### Información del Plan Docente

Academic Year	2016/17
Academic center	100 - Facultad de Ciencias
Degree	540 - Master's in Industrial Chemistry
ECTS	10.0
Course	1
Period	Annual
Subject Type	Compulsory
Module	---

### 1. Basic info

#### 1.1. Recommendations to take this course

#### 1.2. Activities and key dates for the course

### 2. Initiation

#### 2.1. Learning outcomes that define the subject

#### 2.2. Introduction

### 3. Context and competences

#### 3.1. Goals

#### 3.2. Context and meaning of the subject in the degree

#### 3.3. Competences

#### 3.4. Importance of learning outcomes

### 4. Evaluation

### 5. Activities and resources

#### 5.1. General methodological presentation

#### 5.2. Learning activities

#### 5.3. Program

Industrial Chemistry

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### Program

#### **General Aspects of the Chemical Industry**

The chemical industry in Spain. Specific features of the chemical industry production. Environmental aspects.

#### **General synthetic approaches to Industrial Chemistry**

Raw materials. Commodities. Industrial catalyst. Chemical solvents. Prevention and safety in the chemical industry.

#### **Industrial Inorganic Chemistry**

##### **The problematics of water**

Requirements regarding waters in relation with their use. The elimination of suspensions from waters. The softening of waters. The removal of cations from waters and demineralization of waters. The desalination of waters. Waters conditioning processes.

##### **The industrial utilization of air**

Physical separation of gases from the air: theoretical basis for liquefaction. The Linde process. The Claude process. The production of noble gases from air.

##### **The industrial compounds of nitrogen**

The synthesis of ammonia: the Haber-Bosch process. The industrial production of nitric acid: the Ostwald process. Modified processes. Applications. Hydrocyanic acid and cyanides. Hydrazines. Other derivatives.

##### **The phosphorus industry**

Phosphate minerals. The preparation of phosphorus. The phosphoric acid industry. Compounds derived from elementary phosphorus. Salts derived from phosphoric acid. The problem of phosphorus in the biosphere.

##### **Sulphur and its principal compounds**

The extraction of natural sulphur. The production of sulphur from sulphuriferous gases, sulphides and sulphates. Sulphur dioxide: production and uses. Sulphuric acid: the preparation by heterogeneous catalysis. Other sulphur products of industrial importance.

##### **The chlorine-alkali industry**

Chlorine and its industrial inorganic compounds. The inorganic fluorine industry. The minor halogens. Production of sodium and potassium, and related derivatives.

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### Carbon and silicon

Carbon natural sources. Chemical processes related to carbon monoxide and carbon dioxide. Inorganic carbon compounds for industrial use: carbonates and bicarbonates, the Solvay process. Uses and applications of carbonates. Silicon, silica and silicates. The silicon industry.

### Aluminium

Production of alumina: the Bayer process. Production of aluminium: the Hall-Heroult process. Aluminium applications: light alloys. Recovery and recycling of aluminium.

### Production of iron and steel.

The raw material of iron and steel making. The production of iron and steels. Corrosion techniques.

### Other metals of industrial importance

Copper: properties and production. The metallurgy of lead. The metallurgy of zinc.

### Industrial Organic Chemistry

#### Main sources of industrial organic chemical products

Petrochemistry: Separation of the components of natural gas. Petroleum distillation: fractions. Petroleum refining reactions.

Carbochemistry: Coal processing as a source of raw materials for chemical industry.

Biotechnology in organic chemical industry.

#### Basic products in Industrial Organic Chemistry

Basic chemicals derived from natural gas and petroleum. Olefins: ethylene, propylene and C 4 fraction. Aromatics: benzene, toluene and xylenes.

Chemicals from the C 1 fraction: synthesis gas ( $\text{CO} + \text{H}_2$ ). Methane. Methanol. Formaldehyde. Other C 1 derivatives.

Chemicals from coal: Acetylene. Aromatic derivatives from coke production.

Chemicals from renewable sources: Exploitation of biomass. Biofuels. Main chemicals from fats and oils. Main chemicals from carbohydrates. Introduction to fermentation products.

#### Industrial sectors of Organic Chemistry

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Large scale production: commodities.

Fine chemistry.

One example of large scale production in organic chemical industry: Plastics. Polymer industry. Bioplastics.

One example of fine chemistry: Pharmaceutical industry. Features. Properties of drugs. Drug design. Future of pharmaceutical products.

### **Seminaries.**

Tensioactive agents.

Agrochemistry.

Regulations of industrial chemicals.

Selection criteria and synthetic routes for industrial products.

Patents and scientific publications.

Other subjects ...

### **5.4.Planning and scheduling**

### **5.5.Bibliography and recommended resources**