Centre	**University College of Engineering of Vitoria-Gasteiz**
Name of subject	**26091 – Industrial Chemistry**
Qualification	**Degree in Industrial Chemical Engineering**
Type	**Compulsory**
Credits	**6 ECTS**
Year	**3**
Term(s)	**2nd**
Department	**Chemical and Environmental Engineering**
Language	**Spanish**

Outcomes / Objectives

Utilisation and transformation of raw materials and energy resources

1. Be able to design and manage mass balance processes. TEQI1

2. Acquire knowledge to manage energy balance processes. TEQI1

3. Understand the transformation techniques of the main raw materials. TEQI2

4. Be able to design and manage procedures for the utilisation of energy resources TEQI3

5. Be able to design and manage manufacturing processes for various products. TEQI2

6. Be able to design and manage applied experimentation procedures and operate equipment and systems related to thermodynamic concepts in physical processes. TEQI5

7. Develop abilities and acquire skills to design compound synthesis processes applying safety standards. TEQI7.

8. Acquire the ability to apply the strategies of scientific methodology: propose hypotheses and solutions to solve chemical engineering problems. TEQI8

9. Use specific vocabulary and terminology to effectively communicate knowledge, procedures and results in the field of chemical engineering. TEQI9.

10. Work efficiently in multidisciplinary environments integrating capabilities and knowledge to make decisions in the field of chemical engineering. TEQI10

11. Have knowledge of, understand and apply legislation, specifications, and enforceable rules and regulations. TEQI11

12. Carry out measurements, calculations, studies and reports during and upon completion of each practical task carried out in the subject. TEQI12

OBJECTIVES

Apply the knowledge of the chemical properties of raw materials.

Operate equipment and systems applying basic techniques and operations and chemical processes

Have knowledge of the main production processes in the chemical sector.

Relate energy and production aspects to their environmental impact.

Minimise the harmful effects of large-scale production of materials.

Syllabus

Unit 1. The chemical industry. Raw materials. Raw materials in the chemical industry. Main chemicals.

Unit 2. Air and water as raw materials. Physical separation of air gases. Applications of the components of air. Electrolysis of water.

Unit 3. Alkali halide and soda industry. Separation of salts. Sodium chloride and derivative salts. Electrolysis. Solvay process.

Unit 4. Nitrogen industry. Ammonia synthesis. Obtaining nitric acid and applications. Other derivatives of ammonia. Explosives.

Unit 5. Phosphorus industry. Fertilisers. Obtaining elementary phosphorus and calcined phosphates. Wet decomposition: Superphosphates and phosphoric acid.

Unit 6. Sulphur industry. Obtaining sulphur and derivatives. Pyrite roasting: Sulphuric acid manufacture: Applications and derivatives.

Unit 7. Construction ancillary industries. Process for obtaining and applications of gypsum. Process for obtaining limestone and use as aggregate. Portland cement. Other types of cement.

Unit 8. Glass and ceramic industry. Glass manufacture. Manufacture of ceramic materials. Characteristics and applications. Refractories.

Unit 9. Coal industry. Technological use of coal: Distillation, gasification. Activated carbon. Graphite. Industrial diamonds.

Unit 10. Petroleum and its technology. Refining processes. Transformation, synthesis. Product purification. Lubricants.

Unit 11. Petrochemical industry. Basic petrochemical techniques, separation of species, transformation of hydrocarbons: Obtaining acetylene, etc. Derivatives.

Unit 12. Polymer industry. Rubber and derivatives. Polymers. Transformation of plastics. Natural and synthetic rubber. Transformation techniques.

Unit 13. Paper industry. Transformation of cellulose. Physical and chemical pulps. Pulp conditioning. Paper manufacture.

Methodology

Teaching Method

Face-to-Face Teaching Hours								
Lectures	**Seminars**	**Classroom practice**	**Lab. practice**	**Computer sessions**	**Clinical practice**	**Workshops**	**Industrial workshops**	**Field practice**
42	**6**							**12**
Student Hours of Non Face-To-Face Activities								
Lectures	**Seminars**	**Classroom practice**	**Lab. practice**	**Computer sessions**	**Clinical practice**	**Workshops**	**Industrial workshops**	**Field practice**
63	**9**							**18**

Assessment System

General criteria

→ Practical tasks (exercises, case studies or problems)
→ Individual assignments
→ Group assignments
→ Presentation of assignments, reading...

Clarification regarding assessment

The subject is divided into two parts. Each part has a theory exam comprising several essay questions and/or problems.

Type of exam: descriptive questions. About processes, reactions and applications of the substances studied.

There will be individual assignments on the field practice experience.

There will be a group assignment on a sector of industrial chemistry, which is presented orally, in group.

Assessment:

Midterm partial exam passing score: 4.0 ≤ exam.

Exam < 4.0. » this part is taken in the final exam.

Requirement for passing the subject by passing the midterm exams:

10.0 ≤ ∑ midterm exams

The final grade is based on the average of the two midterm exams.

There will be a final exam of the entire subject and any unpassed or missed midterms in June and July.

Midterm exams passed in June do not need to be retaken in July.

If students have passed any midterm exams but failed the subject, they must retake the entire subject the following year.

Requirements to pass the subject in the final exam in June or July:

1. 4.0 ≤ exam

2. Final grade = (∑ midterm exams / 2) x 0.75 + (∑ assignments / n) x 0.15 + (assignment on a single topic) + oral presentation) x 0.10

3. 5 ≤ final grade

Field practice assignments are valid for the following year. After two years they must be undertaken again.

Bibliography

Basic Bibliography

- Basic Bibliography (SPANISH)
- Juan García, Diego y col. Química industrial. Horacio Escarabajal Editor. 1ª ed., 1ª imp. 2006.
- Vian Ortuño, Angel. Introducción a la Química Industrial. Ed. Reverté, 1ª ed., 5ª imp. Barcelona, 2007.
- Shreve, R. N., Austin, G.T. Chemical Process Industries (5º de.). Mc.Graw Hill, Nueva York, 1984. Traducción al español de la 5 º edición en inglés: Austin, George T., Manual de Procesos Químicos en la Industria. Mc. Graw Hill. Méjico, 1993.
- Juan García, Diego y col. Química industrial. Horacio Escarabajal Editor.1ª ed., 1ª imp. 2006.

In-depth Bibliography

- Stocchi, E. Industrial Chemistry. Ellis Horwood, Nueva York, 1990
- Vincent Vela, María y col. Química industrial orgánica. Universidad Politécnica de Valencia. Servicio de Publicaciones. 1ª ed., 1ª imp. 2006
- Maria R. Gómez Antón y col. Química Inorgánica y orgánica de interés industrial

Magazines

Chemical Engineering

- http://www.rbi.es/publicaciones/ingenieria-quimica.htm

Water Technology

- http://www.rbi.es/publicaciones/tecnologia-agua.htm

Websites

Federación de Industrias Químicas de España

- http://www.feique.org/

Website on the major companies in the sector

- http://www.quimicainfo.com/