Centre	**University College of Engineering of Vitoria-Gasteiz**
Name of subject	**27818 – Chemical Engineering Experimentation II**
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

1. Be able to design and manage applied experimentation procedures and operate heat transfer related equipment and systems, using heat exchangers. TEQI3

2. Be able to design and manage applied experimentation procedures and operate mass transfer related equipment and systems, applying the concepts of liquid-vapour, liquid-liquid and solid-liquid phase equilibrium. TEQI3

3. Be able to design and manage applied experimentation procedures and operate mass transfer related equipment and systems, applying the techniques of distillation, rectification, extraction and absorption. TEQI3

4. Be able to design and manage applied experimentation procedures and operate mass transfer related equipment and systems, using continuous operation and single-stage and multistage systems. TEQI3

5. Apply the strategies of scientific methodology, analyse the problem situation qualitatively and quantitatively; propose hypotheses and solutions to solve chemical engineering problems. TEQI8.

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

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

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

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

Syllabus

Practical task 1. Heat exchange.
Tube heat exchangers. Plate heat exchangers. Exchange efficiency. Influence of flow rates. Heat transfer coefficient calculation.

Practical task 2. Liquid-vapour equilibrium.
Liquid-vapour equilibrium diagrams. Azeotropic mixtures. Determination of activity coefficients.

Practical task 3. Distillation.
Steam distillation. Separation efficiency. Determination of the MW of an organic compound.

Practical task 4. Rectification in plate towers.
Determination of the number of theoretical stages. Calculation of the minimum reflux relationship. Plate efficiency and number of actual plates.

Practical task 5. Rectification in packed columns.
Flooding phenomenon. Determination of the transfer unit height and the number of transfer units. Calculation of mass transfer coefficients. Column energy efficiency.

Practical task 6. Liquid-liquid extraction equilibrium.
Extraction equilibrium diagrams. Straight lines. Alders conjugate curve.

Practical task 7. Multistage counter-current extraction.
Single-stage and multistage extraction efficiency.

Practical task 8. Lixiviation.
Lixiviation equilibrium diagrams. Soxhlet extractor.

Practical task 9. Gas absorption.
Gas absorption equilibrium. Absorption efficiency. Determination of mass transfer parameters

Methodology

Teaching Method

Face-to-Face Teaching Hours								
Lectures	**Seminars**	**Classroom practice**	**Lab. practice**	**Computer sessions**	**Clinical practice**	**Workshops**	**Industrial workshops**	**Field practice**
			60					
Student Hours of Non Face-To-Face Activities								
Lectures	**Seminars**	**Classroom practice**	**Lab. practice**	**Computer sessions**	**Clinical practice**	**Workshops**	**Industrial workshops**	**Field practice**
			90					

Assessment System

General criteria

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

Clarification regarding assessment

→Exam (presentation of assignments): 50%
→Laboratory reports: 40%
→Other: 10%
Students will carry out the practical tasks in pairs, but will be marked individually.

Compulsory materials

Laboratory material available at the University College of Engineering of Vitoria-Gasteiz Chemical and Environmental Engineering Laboratory.

Bibliography

Basic Bibliography

- CALLEJA PARDO,G Introducción a la ingeniería química. Ed Síntesis
- COSTA NOVELLA,E Ingeniería química Ed. Alambra
- COSTA LOPEZ,J Curso de química técnica. Ed Reverté
- Mc. CABE W.L. Operaciones Básicas de Ingeniería Química. Ed. Mc. Graw Hill
- COULSON J.M. Ingeniería Química. Ed. Aguilar
- OCON J. Y TOJO G. Problemas de Ingeniería Química. Ed. Aguilar

In-depth Bibliography

- KREITH F. Y BOHN Principios de transferencia de calor. Ed. Thomson
- TREYBAL R.E. Operaciones de Transferencia de masa. Ed. Mc. Graw Hill
- RH PERRY Manual del ingeriero quimico ed Mcgraw-Hill
- CJ KING Procesos de separación Ed Reverté

Magazines

- Chemical Engineering.
- Química e Industria.
- Ingeniería Química.

Websites

- http://www.cheric.org/research/kdb/
- http://moodle3.ehu.es/course/view.php?id=6879