



Course guides

820528 - OBA2 - Unit Operations II

Last modified: 04/06/2021

Unit in charge: Barcelona East School of Engineering
Teaching unit: 713 - EQ - Department of Chemical Engineering.

Degree: BACHELOR'S DEGREE IN CHEMICAL ENGINEERING (Syllabus 2009). (Compulsory subject).

Academic year: 2021 **ECTS Credits:** 6.0 **Languages:** Catalan

LECTURER

Coordinating lecturer: ORIOL GIBERT AGULLO

Others:

Primer quadrimestre:
FRANCISCO ESTRANY CODA - T10
ORIOL GIBERT AGULLO - T10

Segon quadrimestre:
FRANCISCO ESTRANY CODA - M10
ORIOL GIBERT AGULLO - M10

PRIOR SKILLS

Find relevant information in the field of chemical engineering and correct oral and written expression, interpret graphs and diagrams, knowledge of transmission of heat and physicochemical

REQUIREMENTS

OPERACIONS BÀSIQUES I - Prerequisite

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

1. Understand mass and energy balances, biotechnology, mass transfer, separation operations, chemical reaction engineering, the design of reactors, and the recovery and processing of raw materials and energy resources.

Transversal:

2. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 3. Communicating clearly and efficiently in oral and written presentations. Adapting to audiences and communication aims by using suitable strategies and means.

TEACHING METHODOLOGY

LEARNING OBJECTIVES OF THE SUBJECT

To Acquire the necessary theoretical knowledge for the calculation and design industrial plants both mass transfer and simultaneous transfer of heat and matter, such as distillation, rectification continuous and discontinuous, solids drying, gas absorption, liquid-liquid extraction, etc..

To acquire analytical skills and ability to use information sources to solve exercises and problems of all these processes and facilities



STUDY LOAD

Type	Hours	Percentage
Self study	90,0	60.00
Hours large group	60,0	40.00

Total learning time: 150 h

CONTENTS

1. Introduction to the operations with mass transfer

Description:

Introduction to the operations with mass transfer. Diffusion. Film and double-film theories. Mass transfer coefficient.

Full-or-part-time: 2h

Theory classes: 2h

2. Distillation

Description:

Distillation. Liquid-vapor equilibrium. Flash distillation. Differential distillation. Rectification distillation. Column calculation. Hydraulic design.

Full-or-part-time: 10h

Theory classes: 10h

3. Air-water interaction

Description:

Humidity, dew point, humid temperature and adiabatic saturation temperature, enthalpy of air-water systems. Psychrometric diagram. Humidification, cooling, etc.

Full-or-part-time: 4h

Theory classes: 4h

4. Cooling towers

Description:

Industrial cooling circuits: open, closed and half open. Differential characteristics between them. Cooling towers: problematic and their specific characteristics.

Full-or-part-time: 4h

Theory classes: 4h



5. Solids drying

Description:

Drying kinetics: critical humidity, precritical and postcritical periods. Drying rate. Humidity removal mechanisms in both mentioned periods. Drying time in each period and total duration of drying.

Full-or-part-time: 6h

Theory classes: 6h

6. Absorption

Description:

Gas-liquid equilibrium. Absorption columns. Calculation and column design.

Full-or-part-time: 8h

Theory classes: 8h

7. Liquid-liquid extraction

Description:

Liquid-liquid extraction of binary mixtures in one stage of equilibrium and in various stages of equilibrium. Specific diagrams. Mass balance and design equations.

Full-or-part-time: 8h

Theory classes: 8h

8. Solid-liquid extraction

Description:

Mass transfer coefficients. Equipment. Calculation of number of stages.

Full-or-part-time: 6h

Theory classes: 6h

9. Adsorption

Description:

Adsorption isotherms. Kinetics. Equipment.

Full-or-part-time: 8h

Theory classes: 8h

GRADING SYSTEM



BIBLIOGRAPHY

Basic:

- Treybal, Robert Ewald. Operaciones de transferencia de masa. 2ª ed. México [etc.]: McGraw-Hill, 1988. ISBN 9686046348.
- McCabe, Warren L.; Smith, Julian C.; Harriott, Peter. Operaciones unitarias en ingeniería química. 7ª ed. Madrid [etc.]: McGraw-Hill, 2007. ISBN 9701061748.
- Martínez de la Cuesta, Pedro J.; Rus Martínez, Eloisa. Operaciones de separación en ingeniería química. Madrid [etc.]: Prentice Hall, 2004. ISBN 8420542504.
- Ocón García, Joaquín; Tojo Barreiro, Gabriel. Problemas de ingeniería química : operaciones básicas. 3ª ed. Madrid: Aguilar, 1968. ISBN 8403209975.

Complementary:

- Vian Ortuño, Ángel; Ocón García, Joaquín. Elementos de ingeniería química : operaciones básicas. 5ª ed. Madrid: Aguilar, 1967. ISBN 8403201532.
- Miranda Barreras, Angel Luis. Aire acondicionado. 5a ed. Barcelona: Ceac, 2004. ISBN 9788432910791.
- Manual del ingeniero químico [on line]. 4ª ed. Madrid [etc.]: McGraw-Hill, 2001 [Consultation: 08/06/2020]. Available on: http://www.ingebook.com/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=6572. ISBN 9788448612788.
- King, C. Judson. Procesos de separación. Barcelona: Reverté, 1980. ISBN 8429173013.