Course guide
240655 - 240655 - Basic Operations in the Chemical Industry

Last modified: 16/05/2023

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

Degree: **Academic year:** 2023 **ECTS Credits:** 4.5
Languages: Catalan, Spanish

LECTURER

Coordinating lecturer: Perez Gonzalez, Juan Jesus

Others: Arnaldos Viger, Josep

PRIOR SKILLS

Basic knowledge on thermodynamics. Mass balances.

TEACHING METHODOLOGY

Lectures and numerical applications.

LEARNING OBJECTIVES OF THE SUBJECT

Ability to understand and apply basic principles of general chemistry, organic and inorganic chemistry and their applications in engineering.
Apply knowledge of mathematics, physics, chemistry, biology and other natural sciences, obtained through study, experience and practice using critical reasoning to establish workable solutions to technical problems.
Ability to design and analysis of chemical processes.
Integrate easily interdisciplinary and creative technical team of any company in the chemical industry or research center.
Design products, processes, systems and services for the chemical industry, as well as the optimization of those already developed on the basis of technological various areas of chemical engineering, comprehensive processes and transport phenomena, separation operations and engineering of chemical reactions, nuclear, electrochemical and biochemical.
Knowledge of mass and energy balances, biotechnology, mass transfer, separation operations, chemical reaction engineering, reactor design, and recovery of raw materials and energy resources.
Integrate easily indiscipline and creative technical team of any company in the chemical industry or research center.

STUDY LOAD

Type	Hours	Percentage
Self study	67,5	60.00
Hours medium group	45,0	40.00

Total learning time: 112.5 h

CONTENTS

Chemical potential

Description:
Open systems. The concept of chemical potential. Ideal gases, ideal gas mixtures. Real gases.

Specific objectives:
Tackling the study of open systems. Understand the concept of chemical potential.

Related activities:
Lectures and exercises.

Full-or-part-time: 4h
Practical classes: 4h

One component phase equilibria

Description:
Chemical potential of a liquid. Description of the vapor-liquid equilibrium. The Clausius-Clapeyron equation. The rule of phases.

Specific objectives:
Using the concept of chemical potential to describe the phase equilibrium in one component systems.

Related activities:
lectures and exercises

Full-or-part-time: 4h
Practical classes: 4h

Solutions

Description:
Chemical potential of an ideal solution. Raoult's law. Colligatives properties.

Specific objectives:
Applying the concept of chemical potential to describe ideal solutions. Description of property coligatives

Related activities:
Lectures and exercies

Full-or-part-time: 4h
Theory classes: 4h

Vapor-liquid equilibrium in systems of more than one component

Description:
Vapor-liquid equilibrium in systèmes ideals more than one component. Vapor-liquid equilibrium in real systems of more than one component. Azeotropes.

Specific objectives:
Describe the vapor-liquid equilibria in ideal and real systems of more than one component.

Related activities:
lectures and exercies

Full-or-part-time: 6h
Theory classes: 6h

Filtration

Description:
Description of the process. Darcy law. Types of filtration.

Specific objectives:
Describe the process of filtration. Derive the equations of the process.

Related activities:
Lectures and exercises

Full-or-part-time: 3h 30m
Theory classes: 3h 30m

Centrifugation

Description:
Description of the process. Equations that describe the process.

Specific objectives:
To familiarize students with the process of centrifugation. Derive the equations that describe it.

Related activities:
Lectures and exercies.

Full-or-part-time: 3h 30m
Theory classes: 3h 30m

distillation

Description:
Introduction. Vapor-liquid equilibrium. Binary mixtures. Distillation "flash" or equilibrium. Distillation rectification. Basic design of rectification columns: Sorel-Lewis method, McCabe-Thiele method. Multicomponent mixtures. Equip.

Specific objectives:
Describe the process of distillation. Equations that describe the process.

Related activities:
Lectures and exercises.

Full-or-part-time: 8h
Theory classes: 8h

Gas absortion

Description:
GGas-liquid equilibrium. Absorption equilibrium stages. Absorption continuous contact with the phases of mass transfer rate, the number of transfer units, transfer unit height, mass transfer coefficients. Calculation and design of columns filling.

Specific objectives:
Describe the process of absorption of gases. Equations that describe regulate the process.

Related activities:
Lectures and exercies.

Full-or-part-time: 8h
Theory classes: 8h

Solid-liquid extraction

Description:
Definition. Applications and equipment in the industry. Diagrams pseudo balance. Discontinued operations or contact form. Continuing operations upstream. Effectiveness.

Specific objectives:
Describe qualitatively and quantitatively the solid-liquid extraction process.

Related activities:
Lectures and exercies.

Full-or-part-time: 4h
Theory classes: 4h

GRADING SYSTEM

Mark= 0,25*AC+0,25*EP+0,5*EF
AC=continuous evaluation
EP=partial exam
EF=final exam

BIBLIOGRAPHY

Basic:
- McCabe, Warren L. [et al.]. Operaciones unitarias en ingeniería química. 7a ed. Madrid: MacGraw-Hill, 2007. ISBN 9789701061749.
- De Paula, Julio ; Atkins, Peter. Atkins Química física. 8a ed. Buenos Aires: Panamericana, 2008. ISBN 9789500612487.
- Coulson, J. M. ; Richardson, J.F. Ingeniería Química, Vol I : Flujo de fluidos, transmisión de calor y transferencia de materia.. Barcelona: Reverte, 1979-1984. ISBN 8429171347.
- Coulson, J. M. ; Richardson, J.F. Ingeniería Química. Vol II : Operaciones Básicas.. Barcelona: Reverte, 1979-1984. ISBN 8429171347.