Course guide
330166 - AEPP - Further Process and Product Engineering

Last modified: 04/05/2023

Unit in charge: Manresa School of Engineering
Teaching unit: 750 - EMIT - Department of Mining, Industrial and ICT Engineering.

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

Academic year: 2023 **ECTS Credits:** 6.0 **Languages:** Catalan

LECTURER

Coordinating lecturer: Dorado Castaño, Antonio David

Others: Bonsfills Pedros, Anna

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
1. Calculate and design basic operations and reaction units of common industrial processes. Solve problems and apply theoretical knowledge to practice. Develop the capacity for analysis and synthesis.

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.
3. SELF-DIRECTED LEARNING - Level 3. Applying the knowledge gained in completing a task according to its relevance and importance. Deciding how to carry out a task, the amount of time to be devoted to it and the most suitable information sources.

TEACHING METHODOLOGY

The subject consists of four hours of class per week, which are dedicated to explaining the theoretical foundations and solving problems. Laboratory practices will also be carried out.

LEARNING OBJECTIVES OF THE SUBJECT

At the end of the course the student must be able to:
- Calculate and design certain basic operations and real reactors in common industrial processes.
- Solve problems and apply theoretical knowledge to practice.
- Develop the capacity for analysis and synthesis.
- Efficient oral and written communication.
- Learn autonomously.

STUDY LOAD

Type	Hours	Percentage
Self study	90,0	60.00
Hours large group	45,0	30.00
Hours small group	15,0	10.00

Total learning time: 150 h

CONTENTS

Content title 1: Industrial processes with liquid-liquid extraction

Description:
1.1. Totally immiscible liquid mixtures.
1.1.1. Counter current flow
1.1.2. Cross flow
1.1.3. Fractional extraction

1.2. Partially miscible liquid mixtures
1.2.1. Single stage
1.2.2. Countercurrent operation

1.3. Solid-liquid extraction

Specific objectives:
- Know and identify industrial processes with liquid-liquid extraction units
- Calculate and design liquid-liquid extraction units

Related activities:
- Theoretical classes.
- Posing and solving problems in class.

Full-or-part-time: 60h
Theory classes: 12h
Laboratory classes: 12h
Self study : 36h

Content title 2: Industrial processes with real reactors

Description:
2.1. Residence time distribution
2.1.1. DTR measurements
2.1.2. DTR Features
2.1.3. RTD in ideal reactor

2.2. Modeling of reactors with DTR
2.2.1. Models with no adjustment parameters
2.2.2. Models with a tuning parameter
2.2.3. Models with two adjustment parameters (compartmentalized models)

Specific objectives:
- Know and identify industrial processes with multiphase reactors
- Calculate and design multiphase reactors

Related activities:
- Theoretical classes.
- Posing and solving problems in class.

Full-or-part-time: 60h
Theory classes: 12h
Laboratory classes: 12h
Self study : 36h

Content title 3: Other industrial processes

Description:
1. Industrial processes with fluidization
2. Industrial processes with membranes
3. Industrial processes with multiphase reactors
4. Industrial processes with crystallization

Specific objectives:
- Know and identify industrial processes with crystallization units
- Calculate and design crystallization units

Related activities:
- Theoretical classes.
- Posing and solving problems in class.

Full-or-part-time: 30h
Theory classes: 6h
Laboratory classes: 6h
Self study : 18h

ACTIVITIES

Activity title 1: AUTONOMOUS PROBLEM RESOLUTION

Description:
The student is proposed a series of problems that must be solved individually and delivered.

Specific objectives:
Track learning in the different operations presented.

Material:
Atenea Campus

Delivery:
Atenea Campus

Full-or-part-time: 44h
Laboratory classes: 30h
Self study: 14h

Activity title 2: WRITTEN TESTS

Description:
Individual written tests will be carried out.

Specific objectives:
Know the student's learning individually.

Material:
Atenea Campus

Delivery:
Atenea Campus

Full-or-part-time: 94h
Theory classes: 4h
Self study: 90h

Activity title 3: LABORATORY PRACTICES

Description:
Chemical engineering laboratory practices.

Specific objectives:
Experimenting with the contents worked on in the classroom and knowing the student's learning individually.

Material:
Atenea Campus

Delivery:
Atenea Campus

Full-or-part-time: 94h
Practical classes: 4h
Self study: 90h

GRADING SYSTEM

Final mark = 45% individual written test 1 + 45% laboratory work + 10% problem solving.

EXAMINATION RULES.

The activities are part of the continuous evaluation. If the student does not carry out any of the activities, it will be considered not scored.

BIBLIOGRAPHY

Basic:
- Trambouze, P.; Landeghem, H. van; Wauquier, J. P. Chemical reactors: design, engineering, operation. Houston: Gulf Publising Company, 1988. ISBN 2710805421.
- Elias Castells, X., dir. Tratamiento y valorización energética de residuos. Madrid: Díaz de Santos, 2005. ISBN 8479786949.
- Mayer, L.; Tegeder, F. Métodos de la industria química: en diagramas de flujo coloreados. Barcelona: Reverté, 1987. ISBN 8429179607.
- Coulson, J. M.; Richardson, J. F. Chemical engineering. 3rd ed. Oxford: Butterworth-Heinemann, 1994. ISBN 0080410030.
- Levenspiel, O. Chemical reaction engineering [on line]. 3rd ed. New York: John Wiley & Sons, 1999 [Consultation: 27/05/2022]. Available on: https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?docID=5758266. ISBN 9780471254249.
- Levenspiel, O. Flujo de fluidos e intercambio de calor [on line]. Barcelona: Reverté, 1993 [Consultation: 08/06/2022]. Available on: https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=8184. ISBN 8429179682.
- McCabe, W. L.; Smith, J. C.; Harriott, P. Unit operations of chemical engineering. 7th ed. Boston: McGraw-Hill, 2005. ISBN 0071247106.
- Wankat, P. C. Ingeniería de procesos de separación. 2ª ed. México: Pearson Educación, 2008. ISBN 9789702612810.

Complementary:
- Perry, Robert H.; Green, Don W., eds. Perry's chemical engineers' handbook [on line]. 8th ed. New York: McGraw-Hill, 2008 [Consultation: 10/06/2022]. Available on: https://search-ebscohost-com.recursos.biblioteca.upc.edu/login.aspx?direct=true&AuthType=ip,uid&db=nlebk&AN=219494&site=ehost-live&ebv=EB&ppid=pp_C. ISBN 9780071593137.
- Perry, R. H.; Green, D. W., eds. Perry's chemical engineers' handbook [CD-ROM]. New York: McGraw-Hill, 1999. ISBN 0071344128.

RESOURCES

Other resources:
Atenea Campus