295562 - 295EQ132 - Advanced Catalytic Reactors

Coordinating unit: 295 - EEBE - Barcelona East School of Engineering
Teaching unit: 713 - EQ - Department of Chemical Engineering
Academic year: 2019
Degree: MASTER'S DEGREE IN CHEMICAL ENGINEERING (Syllabus 2019). (Teaching unit Optional)
ECTS credits: 6  Teaching languages: English

Teaching staff

Coordinator: Llorca Pique, Jordi
Others: Perez Moya, Montserrat
Soler Turu, Lluis

Opening hours

Timetable: To be determined by students and faculty

Prior skills

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Requirements

Have passed the subject "Chemical and Catalytic Reaction Engineering" (Q1)

Degree competences to which the subject contributes

Generical:
CGMUEQ-01. Ability to apply the scientific method and the principles of engineering and economics, to formulate and solve complex problems in processes, equipment, facilities and services, in which the matter undergoes changes in its composition, state or energy content, characteristic of the chemical industry and other related sectors among which are the pharmaceutical, biotechnological, materials, energy, food or environmental
CGMUEQ-02. To conceive, project, calculate and design processes, equipment, industrial facilities and services, in the field of chemical engineering and related industrial sectors, in terms of quality, safety, economy, rational and efficient use of natural resources and environment conservation
CGMUEQ-04. To carry out the appropriate research, undertake the design and manage the development of engineering solutions, in new or little known environments, relating creativity, originality, innovation and technology transfer

Transversal:
03 TLG. THIRD LANGUAGE. Learning a third language, preferably English, to a degree of oral and written fluency that fits in with the future needs of the graduates of each course.

Teaching methodology

Classroom. Self-study. Learning from projects and study cases

Learning objectives of the subject

Knowledge of the different types of catalytic wall reactors and their operation
Knowledge of catalyst deposition techniques
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Knowledge of the operation of structured reactors and microreactors
Ability to design a process with catalytic wall reactors
Knowledge of the fundamentals and operation of catalytic membrane reactors and their applications
Knowledge of the mechanism of photocatalytic reactions and operation of photocatalysts
Knowledge of the different types of photocatalytic reactors and their applications
Ability to design a photocatalytic process

<table>
<thead>
<tr>
<th>Study load</th>
<th>Hours large group: 28h</th>
<th>18.67%</th>
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<tbody>
<tr>
<td></td>
<td>Hours medium group: 0h</td>
<td>0.00%</td>
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<tr>
<td></td>
<td>Hours small group: 14h</td>
<td>9.33%</td>
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<td></td>
<td>Guided activities: 6h</td>
<td>4.00%</td>
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<tr>
<td></td>
<td>Self study: 102h</td>
<td>68.00%</td>
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# Content

## Structured reactors

<table>
<thead>
<tr>
<th>Description:</th>
<th><strong>Learning time:</strong> 28h 30m</th>
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</table>
| Honeycomb catalytic reactors with ceramic and metallic substrates. Techniques of deposition of catalysts in structured reactors. Environmental applications. Microreactors: manufacturing, mass and heat transfer, advantages of "scale out" vs. "cale up". Applications in the chemical and pharmaceutical industry. Peripheral elements | Theory classes: 7h 30m  
Self study : 21h |

<table>
<thead>
<tr>
<th>Related activities:</th>
<th>Specific objectives:</th>
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</thead>
<tbody>
<tr>
<td>Design of a structured reactor or microreactor</td>
<td>To learn the different types of catalytic wall reactors and how to coat them with a catalyst. To understand the operation of the catalytic converters of vehicles with combustion engines. To know the advantages of microreactor technology and its applications</td>
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## Membrane catalytic reactors

<table>
<thead>
<tr>
<th>Description:</th>
<th><strong>Learning time:</strong> 24h</th>
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</table>
Self study : 18h |

<table>
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<tr>
<th>Related activities:</th>
<th>Specific objectives:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case study of a real application</td>
<td>To understand the operation of a membrane catalytic reactor and the importance of the operating conditions in its dynamics and behavior. To know the basic control tools of the catalytic membrane reactors and their main applications</td>
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# Photocatalysis

**Learning time:** 24h
- Theory classes: 6h
- Self study: 18h

## Description:

## Related activities:
Search of documentation in patents and scientific literature

## Specific objectives:
To know the principles of photocatalysis and the characteristics of a photocatalyst. To understand the operation principles of photocatalysis and its application in different types of chemical processes

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# Photoreactors

**Learning time:** 13h 30m
- Theory classes: 10h 30m
- Self study: 3h

## Description:
Advanced oxidation processes. Water treatment. Study of the operating parameters: photon transfer, temperature effect, mass transfer. Design of photoreactors

## Related activities:
Study case of a real application

## Specific objectives:
To know the principles of applied photocatalysis and photoreactors, with emphasis on water treatment. To understand the operating parameters of photoreactors and the optimization of photocatalytic processes

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## Qualification system
50% written exam and 50% exercises

## Regulations for carrying out activities
Written exams and exercises are individual
Bibliography

Complementary:


Others resources:

Notes from class and other documents from the Digital Campus