820544 - PDAQ - Purification Treatments and Water Distribution

Coordinating unit: 295 - EEBE - Barcelona East School of Engineering
Teaching unit: 713 - EQ - Department of Chemical Engineering
Academic year: 2015
Degree: BACHELOR'S DEGREE IN CHEMICAL ENGINEERING (Syllabus 2009). (Teaching unit Optional)
ECTS credits: 6

Teaching staff
Coordinator: Francesc Estrany Coda
Others: Jose Ignacio Iribarren Laco
Francesc Estrany Coda

Opening hours
Timetable: Usually 2 hours before and / or after the sessions of the course.

Prior skills
Basic knowledge of chemical solutions: acidity and basicity, ionic equilibrium, complexation and solubility equilibrium.
Knowledge of Physical Chemistry.
Knowledge of analytical chemistry.
Knowledge of fluid mechanics.
Knowledge of Simulation and Process Control.

Requirements
Chemistry (initial phase).
Physical Chemistry (5 th semester)
Analytical Chemistry (5 th semester)
Fluid Mechanics (2 nd semester)
Simulation and Process Control (6 semester)

Degree competences to which the subject contributes
Specific:
1. Understand the basics of physical chemistry.
2. Understand the basics of analytical chemistry.
3. 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.
4. Understand the basic principles of fluid mechanics and its application to problems in the field of engineering. Calculate the parameters of ducts, channels and fluid systems.

Transversal:
5. SUSTAINABILITY AND SOCIAL COMMITMENT - Level 3. Taking social, economic and environmental factors into account in the application of solutions. Undertaking projects that tie in with human development and sustainability.
6. EFFECTIVE USE OF INFORMATION RESOURCES - Level 3. Planning and using the information necessary for an
Knowledge by the student of what the urban water cycle, and the main techniques used for the purification and desalination of water, both conventional and advanced. Principle of operation, typical operating parameters from both theoretical and practical in the laboratory. Calculation and dimensioning of the processing units used in water treatment.

Knowledge of design, calculation and dimensioning of the network elements distribució transport and water, both typical piping and accessories.

**Teaching methodology**

The course uses the methodology exhibition by 50%. The individual work, work in group and in the Laboratory, occupies in total and on average 30% of the weekly activity. Finally, report writing and problem solving has a charge of 20%.

**Learning objectives of the subject**

Knowledge by the student of what the urban water cycle, and the main techniques used for the purification and desalination of water, both conventional and advanced. Principle of operation, typical operating parameters from both theoretical and practical in the laboratory. Calculation and dimensioning of the processing units used in water treatment. Knowledge of design, calculation and dimensioning of the network elements distribució transport and water, both typical piping and accessories.

**Study load**

<table>
<thead>
<tr>
<th>Total learning time: 150h</th>
<th>Hours large group:</th>
<th>45h</th>
<th>30.00%</th>
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<tbody>
<tr>
<td></td>
<td>Hours medium group:</td>
<td>0h</td>
<td>0.00%</td>
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<tr>
<td></td>
<td>Hours small group:</td>
<td>15h</td>
<td>10.00%</td>
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<tr>
<td></td>
<td>Guided activities:</td>
<td>0h</td>
<td>0.00%</td>
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<tr>
<td></td>
<td>Self study:</td>
<td>90h</td>
<td>60.00%</td>
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</tbody>
</table>

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# Content

## CHAPTER 1. - THE HYDROLOGICAL CYCLE. CYCLE URBAN WATER.

### Description:

### Related activities:
Presencial sessions.

### Specific objectives:
Knowledge of current water management model, and awareness of the need to improve management at all levels, and knowledge of the model projects that involve the above improvements.

### Learning time:
- Theory classes: 2h
- Self study: 3h

## CHAPTER 2. - DRINKING WATER

### Description:
Classical techniques: clarification (floculation), sand filtration, activated carbon, chlorination. Chlorine chemistry. Advanced techniques: ozonation, UV disinfection alternative membranes. TSDWs design. Calculation and sizing of major process units.

### Related activities:
Exhibition sessions. Excel exercise performance simulation, and calculation and dimensioning of the main process units of TSDW. Visit to the processing units used for water purification in an ETAP.

### Specific objectives:
Mechanistic understanding of the principles of the conventional techniques of water treatment and knowledge of the operation, computation and design of the processing units involved.

### Learning time:
- Theory classes: 20h
- Self study: 28h
### CHAPTER 3. - DESALINATION

#### Description:

#### Related activities:
Presential sessions. Excel exercise performance simulation, and calculation and dimensioning of the main process units of ETAP. Visit a reverse osmosis (membranes) water purification unit, in a ETAP.

#### Specific objectives:
Mechanistic understanding of the principles of the functioning of the membranes, as well as the main techniques applied to membrane desalination and water purification. Knowledge of the functioning, calculation and design of the main process units of a desalination plant.

### CHAPTER 4. - TRANSPORTATION AND DISTRIBUTION OF WATER

#### Description:

#### Related activities:
Exhibition sessions. Excel exercise performance simulation, and calculation and dimensioning of the main units of a distribution network of drinking water. Visit to a remote unit of a transmission and distribution of drinking water, in a ETAP.

#### Specific objectives:
Knowledge of the functioning of a water distribution network in a big city. Knowledge of procedures for calculating the pumping power for a determinadas transport needs of water, and the procedure for sizing the diameter of the pipelines and distribution aigua.
Two partial checks of theory and problems will be made - 30 % of the final grade each. A problem and proposed specific report of the visit to ETAP will also be evaluated - 10 % of the final grade. A specific work in the field of the subject will be performed by groups - 30 % of the final grade.

Regulations for carrying out activities

Both controls and the tasks should be made and delivered to the preset dates and time frames indicated.

Bibliography

Basic:


Complementary: