



| Teaching Guide | | | | |
|---------------------|--|--------|---|---------|
| Identifying Data | | | | 2014/15 |
| Subject (*) | Enxeñaría Química | Code | 610G01033 | |
| Study programme | Grao en Química | | | |
| Descriptors | | | | |
| Cycle | Period | Year | Type | Credits |
| Graduate | 1st four-month period | Third | Obligatoria | 6 |
| Language | Spanish | | | |
| Prerequisites | | | | |
| Department | Química Física e Enxeñaría Química 1 | | | |
| Coordinador | Kennes , Christian | E-mail | c.kennes@udc.es | |
| Lecturers | Kennes , Christian Vega Martin, Alberto de | E-mail | c.kennes@udc.es alberto.de.vega@udc.es | |
| Web | | | | |
| General description | A materia describe os conceptos básicos da Enxeñaría Química (operacións unitarias, balances de materia, enerxía e cantidade de movemento, fundamentos de fenómenos de transporte, e reactores químicos) | | | |

| Study programme competences | |
|-----------------------------|--|
| Code | Study programme competences |
| A11 | Knowledge and design of unit operations in chemical engineering |
| A15 | Ability to recognise and analyse new problems and develop solution strategies |
| A19 | Ability to follow standard procedures and handle scientific equipment |
| A20 | Ability to interpret data resulting from laboratory observation and measurement |
| A25 | Ability to recognise and analyse link between chemistry and other disciplines, and presence of chemical processes in everyday life |
| B2 | Effective problem solving |
| B5 | Teamwork and collaboration |
| C2 | Oral and written proficiency in a foreign language |
| C3 | Ability to use basic information and communications technology (ICT) tools for professional purposes and learning throughout life |

| Learning outcomes | | | |
|--|--|---------------------------------|----------|
| Subject competencies (Learning outcomes) | Study programme competences | | |
| | Know the fundamentals of unit operations in Chemical Engineering and of their design | A11 A15 A19 A20 A25 | B2 B5 |
| Apply mass and energy balances to unit operations and (bio)reactors | A11 A15 A19 A20 A25 | B2 B5 | C2 C3 |
| Know the fundamentals of applied kinetics and of the design of (bio)reactors | A15 A19 A20 | B2 B5 | C2 C3 |
| Know the fundamentals of mass transfer and heat transfer | A11 A15 A19 A20 A25 | B2 B5 | C2 C3 |



| Contents | |
|---|--|
| Topic | Sub-topic |
| 1. Introduction to Chemical Engineering. | Fundamentals of chemical engineering. Representative examples of processes in the chemical industry. Definitions of common use: (non) continuous operation, (non) steady-state, equilibrium stages, contact between phases, etc. |
| 2. Fundamentals of unit operations. | Classification of unit operations. Mass transfer-, heat transfer-, simultaneous mass and heat transfer-, and momentum transfer- operations. Representative examples of unit operations. Equipment description. |
| 3. Transport phenomena. | Mass transport. Heat transfer. Momentum transfer. Fundamentals of rheology. Viscosity. Analogy between different transfer processes and their governing laws. Examples. |
| 4. Introduction to balance equations. | General problem-solving strategies. Different types of balances. Dimensions, units, and their conversion. |
| 5. Mass balances on non-reactive processes. | General case. Recycle, purge, and by-pass. Steady- and non-steady- state. |
| 6. Mass balances on reactive processes. | Simple and multiple reactions. Recycle, purge, and by-pass. Steady- and non-steady-state.. |
| 7. Energy balances. | Forms of energy. Fundamentals of energy balances. Steady- and non-steady- states. |
| 8. Chemical reactors and bioreactors. | Ideal batch reactors and continuous reactors. Constant and variable volume/density reactors. Design equations. Non-ideal flow. Multiple reactors. Rate equations. Determination of kinetic data. |

| Planning | | | |
|---------------------------------|----------------------|-------------------------------|-------------|
| Methodologies / tests | Ordinary class hours | Student?s personal work hours | Total hours |
| Laboratory practice | 10 | 15 | 25 |
| Guest lecture / keynote speech | 26 | 65 | 91 |
| Problem solving | 9 | 20.25 | 29.25 |
| Mixed objective/subjective test | 3 | 0 | 3 |
| Personalized attention | 1.75 | 0 | 1.75 |

(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

| Methodologies | |
|---------------------------------|--|
| Methodologies | Description |
| Laboratory practice | Sesi3ns experimentais nas que os alumnos deber3n utilizar as montaxes prefijados para tentar comprobar o cumprimento de modelos te3ricos na pr3ctica. |
| Guest lecture / keynote speech | Sesi3ns nas que se explicar3n os contidos te3ricos de cada tema, estud3sen e resolveran varios exemplos e faranse alg3nos exercicios b3sicos de aplicaci3n, en grupos grandes. |
| Problem solving | Sesi3ns nas que os alumnos deber3n solucionar exercicios propostos dos diversos temas, en grupos pequenos. |
| Mixed objective/subjective test | Exame escrito que constase de preguntas de teor3a e/ou problemas. |

| Personalized attention | |
|------------------------|---|
| Methodologies | Description |
| Laboratory practice | Os alumnos realizar3n as pr3cticas de laboratorio coa axuda e atenci3n personalizada do profesor de pr3cticas. As pautas a seguir explic3sen antes de empezar as pr3cticas. |

| Assessment | | |
|---------------|-------------|---------------|
| Methodologies | Description | Qualification |



| | | |
|---------------------------------|---|----|
| Laboratory practice | Puntuácese o traballo realizado no laboratorio e o informe final(competencias: A11, A15, A19, A20, A25, B2, B5, C3) | 15 |
| Guest lecture / keynote speech | Participación en clase e resolución de exercicios (competencias: A11, A15, A25, B2, C2, C3) | 5 |
| Mixed objective/subjective test | Exame escrito (teoría e/ou problemas) (competencias: A11, A15, A25, B2) | 80 |

Assessment comments

- The work done in the laboratory will be taken into account as well as the report describing the results, corresponding to the analysis of data, and conclusions: 15% of the final score.

- The assistance to the activities as well as exercises and problem solving: 5% of the final score.

- Final examination: 80% of the final score.

- The overall score will be the sum of the above described sub-scores. It will be considered that the student did not present the subject's exam if he/she did not go for the final examination.

- In order to pass, the student has to obtain a minimum score of 5/10 in each the three parts described above.

- It will be necessary to attend the laboratory course in order to pass the subject.

- The "matrícula de honor" will be rewarded to the students that achieved the maximum score in the first opportunity of evaluation. In the second opportunity, the same score will be maintained for the lab-course and the exercises (representing 15 and 5% of the final score) but it will be required to repeat the final written exam that will represent 80% of the final score. For successive academic courses, the teaching-learning process will have to start again, and the student will therefore have to repeat all activities and examinations for that new academic course.

Sources of information

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| Basic | <ul style="list-style-type: none"> - COSTA LÓPEZ y col. (). Curso de Química Técnica: Introducción a los procesos, las operaciones unitarias y los fenómenos de transporte en la Ingeniería Química. Editorial Reverté, Barcelona - LEVENSPIEL, O., (). Ingeniería de las reacciones químicas. Ed. Reverté, Barcelona - COSTA NOVELLA y col. (). Ingeniería Química. Vol. 1. Conceptos generales. Edición Alhambra, Madrid - THOMPSON, E.V. & CECKLER, W.H., (). Introducción a la Ingeniería Química. McGraw-Hill - FELDER, R.M. & ROUSSEAU, R.W., (). Principios elementales de los procesos químicos. Addison- Wesley Iberoamericana, Wilmington - HIMMELBLAU, D.M., (). Principios y cálculos básicos de Ingeniería Química. C.E.C.S.A. México |
| Complementary | |

Recommendations

Subjects that it is recommended to have taken before

Subjects that are recommended to be taken simultaneously

Subjects that continue the syllabus

Other comments

(*)The teaching guide is the document in which the URV publishes the information about all its courses. It is a public document and cannot be modified. Only in exceptional cases can it be revised by the competent agent or duly revised so that it is in line with current legislation.