Degree competences to which the subject contributes

General:
- 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-10. Adapt to changes, being able to apply new and advanced technologies and other relevant developments, with initiative and entrepreneurial spirit

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.

Learning objectives of the subject

To know the chemical principles of the polymerization and copolymerization methods, the molecular mechanisms on which they are based and their design possibilities.

Know the technologies that are used in the manufacture of polymers on an industrial scale.
Know the procedures available for the chemical modification of polymers to modify their properties.

<table>
<thead>
<tr>
<th>Study load</th>
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<tbody>
<tr>
<td><strong>Total learning time:</strong> 150h</td>
<td>Hours large group: 28h 18.67%</td>
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<tr>
<td></td>
<td>Hours medium group: 0h 0.00%</td>
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<tr>
<td></td>
<td>Hours small group: 14h 9.33%</td>
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<td>Guided activities: 6h 4.00%</td>
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<tr>
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<td>Self study: 102h 68.00%</td>
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</table>
# Content

## Chapter 1: Introduction to the chemistry of polymerization

| Related activities: | Resolution of a series of specific exercises, application of the contents of the subject. |
| Specific objectives: | Understand the chemical structure of polymers, how it is determined and how it relates to the behavior of polymers. Have basic knowledge about the procedures that are used for the synthesis of polymers and their application at the industrial level. Know the degradation processes that affect polymers in their use and their use in recycling and reuse. |

| Learning time: | 5h |
| Theory classes: | 5h |

## Chapter 2: Polimerization

| Related activities: | Resolution of practical problems and exercises of a theoretical nature that allow to deepen in the application of the concepts introduced in this subject. |
| Specific objectives: | To know the chemical and physicochemical principles of the polymerization methods by means of polycondensation and polyaddication mechanisms and how they are applied to the preparation of polymers at both industrial and laboratory levels. Know the chemical and physicochemical principles of the polymerization methods used in the synthesis of polymers through organometallic catalysts and through special mechanisms and how they apply to the preparation of polymers at both industrial and laboratory levels. |

| Learning time: | 8h |
| Theory classes: | 8h |
### Chapter 3: Copolymerization

<table>
<thead>
<tr>
<th>Learning time: 2h</th>
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</thead>
<tbody>
<tr>
<td>Theory classes: 2h</td>
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</table>

#### Description:

#### Related activities:
Resolution of practical problems and exercises of a theoretical nature that allow to deepen in the application of the concepts introduced in this subject.

#### Specific objectives:
Understand the chemical and physicochemical principles of the copolymerization methods that are used in the synthesis of copolymers through the different possible mechanisms, and how they apply to the preparation and design of copolymers, both at industrial and laboratory levels, from the properties that are required for these materials.
Chapter 4: Polymerization technology. Modification and degradation of polymers.

Learning time: 12h
  Theory classes: 12h

Description:
Chemical reactions on polymers. Modification of properties. Interlocking linkage and formation of gels.
Chemical reactions on polymers. Modification of properties. Interlocking linkage and formation of gels.
Degradation of polymers: analysis and monitoring techniques. Thermal degradation: pyrolysis mechanisms. Depolymerization

Related activities:
Resolution of practical problems and exercises of a theoretical nature that allow to deepen in the application of the concepts introduced in this subject.

Specific objectives:
Know the technologies that are applied in the industrial manufacture of polymers according to the polymerization mechanism involved, the advantages and disadvantages comparatively present and the systems and equipment they need. Acquire the basic criteria for the selection of the technology of the process suitable for the preparation of a specific polymer.
Know the procedures available for the chemical modification of polymers and biopolymers, since these reactions modify the properties of the materials and the limitations presented by their practical application.
Know the parameters that define the existence of chemical, thermal and environmental degradation, the chemical mechanisms involved in the processes of degradation and how these processes are studied and followed by the appropriate techniques of chemical and physical analysis.

Qualification system

2 Partial exams (written tests) and 1 final exam (written test).

Regulations for carrying out activities

Performing specific tasks and wider tasks, periodically commissioned.
Exam: It consists of different theoretical and practical issues related to the program.
Bibliography

**Basic:**


**Complementary:**


**Others resources:**

Supplied by the teaching staff.