The main goal of this subject consists in setting the bases for understanding the main technologies used in the fabrication of plastic components based on thermoplastic materials (extrusion, injection molding, thermoforming, rotational molding, etc), as well as the influence of processing on the final properties of the component.

It is also an objective to develop the capability of the student to choose, according to a specific work-study component, the most suitable material and processing method for its production.
### Study load

<table>
<thead>
<tr>
<th>Total learning time: 150h</th>
<th>Hours large group: 30h</th>
<th>20.00%</th>
</tr>
</thead>
<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: 30h</td>
<td>20.00%</td>
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<tr>
<td></td>
<td>Guided activities: 0h</td>
<td>0.00%</td>
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<tr>
<td></td>
<td>Self study: 90h</td>
<td>60.00%</td>
</tr>
<tr>
<td><strong>TOPIC 1: Thermoplastic materials</strong></td>
<td><strong>Learning time:</strong> 11h</td>
<td></td>
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<td></td>
</tr>
<tr>
<td><strong>Description:</strong></td>
<td><strong>Theory classes:</strong> 3h</td>
<td></td>
</tr>
<tr>
<td>- Definition of thermoplastic material</td>
<td><strong>Laboratory classes:</strong> 4h</td>
<td></td>
</tr>
<tr>
<td>- Types of thermoplastic materials according to structure</td>
<td><strong>Self study:</strong> 4h</td>
<td></td>
</tr>
<tr>
<td>- States of aggregation of polymers: amorphous/semi-crystalline polymers. Crystallinity</td>
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<tr>
<td>- Molecular weight</td>
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<td></td>
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<tr>
<td>- Main families of thermoplastic materials</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Related activities:</strong></td>
<td><strong>Activity 4</strong></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>TOPIC 2: Rheology</strong></th>
<th><strong>Learning time:</strong> 8h</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong></td>
<td><strong>Theory classes:</strong> 2h</td>
</tr>
<tr>
<td>- The concept of viscosity</td>
<td><strong>Laboratory classes:</strong> 4h</td>
</tr>
<tr>
<td>- Influence of temperature, pressure and nature of the material on the viscosity</td>
<td><strong>Self study:</strong> 2h</td>
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<tr>
<td>- Rheology curves</td>
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<tr>
<td><strong>Related activities:</strong></td>
<td><strong>Activity 1</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Activity 2a</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Activity 4</strong></td>
</tr>
</tbody>
</table>
### TOPIC 3: Extrusion

**Description:**
- Definition of extrusion
- Basic elements of an extrusion line
- The extruder
- The extrusion screw
- Analysis of the extrusion process
- Extrusion-based processes
  - Extrusion of profiles and production of polymer fibres
  - Cast-sheet and cast-film extrusion
  - Extrusion blown-film
  - Extrusion coating and lamination
  - Co-extrusion
  - Extrusion blow-molding

**Related activities:**
- Activity 1
- Activity 2a
- Activity 3
- Activity 4

**Learning time:** 51h  
Theory classes: 8h  
Laboratory classes: 8h  
Self study: 35h

### TOPIC 4: Thermoforming

**Description:**
- Definition of thermoforming
- Elements of a thermoforming line
- Thermoforming processes
- Main thermoforming applications

**Related activities:**
- Activity 1
- Activity 2a
- Activity 3
- Activity 4

**Learning time:** 8h  
Theory classes: 2h  
Laboratory classes: 2h  
Self study: 4h
### TOPIC 5: Injection molding

<table>
<thead>
<tr>
<th>Description:</th>
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<tbody>
<tr>
<td>- Definition of injection molding</td>
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<tr>
<td>- The injection molding machine</td>
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<tr>
<td>- The injection molding cycle</td>
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<tr>
<td>- PVT curves</td>
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<tr>
<td>- Analysis of the parameters of injection molding</td>
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<tr>
<td>- Defects in injection-molded plastic components</td>
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<tr>
<td>- Transformation processes based on conventional injection molding</td>
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</table>

<table>
<thead>
<tr>
<th>Related activities:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity 1</td>
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<tr>
<td>Activity 2b</td>
</tr>
<tr>
<td>Activity 3</td>
</tr>
<tr>
<td>Activity 5</td>
</tr>
</tbody>
</table>

**Learning time:** 72h
- Theory classes: 15h
- Laboratory classes: 12h
- Self study: 45h
# Planning of activities

## ACTIVITY 1: LAB CLASSES

**Description:**
Lab/practical classes carried out in the facilities of the Centre Català del Plàstic.

**Support materials:**
- Lab guidelines/content.
- Recommended bibliography.
- Other sources: books, articles, internet, etc.

**Descriptions of the assignments due and their relation to the assessment:**
Compulsory assistance.

**Specific objectives:**
To get acquainted with the main existing processing technologies of thermoplastic materials.

**Hours:** 30h  
Laboratory classes: 30h

## ACTIVITY 2a: LAB REPORTS - FIRST PART (INDIVIDUAL WORK)

**Description:**
Each student will prepare an individual report according to the basic guidelines given in class by the teacher corresponding to each of the lab/practical classes carried out in the facilities of the Centre Català del Plàstic.

**Support materials:**
- Lab guidelines/content (first part).
- Recommended bibliography.
- Other sources: books, articles, internet, etc.

**Descriptions of the assignments due and their relation to the assessment:**
Individual written reports.

**Specific objectives:**
To learn about the preparation of lab reports and develop the student's knowledge regarding the main existing processing technologies of thermoplastic materials.

**Hours:** 15h  
Self study: 15h

## ACTIVITY 2b: LAB REPORTS - SECOND PART (INDIVIDUAL WORK)

**Description:**
Each student will prepare an individual report according to the basic guidelines given in class by the teacher corresponding to each of the lab/practical classes carried out in the facilities of the Centre Català del Plàstic.

**Support materials:**
- Lab guidelines/content (second part).
- Recommended bibliography.
- Other sources: books, articles, internet, etc.

**Descriptions of the assignments due and their relation to the assessment:**
Individual written reports.

**Hours:** 15h  
Self study: 15h
### Specific objectives:
The students will prepare in groups formed by 3/4 students a report about a given subject directly related with the processing of thermoplastic materials, selected from a list of possible subjects prepared by the teacher or proposed by the students.

### ACTIVITY 3: WORK REPORT/PRESENTATION (GROUP WORK) 
**Hours:** 16h
- Theory classes: 2h
- Self study: 14h

**Description:**
The students will prepare in groups formed by 3/4 students a report about a given subject directly related with the processing of thermoplastic materials, selected from a list of possible subjects prepared by the teacher or proposed by the students.

**Support materials:**
- Recommended bibliography.
- Other sources: books, articles, internet, etc.

**Descriptions of the assignments due and their relation to the assessment:**
- Written report and oral presentation.

**Specific objectives:**
- The main objective of this work is to develop the student's capability of looking for recent and useful information related to the processing technologies of plastic materials using different sources.
- Contribute to teamwork consolidation and favouring the communication and distribution of group tasks.

### ACTIVITY 4: FIRST EXAMINATION 
**Hours:** 7h
- Theory classes: 2h
- Self study: 5h

**Description:**
Written exam in which the student will have to show his/her knowledge of the contents learned in class.

**Descriptions of the assignments due and their relation to the assessment:**
- Written exam.

**Specific objectives:**
- To develop the contents learned in the theoretical and practical classes and demonstrate the level of knowledge.

### ACTIVITY 5: SECOND EXAMINATION 
**Hours:** 7h
- Theory classes: 2h
- Self study: 5h

**Description:**
Written exam in which the student will have to show his/her knowledge of the contents learned in class.

**Descriptions of the assignments due and their relation to the assessment:**
- Written exam.

**Specific objectives:**
- To develop the contents learned in the theoretical and practical classes and demonstrate the level of knowledge.
Qualification system

The final degree of the subject will depend on the following evaluation activities:
Activity 2a: 17.5%
Activity 2b: 17.5%
Activity 3: 15%
Activity 4: 25%
Activity 5: 25%

Regulations for carrying out activities

Activity 2a: individual written reports
Activity 2b: individual written reports
Activity 3: written report and oral presentation (group work)
Activity 4: written exam
Activity 5: written exam

Bibliography

Basic:


Complementary:


Others resources:

Information placed in Atenea (intranet)