



## Course guides

# 295754 - 295EM032 - Advances in the Processing of Plastic Materials

Last modified: 30/07/2021

<b>Unit in charge:</b>	Barcelona East School of Engineering	
<b>Teaching unit:</b>	702 - CEM - Department of Materials Science and Engineering.	
<b>Degree:</b>	MASTER'S DEGREE IN MATERIALS SCIENCE AND ADVANCED MATERIALS ENGINEERING (Syllabus 2019). (Compulsory subject).	
<b>Academic year:</b> 2021	<b>ECTS Credits:</b> 6.0	<b>Languages:</b> Spanish

## LECTURER

---

**Coordinating lecturer:** MARIA LLUÏSA MASPOCH RULDUA

**Others:** Santana Perez, Orlando  
García Masabet, Violeta Del Valle  
Abt, Tobias Martin  
León Albitzer, Noel

## PRIOR SKILLS

---

Knowledge about structure and properties of polymeric materials, transport phenomena.

## DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

---

### Specific:

CEMCEM-02. (ENG) Dissenyar i desenvolupar productes, processos, sistemes i serveis, així com l'optimització d'altres ja desenvolupats, atenent a la selecció de materials per a aplicacions específiques

CEMCEM-03. (ENG) Aplicar mètodes innovadors en la resolució de problemes i aplicacions informàtiques adequades, pel disseny, simulació, optimització i control de processos de producció i transformació de materials

CEMCEM-07. (ENG) Dissenyar, calcular i modelar aspectes relacionats amb els materials per a components mecànics, estructures i equips

### Transversal:

01 EIN N2. ENTREPRENEURSHIP AND INNOVATION - Level 2. Taking initiatives that give rise to opportunities and to new products and solutions, doing so with a vision of process implementation and market understanding, and involving others in projects that have to be carried out.

02 SCS N2. SUSTAINABILITY AND SOCIAL COMMITMENT - Level 2. Applying sustainability criteria and professional codes of conduct in the design and assessment of technological solutions.

06 URI N2. EFFECTIVE USE OF INFORMATION RESOURCES - Level 2. Designing and executing a good strategy for advanced searches using specialized information resources, once the various parts of an academic document have been identified and bibliographical references provided. Choosing suitable information based on its relevance and quality.

## TEACHING METHODOLOGY

---

## LEARNING OBJECTIVES OF THE SUBJECT

---

- To deepen in the rheological behavior of polymers and their relation with the molecular structure.
- To study the techniques of characterization of the rheological behavior of polymeric materials.
- To Study the techniques of processing plastic materials by analyzing the production lines and the relationship between the process parameters and the quality of the piece obtained.

## STUDY LOAD

Type	Hours	Percentage
Guided activities	6,0	4.00
Hours large group	42,0	28.00
Self study	96,0	64.00
Hours small group	6,0	4.00

**Total learning time:** 150 h

## CONTENTS

### 1.- Flow of polymeric systems

**Description:**

Rheological behavior of polymers.  
Techniques of rheological characterization.  
Factors that determine rheological behavior.  
Elastic effects on the fluid

**Full-or-part-time:** 30h

Theory classes: 10h

Self study : 20h

### 2.-Extrusion and main lines of production

**Description:**

- The extrusion process
- Description of the machine
- Operation curves: parameters and effects
- Main production lines and typical defects:
  - Production of Multicapas: Coextrusion, lamination and coating.
  - Sheetl Production
  - Fiber production
  - Production of pipes
  - Film production (calendering and blowing)
  - Production of hollow bodies (blown extension)

**Full-or-part-time:** 41h 20m

Theory classes: 12h

Laboratory classes: 6h

Self study : 23h 20m

### 3.- Thermoforming

**Description:**

- Process description.
- Types of thermoforming.
- Material requirements.
- Typical defects and solutions.

**Full-or-part-time:** 4h 30m

Theory classes: 2h

Self study : 2h 30m

#### 4.- Rotational Molding

**Description:**

- Descripción del Proceso.
- Requerimientos del material.
- Defectos típicos y soluciones.

**Full-or-part-time:** 4h 30m

Practical classes: 2h

Self study : 2h 30m

#### 5.- Injection molding

**Description:**

- Machines and parameters of the process
- Description of the mold and functionalities
- Defects and solutions in injected parts

**Full-or-part-time:** 41h 20m

Theory classes: 12h

Laboratory classes: 6h

Self study : 23h 20m

#### 6.-Advanced Processing Techniques

**Description:**

Over-injection  
Co-Injection  
Fluid Assisted Injection  
Injection + Microfoam  
Additive Manufacturing: FDM

**Full-or-part-time:** 6h 10m

Theory classes: 2h

Self study : 4h 10m

#### 7.- Additive manufacturing

**Description:**

content english

**Full-or-part-time:** 4h

Theory classes: 2h

Self study : 2h

## GRADING SYSTEM



## BIBLIOGRAPHY

---

### Basic:

- Osswald, T.A. ; Menges, G. Materials science of Polymers for Engineers. 2nd ed. Munich: Hanser Publishers, 2003. ISBN 1569903484.
- Dealy, J. M. ; Wissbrun, K. F. Melt rheology and its role in plastics processing : theory and applications. Dordrecht: Kluwer, 1999. ISBN 0792358864.
- McCrum, N.G. ; Buckley, C.P. ; Bucknall, C.B. Principles of polymer engineering. 2nd ed. Oxford: Oxford University Press, 1997. ISBN 0198565267.

## RESOURCES

---

### Audiovisual material:

- Nom recurs. Resource

### Hyperlink:

- Videos. Selected videos from the documentary series: How its made. <http://science.discovery.com/tv/how-its-made/> Selected videos of youtube processes.