



Universitat de Lleida

DEGREE CURRICULUM  
**ADVANCED MANUFACTURE  
SYSTEMS**

Coordination: NOGUES AYMAMI, MIQUEL

Academic year 2023-24

## Subject's general information

<b>Subject name</b>	ADVANCED MANUFACTURE SYSTEMS			
<b>Code</b>	14521			
<b>Semester</b>	2nd Q(SEMESTER) CONTINUED EVALUATION			
<b>Typology</b>	Degree	Course	Character	Modality
	Master's Degree in Industrial Engineering	1	COMPULSORY	Attendance-based
<b>Course number of credits (ECTS)</b>	6			
<b>Type of activity, credits, and groups</b>	<b>Activity type</b>	PRAULA	TEORIA	
	<b>Number of credits</b>	3	3	
	<b>Number of groups</b>	1	1	
<b>Coordination</b>	NOGUES AYMAMI, MIQUEL			
<b>Department</b>	INDUSTRIAL AND BUILDING ENGINEERING			
<b>Teaching load distribution between lectures and independent student work</b>	1 ECTS = 10h attendance lessons + 15h of autonomous work Attendance: 40% Autonomus work: 60%			
<b>Important information on data processing</b>	Consult <a href="#">this link</a> for more information.			
<b>Language</b>	Catalan (part of the material in Spanish and English)			
<b>Distribution of credits</b>	3 Theory 3 Practice			

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
ADELL POCH, FRANCESC	francesc@intech3d.es	1,6	
CAMPILLO BETBESE, MANEL	manel.campillo@udl.cat	,8	
CUCURULL BONCOMPTE, GERARD	gerardcb07@hotmail.com	,8	
NOGUES AYMAMI, MIQUEL	miquel.nogues@udl.cat	1,2	
SALAT DUCH, RAMON	ramon.salat@udl.cat	1,6	

## Subject's extra information

There are no previous requirements to do the subject.

### Regarding the safety rules that apply to the laboratory practices:

It is **COMPULSORY** that the students bring the following elements of individual protection (EPI) to the practices at the laboratory.

- Laboratory gown from UdL (unisex) (blue or white colour)
- Protection glasses
- Mechanical protection gloves

They can be purchased through the shop Údels of the UdL:

C/ Jaume II, 67 baixos

Centre the Cultures i Cooperació Transfronterera

<http://www.publicacions.udl.cat/>

The use of other elements of protection (for example caps, masks, gloves of chemical or electrical risk, etc.) will depend on the type of practice to be done. In that case, the teacher will inform of the necessity of specific EPI.

Not bringing the EPI's described or not fulfilling the norms of general security that are detailed below imply that the student can not access to the laboratories or have to go out of them. The no realisation of the practices for this reason imply the **consequences in the evaluation** of the subject that are described in this course guide.

## GENERAL NORMS OF SECURITY IN LABORATORY PRACTICES

- Keep the place of realisation of the practices clean and tidy. The table of work has to be free from backpacks, folders, coats...
- No short trousers or short skirts are allowed in the laboratory.
- Closed and covered footwear is compulsory in the laboratory.
- Long hair needs to be tied.
- Keep the laboratory gown laced in order to be protected from spills of chemicals.
- Bangles, pendants or wide sleeves are not allowed as they can be trapped.
- Avoid the use of contact lenses, since the effect of the chemical products is much bigger if they enter between the contact lenses and the cornea.
- Protection over-glasses can be purchased.
- No food or drink is allowed in the laboratory.
- It is forbidden to smoke in the laboratories.
- Wash your hands whenever you have contact with a chemical product and before going out of the laboratory.
- Follow the instructions of the teacher and of the laboratory technicians and ask for any doubt on security.

For further information, you can check the following information of the Servei de Prevenció de Riscos Laborals de la UdL:

- <http://www.prevencio.udl.cat/ca/integracio-a-la-docencia/>
- <http://www.sprl.udl.cat/ca/capsules-formatives/>

During the realization of visits in companies, the use of personal protective equipment (PPE) set by the centre is mandatory.

## Learning objectives

General objectives:

Understand the different actors that are involved in an advanced productive process. The subject will be focused on the management and quality issues, and special attention will be given to the additive manufacturing.

Particular objectives:

- Know the additive manufacturing technologies
- Design a part in order to be built with 3D printing.
- Set up 3D printing parameters
- Print 3D parts
- Know quality certifications and enterprise structure
- Know what quality implies in a productive process
- To implement quality systems
- Verify the quality of a product
- Know the different managing tools of production systems
- Apply product managing using an specific software

## Competences

**Basic** competences:

- **CB2.** To be able to apply the knowledge gained and to solve problems in new environments in wider contexts (or multidisciplinary) related with the area of study.
- **CB5.** To possess the skills to continue learning self-directed and freelance.

**General** competences EPS:

- **CG4.** Capacity to conceive, design and implement projects and/or provide new solutions, using the tools that the engineering offers.

**Specific** competences:

- **CE2.** Knowledge and capacity to project, calculate and design integrated manufacturing systems.
- **CE8.** Capacity to design and project automated production and advanced process control systems.
- **CE13.** Knowledge on methods and techniques of transportation and industrial maintenance services.

## Subject contents

### 1 Additive manufacturing

- 1.1 Introduction to additive manufacturing systems
- 1.2 FDM technology
- 1.3 Polymeric materials
- 1.4 CAD/CAE/CAM design oriented to additive manufacturing
- 1.5 Software: Layers and printing parameters

### 2 Quality management

- 2.1 Introduction to Quality
- 2.2 ISO certification at enterprises
- 2.3 Enterprise structure
- 2.4 Quality at productive processes
- 2.5 Verification and validation of a product
- 2.6 Audit (Internal / External).
- 2.7 Corrective actions and Non-conformity products

### 3 Productive systems management

- 3.1 Introduction to the different management tools
- 3.2 Product data management (PDM)
- 3.3 Product life cycle management (PLM)
- 3.4 Enterprise resources plan (ERP)

## Methodology

**Lectures:** In the lectures, the contents of the subject is exposed orally by a teacher with the active participation of students

**Problems solving:** In the activities of problems solving, the professors present a complex issue that students must solve, whether working individually or in teams.

**Visits:** In this academic year, all the the external activities as visiting manufacturing sites or fairs has been canceled.

**Work in group:** Learning activity that has to be done through collaboration between members of a group.

## Development plan

Week	Methodology	Unit	Attendance hours	Autonomous work hours	Professor
1-4	Lectures, Problems solving, Practices	Unit 1: Additive manufacturing	16	27	F. Adell
5-13	Lectures, Problems solving, Practices	Unit 2: Quality management	16	27	M. Campillo G. Cucurull
5-13	Lectures, Problems solving, Practices	Unit 3: Productive systems management	16	27	R. Salat
14	Visit	Units 1-3	6	5	M. Nogués
15	Work in group	Units 1-3	4	4	M. Nogués

## Evaluation

The subject has 3 topics, where each topic will have at least one exam and one assignment.

Therefore, the subject will consist of at least 3 exams and 3 papers

The weight established to each evaluation activity, out of a total of 100, is as follows:

Activity	Weight
Additive manufacturing exam	19%
Additive manufacturing work in group	10%
Additive manufacturing class attendance	3%
Quality manufacturing exam	16%
Quality manufacturing work in group	16%
Productive managing System exam	22%
Productive managing System work in group	7%
Productive managing System class attendance	3%
Manufacturing integrations system	4%

In case of **alternative grading**, there will be a single theoretical exam that will include the entire syllabus presented in class (60%), and a practical work (40%) that may include parts of the different topics.

## Bibliography

### Basic Bibliography

Antonio Domínguez Machuca y otros. Dirección de operaciones: Aspectos tácticos y operativos en la producción y los servicios. Ed. Mc Graw-Hill.

Jay Heizer y Barry Render. Dirección de la producción, decisiones estratégicas. Ed. Prentice Hall.

Luis Cuatrecasas. Diseño avanzado de procesos y plantas de producción flexible. Ed Profit.

Aguayo Gonzalez F. Metodología del diseño industrial: un enfoque desde la ingeniería concurrente. Ed. Rama.

### Complementary Bibliography

UNE-EN ISO 9001:2015. Sistemas de gestión de la calidad.

## **Other resources**

Eliyahu M. Goldratt Jeff Cox. La Meta, Un proceso de mejora continua. Ed. Diaz de Santos.

Xavier Sala i Martín. Economía liberal, para no economistas y no liberales. Ed. DeBolsillo.