



Universitat de Lleida

DEGREE CURRICULUM  
**ADVANCED DESIGN OF  
TANNING PROCESSES 2**

Coordination: COMBALIA CENDRA, FELIP

Academic year 2023-24

## Subject's general information

<b>Subject name</b>	ADVANCED DESIGN OF TANNING PROCESSES 2			
<b>Code</b>	103151			
<b>Semester</b>	2nd Q(SEMESTER) CONTINUED EVALUATION			
<b>Typology</b>	Degree	Course	Character	Modality
	Master's Degree in Leather Engineering	1	COMPULSORY	Attendance-based
<b>Course number of credits (ECTS)</b>	5			
<b>Type of activity, credits, and groups</b>	<b>Activity type</b>	PRALAB	PRAULA	TEORIA
	<b>Number of credits</b>	2.5	1	1.5
	<b>Number of groups</b>	1	1	1
<b>Coordination</b>	COMBALIA CENDRA, FELIP			
<b>Department</b>	INDUSTRIAL AND BUILDING ENGINEERING			
<b>Teaching load distribution between lectures and independent student work</b>	in-person class: 40% autonomous: 60%			
<b>Important information on data processing</b>	Consult <a href="#">this link</a> for more information.			
<b>Language</b>	Catalan Spanish English			
<b>Distribution of credits</b>	Theoretical credits: 5,5 ECTS Pracula credits: 0,5 ECTS Pralab credits: 3 ECTS			

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
COMBALIA CENDRA, FELIP	felip.combalia@udl.cat	5	

## Subject's extra information

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

- Laboratory gown from UdL
- 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/>

There will be a specific service for the *Campus Universitari d'Igualada*.

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 lense 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 document of the *Servei de Prevenció de Riscos Laborals de la UdL*: <http://www.sprl.udl.cat/alumnes/index.html>

## Learning objectives

1. Understand the chemical fundamentals in tanning and wet-end processes.
2. Recognize the environmental impact of each operations in tanning and wet-end process. Recognize the nature of waste products generated in the process and its basic management.
3. Solve technical problems in the tanning and wet-end stage. Suggest solutions through process redesign.
4. Design advanced formulations of tanning, neutralization, retanning, dyeing and fat-liquoring.
5. Analyze the variables that affect the parameters of touch, physical resistance, firm-grained and fine-grained, dyeing goodness as leading exponents of leather quality.
6. Schedule in a practical way the production of different leather articles.
7. Recognize the different product families involved in the tanning and wet end processes and know how to formulate them to obtain different properties and characteristics that define leather.
8. Recognize different kinds of skins and identify its applications.

## Competences

### Basic

B06. To possess and understand knowledge that provides a basis or opportunity to be original in the development and / or application of ideas, often in a research context.

B07. That students know how to apply the knowledge acquired and have the ability to solve problems in new or little-known environments (or multidisciplinary) contexts related to their area of study.

B10 That students have the learning skills that allow them to continue studying in a way that will be largely self-directed or autonomous.

### General

CG1. To apply properly mathematical, analytical, scientific, instrumental, technological and management aspects.

CG2. To technically and economically manage projects, facilities, plants, companies and technology centers.

CG3. To investigate, develop and innovate.

CG4. Lead, plan and supervise multidisciplinary teams.

### Transversal

CT1. Communicate clearly and precisely orally and in writing in Catalan and Spanish and in a third language, especially English.

CT3. Propose innovative, creative and entrepreneurial solutions in situations typical of the professional field.

CT4. Evaluate the sustainability and social impact of the proposed proposals and act with ethical, environmental and professional responsibility.

### Specific

CE1. Analyze the different raw materials, intermediate and final products in the leather manufacturing process.

CE2. To analyze, apply and project the main unit operations and the systems that make up the leather manufacturing process.

CE4. To apply theories and principles of leather engineering in order to analyze complex situations and make decisions through engineering resources.

CE5. To identify the main industrial processes of leather manufacturing in its three phases: beamhouse phase, tanning and re-tanning phase and finishing phase.

CE10. Design strategic planning and apply it to production, quality and environmental management systems in the field of leather engineering.

## Subject contents

### 4. TANNING OPERATIONS

#### 4.1 Tanning systems:

- Generalities.

#### 4.2 Mineral tanning:

- Understanding the process: objectives. Reagents and chemical process.
- Mineral tanning systems.
- Solution or compensation of problems that may have occurred at other stages.
- Connection between this operation and the final article. • Sustainability of the process.

#### 4.3 Organic tanning:

- Understanding the process: objectives.
- Reagents and chemical process
- Organic tanning systems.
- Solution or compensation of problems that may have occurred at other stages.
- Connection between this operation and the final article.
- Sustainability of the process.

#### 4.4 Other tanning systems

### 5. RETANNING

#### 5.1 Retanning:

- Generalities

#### 5.2 Retanning with metallic salts:

- Understanding the process: objectives
- Reagents and chemical process
- Retanning systems with metallic salts.
- Solution or compensation of problems that may have occurred at other stages.
- Connection between this operation and the final article.
- Sustainability of the process.

#### 5.3 Retanning with natural and synthetic tannins:

- Understanding the process: objectives
- Reagents and chemical process
- Retanning systems with natural and synthetic tannins.
- Solution or compensation of problems that may have occurred at other stages.
- Connection between this operation and the final article.
- Sustainability of the process.

#### 5.4 Retanning with resin compounds and others:

- Understanding the process: objectives
- Reagents and chemical process
- Retanning systems with resin compound and others.
- Solution or compensation of problems that may have occurred at other stages.
- Connection between this operation and the final article.
- Sustainability of the process.

## 6. DYEING

### 6.1 Dyeing

- Understanding the process: objectives
- Reagents and chemical process
- Dyeing systems and stages of the process where apply them.
- Solution or compensation of problems that may have occurred at other stages.
- Connection between this operation and the final article.
- Sustainability of the process

## 7 FAT-LIQUORING

### 7.1 Fat-liquoring

- Understanding the process: objectives
- Reagents and chemical process
- Fat-liquoring systems and stages of the process where apply them.
- Solution or compensation of problems that may have occurred at other stages.
- Connection between this operation and the final article.
- Sustainability of the process.

## Methodology

### THEORY CLASSES

Expository lectures: by the teacher, with the explanation of concepts, materials and work plan.

Support material: Course notes and relevant bibliography.

Specific objectives :At the end of the course the student should be able to: - Meet every stage of processing from the skin to the tanned leather in the mineral and organic tanning. - Design processes based on the requirements of the final article. Acquire judgment to modify processes based on existing problems in the leather. Know the basis of chrome neutralizing process.Know all the available retanning systems.

General description: Individual exercises, self-learning and individual study.

Support material: Course notes and relevant bibliography.

Deliverable: Exercises to deliver at the end of every unit via digital campus.

Specific objectives:At the end of the course students should have increased their abilities to: Solve problems ,reading understanding ,find information ,self study

### PRACTICES IN THE TANNING PILOT PLANT

General description: Formulations of different processes will be performed on a pilot level, individually or in small groups. It should be performed a notebook where to recorded all the modifications of the process and used products during the process.

Support material :Practices are held at the tanning pilot plant. All materials and reagents are in the same pilot plant. The scripts of the processes will be provided by the teacher in charge of monitoring practices.

Deliverable: At the end of these practices the student shall deliver the practices report, which will contain notes of all the data, calculations, incidents, and observations.

## Development plan

Week	Methodology	Units	In-person hours	Autonomous hours
1	Master class/ Virtual/ Problems	4.1	5,5	8,25
2	Master class/ Virtual/ Problems	4.2	5,5	8,25
3	Master class/ Virtual/ Problems	4.3	5,5	8,25
4	Master class/ Virtual/ Problems	4.4	5,5	8,25
5	Master class/ Virtual/ Problems	5.1	5,5	8,25
6	Master class/ Virtual/ Problems	5.2	5,5	8,25
7	Master class/ Virtual/ Problems	5.3	5,5	8,25
8	PARTIAL EXAMS			
9	Master class/ Virtual/ Problems	5.3/5.4	5,5	8,25
10	Master class/ Virtual/ Problems	5.4	5,5	8,25
11	Master class/ Virtual/ Problems	6.1	5,5	8,25
12	Master class/ Virtual/ Problems	7.1	5.5	8.25
14	FINISHING PRACTICES			
15	PROCESS DESIGN PRACTICES			
16	PARTIAL EXAMS			
17	PARTIAL EXAMS			
18	PARTIAL EXAMS			
19	TUTORING			
20	RECUPERATION EXAMS			

## Evaluation

Exercises	10%
Practices	30%

Exam 1	20%
Exam 2	30%
Visits	5%
Informs	5%

## Bibliography

### Basic:

Soler, J. Procesos de Curtidos. Igualada: EUETII-ESAI,2000. ISBN 84-1837-2-5

Soler, J. Diseño de Procesos de Curtidos. Igualada:EUETII-ESAI,2005. ISBN 84-931837-6-8

### Supplementary:

Adzet, J.M. Química Técnica de Teneria. Igualada: EUETII-ESAI, 1985. Bacardit, A.;Ollé, LI. Maquinaria de Curtidos. Igualada: EUETII-ESAI, 2005. ISBN 84-931837-4-1

Font, Joaquim. Análisis y ensayos en la Industria del Curtido. Igualada: EUETII-ESAI, 2005. ISBN 84-931837-5-X

Gerhard, J. Posibles fallos en el cuero y en su producción. [s. l.]: Lampertheim: G. John , 1998.

Morera, J.M. Química Técnica de Curtición . Igualada: EUETII-ESAI, 2000. ISBN 84-931837-0-9

O'Flaherty,F.(Ed). [et al.]. "The Chemistry and Technology of Leather". USA: Malabar, Krieger Pub., 1978.