Course guide
220232 - 220232 - Paper Manufacturing Technology and Derivatives

Unit in charge: Terrassa School of Industrial, Aerospace and Audiovisual Engineering
Teaching unit: 717 - DEGD - Department of Engineering Graphics and Design.
Degree: MASTER'S DEGREE IN INDUSTRIAL ENGINEERING (Syllabus 2013). (Optional subject).
Academic year: 2023
ECTS Credits: 5.0
Languages: Catalan, Spanish

LECTURER

Coordinating lecturer: Cusola Aumedes, Oriol

Others:

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
4. Ability to select and evaluate various sources of vegetable fibers suitable for the manufacture of fibrous materials (biomaterials, pulp and paper) with certain technical characteristics.
1. Ability to analyze, implement and project the main unitary operations and systems which compose manufacturing processes of fibrous materials (biomaterials, core and paper).
2. Ability to analyze and evaluate the physical, mechanical and optical properties about specific fibrous materials (biomaterials, core and paper).
3. Ability to develop new types of paper or paper products according to their specifications and specific technical applications.

TEACHING METHODOLOGY

Methodology is divided in three main parts:
- Lectures for theoretical issues.
- Working sessions (exercises and problem solving and facilities visit).
- Self-study, exercises and activities.
Theoretical sessions will be used to present and develop the theoretical foundations of the subject, also the concepts and methods, and finally appropriate examples to facilitate understanding.
Practical sessions in the classroom will provide students the ability to apply theoretical concepts to problem solving, always based on critical thinking. Coursework will promote the contact and use of the basic tools needed to solve problems.
Students will work in autonomous way on material provided by the teachers and also on the results of the working sessions to definitively fix the theoretical concepts. Teachers will provide a study guide through ATENEA.

LEARNING OBJECTIVES OF THE SUBJECT

At the end of the course the student should:

Having the theoretical knowledge related to papermaking unit operations.

Having the knowledge and skills to analyze and design the manufacturing processes of different types of paper from different types of pulps and recycled papers (old papers), as well as the operations related to the conversion of paper.

Having the knowledge and skills to perform the verification and control of facilities, processes and systems whose purpose is the manufacture of paper and related operations.
### STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self study</td>
<td>80.0</td>
<td>64.00</td>
</tr>
<tr>
<td>Hours small group</td>
<td>15.0</td>
<td>12.00</td>
</tr>
<tr>
<td>Hours large group</td>
<td>30.0</td>
<td>24.00</td>
</tr>
</tbody>
</table>

**Total learning time:** 125 h

### CONTENTS

#### Unit 1. Introduction to paper manufacturing

**Description:**

**Related activities:**
Realization of a scientific-technical work on features and technological properties of different types of papers.

**Full-or-part-time:** 4h
- Theory classes: 1h
- Self study: 3h

#### Unit 2: Preparation of stock for papermaking

**Description:**

**Related activities:**

**Full-or-part-time:** 30h
- Theory classes: 8h
- Laboratory classes: 3h
- Self study: 19h

#### Unit 3. Approach system and sheet forming process

**Description:**

**Related activities:**
Design of approach system circuits. Delivery of proposed problems.

**Full-or-part-time:** 16h
- Theory classes: 5h
- Laboratory classes: 1h
- Self study: 10h
# Unit 4. Press section

**Description:**
Pressing fundamentals. Types of presses. Balances in the press section. Paper properties related to this part of the process.

**Full-or-part-time:** 9h  
Theory classes: 3h  
Self study: 6h

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# Unit 5. Paper drying

**Description:**

**Related activities:**
Delivery proposed problems.

**Full-or-part-time:** 29h  
Theory classes: 5h  
Laboratory classes: 4h  
Self study: 20h

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# Unit 6. Paper converting

**Description:**
Paper finishing: Physical treatments (calendering, creping, embossing, etc.). Physico-chemical treatment (surface sizing, coating, etc.).

**Related activities:**
Power requirements to drive paper machines.  
Delivery of proposed problems.

**Full-or-part-time:** 13h  
Theory classes: 4h  
Laboratory classes: 1h  
Self study: 8h

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# Unit 7. Reduction of environmental impact of the manufacture of paper

**Description:**

**Related activities:**
Design of water units process and wastewater treatment. Paper mill visits in order to make an approach to the industrial reality of the manufacturing processes.  
Delivery of proposed problems and report paper mill visits.

**Full-or-part-time:** 24h  
Theory classes: 4h  
Laboratory classes: 6h  
Self study: 14h
GRADING SYSTEM

The final mark is based on the following evaluative acts:
- Activity 1 (control knowledge written test): Midterm Exam: 35%
- Activity 2 (Evaluation of resolution of case studies and work with individual reports and oral presentations): problems and practical cases: 30%
- Activity 3 (control of knowledge written test): Final exam: 35%

The unsatisfactory result in the midterm exam (Activity 1) may be redirected by a written test on the day set for the final exam (Activity 3). Students who didn't assist at the midterm exam (Activity 1) or with a grade lower than 5.0 in the midterm exam (Activity 1) can access this test. The grade obtained in the redirected test will replace the initial grade as long as it is higher.

For those students who meet the requirements and submit to the reevaluation examination, the grade of the reevaluation exam will replace the grades of all the on-site written evaluation acts (tests, midterm and final exams) and the grades obtained during the course for lab practices, works, projects and presentations will be kept.

If the final grade after reevaluation is lower than 5.0, it will replace the initial one only if it is higher. If the final grade after reevaluation is greater or equal to 5.0, the final grade of the subject will be pass 5.0.

BIBLIOGRAPHY

Basic:
- Professorat de l'assignatura. Apunts lliurats pel professorat.

Complementary: