320077 - DELLNT - Design of Non-Woven Linear and Laminar Structures

Coordinating unit: 205 - ESEIAAT - Terrassa School of Industrial, Aerospace and Audiovisual Engineering
Teaching unit: 702 - CMEM - Department of Materials Science and Metallurgy
Academic year: 2019
Degree: BACHELOR'S DEGREE IN TEXTILE TECHNOLOGY AND DESIGN ENGINEERING (Syllabus 2009).
ECTS credits: 6
Teaching languages: Catalan

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Teaching staff
Coordinator: Cano Casas, Francesc

Prior skills
Previously studying the subject Materials for Textile Product Design is highly desirable.

Degree competences to which the subject contributes

Specific:
1. TEX: Knowledge of lineal textile structures and non-woven clothes.

Transversal:
2. SELF-DIRECTED LEARNING - Level 3. Applying the knowledge gained in completing a task according to its relevance and importance. Deciding how to carry out a task, the amount of time to be devoted to it and the most suitable information sources.
3. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 3. Communicating clearly and efficiently in oral and written presentations. Adapting to audiences and communication aims by using suitable strategies and means.
4. TEAMWORK - Level 3. Managing and making work groups effective. Resolving possible conflicts, valuing working with others, assessing the effectiveness of a team and presenting the final results.

Teaching methodology
- Presential lecturing sessions for delivery of the topics with active student involvement.
- Presential sessions of practical work.
- Self-directed study and preparation of deliverables; spinning development project; technical study of various non-woven laminates. Cooperative learning.
- Preparation and completion of assessable teamwork activities.

Learning objectives of the subject
GLO1. To become acquainted with spinning techniques and processes.
GLO2. To be able to select the most suitable spinning process for each type of yarn in terms of applications and technical and economic requirements.
GLO3. To develop specific and transversal skills associated with the academic work.
GLO4. To acquire the ability to identify non-woven laminates, and knowledge of their manufacturing processes, applications and technical specifications.
### Study load

<table>
<thead>
<tr>
<th>Total learning time: 150h</th>
<th>Hours large group: 30h</th>
<th>20.00%</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Hours medium group: 0h</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>
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</table>
### Topic 1: CHARACTERIZATION OF YARNS

<table>
<thead>
<tr>
<th>Learning time: 30h</th>
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<tbody>
<tr>
<td>Theory classes: 15h</td>
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<tr>
<td>Laboratory classes: 6h</td>
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<tr>
<td>Self study: 9h</td>
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#### Description:
- 1.1. Yarn numbering.
- 1.2. Consolidation of a yarn structure by twisting.
- 1.3. Yarn strength and stretching.
- 1.4. Mass irregularity indices.
- 1.5. Yarn hairiness.
- 1.6. Fundamentals of yarn friction.

#### Related activities:
RA0, RA1, RA2, RA3, RA4 and RA5.

#### Specific objectives:
- SO1. To learn the main yarn parameters.
- SO2. To learn the technical specifications for each yarn parameter as a function of intended use for the end product.
- SO3. To understand industrial problems arising from variability in yarn parameters.
- SO4. To learn the methodology for identifying faults in yarns produced by the different spinning machine types.
## Topic 2: SHORT-FIBRE SPINNING SYSTEMS

<table>
<thead>
<tr>
<th>Learning time: 44h</th>
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<tbody>
<tr>
<td>Theory classes: 20h</td>
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<tr>
<td>Laboratory classes: 5h</td>
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<tr>
<td>Self study: 19h</td>
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### Description:

2.1. Basic spinning calculations.
2.2. Technical study of the main short-fibre spinning systems.
2.3. Structural properties of the yarns produced by each type of spinning system and influence on their weaving, dyeing and/or finishing. Winding of yarns as a function of their technical weaving and/or dyeing requirements.
2.4. Criteria for selection of short-yarn types in accordance with the technical specifications of the target fabric.

### Related activities:

RA6, RA7, RA8, RA9, RA10, RA11 and RA12.

### Specific objectives:

SO5. To learn the main calculations for spinning processes.
SO6. To understand the different ways of obtaining short fibres depending on their intended use.
SO7. To understand the structural differences between yarns produced by different short-fibre spinning systems and their relationship to the end product.
SO8. To be able to design a short-fibre spinning operation plan, and to manage its production and quality related aspects.
### Topic 3: LONG-FIBRE SPINNING SYSTEMS

<table>
<thead>
<tr>
<th>Description:</th>
<th>Learning time: 44h</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1. Technical study of the main long-fibre spinning systems.</td>
<td>Theory classes: 20h</td>
</tr>
<tr>
<td>3.2. Transformation of chemical fibre wires correctly into cut fibres.</td>
<td>Laboratory classes: 5h</td>
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<tr>
<td>3.3. Structural properties of yarns produced by different types of spinning systems and influence on their weaving, dyeing and/or finishing.</td>
<td>Self study: 19h</td>
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<tr>
<td>3.4 Criteria for selection of long-yarn types in accordance with the technical specifications of the target fabric.</td>
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<tr>
<td>3.5. Development of an operation plan for the production of long fibres.</td>
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<tr>
<td>3.6. Similarities and differences between short- and long-fibre yarn production processes.</td>
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<tr>
<td>3.7. Texturing technology. Advantages and disadvantages of each texturing system in terms of the intended textile use of the end product. Textured yarn control.</td>
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#### Related activities:
RA13, RA14, RA15, RA16, RA17 and RA18.

#### Specific objectives:
- SO9. To learn the different ways of producing yarns for long-fibre spinning depending on their intended use.
- SO10. To understand the structural differences between yarns produced by long-fibre spinning systems and their influence on the characteristics of the end product.
- SO11. To be able to develop an operation plan for a long-fibre spinning process and manage its production and quality aspects, and to understand the similarities and differences between short- and long-fibre spinning processes.
- SO12. To understand texturing technology.
### Topic 4: NON-WOVEN LAMINATES

**Description:**
- 4.1 Fibre types. Fundamentals of webbing and lapping. Technical features and properties.
- 4.2 Adaptation of conventional carding techniques for the production of non-woven laminates with the dry method.
- 4.3 Aerodynamic webbing methods. Characteristics, properties, performance and uses of the products.
- 4.4 Wet consolidation of laminates. Advantages and disadvantages.
- 4.5 Production of non-woven laminates by melting. Comparison with other systems.
- 4.6 Web consolidation by punching. Descriptive study of punching equipment. Comparison with other consolidation systems.
- 4.7 Consolidation by melting in the presence or absence of pressure.
- 4.8 Chemical consolidation. Most suitable binders and application methods. Comparison with other systems.
- 4.9 "Tufting". Loop or hair formation. Machinery. Product performance and usage fields.

**Related activities:**
- RA19.

**Specific objectives:**
- SO13. To learn the different ways of obtaining non-woven laminates according to the particular technological requirements.
- SO14. Comparative technical and commercial study of different available methods.

### THEME 5: CHEMICAL FIBER SPINNING SYSTEMS

**Description:**
- 1. Fusion spinning.
- 2. Dry spinning.
- 3. Wet spinning.
- 4. Drafting post-spinning.
- 5. Stabilization.
- 6. Spinning finishes.
- 7. Textured Systems

**Learning time:** 3h
- Theory classes: 3h
Qualification system

During the academic year two partial exams will be made, marked by the official academic calendar. 60% of the final mark of the subject will be the arithmetic mean of the two partial notes. 20% corresponds to the average of the notes of the practices. And the other 20% to the note of a job. In order to pass the course, an average grade of five or more must be obtained. The student who does not approve the subject with the average of notes, will have the right to a final exam of all the theoretical / practical content of the subject.

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:


