

Course guide

205554 - 205554 - Advances in Knitted and Woven Fabrics

Last modified: 29/05/2025

Unit in charge: Terrassa School of Industrial, Aerospace and Audiovisual Engineering
Teaching unit: 702 - CEM - Department of Materials Science and Engineering.

Degree: MASTER'S DEGREE IN TEXTILE DESIGN AND TECHNOLOGY (Syllabus 2020). (Compulsory subject).

Academic year: 2025 **ECTS Credits:** 5.0 **Languages:** English

LECTURER

Coordinating lecturer: HEURA VENTURA CASELLAS

Others: Mijas Vélez, Gabriela Dayana

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

MUDITT-CE2. The ability to analyse and apply weaving technologies for the development of advanced fabrics.

Generical:

CG3. Lead, plan and supervise multidisciplinary teams.

MUDITT-CG5. Carry out strategic planning and apply it to production, quality and environmental management systems in the field of textile design and technology.

MUDITT-CG1. Apply mathematical, analytical, scientific, instrumental, technological and management knowledge related to the field of textile design and technology.

MUDITT-CG2. Project, calculate and design products and processes related to the field of textile design and technology.

MUDITT-CG4. Carry out research, development and innovation in the field of textile design and technology.

Transversal:

CT3. TEAMWORK: Being able to work in an interdisciplinary team, whether as a member or as a leader, with the aim of contributing to projects pragmatically and responsibly and making commitments in view of the resources that are available.

Basic:

CB06. Manage original concepts in research projects.

CB07. Student capacity to use their knowledge in new and multidisciplinary situations.

CB08. Generate decision from incomplete information assuming its social and ethical responsibilities.

CB09. Improve technical communication of results.

CB10. Improve self-learning capacity

TEACHING METHODOLOGY

The teaching methodology is divided into three parts:

- Face-to-face presentation sessions - participation in the contents and realisation of exercises.
- Face-to-face sessions of laboratory work.
- Self-study work, and realisation of exercises and activities.

In the sessions of presentation -participation of the contents, the teaching staff will introduce the theoretical bases of the subject, concepts, methods and results, illustrating it with suitable examples and requesting, where appropriate, exercises to facilitate their understanding.

In the laboratory work sessions, the teaching staff will guide the student in the application of theoretical concepts for the resolution of experimental assemblies, basing critical reasoning at all times. Activities to be solved during class and at home will be proposed to the student, to encourage contact and use of the basic tools necessary to develop an instrumentation system.

The student, independently, has to work on both the material provided by the teaching staff and the results of the work-problem sessions to assimilate and fix the concepts. The teaching staff will provide a study plan and follow-up activities (ATENEA).

LEARNING OBJECTIVES OF THE SUBJECT

At the end of the course the student must:

- Know the most important characteristics and properties of the latest developments related to fibres, yarns and fabrics for applications in textiles for technical use
- Know how to select and characterize textile materials for a given application of a technical nature (smart fabrics, geotextiles, textiles for protection, etc.)
- Understand and characterize textile materials according to technical and quality criteria

STUDY LOAD

Type	Hours	Percentage
Self study	80,0	64.00
Hours small group	45,0	36.00

Total learning time: 125 h

CONTENTS

Module 1: Structure-properties relationship

Description:

- 1.1. Classification of textile structures
- 1.2. Structural parameters of knitted fabrics
- 1.3. Structural parameters of woven fabrics
- 1.4. Influence of structural parameters on the mechanical properties of the fabric
- 1.5. Influence of structural parameters on other properties

Related activities:

Theoretical sessions in the classroom (face-to-face)
Practical sessions in the laboratory (face-to-face)
Autonomous study and realization of exercises (not face-to-face)

Full-or-part-time: 14h

Theory classes: 6h
Self study : 8h

Module 2: Knitted 2D and 3D structures

Description:

- 2.1. Warp knitted and weft knitted double layer structures
- 2.2. 3D knitted structures (spacer fabrics, tubular structures, etc.)
- 2.3. 3D knitted products (whole-garment)

Related activities:

Theoretical sessions in the classroom (face-to-face)
Practical sessions in the laboratory (face-to-face)
Autonomous study and realization of exercises (not face-to-face)

Full-or-part-time: 32h

Laboratory classes: 12h
Self study : 20h

Module 3: 2D and 3D woven structures

Description:

- 3.1. Characteristics and applications of 2D and 3D woven structures
- 3.2. Narrow fabrics
- 3.3. Pile fabrics: terry fabrics, velvet, etc.

Related activities:

Theoretical sessions in the classroom (face-to-face)

Practical sessions in the laboratory (face-to-face)

Autonomous study and realization of exercises (not face-to-face)

Full-or-part-time: 24h

Laboratory classes: 9h

Self study : 15h

Module 4: Other complex structures

Description:

- 4.1. Braided textiles
- 4.2. Multiaxial fabrics

Related activities:

Theoretical sessions in the classroom (face-to-face)

Practical sessions in the laboratory (face-to-face)

Autonomous study and realization of exercises (not face-to-face)

Full-or-part-time: 21h

Laboratory classes: 9h

Self study : 12h

Module 5: Textile structures for technical applications

Description:

- 5.1. Textiles for civil engineering (Geotech)
- 5.2. Textiles for agriculture and fishing (Agrotech)
- 5.3. Textiles for construction (Buildtech)
- 5.4. Textiles for medical and hygienic use (Medtech)
- 5.5. Textiles for the automotive and transport sector (Mobiltech)
- 5.6. Textiles for protection (Protech)
- 5.7. Textiles for sports (Sportech)
- 5.8. Textiles for industrial uses (Indutech)
- 5.9. Textile for packaging (Packtech)
- 5.10. Textiles for environmental protection (Oekotech)

Related activities:

Theoretical work sessions in the classroom (face-to-face)

Practical work sessions in the laboratory (face-to-face)

Preparation and elaboration of evaluable activities individually or in groups (not face-to-face)

Autonomous work of study and realization of exercises (not face-to-face)

Full-or-part-time: 34h

Laboratory classes: 9h

Self study : 25h

GRADING SYSTEM

The final grade will be calculated:

- Written or oral tests to control individual knowledge (E): 20% 1st partial; 20% 2nd partial
- Evaluation of practical work through deliverable reports (T): 30%
- Written and/or oral presentations related to the contents of the subject (P): 30%

For those students who meet the requirements and take the re-evaluation exam, the grade of the re-evaluation exam will replace the marks of all the evaluation activities that are face-to-face written tests (controls, partial and final exams) and will be maintained the grades of practices, works, projects and presentations obtained during the course.

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

BIBLIOGRAPHY

Basic:

- Spencer, David J. Knitting technology: a comprehensive handbook and practical guide [on line]. Cambridge UK: Woodhead, 2001 [Consultation : 04/11/2022]. Available on : <https://www-sciencedirect-com.recursos.biblioteca.upc.edu/book/9781855733336/knitting-technology>. ISBN 1855733331.
- Ray, Sadhan Chandra. Fundamentals and advances in knitting technology [on line]. Cambridge: Woodhead, 2011 [Consultation: 24/01/2023]. Available on : <https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?pq-origsite=primo&docID=3050429>. ISBN 9780857095558.
- Au, K.F. Advances in knitting technology [on line]. Cambridge: Woodhead Pub.; The Textile Institute, 2011 Available on : <https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?pq-origsite=primo&docID=3050429>. ISBN 9780857095558. ISBN 9781845693725.
- Gandhi, K. L. Woven textiles: principles, developments and applications. Cambridge: Woodhead Publishing, cop. 2012. ISBN 9781845699307.
- Boussu, Francois; Kyosev, Yordan. Advanced weaving technology [on line]. Cham: Springer, 2022 [Consultation: 27/06/2025]. Available on: <https://link-springer-com.recursos.biblioteca.upc.edu/book/10.1007/978-3-030-91515-5>. ISBN 9783030915148.
- Jitendra Pratap Singh; Swadesh Verma. Woven terry fabrics: manufacturing and quality management. Amsterdam: Woodhead Publishing, 2017. ISBN 9780081006863.
- Sugun, Bangalore Sridharan. Practical approach to 3D weaving. Cham: Springer, 2021. ISBN 9783030804268.
- Hu, Jinlian. 3-D fibrous assemblies: properties, applications and modeling of three-dimensional textile structures. Cambridge, Eng.: Boca Raton, FL: Woodhead Publishing; Textile Institute; CRC Press, 2008. ISBN 9781845693770.

Complementary:

- Behera, B.K; Hari, P.K. Woven textile structure: theory and applications. Cambridge: Boca Raton: Woodhead Publishing; CRC Press, cop. 2010. ISBN 9781845695149.
- Bunsell, A. R. Handbook of tensile properties of textile and technical fibres. Cambridge: Boca Raton: Woodhead; CRC, 2009. ISBN 9781845693879.
- Gandhi, K. L. Woven textiles: principles, developments and applications. Cambridge: Woodhead Publishing, cop. 2012. ISBN 9781845699307.
- Horrocks, A.R.; Anand, S.. Handbook of technical textiles. Vol. 2, Technical textile process [on line]. Cambridge UK: Woodhead Publishing; Textile Institute, 2016 [Consultation: 04/11/2022]. Available on : <https://www-sciencedirect-com.recursos.biblioteca.upc.edu/book/9781782424659/handbook-of-technical-textiles>. ISBN 9781782424888. ISBN 9781782424888.
- Hu, Jinlian. Structure and mechanics of woven fabrics. Cambridge: Woodhead Publishing Limited; The Textile Institute, 2004. ISBN 0849328268.
- Miravete, A. 3-D textile reinforcements in composite materials. Boca Raton [etc.]; Cambridge: CRC Press: Woodhead, 1999. ISBN 0849317959.
- Jamshaid, Hafsa (Ed.); Mishra, Rajesh (Ed.). Knitting science, technology, process and materials: a sustainable approach. Cham: Springer, 2024. ISBN 9783031449291.