META SKILLS 4TCLF

WP4- New modular training curricula/ training modules "Inside Fashion"

Deliverable 4.2. Curricula for courses focused on CIRCULAR ECONOMY and DIGITAL FASHION

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Executive Summary

Tasks, deliverables and milestones of the 4th working package - New modular training curricula/training modules "Inside Fashion"

The METASKILLS4TCLF project is robust and ambitious, responding to all objectives of the Alliances for Sectoral Cooperation on Skills (implementing the "Blueprint"), intercepts the PACT4SKILLS TCLF[1] pillars, and consolidates the outcomes of the former Skills4Smart TCLF Industries 2030 project[2]. Thus, the skills strategy, curricula and contents are the new results having a stronger and wider scope of cooperation, anticipating and responding to new skills gaps with innovative educational multilevel resources and delivering methodologies, involving new actors in the educational scene of TCLF across Europe, raising attractiveness and inclusion, preventing that "no talent is wasted", together with a strong dissemination campaign and sustainability plan.

The curricula design takes into consideration the inputs from the key trends, challenges and unpredictable impacts on European TCLF industries such as the deeper intervention of Artificial Intelligence and Virtual/Augmented immersive space, but also the post effects of the pandemic crisis, climate changes, environmental and human-made/war potential disasters. In this direction, the new modular training curricula/training modules "Inside Fashion" (both for initial education & training and upskilling-reskilling of the workforce) in a total of 2 curricula for HE, 2 for EQF 4-5 level, 2 for EQF 3-4, to circular economy for fashion industry and digital fashion, bot 1 textile and cloths and 1 footwear and leather, all tested in due piloting opportunities.

Titled **New modular training curricula/training modules "Inside Fashion", the 4th working package** is dedicated to curricula development, and it links to the following project objectives:

- develop **new and innovative** curricula to tackle specific TCLF sector urgent needs deriving from covid-19 impact, as well as the new challenges such as energy, and socio-political issues;
- develop **modular curricula for circular economy and digital fashion consisting in** 6 curricula and training programmes for all TCLF sectors with optional modules to facilitate the immediate integration into the continuing vocational training programmes for up-skilling and re-skilling the labour force by innovative blended and work-based learning;
- define curricula standards as **micro-credentials**, facilitating the measures for the formal recognition of the new or adapted vocational VET and HE curricula and qualifications, in line with the European Qualification Framework (EQF) /National Qualifications Framework (NQFs) and informed by ESCO;
- facilitate the upskilling/reskilling process through a **scanning skills balance**, designed to allow new entries, employees and/or un-employees to create their training itinerary (tailored courses).

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[1] Pact for Skills for the EU TCLF industries, Released on December 2021, Updated March 2024 https://pact-for-skills.ec.europa.eu/document/download/17037a33-4733-4d98-a366-51018f01674a_en?filename=TCLF%20Skills%20Alliance_Partnership%20agreement_Updated_13_03_2024.pdf&prefLang=sv

[2] **Skills4Smart TCLF Blueprint project, period 2018-2021,** https://s4tclfblueprint.eu/

TASKS

The **AIM** of Deliverable 4.2. Curricula for courses focused on CIRCULAR ECONOMY + DIGITAL FASHION is to develop 6 new modular curricula on CIRCULAR ECONOMY FOR FASHION IN-DUSTRY and DIGITAL FASHION. To fulfil the hereby nominated aim, the following tasks and milestones were conducted.

T4.1   Mapping of existing upskilling and reskilling support available in the TCLF sector.
This task aims to identify the existing relevant EU/national sectoral training support addressing the highly demanded skills on sustainability, circular economy and digitalisation. An online tool (*Upskilling and Reskilling Mapping Tool*) will be released under the public website of the project to assist TCLF companies, workers and/or un-employees, generally, those who want information or need to be reskilled/upskilled. This tool will identify the right mix of professional competencies all over the TCLF value chains and is designed to (1) collect and display info on the free available e-courses/training modules in digital format to support upskilling and reskilling in the TCLF sectors, (2) assist various professionals working for the TCLF industries to pinpoint their upskilling/re-skilling needs, (3) offer public and private stakeholders a tool to assess the incorporation of circular economy and digital skills in their teams. This tool will help drive decision-making for indi-viduals and companies regarding upskilling and reskilling opportunities. Also, it will help avoid overlapping the new modular training curricula/modules and contents as an essential input in the curricula design. The selected materials will be made available through the European Fashion Campus, becoming a comprehensive information portal for the fashion ecosystem. The materials will support upskilling and reskilling and direct users towards paths to acquire the entrance re-quirements in terms of skills/knowledge to attend the developed training modules in the project.

T4.2   Design standards for micro-credentials and curricula/training modules (including training methodology and training assessment).   This task aims to design authentic learn-ing standards for new transversal sectoral curricula: Circular Economy for Fashion Industry and Digital Fashion. According to Donovan et. a, 1991, "in education, authentic learning is an instruc-tional approach that allows students to explore, discuss, and meaningfully construct concepts and relationships in contexts that involve real-world problems and projects relevant to the learner". In this respect, this task will define authentic learning standards concerning circular economy and digital skills. In addition, pedagogic strategies, such as personalised, community-based and pro-ject-based learning, will be addressed. Training assessments will also include authentic learning elements, especially demonstrations of learning, personal learning plans, capstone projects and portfolios. A common standard for international apprenticeship schemes *Inside Fashion Industry* will also be developed, as well as a standard for joint training programmes to be awarded by more than one E&T provider, thus facilitating cross-border certification and building mutual trust, con-tributing to the increased learner and professional mobility in the sector.

The new designed standards will detail various training methodologies and assessment criteria to be applied and will feed into the EU Skills Panorama and the European Skills, Competencies, Qualifications and Occupations (ESCO). According to the proposed EU standard of constitutive elements of micro-credentials, each course will describe the identification of the learner, title of the micro-credential, learning outcomes, notional workload needed to achieve the learning out-comes (in ECTS, wherever possible), type of participation in the learning activity, type of assess-ment and entrance requirements including prior learning (formal, non-formal, informal).

Standards will include the entrance requirements based on: 1) Previous formal, no formal and informal learning; 2) Preparation. The requirements will be evaluated through an entrance test to assess the knowledge and skills required to attend the new innovative training course, based on METAVERSE and work (WP4.3-5).

T4.3   Develop curricula for courses focused on CIRCULAR ECONOMY + DIGITAL in FASHION. Based on the results of WP3 and applying the authentic learning standards (T4.2), this task aims to develop 6 new modular curricula on *Circular Economy for Fashion Industry* and *Digital Fashion*.   The curricula will be designed as complete frameworks to fulfil the learning criteria for initial and continuous training in VET Providers and Higher Education institutions. Curricula will address urgent skills needs in occupations in an industrial ecosystem resulting from the Covid-19 pandemic and the digital and green transition. In addition, the project proposes an EQF multilevel approach, including EQF levels from 3/4 to 7. For Circular economy, 1 curriculum is for HE (EQF 6/7), 1 curriculum is for EQF 4/5 (medium) and 1 curriculum is for EQF 3/4 (lower). Same distribution for Digital fashion. Through this multilevel approach, the EQF descriptors will be analysed so that the provision of knowledge and skills is delivered gradually, from the intermediate to the advanced level. Based on the new curricula frameworks, several short training programs/ modules will be defined to respond to the upskilling and reskilling needs identified in task T4.1. The curricula and training programmes are structured on units of learning outcomes, in line with the European Qualifications Framework (EQF) / National Qualifications Frameworks (NQFs) and informed by ESCO. Also, the curricula will deliver job-specific skills and key competencies, notably transversal skills and STEAM disciplines. Apart from just a collection of Knowledge, Skills and Attitudes, the new curricula integrate work-based learning into the new training content, including opportunities to apply knowledge in practical "real-life" workplace situations and embed international learning experiences. The new curricula will be designed based on common, sectoral definitions of learning outcomes, standards and key micro-credential principles to help widen learning opportunities and strengthen the role of HE and VET institutions in lifelong learning by providing more flexible and modular learning opportunities. Thus, the project proposal explores the concept and use of micro-credentials, contributing to the Council of the EU recommendations regarding implementing micro-credentials (released in June 2022).

T4.4   Update Skills4Smart TCLF 2030 curricula.   Based on the mapping performed in WP3, the partners return to the 8 curricula developed in the Skills4Smart TCLF project to see if these 8 occupations have been touched - and how - by the updates that emerged in the research done. If the occupations involved in the innovation processes studied are among the 8 from the S4TCLF, they will be accordingly updated in this task. In relation to the MOOCs designed and developed in S4TCLF project, and related to the updated curricula, a document will be developed that highlights the changes in progress or refers to other contents or insights interesting for learners.

T4.5   Create optional strands (optional training paths).   Promoting lifelong learning and professional development in the TCLF sector is a priority. In this task, a *scanning skills balance* will be created that will allow each participant to create their own training itinerary. The skills questionnaire will include different training paths with Circular Economy for Fashion Industry and Digital Fashion as a common core. These modular and flexible pathways for EQF levels 3/4 to 7 will respect the principles of transparency and comparability of qualifications, in order to make it possible to compare qualifications in different countries. The scanning skills balance will record the participants' initial knowledge level and the interests expressed at the level of knowledge they expect to achieve. The scanning skills balance tool can be used by a wide range of participants as it comprises modular training for levels 3/4 to 7. The tool records the starting knowledge and allows the participant to compare the initial competencies with the selection of modules undertaken. After the completion of the questionnaire, the participant will receive the Individual Competence Plan with the training path to be followed.

T4.6.   First validation of the curricula against industry's training needs on circular economy and digital skills. The first version of the curricula will be released within the 1st year

project to be validated by stakeholders (T4.6) against the identified needs in WP3. 12 interviews (2 interviews x 6 curricula) per country will be organised with relevant stakeholders from HE, VET providers and companies outside of the consortium. After that, the second version of the curricula will be released as the starting point for WP5. After releasing the contents in WP5, the curricula will follow a second validation step with relevant stakeholders in the sector, this time against the developed content and digital supported tools in WP5 (T5.8). The final validation of the curricula is planned after the implementation of piloting in WP8 (T8.3).

DELIVERABLES AND MILESTONES

D4.1   Upskilling and Reskilling Mapping (lead partner CTCP) - Online tool to support TCLF companies and individuals to identify the right mix of professional competencies all over TCLF value chains

- *Milestone MS13 -Test the online tool for Upskilling and Reskilling Mapping (CTCP). Postponed in order to be integrated into Fashion Campus. For the purpose of submitting the deliverable D4.1, a data base was compiled as basis for the online tool.*

D4.2   Curricula for courses focused on CIRCULAR ECONOMY and DIGITAL FASHION (lead partner TUIASI) contains 6 new modular curricula on Circular Economy for Fashion Industry and Digital Fashion, distributed as: 2 for HE, 2 for EQF 4/5 (medium), 2 for EQF 3/4 (lower). Each curriculum comprises a set of modular training courses allowing students/workers to create their own training path. Generally, curricula are transversal but a specific focus on the subsectors will be done. Also, curricula refer to one or more occupations (profiles), because they work horizontally.

- *Milestone MS3 (lead partner UdL): Release the standards for micro-credentials and curricula/training modules*
- *Milestone MS14 (lead partner AVECAL): First validation of the curricula - Each partner/country will invite relevant stakeholders from academia, VET, research and the business communities to give proactive responses throughout out a validation process based on interviews.*

D4.3   Revision of Skills4Smart TCLF 2030 curricula (lead partner POLICAZ)   - 1 report that highlights the changes in the S4TCLF curricula in relation to the newly identified skills on circular economy and digitalisation of the fashion industry

D4.4.   Scanning skills balance for optional training paths (lead partner CITEVE)- Online tool based on a questionnaire that allows the participant to receive the Individual Competence Plan with the training path to be followed.

- *Milestone MS15 (lead partner CITEVE) Test the online scanning skills balance for optional training paths*

ROLE OF PARTNERS

To design a European sector-wide agreed 'core' curricula and training programmes the METASKILLS4TCLF consortium included the following partners: VET providers, research and technological centres, HE providers/universities, associations, policy representatives and national authority for recognition and certification. The role of the partners in developing the METSKILLS curricula is distributed among developer partners, internal validation and supervisor partners, as well as other contributing roles.

Curricula and content developer partners	Internal validation/ Content Supervisors/Proof-readers partners	Other roles- Facilitators/contributors
1. CENTRO TECNOLOGICO DO CALÇADO DE PORTUGAL (CTCP) 5. POLITECNICO CALZATURIERO SCARL (POLICALZ) 6. PIN SOC.CONS. A R.L. - SERVIZI DIDATTICI E SCIENTIFICI PER L UNIVERSITA DI FIRENZE (PIN SCRL) 7. CENTRO TECNOLOGICO DAS INDÚSTRIAS TEXTIL E DO VESTUARIO DE PORTUGAL (CITEVE) 10. UNIVERSIDAD DE LLEIDA (UNIV. DE LLEIDA) 12. UNIVERSITATEA TEHNICA GHEORGHE ASACHI DIN IASI (TUIASI) 14. PRUF-UND FORSCHUNGSINSTITUT PIRMASENS EV (PFI) 15. FILK FREIBERG INSTITUTE GGMBH (FILK) 18. INSTITUT TEXTILE ET CHIMIQUE DE LYON (ITECH) 21. SIEC BADAWCZA LUKASIEWICZ - LODZKI INSTYTUT TECHNOLOGICZNY (LIT)	2. CONFEDERATION EUROPEENNE DE L'INDUSTRIE DE LA CHAUSSURE ASBL (CEC) 3. CONFEDERATION DES ASSOCIATIONS NATIONALES DE TANNEURS ET DE MEGISSIERSDE LA COMMUNAUTE EUROPEENNE (COTANCE), 4. EUROPEAN APPAREL AND TEXTILE CONFEDERATION AISBL (EURATEX) 8. SPIN 360 SRL (SPIN 360 SRL) 9. ASOCIACIÓN VALENCIANA DE EMPRESARIOS DEL CALZADO	1.1. ASSOC PORT INDUSTRIAIS CALÇADO COMPONENTES ARTIGOS PELE E SEUS SUCEDÂNEOS (APICCAPS) 6.1. UNIVERSITA DEGLI STUDI DI FIRENZE (UNIFI) 7.1. ASSOCIACAO TEXTIL E VESTUARIO DE PORTUGAL (ATP) 10.1. ASSOCIACIO LEATHER CLUSTER BARCELONA 11. CONSELLERÍA DE EDUCACIÓN, CULTURA Y DEPORTE (CIDA) 13. CENTRUL NATIONAL DE DEZVOLTARE A INVATAMANTULUI PROFESIONAL SI TEHNIC (CNDIPT) 16. HELLENIC CLOTHING INDUSTRY ASSOCIATION (HCIA) 17. CONFINDUSTRIA MODA - FEDERAZIONE ITALIANA MODA TESSILE E ACCESSORIO (CONFIDUSTRIA) 19. BORAS KOMMUN (BORAS STAD) 20. UKRAINIAN ASSOCIATION OF LIGHT INDUSTRY ENTERPRISES (UKRLEGPROM)

1. Overview on the micro-credentials in METASKILLS4TCLF partner countries

The European Centre for the Development of Vocational Training (CEDEFOP) has gathered data from a range of sources, including primarily European vocational education and training (VET) providers, national authorities, employee and employer organizations, as well as through in-depth country case studies, interviews, and its ReferNet network. The findings indicate that micro-credentials have only recently gained significant attention in policy discussions across Europe, despite the long-standing presence of short courses and certifications that support labour market-oriented education and training.

Table 1. Perceptions of micro-credentials in the ten project partner countries[3]

Country	Defining micro-credentials in national contexts of project partner countries
France	Questions and misunderstandings exist about micro-credentials. Part of the problem is the French translation of micro-credentials into 'micro-qualification' (micro-certifications in French), but also the lack of a common and shared definition around it. Introducing micro-credentials into a particularly complex, highly structured and evolving qualifications framework is confusing for the various stakeholders. For example, the term 'micro' could either refer to the duration of the training or to the fact that micro-credentials are a component of a qualification. In France, there are no official documents that address the issue of their development and recognition within the education system: no description of micro-credentials exists in the French legal framework. It is left to international or private sources such as training organisations to specify the description. Often, micro-credentials are regarded as being like open badges. Etymologically, in this case, we would rather use the terms "micro-justificatives" or "micro-certificates". Finally, the term micro-certification can be considered as part of a qualification broken down into micro blocks, but the use of the term certification may be problematic. Given the misunderstandings that have surrounded the introduction of micro-credentials, experts have recently attempted to specify their scope. AFDET (Association Française pour le Développement de l'Enseignement Technique) proposes a definition of micro-credentials, translated into French as micro-certifications: 'Each micro-certification is designed to be displayed as soon as 'mastery of a specific skill' is achieved. They can be awarded, for example, by a training organisation following participation in a training course'(Kastler, 2021).
Germany	Micro-credentials are considered as very short learning units and supplemental training that leads to a certificate in the unregulated (private) VET sector, attesting learning outcomes. Similarities between micro-credentials and certified courses for additional training or partial vocational qualifications in the regulated sector were also identified. The latter are embedded in the national VET system and lead to nationally recognised qualifications for a profession.

Greece	No policy developments have yet taken place on including micro-credentials into the national qualifications system. The concept of micro-credentials has, however, been incrementally discussed among education and labour market experts as well as policy-makers. In Greece, micro-credentials, while not formally recognised and included in the national qualification system, have been endorsed in continuing professional development as a strategy for upskilling and reskilling. The Labour Ministry and the Manpower Organisation (OAED) provide Employment and vocational training fund (LAEK) programmes to enterprises, which organise training for their employees using subsidy funding from the OAED. Micro-credentials are also offered by lifelong learning centres and vocational education and training institutions as well as enterprise learning centres and trade unions learning centres. However, these are not recognised as part of the formal qualifications system.
Italy	There are micro-qualifications at regional level, including individual units of competence that can be separately certified and included within regional repositories and in the National Repository. Micro-qualification can be used in continuing training for workers, adult upskilling and reskilling, secondary education and adult education. In higher education, there are nano degrees, open and digital badge. In the Italian VET sector, micro-qualifications (single units of one or more competences) are widespread and can be referenced to the NQF/EQF. They are regulated by legislative Decree No 13 of 16 January 2013, which established the National System for the Certification of Competences (NSCC). Micro-qualifications represent short-term pathways.
Poland	The term micro-credentials is relatively new in Poland, and its meaning is somewhat vague, mainly due to the variety of their forms and the lack of a commonly shared definition. The term has been already translated into Polish (mikro-poświadczenia), but it is rarely used. The concept refers to a range of documents – or to even more broadly defined means of recording and representing an individual's skills – which serve to prove that the holder possesses specific skills. Alternative credentials, open badges, digital badges, are gaining importance as effective professional development tools and essential elements of life-long learning. Micro-credentials are better known in higher education, where they are associated with MOOCs. Digital badges are more often used in the private sector. Some market qualifications (11) are small enough to be considered micro-credentials (Stęchły and Nowakowski, 2021).
Portugal	Micro-credentials are used in Portugal within the context of the national qualifications system (SNQ). Two training offers correspond to the definition of micro-credentials. The first, training units of short duration (Unidades de Formação de Curta Duração, UFCD), are included in the national catalogue of qualifications (Catalogo Nacional de Qualificações, CNQ). Each UFCD corresponds to a competence unit (UC) and represents a structured set of learning objectives with a pedagogical sequence. The second type comprises, short-duration training that is not included in the CNQ. Such training can be smaller in workload than UFCDs and may be developed/designed in a different way from the CNQ approach. Nevertheless, such training is in high demand by companies (especially SMEs) and is provided by vocational training centres in response to labour market needs.[4]
Romania	Micro-credentials are not common in Romania and are mostly discussed within the context of CVET and higher education. The closest example in Romania to the concept of micro-credentials is the recognition/validation of competences achieved in non-formal/informal settings, which is carried out through the National Authority for Qualifications.
Spain	There is an overall agreement that micro-credentials certify the learning outcomes acquired following a short learning experience. The organic law on VET, approved in March 2022, describes micro-credentials as a proof of the learning outcomes a

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[4] *https://www.ua.pt/pt/microcredenciais*

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	learner has acquired following a short learning experience. Learning outcomes refer to concrete skills; they will be defined in the forthcoming national Catalogue of Vocational Competence Standards (Catálogo Nacional de Estándares de Competencias Profesionales) which will replace the existing Qualifications Catalogue (Catálogo de Cualificaciones). Micro-training will be related to competence standards, a smaller reference than the current qualifications. Micro-credentials will initially lead to a non-formal vocational certificate. Subsequently, learners can acquire a VET diploma through further accumulation of micro-credentials. As a result, micro-credentials are understood as an element or part of formal VET studies. The law also states that all training will be accreditable, accumulated and stackable. Depending on whether the training addresses one competence standard, various training modules, or a complete training cycle, they will range from micro-training to vocational training qualifications. All training should be embedded into training pathways leading to accreditation, certification and qualifications acknowledged in Spain and the EU. A Royal Decree, approved in September 2021, states that universities can deliver training of less than 15 ECTS that may require a previous university degree, in the form of micro-credentials or micro-modules. Thus, universities are able to provide certified learning results linked to short-term training activities. These courses are part of lifelong learning and have the purpose of updating or training in new skills or knowledge but are not part of a diploma. They are open to graduate or undergraduate students of all ages. In contrast to the definition proposed by the Ministry of Education, micro-credentials are not defined as part of graduate studies and will not contribute towards a graduate diploma. According to the Public Employment Service (SEPE) and the National Foundation for Training for Employment (FUNDAE), micro-credentials are also envisaged to certify achieved learning outcomes through a short learning experience. In the future, learning outcomes could be associated with the skills defined in the Catalogue of Training Specialities (Catálogo de Especialidades Formativas) managed by SEPE, following non-formal training. Micro-credentials are thus understood as proof of an employee's skills that have value in the labour market.
Sweeden	In the Swedish higher education, freestanding courses are micro-credentials, but this does not exclude that other types of micro-credentials also exist. Thus, there is a need for the higher education institutions to be very clear and inform about the added value for the individual that exists with the micro-credentials that the universities and university colleges offer, which are credit-bearing courses in higher education. What distinguishes the higher education institutions' courses from other micro-credentials is that they can be said to be "högskolemässiga", that is, they are research-based and quality-assured according to accepted academic principles and values that are codified in the Swedish framework for higher education. They are subject to a common set of regulations and supervision as well as established practices and agreements especially for higher education. Short qualifications, in the form of modules, are well established in the Swedish formal education system. Each module covers around 4% of a formal upper secondary VET diploma. These modules can be accumulated into a VET diploma. Other forms of short qualification (i.e. micro-credentials) are courses/programmes in liberal adult education, short higher vocational education (HVE) courses, and courses offered in the private sector. In addition, formal education providers can offer short VET courses/programmes on demand (tailored to the needs of the client). However, such short courses do not lead to formal qualifications.[5]

[5] *Association of Swedish Higher Education Institutions (SUHF) General Assembly of 20 March 2024, Guideline on micro-credentials, https://suhf.se/app/uploads/2024/03/SUHF-Guideline-on-Micro-Credentials-EN-240328.pdf*

Ukraine	Micro-credentials are implemented as an integral part of the National Qualifications System to provide formal recognition of specific skills, abilities, and competencies that can be acquired through short-term learning. At the current stage in Ukraine, the National Qualifications System covers only full and partial qualifications, which can be academic and professional. [6]

2. Standards elements to describe a micro-credential

Based on EU recommendations on micro-credentials, common standards were designed to be followed by all partners in the curricula design process. As highlighted in the literature, critical information elements of a micro-credential play a key role in ensuring that end users—such as learners, employers, and educational institutions—comprehend the implications and significance of micro-credentials (Cedefop, 2022).[7] The standard elements to describe micro-credentials vary within and outside formal education and training systems. The most common elements are:

- Title of the micro-credential;
- Learning outcomes;
- National workload needed to achieve the learning outcomes;
- Level and cycle of the learning experience leading to the micro-credential (EQF, QF, EHEA);
- Type of assessment;
- Form of participation in the learning activity;
- Type of quality assurance used to underpin the micro-credential

To these elements that any standard must contain, the following mandatory ones are added:

- Stakeholders and end users;
- Country/region of the issuer;
- Awarding body;
- Date of issuing;

2.1. Title of the micro-credential

The title of a micro-credential is a concise description that reflects the content and focus of the learning experience. It should communicate the specific skill or knowledge area that the credential represents. A well-crafted title is essential for providing immediate insight into the nature of the learning outcomes it describes. For instance, the European Commission's "EU Academy" offers a micro-credential titled "Introduction to Artificial Intelligence for Public Service Interoperability" (EU Academy, 2024)[8]. This title directly communicates the subject matter (Artificial Intelligence) and its intended audience (Public Service), making identifying the course's relevance easy.

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[6] *Semigina T., Rashkevych Y., Reznik H., Stepankova N., 2024, National Framework for Micro-Credentials Launching in Ukraine, https://ikpt.uipa.edu.ua/wp-content/uploads/2024/07/Ukraine_EN_National_Framework_Micro-Credentials.pdf*
[7] *Cedefop (2022). Microcredentials for labour market education and training: first look at mapping microcredentials in European labour-market-related education, training and learning: take-up, characteristics and functions. Luxembourg: Publications Office. Cedefop research paper, No 87. http://data.europa.eu/doi/10.2801/351271*
[8] *EU Academy (2024). Introduction to Artificial Intelligence for Public Service Interoperability . https://academy.europa.eu/courses/introduction-to-artificial-intelligence-for-public-service-interoperability*

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2.2. Learning outcomes

Learning outcomes are the specific skills, knowledge, and competencies a learner is expected to acquire upon completing a micro-credential. They should be measurable, achievable, and relevant to the credential's purpose. Linking micro-credentials to clearly defined learning outcomes can support their integration into qualifications frameworks and affirm their strong relationship to the appropriate occupational profiles and qualifications (Cedefop, 2023).[9]

The ESCO portal is a valuable tool for identifying knowledge/skills and adapting them to a new course (ESCO, 2024).[10]

In Spain, current draft regulations in the VET and higher education sectors view micro-credentials as evidence of specific learning outcomes, defined as concrete skills within the forthcoming national Catalogue of Vocational Competence Standards, which will provide a more targeted reference than the broader Qualifications Catalogue (Cedefop, 2022). [11]

In Germany, the focus on learning outcomes has been a foundational element in IVET and CVET. Micro-credentials represent concise qualifications completed in less than a year, resulting in certificates that serve various functions, such as enhancing employability or accumulating credentials (Haseloff, 2023).[12]

2.3. National workload needed to achieve the learning outcomes

The national workload, often expressed in European Credit Transfer and Accumulation System (ECTS) credits, quantifies the time and effort required to achieve the learning outcomes. The duration of learning experiences leading to micro-credentials varies considerably, depending on the provider and the intended purpose. Additionally, self-paced platforms such as Udacity, Coursera, and EdX further enhance flexibility by allowing learners to progress according to their availability (Cedefop, 2022).[13]

For instance, in Spain, the term micro-credential can refer to short-duration learning experiences outside the formal VET system. The State Public Employment Service (SEPE) offers over 4000 training specialities ranging from 3 to 1110 hours, typically resulting in diplomas or certificates of attendance (González Gago, 2023). [14]

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[9] Cedefop (2023). *Microcredentials for labour market education and training: microcredentials and evolving qualifications systems. Luxembourg: Publications Office. Cedefop research paper, No 89.* http://data.europa.eu/doi/10.2801/566352
[10] ESCO (2024). *Skills and competencies.* https://esco.ec.europa.eu/en/classification/skill_main
[11] Cedefop (2022). *Microcredentials for labour market education and training: first look at mapping microcredentials in European labour-market-related education, training and learning: take-up, characteristics and functions. Luxembourg: Publications Office. Cedefop research paper, No 87.* http://data.europa.eu/doi/10.2801/351271
[12] Haseloff, Gesine (2023). *Case study Germany: Microcredentials for labour market education and training. First look at mapping microcredentials in European labour-market-related education, training and learning: take-up, characteristics and functions. Thessaloniki: Cedefop.* https://www.cedefop.europa.eu/files/germany_microcredentials_mapping.pdf
[13] Cedefop (2022). *Microcredentials for labour market education and training: first look at mapping microcredentials in European labour-market-related education, training and learning: take-up, characteristics and functions. Luxembourg: Publications Office. Cedefop research paper, No 87.* http://data.europa.eu/doi/10.2801/351271
[14] González Gago, Elvira (2023). *Case study Spain: Microcredentials for labour market education and training. First look at mapping microcredentials in European labour-market-related education, training and learning: take-up, characteristics and functions. Thessaloniki: Cedefop.* https://www.cedefop.europa.eu/files/spain_microcredentials_mapping.pdf

According to Cedefop (2023), in France, OpenClassrooms, a private online learning provider, offers short courses averaging 5 to 15 hours and modular programs leading to occupational certificates, ranging from 6 to 12 months. In Norway, modular industry programs utilise micro-topics (mikroemner) and micro-credentials (minikvalifikasjoner, which translates to mini-qualifications) as a structured approach to enhancing competency development within specific industries. These programs are designed to be highly flexible, offering courses and short-term modules that can carry as 2.5 ECTS credits, thereby allowing for targeted skill acquisition and credentialing in a modular format.[15]

Generally, a micro-credential can have several assigned/estimated ECTS that vary in different countries, and the number of ECTS credits varies from 1 to more than 100 (European Commission, 2021)[16]. **One micro-credential, designed to enhance specific skills or competencies, is designated for a comprehensive training program spanning 25 hours**, ensuring focused and efficient learning outcomes tailored to meet learners' needs (Cedefop, 2023; European Commission, 2020). [17,18]

2.4. Level and cycle of the learning experience leading to the micro-credential

The level and cycle of a micro-credential refer to the complexity and depth of learning, often aligned with frameworks such as the European Qualifications Framework (EQF), Qualifications Framework (QF), and the European Higher Education Area (EHEA). These frameworks provide a reference point for comparing qualifications across different education systems. Also, aligning with these frameworks helps learners and employers understand micro-credentials complexity and their educational context, facilitating recognition and transferability across borders.

As it is highlighted by Cedefop (2023) [19], the Micro-credentials are not offered as a replacement for full qualifications but as add-ons or supplementary credentials/qualifications that complement existing competencies with updated ones. In some cases, micro-credentials are part of a traditional qualification, as in Sweden's short qualifications. A micro-credential might not be offered as part of a conventional qualification, but it can eventually lead to one through the recognition and validation of prior learning, as it is Malta's award. In addition, a micro-credential may not be part of a qualification and does not necessarily lead to one. Still, it aligns with a set of learning outcomes covered by a full qualification, such as training units of short duration or UFCD in Portugal. Finally, a micro-credential might represent an independent credential but supplement/complement and be coherent with a particular qualification regarding its scope and related learning outcomes.

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[15] *Cedefop (2023). Microcredentials for labour market education and training: microcredentials and evolving qualifications systems. Luxembourg: Publications Office. Cedefop research paper, No 89. http://data.europa.eu/doi/10.2801/566352*
[16] *European Commission (2021). Micro-credentials and Bologna Key Commitments, MICROBOL. https://ec.europa.eu/education/education-in-the-eu/european-education-area/a-european-approach-to-micro-credentials_en*
[17] *Cedefop (2023). Microcredentials for labour market education and training: microcredentials and evolving qualifications systems. Luxembourg: Publications Office. Cedefop research paper, No 89. http://data.europa.eu/doi/10.2801/566352*

[18]*European   Commission.   (2020).   Digital   Education   Action   Plan   2021-2027. https://ec.europa.eu/education/sites/default/files/document-library-docs/deap-swd-sept2020_en.pdf*

[19] *Cedefop (2023). Microcredentials for labour market education and training: microcredentials and evolving qualifications systems. Luxembourg: Publications Office. Cedefop research paper, No 89. http://data.europa.eu/doi/10.2801/566352*

2.5. Type of assessment

When assessing micro-credentials, the goal is to ensure that learners have achieved the necessary competencies in the desired study. Various types of assessments can be used for micro-credentials, depending on the course quality and each serving different purposes based on the learning outcomes and skills being measured. Most assessments are performed by the organisation holding the micro-credentials, however, it is not uncommon for independent assessors to be called upon[20].

Common forms of assessment include quizzes and short tests, which are administered throughout the course to evaluate real-time understanding, providing immediate feedback to learners. Additionally, practical activities allow learners to apply new knowledge in controlled environments, helping them monitor their own progress. Peer reviews, where participants assess each other's work, promote collaborative learning and reflective practices. Summative assessments, such as final exams, measure learners' overall mastery at the conclusion of the program. Similarly, projects and portfolios offer a comprehensive synthesis of the knowledge and skills developed during the course.

Competency-based assessments often require learners to demonstrate specific skills or complete tasks in simulated or real-world environments by the end of the micro-credential program. Practical assessments, which include hands-on activities such as lab work or simulations, test the learners' ability to perform job-related tasks. Self-assessments and reflections can also prove valuable as learners critically evaluate their own progress and understanding.

Other notable assessment methods include peer and collaborative evaluations, where learners complete group projects, with their contributions assessed by both peers and instructors according to established criteria. Digital assessments and badging are increasingly popular, particularly for remote learning, allowing assessments to be conducted online. These assessments may include coding tests or automated essay grading, which provide instant feedback. Digital badges serve as verifiable credentials that can be showcased on platforms such as LinkedIn, signifying the successful completion of a micro-credential.

In conclusion, micro-credential assessments should align closely with the specific skills and competencies the credential aims to impart. Given that many learners pursue micro-credentials while employed, the assessments should be flexible and accessible. Emphasizing practical, real-world applications and timely feedback, these assessments differ from traditional academic evaluations, focusing more on skill-based and professional development.

2.6. Form of participation in the learning activity

Participation in learning activities for a micro-credential can take various forms, reflecting the flexibility and accessibility of these programs. Micro-credential frameworks in countries promoted by the European Commission and various educational institutions, are designed to meet diverse learner needs, and therefore offer a variety of ways to engage in learning. Common forms of participation in micro-credential learning activities across Europe are online learning, blended

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[20] *Cedefop (2022). Microcredentials for labour market education and training: first look at mapping microcredentials in European labour-market-related education, training and learning: take-up, characteristics and functions. Luxembourg: Publications Office. Cedefop research paper, No 87. http://data.europa.eu/doi/10.2801/351271*

learning (hybrid), in-person learning, workplace-based learning, peer-to-peer learning and collaboration, competency-based participation, interactive and gamified learning, assessment and feedback-oriented participation, recognition of prior learning (RPL) and open learning[21].

Online learning offers self-paced flexibility, allowing learners to study materials and complete tasks at their own speed—an attractive option for working professionals. This mode may include live classes via video conferencing (e.g., Zoom, Microsoft Teams), webinars, and virtual workshops. Discussion forums and online communities also facilitate interaction between peers and instructors through platforms like Moodle and Canvas.

Blended learning combines online and face-to-face experiences, providing flexibility while still enabling hands-on engagement through workshops, labs, or seminars. On the other hand, traditional in-person learning features classroom lectures, fieldwork, and practical labs, offering a physical, immersive learning environment.

Workplace-based learning, or on-the-job training, involves practical experience in a professional setting. Learners apply new skills directly in the workplace, often under the guidance of mentors. This approach is common for industry-specific micro-credentials, such as those related to vocational education and training (VET).

Peer-to-peer learning involves collaborative assignments where learners work together, benefiting from one another's insights. This may include peer assessments or even co-creation of study materials. Competency-based learning focuses on mastery of specific tasks, such as coding challenges or problem-solving exercises.

Interactive methods, including simulations, role-playing, and gamified learning, are gaining traction, particularly in fields like healthcare and engineering. Technologies such as virtual reality (VR) and augmented reality (AR) are also being adopted for more immersive learning experiences.

Recognition of prior learning (RPL) allows learners to earn micro-credentials by submitting evidence of previously acquired skills, such as portfolios or professional experience.

Many micro-credential programs are designed with flexibility in mind, catering to a diverse range of learners, including those already employed. This inclusive approach accommodates various learning styles and career goals, creating practical, accessible, and innovative learning opportunities.

2.7. Type of quality assurance used to underpin the micro-credential

The Quality Assurance (QA) process is critical in ensuring the integrity and value of micro-credentials, which are concise, targeted certifications. This process involves rigorous assessment to ascertain that these micro-credentials adhere to high educational and professional standards, upholding their credibility and gaining widespread acceptance. An important facet of QA is the accreditation of micro-credentials by academic institutions or professional bodies, aligning these credentials with recognised standards. Moreover, integrating micro-credentials into national and international qualification frameworks, such as the European Qualifications Framework (EQF)

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[21] *A European approach to micro-credentials. (n.d.). European Education Area. https://education.ec.europa.eu/education-levels/higher-education/micro-credentials*

and the European Credit Transfer and Accumulation System (ECTS), is essential to comply with established educational benchmarks.

Endorsements from industry and employers are also pivotal in validating that the skills imparted through micro-credentials are pertinent to current market demands. With the increasing use of AI tools, data-driven QA leveraging learning analytics to monitor learner engagement, performance, and completion rates is growing in prevalence. This data aids in identifying trends and areas for improvement, guaranteeing that the micro-credentials remain effective and attuned to learners' needs.

Quality assurance processes also encompass external validation, including peer reviews and independent national or international quality agency evaluations. Providers often utilise learner feedback, continuous improvement cycles, and digital credentialing standards (such as verifiable digital badges) to maintain and enhance the quality of their programs. These mechanisms ensure that micro-credentials are transparent, transferable, and valuable to learners, employers, and educational institutions.[22] The combination of accreditation, industry endorsement, rigorous assessments, and learner feedback creates a robust system to maintain the integrity and value of micro-credentials in Europe and globally.

3. Methodology for developing curricula for courses focused on Circular Economy and Digital Fashion

The methodology for developing the curriculum, based on a modular structure of micro-credentials, started from the recommendations of the documents developed by European organisations. European organizations, authority bodies, and regulatory bodies that have recently published reports or guidelines on micro-credentials in higher education and vocational education and training (VET):

Organisation/ Authority Body	Report/Guiding document	Short description
European Commission	*European Approach to Micro-Credentials for Lifelong Learning and Employability* (2021)	This report intends to give a common understanding of micro-credentials all across Europe. Also it creates a basis for ensuring that micro-credentials are recognised across different sectors and countries within the EU, particularly in higher education and VET.
European Association for Quality Assurance in Higher Education (ENQA)	*Micro-Credentials and Quality Assurance* (2023)	ENQA explores the role of quality assurance in the development and implementation of micro-credentials within higher education institutions across Europe.

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[22] *ENQA. (2024, February 6). Working group report: quality assurance of micro-credentials • ENQA. https://www.enqa.eu/publications/QA-of-micro-credentials/*

European Centre for the Development of Vocational Training (Cedefop)	*Micro-Credentials for Labour Market Education and Training* (2023)	This report emphasizes their prospective for UPSKILLING and RESKILLING in the labour market. It offers an analysis of how micro-credentials are being used within the framework of Vocational Education and Training (VET) in Europe.
European University Association (EUA)	*Micro-Credentials in European Higher Education* (2022)	The EUA report discusses the implementation of micro-credentials in Higher Education (HE), focusing on their design, recognition, and integration within existing degree structures.
European Quality Assurance Register for Higher Education (EQAR)	*Micro-Credentials and the Role of Quality Assurance* (2023)	EQAR discusses how micro-credentials can be incorporated into the existing quality assurance frameworks in higher education, ensuring their credibility and recognition.
European Training Foundation (ETF)	*Micro-Credentials in Vocational Education and Training* (2023)	The ETF's report investigates the adoption of micro-credentials in vocational education and training, particularly focusing on non-EU countries that are part of the EU's neighbourhood policies.
European Skills Agenda	*European Skills Agenda - Supporting the Green and Digital Transitions* (2020	While not solely focused on micro-credentials, this agenda by the European Commission outlines the role of micro-credentials in supporting skills development for the green and digital transitions.

The introduction of the micro-credential system is, on the one hand, demanded by the labour market, as it is a form of delivery of short courses at different EQF levels, which provide a timely and rapid solution to the problem of the shortage of skilled and highly skilled labour, especially in areas that are evolving at a very fast pace, such as digital technologies, circular economy, environmental, social and resilience issues that professionals in manufacturing industries such as textiles, clothing, leather and footwear need to address in a convincing and precise way.

The implementation of micro-credentials appears to be easier in Higher Education, considering that the whole higher education system in Europe has moved to the credit system (ECTS) following the Bologna recommendations. Broadly speaking, the system of micro-credentials seems to be similar to the system used to describe courses in science programmes at EQF levels 6-8. However, there are deeply issues to be accommodate, especially in relation with recognition, certification and validation of various certification schemes in the common space of labour market in Europe. The introduction of a similar system for VET needs to harmonise the different realities from country to country. In this respect, bodies such as the European Centre for the Development

of Vocational Training (CEDEFOP) and the European Training Foundation (ETF) are closely following this new orientation of VET and are developing guidelines and reports, analytical studies and studies to support VET providers.

In order to answer the various questions still raised by education experts on how to develop a curriculum for a micro-credential, the METASKILLS 4 TCLF consortium adopted the following methodology:

1. As a first step, presentation sessions were organised to expose partners to different variants and definitions, as well as different models for implementing micro-credentials. In the partnership there are partners who are taking steps to implement this system in their organisations (universities), but also partners who are familiarising themselves with this system. It was therefore necessary to have a common model of understanding of the concepts within the consortium in order to harmoniously apply the requirements for the development of a curriculum based on micro-credentials.
2. Partners representing professional associations, manufacturers and the labour market have defined a common approach to the requirements that a micro-credential for the textile, clothing, leather and footwear sector must meet, in particular with regard to scalability and the use of this system in different learning and training contexts, especially with regard to reskilling and upskilling.
3. The partners in education and training (universities, research and training centres, technology centres) have applied the relevant requirements for the definition of learning outcomes in close relation to the training needs of enterprises, to the existing practices in higher education and have tried to transfer these good practices to VET.
4. Micro-credentials have been defined for the two strands of the circular economy and digital fashion. For each guideline, micro-credentials covering all four sectors were defined as core micro-credentials. For each sector, specific micro-credentials have been defined to further deepen the study in the respective field. The partners proposed several variants, which required several iterations to arrive at a consistent approach, but at the same time allowed for significant differentiation in terms of EQF level according to the descriptors used.

CIRCULAR ECONOMY	DIGITAL FASHION
- Circular Economy in Fashion - a Comprehensive Overview - Carbon Footprint of the Fashion Industry - Ethical and climate reasons for supporting circular economy - New materials and equipment for circular economy - Strategies for eco-conscious branding and marketing - Innovative Materials for Circular Fashion - Design Thinking for Circular Fashion - Reducing Material Waste in Production - Social Responsibility in the Fashion Industry - Fashion products reuse and repair innovation	- Digitalisation in the Fashion Industry - Artificial Intelligence (AI) in the Fashion Industry - Virtual and Augmented Reality in the Fashion Industry - Digital Marketing and E-commerce for the Fashion Industry 3D Printing and Fashion Production - Interactive Digital Technologies in the Fashion Industry - Leadership and Management in the Fashion Industry - Process and Material Traceability in the Fashion Industry - Quality control and assurance solutions based on sensing and artificial vision - Industry 5.0 - Digital Solutions in Textile Production

• Sustainable Textile Innovation • Eco-friendly Dyeing and Finishing for the Textiles Industry/Best Available Techniques (BAT) for the Textiles Industry • Eco-Design Principles for Clothing • Sustainable Clothing Production Processes • Innovative Solutions for Leather Waste Reduction • Sustainable Leather Innovation • Eco-Design Principles for Footwear • Sustainable Footwear Production Processes	• Technological Transfer and Data Management in the Textile Industry • Digital Design and Prototyping in Clothing • Textile Wearables Technologies • Digital Solutions in Leather Production • Technological Transfer and Data Management in the Leather Industry • Digital Design and Prototyping in Footwear • Wearable Technology and Digital Customization in Footwear

5. Each micro-credential was given a code and distributed to the partners for curriculum design. A template was developed to collect the elements described in the standard for the development of micro-credentials (Chapter 2), agreed by the partners on the basis of the documentation and recommendations of the above-mentioned authoritative bodies. The template includes the following elements:

   - Aim and Description of the micro-credential
   - Prerequisites for users to start the course
   - Workload and individual study necessary. The microcredits were calculated based on the rule of 25 hours per 1 microcredit. The workload was distributet among Lectures, Exercises or/and Project work . Seminars laboratory or Practical VR experiences and Final Assessment.
   - Learning Outcomes defined as Knowledge and Skills, were designed based on the databases extracted from the ESCO portal - https://esco.ec.europa.eu/en
   - Syllabus/ content distribute by chapters and subchapters
   - Learning delivery formats as initial assessment to establish the initial level, E=-book with Augmented Reality experiences, VR scenarios and Final assessment based on test quizzes and/or project works
   - Pathways for learner gives the requirements and demand for future jobs in relation to the course's topics. This section   summarises what the learner is able to do at the end of the course.

AIM/Purpose and short description of the course	
Prerequisites for users to start the course	

	Lectures	Exercises/ Project Works	Seminar/ Laboratory Practice/VR experience	Final assessments	Total
Workload					
Individual study					
MICROCREDITS =Total hours/25					

Learning outcomes/ skills and competences	*[The Learning Outcomes are designed based on the databases extracted from the ESCO portal . The Knowledge and Skills are identified in the sector or in other sectors to be adapted to the new course – https://esco.ec.europa.eu/en]*
Syllabus	*[The micro-credential has 5- max 10 chapters, each chapter having 3-4 subchapters maximum.]*
Learning/teaching delivery formats	Incorporating innovative delivery formats can greatly enhance students' learning experience and engagement in this course. The learning and teaching delivery formats selected for this course are: • **Initial assessment**. The level of competency is established at the beginning of the course based on a test quiz/ Prerequisites for users to start the course) • **E-book** . The e-book includes all the **TOPICS** from Syllabus+ **AR -Augmented Reality exercises, Tests and Project works**) • **VR experience** - The VR courses are selected from the micro-credentials allocated to each curriculum based on a coherent scenario. • **Final assessment** - This assessment establishes the level of competency acquired after completing the Micro-credential.
Type of the Final Assessment	☐ **Project-based assessment** - Assign students a final project where they apply the knowledge acquired in this course to solve real-world fashion-related problems ☐ **Quizzes** ☐ **Presentations and demonstrations:** students prepare and deliver presentations showcasing their understanding of the theoretical concepts and the ability to communicate innovative ideas

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	☐ **Reports on laboratory work/practical exercises** ☐ **Others**... please detail….
Pathway for a Successful Learner	*[The requirements and demand for future jobs in relation to the course's topics are estimated. Based on the Skills describe in a previous section, this section summarises what the learner is able to do at the end of the course.]*

6. The mapping of micro-credentials to each EQF level was carried out in two steps, as follows

- From the EQF definitions, keywords describing the level of knowledge and competence were selected (table below).

- From the total number of micro-credentials, elements were identified on the basis of content (syllabus) to allow for a broader general approach at EQF level 4, a specialised approach at EQF level 5 and an integrative, systemic approach as provided by higher education.

	EQF 4 Level	EQF 5 Level	EQF 6 Level
Descriptors of EQF levels[23]	Knowledge: Factual and theoretical knowledge in broad contexts within a field of work or study	Knowledge: Comprehensive, specialised, factual and theoretical knowledge within a field of work or study and an awareness of the boundaries of that knowledge	Knowledge: Advanced knowledge of a field of work or study, involving a critical understanding of theories and principles
	Skills: A range of cognitive and practical skills required to generate solutions to specific problems in a field of work or study	Skills: A comprehensive range of cognitive and practical skills required to develop creative solutions to abstract problems	Skills: Advanced skills, demonstrating mastery and innovation, required to solve complex and unpredictable problems in a specialised field of work or study
Key words	• broad field and factual knowledge, • generate solution to problems in the field of work	• comprehensive and specialised knowledge, • creative solutions to abstract problems	• advanced knowledge and skills, • innovation, • solve complex and unpredictable problems

The following tables show the distribution of microcredentials on each EQF level. The detailed description of each microcredential, according to the template explained above, is presented in Annexes 1-36.

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[23] Description of the eight EQF levels, https://europass.europa.eu/en/description-eight-eqf-levels

Code	Title of the Course/Micro-credential for CIRCULAR ECONOMY	EQF 4 Level	EQF 5 Level	EQF 6 Level
CE_MC1	Circular Economy in Fashion - a Comprehensive Overview	x	x	x
CE_MC2	Carbon Footprint of the Fashion Industry			x
CE_MC3	Ethical and climate reasons for supporting circular economy		x	
CE_MC4	New materials and equipment for circular economy	x		
CE_MC5	Strategies for eco-conscious branding and marketing			x
CE_MC6	Innovative Materials for Circular Fashion		x	x
CE_MC7	Design Thinking for Circular Fashion			x
CE_MC8	Reducing Material Waste in Production	x		
CE_MC9	Social Responsibility in the Fashion Industry			x
CE_MC10	Fashion products reuse and repair innovation	x		
CE_MC11	Sustainable Textile Innovation		x	x
CE_MC12	Eco-friendly Dyeing and Finishing for the Textiles Industry/Best Available Techniques (BAT) for the Textiles Industry	x	x	
CE_MC13	Eco-Design Principles for Clothing		x	x
CE_MC14	Sustainable Clothing Production Processes	x	x	
CE_MC15	Innovative Solutions for Leather Waste Reduction	x	x	
CE_MC16	Sustainable Leather Innovation		x	x
CE_MC17	Eco-Design Principles for Footwear		x	x
CE_MC18	Sustainable Footwear Production Processes	x	x	

Code	Title of the Course/Micro-credential for DIGITAL FASHION	EQF 4 Level	EQF 5 Level	EQF 6 Level
DF_MC1	**Digitalization in the Fashion Industry- Overview**	x	x	x
DF_MC2	**Artificial Intelligence (AI) in Fashion Industry**			x
DF_MC3	**Virtual and Augmented Reality in Fashion Industry**		x	
DF_MC4	**Digital Marketing and E-commerce for Fashion Industry**		x	
DF_MC5	**3D Printing and Fashion Production**			
DF_MC6	**Interactive Digital Technologies in the Fashion Industry**	x	x	x
DF_MC7	**Leadership and Management in Fashion Industry**			x
DF_MC8	**Process and Material Traceability in Fashion Industry**	x	x	
DF_MC9	**Quality control and assurance solutions based on sensing and artificial vision**	x		
DF_MC10	**Industry 5.0**			x
DF_MC11	**Digital Solutions in Textile Production**	x	x	
DF_MC12	**Technological Transfer and Data Management in Textile Industry**			x
DF_MC13	**Digital Design and Prototyping in Clothing**		x	
DF_MC14	**Textile Wearables Technologies**			x
DF_MC15	**Digital Solutions in Leather Production**	x	x	
DF_MC16	**Technological Transfer and Data Management in Leather Industry**			x
DF_MC17	**Digital Design and Prototyping in Footwear**		x	
DF_MC18	**Wearable Technology and Digital Customization in Footwear**			x

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13   *https://www.ua.pt/pt/microcredenciais*

Annex 1. CE_MC1- Circular Economy in Fashion – a Comprehensive Overview

Developer partner	**PIN-SOC.CONS. A R.L. – SERVIZI DIDATTICI E SCIENTIFICI PER L UNIVERSITA DI FIRENZE**
AIM/Purpose and short description of the course	The course addresses the topic of the circular economy in a general sense, providing the student with the general foundations to enhance their knowledge. The lessons will provide the tools to learn about the topic of the circular economy, its origins and the glossary of circularity. Circular business models are analysed and will include concrete examples. The approach is multi-sectoral and not focused on textiles and fashion. Special attention will be put on the circularity on natural fibres and materials coming from agriculture and their biodegradability. By incorporating innovative delivery formats, the course will provide students with dynamic and engaging learning experiences in the Metaskills4TCLF METAVERSE environment that leverages cutting-edge technologies and pedagogical approaches.
Prerequisites for users	The course introduces the topic of circular economy and is to be considered the starting point for enhancing one's knowledge in this area of action.

Workload	Lectures	Seminars	Project Works	Labora-tory Prac-tice	Course as-sessments	Total
Teaching hours	15		20	15	5	55
Individual study hours	15		15	15	0	45

Total HOURS		**100**
Number of MICROCREDITS	**Total hours/25=**	**4 ETCS**

Learning outcomes/ skills and competences	**Knowledge** Circular economy: the circular economy aims to keep synthetic materials and products in use for successive lifecycles recycling them at the end of their life cycle. In the case of natural materials, the focus is on their reuse and their ability to reintegrate the biosphere after their service life. It improves resource efficiency and helps to reduce the demand for virgin materials. **Skills/Competences** ● Analyse the life cycle of resources: evaluate the use and possible recycling of raw materials in the whole product life cycle or their biodegradability or composability. Consider applicable regulations, such as the European Commission's Circular Economy Policy Package ● Adopt ways to reduce the negative impact of consumption: apply principles, poli-cies and regulations aimed at environmental sustainability, including the use of agricultural co- and by-products, the reduction of waste, energy and water con-sumption, the reuse and recycling of products, and the engagement in the shar-ing economy.

Syllabus	1. **Circular Economy definitions** • Evolution of the circular economy concept • Terms and definitions • Life-cycle thinking 2. **Principles and Concepts of Circular Economy** • Use fewer primary resources • Use regenerating resources, favour the use of by-products • Efficient use of resources • Circular practices: recycling and upcycling, biodegradability/ compostability 3. **Circular Economy Models: Cradle-to-Cradle, Sharing Economy, etc.** • Cradle-to-Cradle Approach • Industrial symbiosis, intra-sector, cross-sector • Collaborative economy 4. **Circular transition in Europe: Challenges and Opportunities** • European Green Deal • EU Circular Economy Action Plan 2020 • European Strategy for sustainable and circular textiles 5. **Economic, Environmental, and Social Benefits of Circular Economy** • Circular Economy and SDGs • The social dimension of the circular economy • Circular business models in textile & leather
Learning/teaching de-livery formats	Incorporating innovative delivery formats can greatly enhance students' learning experience and engagement in this course. The learning and teaching delivery formats selected for this course are: • **Initial assessment** • **E-book** • **Case studies in AI-Driven Fashion Design** • **VR experience** • **VR exercises** • **Final assessment**
Type of Final Assessment	✓ **Project-based assessment** – Assign students a final project where they apply the knowledge acquired in this course to solve real-world fashion-related problems ✓ **Quizzes** ✓ **Presentations and demonstrations:** students prepare and deliver presentations showcasing their understanding of the theoretical concepts and the ability to communicate innovative ideas ✓ **Reports on laboratory work/practical exercises** ✓ **Others**
Pathway for a Success-ful Learner	**Estimation of the job/occupation demand:** The circular economy represents the new production and design paradigm and is also at the basis of important regulatory changes, which are transforming the industry's business models in Europe and around the world. The course allows you to have a solid foundation in approaching this topic. **By the end of this course**, the student will have explored the concept of circular economy and analysed the correct terminology to be able to talk about this topic in a clear and non-opaque way. They will also have analysed circular business models and best practices, indicating useful sources for developing initiatives and projects.

Annex 2. CE_MC2 – Carbon Footprint of the Fashion Industry

Developer partner	**UDL- UNIVERSIDAD DE LLEIDA**
AIM/Purpose and short description of the course	This course aims to educate students on the environmental impacts of the fashion industry, specifically focusing on its carbon footprint. This course provides an in-depth analysis of the fashion industry's carbon footprint, examining each stage of the product lifecycle and identifying key areas of environmental impact. Students will gain a comprehensive understanding of the production processes, supply chains, and consumer behaviours that contribute to the fashion industry's carbon emissions. The course will also explore sustainable practices and innovative solutions to reduce the industry's carbon footprint, fostering a sense of responsibility and empowerment to drive positive change within the fashion sector. *Photos created by AI Image*
Prerequisites for users to start the course	To ensure a successful learning experience in the "Carbon Footprint of the Fashion Industry" course, participants should meet the following prerequisites: • Ability to analyse and interpret data, case studies, and industry reports. • Critical thinking skills to assess the environmental impact of various fashion industry practices.

Workload	Lectures	Seminars	Project Works	Laboratory Practice	Course assessments	Total
Teaching hours	15		20	15	5	55
Individual study hours	15		15	15	0	45
					Total HOURS	**100**
				Number of MICROCREDITS	**Total hours/25=**	**4 ETCS**

Learning outcomes/ skills and competences	• Describe the various stages of the fashion product lifecycle and their associated carbon footprints. • Identify the primary sources of carbon emissions within the fashion industry. • Assess the environmental impacts of different textile and leather production processes. • Evaluate the carbon footprint of various fashion supply chains.

	- Examine how consumer habits and trends contribute to the carbon footprint of the fashion industry. - Propose changes in consumer behaviour that can lead to a reduction in carbon emissions. - Identify and analyse sustainable materials and eco-friendly production techniques. - Investigate innovative solutions and technologies aimed at reducing the fashion industry's carbon footprint. - Formulate actionable strategies for implementing sustainable practices within fashion brands and businesses. - Present findings and recommendations related to the carbon footprint of the fashion industry clearly and persuasively.
Syllabus	1. **Understanding Fashion's Carbon Footprint: Scope and Impact** • Overview of the Fashion Industry and Its Environmental Impact • The Concept of Carbon Footprint in the Context of Fashion • Measuring and Reporting Carbon Emissions in Fashion 2. **Carbon Emissions Across the Fashion Supply Chain** • Greenhouse Gas Emissions from Textile and Leather Production • Assessing Emissions in Manufacturing and Transportation • Packaging and Waste Management in the Fashion Supply Chain • Metrics for the Durability of products and materials 3. **Fast Fashion and its Contribution to Carbon Emissions** • Analysing the Fast Fashion Business Model • Overproduction and Overconsumption in Fast Fashion • Social and Environmental Costs of Fast Fashion 4. **Carbon Footprint Reduction Strategies in Fashion** • Promoting Sustainable Materials and Practices • Value Chain Optimization for Lower Emissions • Adoption of Circular Economy Principles 5. **Innovation in Sustainable Fashion to Lower Carbon Footprint** • Advances in Eco-friendly Textile and Leather Technologies. • Closed-loop recycling • To zero water discharge
Learning/teaching delivery formats	Incorporating innovative delivery formats can greatly enhance students' learning experience and engagement in this course. The learning and teaching delivery formats selected for this course are: • **Initial assessment** • **E-book** • **Case studies in AI-Driven Fashion Design** • **VR experience** • **VR exercises** • **Final assessment**
Type of assessment	✓ **Online quizzes** – Regular assessments to evaluate students' understanding of the material, track their progress, and provide feedback. ✓ **Project-based assessment** – Assign students a final project where they apply the knowledge acquired in this course to solve real-world fashion-related problems. ✓ **Case studies** – present students with case studies and ask them to analyse and critique the approaches used, identifying strengths, weaknesses, opportunities, and threats. Encourage students to propose alternatives or improvements.

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Pathway for a Successful Learner	**Estimation of the job/occupation demand:** As the global focus on environmental sustainability intensifies, the demand for professionals who can drive eco-friendly practices within the fashion industry is expected to grow. Key roles include: - Sustainability Coordinators and Managers - Environmental Compliance Specialists - Sustainable Fashion Designers - Supply Chain Analysts and Managers - Corporate Social Responsibility (CSR) Specialists - Environmental Impact Assessors - Eco-Friendly Product Development Managers - Sustainable Fashion Consultants **By the end of this course,** students will have the knowledge and skills necessary to contribute to the development and implementation of sustainable practices, making them valuable assets to any fashion-related organization committed to reducing its carbon footprint.

Annex 3. CE_MC3 – Ethical and Climate Reasons for Supporting Circular Economy

Developer partner	PFI- PRUF-UND FORSCHUNGSINSTITUT PIRMASENS EV
AIM/Purpose and short description of the course	This course aims to provide students with a comprehensive understanding of the ethical and climate issues associated with the fashion industry and the importance of supporting a circular economy in order to mitigate those negative impacts. Ethically, the circular economy aims to reduce waste and conserve resources by promoting the reuse, recycling, and repurposing of products, thereby minimising environmental harm and labour exploitation. It also encourages fair labour practices and creates local jobs in the recycling and refurbishing industries. From a climate perspective, the circular economy lowers greenhouse gas emissions by extending product lifecycles and reducing the need for new production, which consumes more energy and resources. By incorporating innovative delivery formats, the course will provide students with dynamic and engaging learning experiences in the Metaskills4TCLF METAVERSE environment that leverages cutting-edge technology and pedagogical approaches. *Pictures generated with AI*
Prerequisites for users to start the course	Before delving into the ethical and climate reasons for supporting a circular economy in fashion, it's helpful—but not mandatory—for learners to have a foundation in fashion-related concepts. A general understanding of the fashion industry, including trends, consumer behaviour, and business processes, will provide valuable context for exploring the ethical and climate issues within the sector.

Workload	Lectures	Seminars	Project Works	Laboratory Practice	Course assessments	Total
Teaching hours	15		20	15	5	55
Individual study hours	15		15	15	0	45
Total HOURS						**100**
Number of MICROCREDITS					**Total hours/25=**	**4 ETCS**

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Learning outcomes/ skills and competences	Knowledge (2-3 pieces of knowledge): • Understanding of Environmental Impact: Students should gain knowledge about how traditional linear economies negatively contribute to environmental degradation, including resource depletion, waste generation, and greenhouse gas emissions. • Ethical Implications: Students should learn about the ethical issues linked to the fashion industry, such as labour exploitation, poor working conditions, and the socioeconomic and environmental/health impact on communities in developing countries. • Principles of the Circular Economy: Students should understand the principles and practices of circular economy, and how these can mitigate ethical and environmental issues. Skills/Competences (2-3 skills/competences): • Practice working with datasets and available resources and extracting meaningful insights into the ethical and environmental issues related to the fashion industry. • Ability to analyse problems critically and think creatively to develop solutions tailored to fashion-related ethical and environmental challenges. • Experiment with and exposure to advocacy and awareness in support of the circular economy
Syllabus	1. **Ethical Concerns in the Fashion Industry: Labour Rights, Fair Wages, etc**. • Overview of the fundamentals of sustainability • Historical context and evolution of social sustainability efforts • Social and economic aspects of sustainability and risks in the fashion industry (labour rights, fair wages, social justice, child labour, etc.) 2. **Climate Crisis and the Urgency for Sustainable Solutions** • Comprehending the causes of climate change • Current and projected effects of climate change on ecosystems, economies, and communities worldwide 3. **Circular Economy as a Response to Ethical and Climate Challenges** • Regulatory framework and the Green Deal • EU circular economy action plan • Ethical consumption and consumer responsibilities • Ethical resourcing – Supply chain management • Minimising waste and maximising resource efficiency • Innovation and research 4. **Environmental Justice and Equity in Circular Economy Practices** • Environmental racism and the Environmental Justice Movement • Inclusive resource management • Community Empowerment • Reduction of Environmental burdens 5. **Mobilising Support for Circular Economy: Advocacy and Awareness** • Advocacy Strategies • Public Awareness Campaigns • Stakeholder Engagement
Learning/teaching delivery formats	Incorporating innovative delivery formats can greatly enhance students' learning experience and engagement in this course. The learning and teaching delivery formats selected for this course are: • **Initial assessment** • **E-book** • **Case studies in AI-Driven Fashion Design** • **VR experience**

	• **VR exercises** • **Final assessment**
Type of assessment	✓ **Project-based assessment:** Assign students a final project where they apply the knowledge acquired in this course to solve real-world fashion-related problems ✓ **Case studies:** Present students with case studies and ask them to analyse and critique the approaches used, identifying strengths, weaknesses, opportunities, and threats. Encourage students to propose alternatives or improvements. ✓ **Presentations and demonstrations: S**tudents prepare and deliver presentations showcasing their understanding of the theoretical concepts and the ability to communicate innovative ideas ✓ **Written reports on laboratory work/practical exercises** ✓ **Written essay** ✓ **Peer assessment and feedback: S**tudents will critically evaluate their peers' work based on predefined criteria such as technical accuracy, clarity of presentation, and creativity of solutions ✓ **Formal exams and evaluations**
Pathway for a Successful Learner	Estimation of the job/occupation demand: As the demand for sustainability and circular economy approaches continues to grow, it is crucial for employees to understand the underlying reasons for such a change. By the end of this course, students will possess the knowledge and skills necessary to grasp the ethical and climate concerns linked to the fashion industry. This will empower them to drive innovation, enhance efficiency, and promote circular economy practices within the fashion sector.

Annex 4. CE_MC4 – New Materials and Equipment for Circular Economy

Developer partner	**ITECH LYON- INSTITUT TEXTILE ET CHIMIQUE DE LYON**
AIM/Purpose and short description of the course	New Material and Equipment for Circular Economy is designed to equip industry technicians with the knowledge and skills necessary to drive sustainability in the fashion sector. This comprehensive course explores the latest advancements in textiles, leather and other sustainable materials, as well as cutting-edge equipment that supports a circular economy. Participants will delve into bio-based innovations, advanced recycling processes, and material recyclability and reusability strategies. The curriculum also includes Virtual Reality (VR) Manufacturing, allowing students to visit virtual recycling manufacturing facilities and production departments. Additionally, investment opportunities in circular economy technologies will be explored. *Picture generated with AI*
Prerequisites for users to start the course	Before delving into the topic of new materials and equipment for the circular economy,, it is important to know the basics of fashion industry materials, production processes and supply chain. With this prerequisite knowledge, students can better understand the academic content of this course and carry out an efficient project.

Workload	Lectures	Seminars	Project Works	Laboratory Practice	Course assessments	Total
Teaching hours	15		20	15	5	55
Individual study hours	15		15	15	0	45
Total HOURS						**100**
Number of MICROCREDITS					Total hours/25=	**4 ETCS**

Learning outcomes/ skills and competencies	Knowledge: ● Understanding of new materials and equipment for the circular economy: Students should gain knowledge about sustainable and/or circular materials and existing recycling processes. ● Strategies for Material Recyclability and Reusability: Students should understand the strategies needed for a circular economy, including the importance of the supply chain, regulations, and marketing Skills/Competences : ● Ability to consider new materials and/or processes in the circular economy. ● Ability to analyse problems critically on circular economy strategies and to identify the challenges to achieve sustainable solutions.
Syllabus	1. **Advanced Sustainable Materials** ● Definition of Advanced Sustainable Materials ● Overview of sustainable textiles, leathers and sole materials ● Overview of alternatives materials 2. **Bio-based Innovations: Harnessing Natural Resources for Circular Solutions** ● Definition of a Circular Bio-based Material ● New bio-based textiles ● Biodegradable leathers ● Bio-based dyeing and coating for textiles and leathers 3. **Cutting-Edge Equipment for Circular Production Processes** ● Recycling processes for textiles: Automated sorting line and chemical process ● Footwear recycling process ● Innovative sewing yarn for thermal disassembling system ● Leather wastes recycling process 4. **Strategies for Material Recyclability and Reusability** ● National and European Regulations for recycling and reusing in fashion industry ● Eco-conception of materials for recyclability and reusability ● User awareness marketing ● Supply chain: collecting, sorting and materials preparation 5. **Investment Opportunities in Circular Economy Technologies and Infrastructure** ● Industrial relocation in Europe using recycled materials ● Funding opportunities from National or European programs to achieve new innovative industrial recycling structures
Learning/teaching delivery formats	Incorporating innovative delivery formats can greatly enhance students' learning experience and engagement in this course. The learning and teaching delivery formats selected for this course are: ● **Initial assessment** ● **E-book** ● **Case studies in AI-Driven Fashion Design** ● **VR experience** ● **VR exercises** ● **Final assessment**
Type of assessment	✓ **Project-based assessment** – Assign students a final project where they apply the knowledge acquired in this course to solve real-world fashion-related problems

	✓ **Case studies** – present students with case studies and ask them to analyse and critique the approaches used, identifying strengths, weaknesses, opportunities, and threats. Encourage students to propose alternatives or improvements. ✓ **Presentations and demonstrations:** students prepare and deliver presentations showcasing their understanding of the theoretical concepts and the ability to communicate innovative ideas ✓ **Written reports on laboratory work/practical exercises** ✓ **Written essay** ✓ **Peer assessment and feedback:** students will critically evaluate their peers' work based on predefined criteria such as technical accuracy, clarity of presentation, and creativity of solutions ✓ **Formal exams and evaluations**
Pathway for a Successful Learner	Estimation of the job/occupation demand: As the demand for sustainability and circular economy approaches continues to grow, it is crucial for technicians in the fashion industry to understand what sustainable and/or circular materials are and to know the existing recycling processes. By the end of this course, students will possess the knowledge and skills to identify and evaluate new materials in the context of transitioning towards sustainability and circular economy. Additionally, they will gain a deep understanding of recycling processes and strategies to reduce waste in the fashion sector.

Annex 5. CE_MC5 – Strategies for Eco-conscious Branding and Marketing

Developer partner	**PIN-SOC.CONS. A R.L. – SERVIZI DIDATTICI E SCIENTIFICI PER L UNIVERSITA DI FIRENZE**
AIM/Purpose and short description of the course	Efficient communication and marketing are essential for the world of fashion today. Companies face which encounters increasingly informed consumers exposed to an unlimited number of news and messages. They are also claiming for more a more transparent and verified information on sustainable attributes, and therefore companies must avoid the use of opaque and non-evidence-based messages that can fall into greenwashing. This course aims to equip students with the means to objectively analyse the sustainability attributes of a brand and communicate them in a careful and verified manner. By incorporating innovative delivery formats, the course will provide students with dynamic and engaging learning experiences in the Metaskills4TCLF METAVERSE environment that leverages cutting-edge technologies and pedagogical approaches. *Photo by Marianne Krohn on Unsplash*
Prerequisites for users	Before approaching responsible marketing, it is helpful for learners to have a basic knowledge of marketing and the use of social media. It is also important to be interested and understand the topic of sustainability in fashion and have a basic knowledge of the sector that will help identify cases of greenwashing.

Workload	Lectures	Seminars	Project Works	Laboratory Practice	Course assessments	Total
Teaching hours	15		20	15	5	55
Individual study hours	15		15	15	0	45
Total HOURS						**100**
Number of MICROCREDITS					**Total hours/25=**	**4 ETCS**

| Learning outcomes/ skills and competences | **Knowledge**
 ● Communication techniques to create, communicate and provide value and awareness to customers of fashion products and services, enhancing the sustainable approach to production.
 Skills/Competences
 ● Design brand guidelines: develop and implement guidelines for strategic brand handling by all stakeholders; discuss relevant content such as future expectations and brand guidelines; be prepared to face challenges.
 ● Promote sustainability contents: develop the concept of sustainability and contents through marketing and digital marketing campaigns. |

	● Support responsible consumer behaviour: understand and connect with consumers from different cultures, countries and ideologies to create their commitment to the sustainability challenge.
Syllabus	**1. Communicating Sustainability: Importance and Challenges** ● The glossary of sustainability. ● Evolution of sustainable communication. ● EU regulatory developments concerning sustainability claims and how to ensure compliance. **2. Building an Eco-Conscious Brand Identity** ● How to do an assessment of a brand's sustainability strategy. ● Defining the pillars of the sustainable approach of the brand. ● Setting a sustainable brand culture. **3. Marketing Sustainable Fashion: Storytelling and Engagement** ● The role of storytelling in Sustainable Communication. ● The use of narratives to promote and raise awareness about sustainability. ● How to build a sustainable marketing strategy based on concrete and verifiable actions. **4. Leveraging Digital Platforms for Eco-Conscious Marketing** ● How consumers using social media are informed about sustainable fashion. ● Create and edit digital content. ● Plan a digital marketing campaign. **5. Collaborations and Partnerships for Amplifying Sustainability Messages** ● The role of collaborations and partnerships . ● Information and communication: how to educate consumers on identifying more sustainable business models. ● Advocacy marketing: definition and examples.
Learning/teaching delivery formats	Incorporating innovative delivery formats can greatly enhance students' learning experience and engagement in this course. The learning and teaching delivery formats selected for this course are: ● **Initial assessment** ● **E-book** ● **Case studies in AI-Driven Fashion Design** ● **VR experience** ● **VR exercises** ● **Final assessment**
Type of Final Assessment	✓ **Project-based assessment** – Assign students a final project where they apply the knowledge acquired in this course to solve real-world fashion-related problems ✓ **Quizzes** ✓ **Presentations and demonstrations:** students prepare and deliver presentations showcasing their understanding of the theoretical concepts and the ability to communicate innovative ideas ✓ **Reports on laboratory work/practical exercises** ✓ **Others**
Pathway for a Successful Learner	**Estimation of the job/occupation demand:** Conscious and informed communication in the field of fashion is a very relevant skill for the sector, to avoid cases of greenwashing and make the brand an advocate of promoting responsible consumption models. **By the end of this course**, students will know the fundamental elements of sustainable marketing for the fashion sector, to build accurate and verifiable communication strategies, as required by recent EU and national regulations. They will also have learned the most appropriate tools to promote an informed marketing strategy, making the brand the protagonist of the promotion of responsible consumption models.

Annex 6. CE_MC6 – Innovative Materials for Circular Fashion

Developer partner	**POLICAZ-POLITECNICO CALZATURIERO SCARL**
AIM/Purpose and short description of the course	The introduction of Innovative Materials in Fashion is led by many different drivers ranging from the imperative to reduce the environmental impact of products, the necessity to improve product performance, allowing greater customization and the need to create new opportunities for businesses. With this module, students will understand the potential of including Innovative Materials in Fashion design, their impact on the final product performance and their different origins. *Source: pexels.com*
Prerequisites for users to start the course	Before starting this module, it could be helpful for students to have a general knowledge about the types of materials usually involved in the production processes of the TCLF Sectors. In particular, which are, currently, the most used materials, their origins and their impact on the environment at the end of their lifecycle.

Workload	Lectures	Seminars	Project Works	Labora-tory Prac-tice	Course as-sessments	Total
Teaching hours	15		20	15	5	55
Individual study hours	15		15	15	0	45
					Total HOURS	**100**
				Number of MICROCREDITS	**Total hours/25=**	**4 ETCS**

Learning outcomes/ skills and competences	**Knowledge:** ● The characteristics, components, advantages and limitations of a wide range of materials most commonly used in fashion production: leather, synthetics or artificial materials, textile, plastic, rubber etc.

	● Basic understanding of the design, development, processing, and application of materials for various purposes. With a focus on new materials based on their structure, properties, synthesis, and performance for a variety of purposes, including increasing the fire resistance of construction materials. **Skills/Competences:** ● Practice how to monitor the environmental impacts and carry out assessments to identify and reduce the company's environmental credentials while taking costs into account. ● Ability to take into account the management of products at their end-of-life in the designing phase. ● Ability to identify possible alternatives to most commonly used materials, exploring the performances and capabilities of bio and composite fibres.
Syllabus	1. **Exploring Recycled and Upcycled Materials** ● Definition of Recycled and Upcycled Materials and most common associated processes ● How Recycled and Upcycled Materials affect the environmental performance of Fashion companies ● Benefits and Challenges of Adopting Recycled and Upcycled Materials 2. **Bio-based Fibers and Materials: Advancements and Applications** ● Leather: the main bio-based material; types, fibres and dermal structure, tannages ● Development and examples of Bio-based Fibers and Materials ● Which are the most common Bio-based Fibers and Materials in the TCLF sectors ● How Bio-based Fibers and Materials affect the performances of the final product 3. **High-Tech Sustainable Fabrics: Performance and Environmental Impact** ● What are High-Tech Sustainable Fabrics: development and examples of application ● How High-Tech Sustainable Fabrics can impact product development and its performances ● Contribution of High-Tech sustainable fabrics in lowering the environmental impact of Fashion companies 4. **Circular Fashion Innovations in Leather and Alternative Materials** ● Environmental metrics of Fashion materials; LCA rules and limitations; the question of durability and service life of products ● Environmental impact of Leather and Textile production and their role in the Fashion Industry ● End of life of Fashion Materials: Biodegradability of Materials; Natural and renewable materials compared to synthetic materials; Recycling ● Environmental impact of Plastic, Synthetic and composite materials ● Circular Fashion; legislative trends ● Synthetic and composite Materials, their Performances, Benefits and Challenges 5. **Challenges and Opportunities in Adopting "Innovative Materials"** ● What are Innovative Materials and example of Best Practices ● Innovative Materials: Challenges and Opportunities ● How Innovative Materials can impact the Environment performances of Fashion companies
Learning/teaching delivery formats	Incorporating innovative delivery formats can greatly enhance students' learning experience and engagement in this course. The learning and teaching delivery formats selected for this course are: ● **Initial assessment**

	• **E-book** • **Case studies in AI-Driven Fashion Design** • **VR experience** • **VR exercises** • **Final assessment**
Type of Final Assessment	✓ **Project-based assessment** – Assign students a final project where they apply the knowledge acquired in this course to solve real-world fashion-related problems ✓ **Quizzes** ✓ **Presentations and demonstrations:** students prepare and deliver presentations showcasing their understanding of the theoretical concepts and the ability to communicate innovative ideas ✓ **Reports on laboratory work/practical exercises** ✓ **Others**
Pathway for a Successful Learner	**Estimation of the job/occupation demand:** New Materials are gaining importance in the fashion market, influencing the environmental performances of Fashion companies. Therefore, the knowledge of their advantages and inconveniences will be crucial and re-defining the future of Fashion production. **By the end of this course**, the students will have the knowledge and skills necessary to assess the application of the most important so-called Innovative Materials and how they impact the performance of the final product. A special focus will be dedicated to Leather, its benefits in terms of quality and environmental performance, and to a comparative assessment of the most used Alternative Materials.

Annex 7. CE_MC7- Design Thinking for Circular Fashion

Developer partner	**CTCP-CENTRO TECNOLOGICO DE CALCADO DE PORTUGAL**
AIM/Purpose and short description of the course	"Design thinking is a way of finding human needs and creating new solutions using the tools and mindsets of design practitioners." – David & Tom Kelley, 2013 "The design process engages a high degree of creativity but in a way that is controlled and directed by the process so that it is channelled towards producing a viable, practical solution to the design problem, meeting or excelling the stated aims of the brief. " – Ambrose & Harris, 2010 In the last decade, Design Thinking has established itself as a method of innovation in organizations. It has been applied to the development of new products, services and business models. Design Thinking is based on understanding the deep needs of different stakeholder profiles, shifting the focus from a process-oriented model to a people-oriented model, ensuring the quality of experience for all stakeholders. Design Thinking is a creative problem-solving methodology that places human needs at the centre of innovation. Over the past decade, it has become a key tool for developing new products, services, and business models, particularly in organizations looking to innovate sustainably. At its core, Design Thinking emphasizes empathy, collaboration, and iteration, ensuring that solutions are user-centred and relevant to the real needs of stakeholders. When applied to the circular economy in fashion, Design Thinking offers a structured approach to rethink fashion production, consumption, and end-of-life processes, promoting sustainability and waste reduction. By focusing on people and their experiences, Design Thinking helps fashion brands innovate sustainably, creating products that are ethical, durable, and environmentally responsible. *Source: https://www.nngroup.com/*

Prerequisites for users to start the course	To enrol and succeed in the course "Design Thinking for Circular Fashion," learners should ideally have the following prerequisites:
	
	Basic Knowledge of Fashion Industry
	   ▪ Understanding of fashion production, design processes, and current challenges in sustainability.
	   ▪ Familiarity with fashion trends, consumer behaviour, and materials used in garment production.

Interest in Sustainability and Circular Economy
- A basic understanding of sustainability concepts, especially in relation to fashion, and a desire to explore solutions that reduce waste, promote recycling, and enable regenerative practices.

Creativity and Open-mindedness
- A willingness to think outside the box, challenge traditional fashion models, and explore innovative, user-centred solutions.

Teamwork and Collaboration Skills
- Design Thinking often involves collaborative projects, so the ability to work effectively in teams, share ideas, and co-create solutions with others is essential.

Problem-Solving and Critical Thinking
- Comfort with identifying challenges and creating solutions, especially in complex systems like fashion, where multiple stakeholders and environmental factors are involved.

Basic Design or Product Development Knowledge (Optional but Beneficial)
- Familiarity with design tools or techniques (e.g., sketching, prototyping) can help, though the course may teach these skills as part of the process.

Workload	Lectures	Seminars	Project Works	Laboratory Practice	Course as-sessments	Total
Teaching hours	15		20	15	5	55
Individual study hours	15		15	15	0	45

Total HOURS		**100**

Number of MICROCREDITS	**Total hours/25=**	**4 ETCS**

Learning outcomes/ skills and competences	Knowledge:
	- Design Thinking Framework - Human-centred Design - Iterative Design Process - Problem-Solving in Fashion - Circular Economy Principles - Design for Disassembly - Material Selection for Circularity - Closed-Loop Systems - Co-creation Models - User Feedback Integration - Personalization and Customization - Engaging Consumers in Sustainability - Upcycling Techniques - Remanufacturing Practices - Repair and Maintenance Design - Modular Design - Lifecycle Assessment - Innovative Circular Fashion Brands - Circular Design Processes - Scaling Circular Innovation - Measuring Impact Skills/competences: - Comprehend the fundamental principles of Design Thinking, including empathy, ideation, and prototyping. - Understand the iterative process of Design Thinking and how it fosters innovation.

	▪ Apply the Design Thinking framework to identify and solve complex challenges in fashion design, with a focus on sustainability. ▪ Understand key circular design principles, such as Design for Disassembly, modularity, and recyclability. ▪ Learn how to design fashion products that are easy to disassemble, repair, and recycle at the end of their life cycle. ▪ Develop the ability to integrate circular design principles into the development of sustainable fashion products. ▪ Learn how to engage stakeholders, including consumers, in the co-creation of fashion products that align with circular economy principles. ▪ Understand user-centred design approaches and how they can improve the lifecycle and sustainability of fashion items. ▪ Apply user research and feedback to design personalized, durable, and sustainable fashion solutions. ▪ Understand various end-of-life design strategies such as upcycling, remanufacturing, and recycling. ▪ Learn how to incorporate these strategies into fashion design to reduce waste and extend the life of garments. ▪ Gain the ability to design products with end-of-life considerations from the outset, supporting a circular fashion system. ▪ Analyse real-world case studies showcasing innovative applications of circular design in the fashion industry. ▪ Identify key success factors and challenges faced by companies implementing circular design practices. ▪ Apply insights from these case studies to develop and refine your own circular fashion design projects.
Syllabus	1. **Understanding Design Thinking: Principles and Process** • What is Design Thinking?: Overview of its history, definition, and importance for innovation. • The mindset and fundamental principles of Design Thinking • Five stages of Design Thinking: Empathize, Define, Ideate, Prototype, Test. • Iterative Process • Human-Centred Innovation: Shifting from product-oriented to people-oriented solutions. • Role of Design Thinking in Fashion: Design Thinking framework to identify and solve complex challenges in fashion design, with a focus on sustainability 2. **Applying Circular Design Principles: Design for Disassembly, etc.** • Key circular design principles, such as design for disassembly, modularity, and recyclability • Introduction to Circular Design: key concepts and objectives of circular fashion. • Design for disassembly: How to create products that can be easily dismantled for reuse or recycling. • Modularity in Fashion: designing clothing that can be reconfigured or adapted for multiple uses. • Material Considerations: selecting sustainable, recyclable, or biodegradable materials. • Life Cycle Thinking: designing with the entire lifecycle of the product in mind, from creation to disposal or reuse. • Waste Minimization: strategies to reduce waste during production and use. • Observation and Interviews • Brainwriting & Idea Clustering • Rapid Prototyping & Concept Testing. 3. **Co-creation and User-Centred Design Approaches in Circular Fashion**

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	- Introduction to Co-Creation: what it means and why it's important for circular fashion. - User Research Methods: Techniques to understand consumer behaviours, needs, and sustainability preferences. - Engaging Stakeholders in Co-Creation: collaborating with consumers, suppliers, and other stakeholders to create value. - Personalization in Fashion: how customization supports sustainability by creating longer-lasting, more cherished products. - Prototyping with Users: developing solutions that align with user expectations through iterative design. - Feedback Loops: collecting and implementing user feedback to improve sustainability in fashion products. **4. Design Strategies for End-of-Life: Upcycling, Remanufacturing, etc.** - Key concepts in sustainable end-of-life strategies. - Upcycling in Fashion: creating new value by transforming old or discarded materials into new products. - Remanufacturing: refurbishing used clothing into new garments or accessories. - Recycling Materials: using recycled fabrics and materials in new fashion designs. - Product Longevity and Durability: designing for long-term use and repairability. - Circular Supply Chains: integrating end-of-life strategies into the fashion supply chain to support a closed-loop system. **5. Case Studies in Circular Design Innovation in Fashion** - Overview of companies successfully using circular design. - Success stories and lessons learnt from Circular Fashion: In-depth analysis of leading brands applying circular economy principles. - Future Trends in Circular Fashion: Emerging innovations and technologies in sustainable fashion design. - Identify key success factors and challenges faced by companies implementing circular design practices.
Learning/teaching delivery formats	Incorporating innovative delivery formats can greatly enhance students' learning experience and engagement in this course. The learning and teaching delivery formats selected for this course are: **Initial assessment** **E-book** **Case studies in AI-Driven Fashion Design** **VR experience** **VR exercises** **Final assessment**
Type of assessment	✓ **Quizzes** ✓ **Exercises** (consolidation of learning outcomes acquired) ✓ **Presentations and demonstrations**: students prepare and deliver presentations showcasing their understanding of the theoretical concepts and the ability to communicate innovative ideas ✓ **Reports** on real-life application and successful stories ✓ **Project-based** challenge (presential, to be assessed by the trainer / tutor, physically, for credits/certification) – Assign students a final project where they apply the knowledge acquired in this course to solve real-world fashion-related problems ✓ **Others** to be defined
Pathway for a Successful Learner	**The job and occupation demand** for Design Thinking in Circular Fashion is expected to continue growing as sustainability becomes central to the fashion industry's future. Roles

focused on innovation, user-centred design, and circular economy practices are increasingly seen as essential, making this a promising career path for professionals with expertise in both Design Thinking and sustainable fashion.

Governments and industries are increasingly pushing for sustainability goals, including circular economy initiatives. This creates a need for designers and strategists who can apply Design Thinking to circular fashion principles, which emphasizes recycling, reuse, and waste reduction.

As consumers become more conscious of environmental issues, they demand more sustainable and customizable fashion options. Companies are looking for professionals who can meet these demands through user-centred and circular design approaches.

Design Thinking can impact in some occupation profiles such as:

Sustainable Fashion Consultants: Professionals who advise fashion companies on integrating circular economy practices into their operations. This role requires a deep understanding of both sustainability and Design Thinking.

Product Development Managers (Circular Fashion): Leading product development with a focus on end-of-life strategies, recycling, and sustainable materials, these managers oversee the entire lifecycle of fashion products.

Innovation Managers: Professionals responsible for driving circular innovation in fashion, ensuring that new products, services, and business models align with sustainable practices.

UX and Consumer Experience Specialists: As fashion brands emphasize co-creation and personalization, demand for specialists in user experience and human-centred design is growing, particularly those focused on sustainability.

Demand is particularly high in regions with strong sustainability commitments, such as Europe (e.g., the EU Green Deal), North America, and increasingly, parts of Asia.

With more fashion companies seeking certification in sustainability, demand for professionals who understand circular design practices and can align their products with industry standards is rising.

By the end of this course, the learners will explore human-centred design methodologies to create sustainable fashion solutions. They will understand key principles like design for disassembly, upcycling, and modularity, and apply these to reduce waste and extend product life cycles. The course emphasizes user-centred innovation, co-creation, and iterative problem-solving to address environmental challenges in fashion. Additionally, learners will analyse real-world case studies of circular design in the industry and develop strategies for implementing circular economy principles in their own projects.

Annex 8. CE_MC8- Reducing Material Waste in Production

Developer partner	**POLICAZ-POLITECNICO CALZATURIERO SCARL**
AIM/ Purpose and short description of the course	The Fashion Industry is one of the main contributors to waste production at every stage of its manufacturing production processes. For this reason, the European Commission and EU national governments have started developing long-term programmes with the objective of significantly reducing the environmental impact of industrial processes. In this course, students will learn how raw materials and energy resources are allocated and used during the production processes in the fashion industry with the aim of developing the ability to identify new and innovative solutions for reducing their environmental impact. They will also deepen their knowledge of supply chain management and discover eco-friendly strategies that can be applied. *Source: pexels.com*
Prerequisites for users to start the course	Before exploring the different techniques for reducing waste production, it is helpful for learners to have a general knowledge of the various phases that make up the production processes. It is also worth having a general understanding of the resources involved in the production process and the supply chain, as well as understand the basic principles of sustainability in the fashion industry.

Workload	Lectures	Seminars	Project Works	Laboratory Practice	Course assessments	Total
Teaching hours	15		20	15	5	55
Individual study hours	15		15	15	0	45

Total HOURS		**100**
Number of MICROCREDITS	**Total hours/25=**	**4 ETCS**

| Learning outcomes/ skills and competences | **Knowledge:**
 • A fundamental understanding of the environmental impact of fashion production processes, the type of energy resources and raw materials involved and their impact on the environment.
 • An understanding of the flow of goods in the supply chain, movement and storage of raw materials, work-in-process inventory, and finished goods from point of origin to point of consumption.
 Skills/Competences:
 • Ability to investigate ideas and spot opportunities to improve the collection, process and recycling of waste materials. |

	• Ability to find solutions for applying principles, policies and regulations aimed at building up a more environmental sustainability business strategy • Acquiring basic ability to manage processes by defining, measuring, controlling and improving processes with the goal of meeting customer requirements profitably.
Syllabus	1. **Waste Generation in Fashion Production: Causes and Impacts** • The basic concept of waste generation in fashion production • Principal types and categories of waste in the TCLF sectors • Environmental impact of waste production in the fashion industry 2. **Lean Manufacturing Principles: Minimising Waste in Production** • General principles of lean manufacturing • Impact of lean manufacturing in waste production 3. **Circular Supply Chain Management Strategies** • What is a supply chain and what are its main characteristics? • Basic principles of supply chain management • Application of sustainable principles to the supply chain management 4. **Closed-Loop Systems: Recycling and Resource Recovery in Production** • Basic recycling strategies and legislation • What is a closed-loop system and what are its benefits and challenges? • How closed-loop systems impact recycling and resources recovery 5. **Implementing Zero Waste Strategies in Fashion Production** • What are the most common zero waste strategies • How zero waste strategies can impact fashion production • Best cases and examples of zero waste strategies in fashion production
Learning/teaching delivery formats	Incorporating innovative delivery formats can greatly enhance students' learning experience and engagement in this course. The learning and teaching delivery formats selected for this course are: • **Initial assessment** • **E-book** • **Case studies in AI-Driven Fashion Design** • **VR experience** • **VR exercises** • **Final assessment**
Types of Final Assessments	✓ **Project-based assessment** – Assign students a final project where they apply the knowledge acquired in this course to solve real-world fashion-related problems. ✓ **Quizzes** ✓ **Presentations and demonstrations:** students prepare and deliver presentations showcasing their understanding of the theoretical concepts and the ability to communicate innovative ideas. ✓ **Reports on best practices/project-based assessment** ✓ **Others**
Pathway for a Successful Learner	**Estimation of the job/occupation demand:** The correct understanding of the supply chain and the ability to find new environmentally friendly solutions for managing the production processes in the Fashion Industry will be fundamental for complying with the current and future legislative and market requirements in the field of sustainability and circularity. **By the end of this course**, the students will have the knowledge and skills necessary to understand the key point in which the supply chain and the production processes could be modified, to foster sustainability in companies operating in the Fashion Industry. Students will also gain general knowledge about existing practices and solutions in the field, as well as discover best practices and successful examples.

Annex 9. CE_MC9_Social Responsibility in the Fashion Industry

Developer partner	**LIT- SIEC BADAWCZA LUKASIEWICZ – LODZKI INSTYTUT TECHNOLOGICZNY**
AIM/Purpose and short description of the course	**AIM:** The aim of the course "Social responsibility in the fashion industry" is to familiarise learners with key aspects of ethical conduct and social responsibility within the fashion sector. By examining topics such as labour rights, ethical sourcing, diversity, and community empowerment, this course seeks to educate participants on the importance of ethical practices and their impact on both industry stakeholders and broader society. **DESCRIPTION:** This course delves into the critical issues surrounding social responsibility in the fashion industry. Through a series of lessons, participants will gain insights into labour rights, fair wages, ethical sourcing, diversity, and corporate social responsibility initiatives. By understanding these concepts, participants will be equipped to contribute to a more sustainable and equitable fashion ecosystem.
Prerequisites for users to start the course	1. **Basic understanding of fashion industry terminology and concepts:** Prior knowledge of terms commonly used in the fashion industry, such as "fast fashion," "sustainable fashion," "supply chain," "textile manufacturing," and "retail operations," will provide a solid foundation for engaging with the course content. Participants should have also foundational knowledge of how the fashion industry operates, including its various stages such as design, manufacturing, distribution, and retail. Understanding the complexities of the supply chain, including sourcing materials and labour, will provide a context for exploring social responsibility issues within the industry. 2. **Awareness of global issues impacting the fashion industry:** Familiarity with global issues such as labour exploitation, environmental degradation, and social inequality, particularly as they relate to the fashion industry, will help participants contextualize discussions on social responsibility and ethical practices. Participants will be acquainted with signs/labels/awards promoting products manufactured with respect for workers' rights. 3. **Interest in social and environmental issues:** A genuine interest in social and environmental issues, particularly as they intersect with the fashion industry, will motivate participants to actively engage with course materials, discussions, and activities aimed at promoting sustainable and ethical practices. 4. **Familiarity with concepts related to corporate social responsibility and ethical business practices:** Prior knowledge of concepts like sustainability, fair trade, and ethical sourcing will be beneficial. This familiarity will help participants grasp the importance of integrating social responsibility into business strategies and understand the significance of initiatives aimed at improving labour conditions and environmental impact. 5. **Access to a reliable internet connection and necessary technology to access online learning platforms, as well as multimedia resources utilized in the course:** Participants need access to a computer or mobile device with internet connectivity to access course materials, participate in online discussions, and complete assignments. Additionally, access to multimedia resources such as videos, articles, and interactive content will enhance the learning experience. 6. **Familiarity with legal rules related to the labour rights:** Participants will familiarise with official documents and regulations issued by EU as well as countries of EU. This knowledge will help them to prevent cases of violations of workers' rights.

Workload	Lectures	Seminars	Project Works	Laboratory Practice	Course assessments	Total
Teaching hours	15		20	15	5	55
Individual study hours	15		15	15	0	45
					Total HOURS	**100**
				Number of MICROCREDITS	**Total hours/25=**	**4 ETCS**

Learning outcomes/ skills and competences	LEARNING OUTCOMES CORPORATE SOCIAL RESPONSIBILITY MANAGER (CODE 1219.2) Corporate social responsibility managers monitor the practices of organisations and companies with regard to ethics and impact on the larger community. They advise on social responsibility and sustainability matters depending on the company's needs. Corporate social responsibility managers promote actions that are environmentally conscious, philanthropic or related to human rights. SKILLS AND COMPETENCES: 1. CORPORATE SOCIAL RESPONSIBILITY / IN FASHION / : The management of business processes in the fashion industry in a responsible and ethical manner, considering economic responsibility towards shareholders as equally important as responsibility towards environmental sustainability and social stakeholders. 2. ADVISE ON CORPORATE SOCIAL RESPONSIBILITY / IN FASHION / : Inform others about the social responsibility of fashion companies and organizations, and advise on matters to prolong their sustainability and ethical practices within the fashion industry. 3. DEMONSTRATE SOCIAL COMPETENCES / IN FASHION / : Ability to interact effectively with other people in the context of the fashion industry, ensuring collaboration and ethical practices. 4. PREVENT SOCIAL PROBLEMS / IN FASHION / : Prevent social problems within the fashion industry by defining and implementing actions that can enhance the quality of life for workers and communities involved in fashion production and distribution.
Syllabus	**1. Labor Rights and Fair Wages in the Fashion Supply Chain** • EU and national legislation related to labour rights. • Understanding labour rights in the fashion industry • Challenges and exploitation in fashion manufacturing • Strategies for ensuring fair wages and worker well-being **2. Ethical Sourcing Practices: Transparency and Accountability** • Importance of ethical sourcing in fashion • Enhancing supply chain transparency • Implementing accountability mechanisms in processes • Awards labelling products manufactured with respect for workers' rights **3. Diversity And Inclusion in the Fashion Industry** • Promoting diversity and inclusivity in fashion • Addressing bias and discrimination in fashion • Strategies for cultural representation and inclusivity **4. Corporate Social Responsibility Initiatives in Fashion** • Overview of corporate social responsibility in the fashion industry • Sustainable practices and environmental responsibility • Corporate social responsibility reporting, evaluation, and impact assessment **5. Empowering Communities Through Social Impact Projects and Partnerships** • Community engagement strategies in fashion

	• Implementing social impact projects in fashion • Collaborative partnerships for sustainable community empowerment **6. Sustainability** • Integrating sustainable practices in fashion design and production • Reducing environmental impact through innovative materials and technologies • Promoting circular fashion through recycling and upcycling initiatives
Learning/teaching delivery formats	Incorporating innovative delivery formats can greatly enhance students' learning experience and engagement in this course. The learning and teaching delivery formats selected for this course are: • **Initial assessment** • **E-book** • **Case studies in AI-Driven Fashion Design** • **VR experience** • **VR exercises** • **Final assessment**
Type of assessment	✓ **Knowledge assessments:** Regular quizzes and assessments will be conducted to evaluate participants' comprehension of theoretical concepts, principles, and terminology related to sensing technologies, artificial vision systems, and their applications in quality control. ✓ **Practical assignments**: analysis of case studies, workshops ✓ **Final examination**: A comprehensive final examination will assess participants' overall understanding of the course content, including theoretical knowledge, practical skills, and their ability to apply sensing and artificial vision solutions to quality control and assurance tasks in the fashion industry.
Pathway for a Successful Learner	**Demand for future jobs:** The fashion industry is increasingly prioritizing social responsibility and ethical practices, driven by consumer demand for sustainable and transparent supply chains. As such, there is a growing demand for professionals who possess expertise in areas related to labour rights, ethical sourcing, diversity and inclusion, corporate social responsibility and community empowerment within the fashion industry. **Summary of learner abilities at the end of the course:** Learner will have a deep understanding of the complexities of the fashion industry and its supply chain dynamics, with a particular focus on social responsibility principles. They will be equipped with knowledge and skills to identify and address labour rights violations, implement fair wage policies, and ensure worker well-being throughout the fashion supply chain. Learners will demonstrate proficiency in implementing ethical sourcing practices, enhancing transparency, and establishing accountability mechanisms to mitigate risks and promote responsible sourcing. They will possess the ability to advocate for diversity, equity, and inclusion within the fashion industry, addressing issues of bias, discrimination, and cultural representation. Participants will be capable of designing and implementing corporate social responsibility initiatives that align with sustainability goals, environmental responsibility, and stakeholder expectations. Through engagement in social impact projects and partnerships, learners will demonstrate the ability to empower communities, foster positive social change, and create shared value within the fashion ecosystem. They will have honed critical thinking, problem-solving, communication, and collaboration skills, enabling them to effectively navigate ethical dilemmas, engage in constructive dialogue, and drive meaningful change within their organizations and the broader industry. By acquiring these competencies, learners will be well-positioned to pursue various career opportunities within the fashion industry, including roles in sustainability management, ethical sourcing, CSR consultancy, community engagement, and advocacy. Additionally, they will be equipped to contribute to the advancement of socially responsible practices and drive positive impact across the fashion value chain. The acquired knowledge and skills may be also used in other sectors.

Annex 10. CE_MC10 – Fashion Products Reuse and Repair Innovation

Developer partner	TUIASI- UNIVERSITATEA TEHNICA GHEORGHE ASACHI DIN IASI
AIM/Purpose and short description of the course	This course is designed to provide students with a comprehensive understanding of eco-friendly practices in the fashion industry, with a focus on the reuse and repair of fashion items. It will explore innovative strategies for extending product longevity, nurturing a repair culture, and engaging consumers in sustainable practices. Students will acquire knowledge about circular business models and advanced techniques in upcycling and remanufacturing, equipping them with the skills to implement sustainable practices in the fashion sector. Students will also learn about recent advancements in upcycling and remanufacturing, and develop strategies to involve consumers in eco-friendly fashion practices. By combining theoretical knowledge and hands-on application, this course prepares students to make significant contributions to a more sustainable fashion industry. *Source: https://www.herzindagi.com/society-culture/different-ways-to-reuse-old-shoes-article-122267* *Source: https://www.wikihow.com/Reuse-Old-Clothes*
Prerequisites for users to start the course	Before diving into the world of *Fashion products reuse and repair innovation*, it is helpful for learners to have a foundation in fashion-related concepts. Therefore, a basic understanding of fashion design and production processes, as well as familiarity with general sustainability concepts is recommended. While no prior experience in repair or upcycling is needed, an interest in sustainable fashion is highly encouraged.

Workload	Lectures	Seminars	Project Works	Laboratory Practice	Course assessments	Total
Teaching hours	15		20	15	5	55
Individual study hours	15		15	15	0	45
Total HOURS						**100**
Number of MICROCREDITS					Total hours/25=	4 ETCS

Learning outcomes/ skills and competencies	**Knowledge**: • A solid understanding of sustainability concepts, design and production processes, and circular business models. Learners will gain awareness of the fashion industry's

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	impact and the importance of sustainable practices, such as extending the lifespan of the products through reuse and repair. **Skills/Competences***:* • Practical experience in applying repair and reuse techniques in the Fashion Industry; • The ability to critically analyse problems and think creatively to discover new ways to extend the lifespan of products.
Syllabus	1. **Extending Product Lifecycles: Importance and Benefits** • Introduction to product lifecycle extension; • Environmental and economic benefits; • Case studies of brands successfully extending product lifecycles. 2. **Repair Culture: DIY and Professional Repair Services in Fashion** • History and evolution of repair culture; • Techniques and tools for DIY repairs; • Overview of professional repair services. 3. **Circular Business Models: Rental, Swapping, Reselling, etc.** • Strategies for creating a circular business model; • Definitions and benefits of each model; • Example of best practices 4.**Innovations in Upcycling and Remanufacturing Fashion Products** • Definition and significance of upcycling and remanufacturing; • Current innovations and technologies in the field, with case studies of successful upcycled and remanufactured products; 5. **Consumer Engagement Strategies for Product Reuse and Repair in Fashion** • Consumer engagement perspectives; • Consumer attitudes and communication; • Community engagement regarding sustainable fashion.
Learning/teaching delivery formats	Incorporating innovative delivery formats can greatly enhance students' learning experience and engagement in this course. The learning and teaching delivery formats selected for this course are: • **Initial assessment** • **E-book** • **Case studies in AI-Driven Fashion Design** • **VR experience** • **VR exercises** • **Final assessment**
Type of Final Assessment	✓ **Project-based assessment** – Assign students a final project where they apply the knowledge acquired in this course to solve real-world fashion-related problems ✓ **Quizzes** ✓ **Presentations and demonstrations:** students prepare and deliver presentations showcasing their understanding of the theoretical concepts and their ability to communicate innovative ideas ✓ **Reports on laboratory work/practical exercises**
Pathway for a Successful Learner	**Estimation of the job/occupation demand:** The fashion industry is increasingly prioritising sustainability, driving demand for professionals skilled in product reuse and repair. The rise in eco-conscious consumers and regulatory pressures on waste reduction contribute to this trend. **By the end of this course**, students will have the ability to implement strategies that prolong the life of fashion products, understanding both the environmental and economic benefits

Annex 11. CE_MC11 – Sustainable Textile Innovation

Developer partner	**PIN-SOC.CONS. A R.L. – SERVIZI DIDATTICI E SCIENTIFICI PER L UNIVERSITA DI FIRENZE**
AIM/Purpose and short description of the course	In recent years, the textile sector has become one of the most dynamic and innovative, thanks to the sustainable approach to production and materials aimed at reducing its environmental and social impact. The course offers a comprehensive overview of the key topics currently shaping the sector. Students will explore the closed-loop approach, which requires applying circular solutions to reduce waste and reintroduce discarded materials into the production processes. The course will cover recycling, a fundamental process for creating yarns and materials that can be used again within fashion, even when mixed with virgin fibres. Bio-based innovations, including in synthetic materials, are creating a revolution in the sector, as are smart textiles, which can also positively impact people's lives. Regarding performance and durability, coatings and treatments can extend the life of products, also introducing new concepts of comfort. By incorporating innovative delivery formats, the course will provide students with dynamic and engaging learning experiences in the Metaskills4TCLF METAVERSE environment, leveraging cutting-edge technologies and pedagogical approaches. *Source: https://unsplash.com/it*
Prerequisites for users	Before approaching this course, students should understand the various steps of textile production and be acquainted with the new challenges involved in making the sector sustainable and circular. It is important to evaluate the application of alternative or less impactful materials or processes by understanding traditional production methods and identifying the issues that need to be addressed.

Workload	Lectures	Seminars	Project Works	Labora-tory Prac-tice	Course as-sessments	Total
Teaching hours	15		20	15	5	55
Individual study hours	15		15	15	0	45
Total HOURS						**100**
Number of MICROCREDITS					**Total hours/25=**	**4 ETCS**

Learning outcomes/ skills and competences	**Knowledge**
	● Textile manufacturing's challenging issues: the new approaches and regulations in the textile system; ● Textile technologies to design, manufacture and evaluate the properties of textiles; ● Sustainable materials: types of materials that minimise the negative impact of textiles on the environment throughout their life cycle. **Skills/Competences** ● Identify and select environmentally friendly materials, components and treatment for the textile processes. Decide on the substitution of certain materials with environmentally friendly ones while maintaining the same level of functionality and other product characteristics; ● Assess the life cycle of resources: evaluate the use and possible recycling of textile products throughout their product life cycle, considering applicable regulations, detailed in the EU strategy for sustainable and circular textiles.
Syllabus	**1. Circular Textile Systems: Closed-loop Approaches to Textile Production and Consumption** ● Closed-loop approach in fashion; ● Analysis of the types of post-industrial textile waste and their reuse in textile production; ● How to engage consumers in the closed-loop economy. **2. Advanced Sustainable Fibres and Yarns: Exploring Recycled and Upcycled Options** ● Recycled and upcycled fibres and yarns: the state of art and new approaches; ● Types of textile recycling: mechanical, chemical, thermomechanical; ● The quality of recycled materials, including downcycling options and industrial symbiosis. **3. Bio-based Textile Alternatives: Innovations in Plant-based and Biodegradable Materials** ● Bio-based and biodegradable materials: definitions; ● Bio-based materials; ● Plant-based innovation in textiles. **4. Smart Textiles: Integration of Technology for Environmental and Functional Benefits** ● Smart Textiles and Wearable Electronics; ● How e-textiles can improve consumers' lives and reduce the fashion industry's ecological footprint; ● New applications of smart textiles: case studies.

	5. Sustainable Textile Coatings and Treatments: Enhancing Durability and Performance • How to measure the durability and performance of a fabric; • The problem of PFAS and the use of alternative substances; • Advanced and sustainable coatings for high-performance textiles.
Learning/teaching delivery formats	Incorporating innovative delivery formats can greatly enhance students' learning experience and engagement in this course. The learning and teaching delivery formats selected for this course are: • **Initial assessment** • **E-book** • **Case studies in AI-Driven Fashion Design** • **VR experience** • **VR exercises** • **Final assessment**
Type of Final Assessment	✓ **Project-based assessment**: Assign students a final project where they apply the knowledge acquired in this course to solve real-world fashion-related problems; ✓ **Quizzes**; ✓ **Presentations and demonstrations:** students prepare and deliver presentations showcasing their understanding of theoretical concepts and their ability to communicate innovative ideas; ✓ **Reports on laboratory work/practical exercises;** ✓ **Others**
Pathway for a Successful Learner	**Estimation of Job/Occupation Demand:** working within the textile industry today requires a concrete approach to innovation, curiosity and to interpret potential changes. These skills are necessary for those who work within the technical departments, as well as those involved in sustainability and management at various levels; **By the end of this course**: Students will have gained a clear understanding of the most important sustainable innovations that will transform the textile sector. The course aims to equip students with the knowledge of basic concepts and provide the tools to stay up-to-date and identify new areas of innovation.

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Annex 12. CE_MC12 – Eco-friendly Dyeing and Finishing for the Textile Industry / Best Available Techniques (BAT) for the Textiles Industry

Developer partner	CITEVE- CENTRO TECNOLOGICO DAS INDUSTRIAS TEXTIL E DO VESTUARIO DE PORTUGAL
AIM/Purpose and short description of the course	The process of dyeing textiles has been identified as a major contributor to environmental pollution due to the use of toxic chemicals and the large amount of water required. Therefore, there has been an increased focus on developing eco-friendly and natural dyeing techniques in recent years. Eco-friendly dyeing and finishing techniques will provide the use of non-toxic, biodegradable, and renewable materials that have a minimal impact on the environment.. More generally, the BAT helps identify best environmental practices in the textile sector, including reducing energy and water consumption, using appropriate products, and effective waste management. By incorporating innovative delivery formats, the course will provide students with dynamic and engaging learning experiences in the Metaskills4TCLF METAVERSE environment that leverages cutting-edge technology and pedagogical approaches. *Source: be@t Project PII-I5-M7 and PI-I2-M5*
Prerequisites for users to start the course	Basic knowledge in chemistry, biology, and mathematics are fundamental. Although knowledge in the textile industry and laboratory color formulation is not fundamental it can facilitate the learning of some topics.

Workload	Lectures	Seminars	Project Works	Laboratory Practice	Course assessments	Total
Teaching hours	15		20	15	5	55
Individual study hours	15		15	15	0	45
Total HOURS						**100**
Number of MICROCREDITS					Total hours/25=	4 ETCS

| Learning outcomes/ skills and competences | **Knowledge**
• Understanding various textile dyeing processes and technologies, including the use of synthetic and natural colorants. It also involves knowledge in techniques for applying colors and patterns to textiles, such as rotary and flatbed screen printing, heat transfer, inkjet printing and others.
• Technologies with the aim of reducing environmental and ecological risks, achieving at the same time, a positive economic, social, and environmental impact. They are innovative technologies designed to prevent, reduce, and recover from the negative impact of humanity in the planet. |

	Skills/Competences • Dyeing and finishing goods in a sustainable manner throughout the product lifecycle which involves promoting social responsibility, conserving resources, and minimizing negative environmental impacts. • Managing textile dyeing machines keeping efficiency and productivity at high levels. • Planning and monitoring textile production to achieve control on behalf of quality, productivity and delivery time.
Syllabus	1. **Natural Dyeing Techniques: Exploring Plant-based and Mineral-based Dyes** • Residues adequation • Textile substrate pretreatment • Dyeing process 2. **Waterless and Low-Impact Dyeing Processes: Minimizing Environmental Footprint** • Pretreatment low impact processes • Dyeing processes with low energy/water consumption • Waterless dyeing processes • Low effluent impact dyeing processes 3. **Sustainable Finishing Methods: Bio-based Softeners and Surface Treatments** • Chemical finishing processes • Bio-based finishing products • Surface treatments 4. **Best Available Techniques (BAT) for Textile Dyeing and Finishing: Case Studies and Applications** • Dyeing case study • Finishing case study 5. **Advancements in Digital Printing: Eco-friendly and Customizable Solutions** • Dyes formulations more eco • Environmental issues • Customizable solutions
Learning/teaching delivery formats	Incorporating innovative delivery formats can greatly enhance students' learning experience and engagement in this course. The learning and teaching delivery formats selected for this course are: • **Initial assessment** • **E-book** • **Case studies in AI-Driven Fashion Design** • **VR experience** • **VR exercises** • **Final assessment**
Type of assessment	✓ **Presentations and demonstrations:** students prepare and deliver presentations showcasing their understanding of the theoretical concepts and the ability to communicate innovative ideas. ✓ **Reports on laboratory work/practical exercises**
Pathway for a Successful Learner	**Estimation of the job/occupation demand:** Professionals with expertise in natural dyeing technology and eco-finishing processes will be in high demand. **By the end of this course**, the students will have the knowledge and skills necessary to explore the different BAT in textile industry, which will empower them to drive innovation, efficiency, and sustainability in the fashion industry through eco sustainable processes.

Annex 13. CE_MC13 – Eco-Design Principles for Clothing

Developer partner	**PIN-SOC.CONS. A R.L. – SERVIZI DIDATTICI E SCIENTIFICI PER L UNIVERSITA DI FIRENZE**
AIM/Purpose and short description of the course	The European legislation is accompanying the textile ecosystem – which includes leather – towards a sustainable and circular transition which has eco-design as one of the central points for achieving the identified objectives. The world of fashion produces too much waste, during the design phase of the garments, the use phase and at the end of their life cycle. Aware and responsible planning can have a positive impact, helping the sector to significantly reduce its impact. The course addresses the topic of durability, both technical and emotional, of garments, and presents the main solutions that can be adopted at the time of design. It deepens knowledge of materials, providing guidance on how to evaluate their sustainability throughout the lifecycle of fashion products including the use phase, always with a view to reducing the impact on the environment and the use of natural resources and facilitating their reuse. Finally, the main zero waste construction techniques are also explained, also presenting the design techniques that can facilitate the reuse of clothes at the end of their life. *Source: Canva*
Prerequisites for users	Before approaching this course, it is important to have a basic knowledge of how an item of clothing is designed and of traditional production techniques. The course is aimed at attendees who want to approach conscious and responsible design, with a complete evaluation of the impacts of an item of clothing in all its phases, from design to end of life.

Workload	Lectures	Seminars	Project Works	Laboratory Practice	Course assessments	Total
Teaching hours	15		20	15	5	55
Individual study hours	15		15	15	0	45
Total HOURS						**100**
Number of MICROCREDITS					Total hours/25=	**4 ETCS**

| Learning outcomes/ skills and competences | **Knowledge**
● Eco-Design principles for Clothing: principles of sustainability and the life cycle of apparel in order to design new eco-friendly garments
Skills/Competences
● Develop eco-design concepts: develop new product concepts complying to eco-design principles: research information to develop new ideas and concepts for the eco-design of a specific production; read scripts and consult directors and other production staff members in order to develop eco-design concepts and plan productions. |

	• Assess waste types: assessing the waste generated along the production processes and the post-consumer life of a garment product.
Syllabus	1. **Designing for Durability: Longevity and Quality in Clothing** • What is durability in the clothing industry • Eco-design for fashion in upcoming European legislation • The evaluation of quality in garment sector 2. **Minimalism and Versatility: Creating Timeless and Multi-functional Garments** • Physical and emotional durability • Capsule wardrobe and minimalist fashion • Design for extending clothing life 3. **Identification of Sustainable Materials** • Sustainable sourcing and impact assessment of the fibres and materials • The role of certifications • Next Gen Materials, pros and cons 4. **Zero Waste Pattern Making and Construction Techniques** • The waste map in the design of an item of clothing • Zero waste construction approach • The role of technology 5. **Clothing Modularity: Designing for Repair, Upcycling, and Disassembly** • Modular clothing and customized garments • 3D technologies for a dynamic upcycling design process • Upcycling and disassembly methods
Learning/teaching delivery formats	Incorporating innovative delivery formats can greatly enhance students' learning experience and engagement in this course. The learning and teaching delivery formats selected for this course are: • **Initial assessment** • **E-book** • **Case studies in AI-Driven Fashion Design** • **VR experience** • **VR exercises** • **Final assessment**
Type of Final Assessment	✓ **Project-based assessment** – Assign students a final project where they apply the knowledge acquired in this course to solve real-world fashion-related problems ✓ **Quizzes** ✓ **Presentations and demonstrations:** students prepare and deliver presentations showcasing their understanding of the theoretical concepts and the ability to communicate innovative ideas ✓ **Reports on laboratory work/practical exercises** ✓ **Others**
Pathway for a Successful Learner	**Estimation of the job/occupation demand:** Eco-design is a fundamental theme for the fashion sector today: the push of European legislation is acting on the sector, driving it to identify design techniques and metrics that reduce the waste of materials in the production phase and that make the products more durable and easily reusable at end of life, including recycling and biodegradation. **By the end of this course**: At the end of this course the student will have explored the basic concepts of eco-design, identifying the waste that is generated in production and use, as of the design phase, understanding the metrics of durability and adopting the techniques necessary to reduce waste and wastage of resources. To extend the life of clothes, the student will learn to make an informed evaluation of the materials used (production, use and end-of-life) and to apply design techniques capable of extending the life of the products, taking into consideration the entire life cycle.

Annex 14. CE_MC14 – Sustainable Clothing Production Processes

Developer partner	**CITEVE- CENTRO TECNOLOGICO DAS INDUSTRIAS TEXTIL E DO VESTUARIO DE PORTUGAL**
AIM/Purpose and short description of the course	This course aims to provide students a comprehensive understanding of how Sustainable Clothing Production Processes are revolutionising the Fashion Industry. Participants will acquire skills and knowledge in techniques, strategies, processes and approaches that produce environmentally low-impact products. The curriculum focuses on producing durable clothing using eco-friendly materials, implementing sustainable sourcing, adhering to ethical labour practices, and promoting textile recycling to reduce landfill waste, which can take hundreds of years to decompose. Leveraging the *Metaskills4TCLF METAVERSE* environment, this course incorporates innovative delivery formats to offer dynamic and engaging learning experiences by using cutting-edge technology and pedagogical approaches. *Source: edited by CITEVE* *Source: Textile 2030 Circularity Pathway*
Prerequisites for users to start the course	Knowledge in fashion industry, including trends, consumer behaviour, business processes, clothing technologies, circular economy principles. An openness to embracing new technologies and innovative processes is also recommended.

Workload	Lectures	Seminars	Project Works	Laboratory Practice	Course assessments	Total
Teaching hours	15		20	15	5	55
Individual study hours	15		15	15	0	45
					Total HOURS	**100**
				Number of MICROCREDITS	**Total hours/25=**	**4 ETCS**

Learning outcomes/ skills and competences	**Knowledge:** • A fundamental understanding of Sustainable Clothing Production Process concepts such as materials, apparel manufacturing processes and machinery; • Knowledge in circular economy, aimed to keep materials and products in use for as long as possible and using sustainable technologies which allow value creation from limited resources while reducing environmental impact. **Skills/Competences:** • Analyse and address challenges in a critically way, by employing creative thinking to develop sustainable products that comply with environmental protection laws and standards and minimise ecological footprints; • Apply knowledge related to materials and components using modern technologies for the development of sustainable products;

	• Implement and/or optimise new production processes to develop sustainable products, aiming to achieve cost efficiency and capability while minimising material waste in the various phases of the process.
Syllabus	1. **Circular Clothing Production Systems** • Overview of the circular clothing production systems; • New manufacturing technologies that promote sustainability in clothing production; • Resource efficient processes technologies (for example: materials, • accessories, energy, water,…). 2. **Clothing Sustainable Construction Methods** • Innovative and sustainable textile materials; • Processes that enhance circularity and extend the lifecycle of fashion products; • Circular business models and value-added services to customers and end-users. 3. **Clothing Production: Planning and Monitoring** • Overview of the production planning and monitoring: objectives, phases, functions & benefits; • Strategies and practises for effective production planning and monitoring; • Tools and software designed for production planning and monitoring. 4. **Clothing Production Monitoring Techniques and Tools** • Overview of production monitoring techniques; • Techniques employed to monitor production activities; • Tools and software for monitoring production processes. 5. **Quality Controls in the Clothing Sustainable Processes** • Legislation, regulations, standards and certifications that govern sustainability in the clothing and fashion industries; • The role and implementation of the Digital product passport (DPP); • Intelligent control systems that ensure compliance with sustainability standards and enhance quality assurance.
Learning/teaching delivery formats	Incorporating innovative delivery formats can greatly enhance students' learning experience and engagement in this course. The learning and teaching delivery formats selected for this course are: • **Initial assessment** • **E-book** • **Case studies in AI-Driven Fashion Design** • **VR experience** • **VR exercises** • **Final assessment**
Type of Final assessment	✓ **Presentations and demonstrations:** students should prepare and deliver presentations showcasing their understanding of the theoretical concepts and the ability to communicate innovative ideas; ✓ **Reports of quality control of the prototypes/practical exercises.**
Pathway for a Successful Learner	**Estimation of the job/occupation demand:** As Sustainable Clothing Production Processes continues to disrupt and transform the fashion industry, professionals with expertise in Sustainable Clothing Production Processes applications in fashion will be in high demand. **By the end of this course**, the students will have the knowledge and skills necessary to navigate this dynamic landscape, which will empower them to drive innovation, efficiency, and sustainability in the fashion industry through Sustainable Clothing Production.

Annex 15. CE_MC15 – Innovative Solutions for Leather Waste Reduction

Developer partner	**UDL- UNIVERSIDAD DE LLEIDA**
AIM/Purpose and short description of the course	The purpose of this course is to educate students on the environmental challenges associated with leather waste and to explore innovative solutions for reducing and managing this waste effectively. Students will learn about the lifecycle of leather products, the environmental impacts of leather waste, and cutting-edge technologies and strategies that can help mitigate these impacts. This course delves into the sources and types of leather waste, examining its environmental consequences and the importance of waste reduction. Students will explore innovative approaches to leather waste management, including recycling, upcycling, biodegradable alternatives, and sustainable manufacturing processes. *Photos created by AI Image*
Prerequisites for users to start the course	To ensure a successful learning experience in the "Innovative Solutions for Leather Waste Reduction" course, participants should meet the following prerequisites: - Familiarity with fundamental concepts related to sustainability, waste management, and environmental impact. - Basic awareness of leather production processes, types of leather, and common uses.

Workload	Lectures	Seminars	Project Works	Labora-tory Prac-tice	Course as-sessments	Total
Teaching hours	15		20	15	5	55
Individual study hours	15		15	15	0	45
					Total HOURS	**100**
					Number of MICROCREDITS	Total hours/25=	**4 ETCS**

| Learning outcomes/ skills and competences | By the end of the "Innovative Solutions for Leather Waste Reduction" course, students will be able to:
Describe the various stages of leather production and consumption and explain how each stage contributes to waste generation. Recognize the different types of leather waste and their environmental impacts. Assess the environmental impacts of various textile and leather production processes. Analyse the environmental consequences and economic implications of leather waste within the industry. |

	• Evaluate current leather waste management practices and identify areas for improvement. • Implement practical solutions such as recycling, upcycling, and sustainable manufacturing processes to reduce leather waste. • Formulate and propose effective strategies for reducing leather waste, integrating principles of the circular economy.
Syllabus	1. **Sustainable Resources and Materials for the Footwear Industry** • Overview of Sustainable Materials • Trends and Innovations in Sustainable Materials • Material Performance and Lifecycle Assessments 2. **Raw Materials Initiatives** • Global Efforts and Policies for Sustainable Raw Materials • Alternative and Innovative Raw Materials • Partnerships and Industry Collaborations 3. **Biodegradability of Leather and other Footwear Materials** • Assessing the Biodegradability of Footwear Materials • Opportunities for Biodegradable Material Development • Standards and Certifications for Biodegradability 4. **Specific Solutions for Leather Waste Reduction** • Process Improvements and Efficiency Measures • Valorisation and Upcycling of Leather Waste • Adoption of Circular Economy Practices 5. **How to Detect and Address Green-Washing in the Leather Sector?** • Identifying Green-Washing Tactics in the Leather Industry • Evaluating Sustainability Claims and Certifications • Promoting Authentic Sustainability Practices
Learning/teaching delivery formats	Incorporating innovative delivery formats can greatly enhance students' learning experience and engagement in this course. The learning and teaching delivery formats selected for this course are: • **Initial assessment** • **E-book** • **Case studies in AI-Driven Fashion Design** • **VR experience** • **VR exercises** • **Final assessment**
Type of assessment	✓ **Online Quizzes** – Regular assessments to evaluate students' understanding of the material, track their progress, and provide feedback. ✓ **Project-Based Assessment** – Assign students a final project where they apply the knowledge acquired in this course to solve real-world leather waste-related problems. ✓ **Case Studies** – present students with case studies and ask them to analyse and critique the approaches used, identifying strengths, weaknesses, opportunities, and threats. Encourage students to propose alternatives or improvements. ✓ **Written reports on Laboratory Work/Practical Exercises** – Practical sessions where students work on projects related to leather waste reduction, such as designing eco-friendly products, developing waste management strategies, or creating awareness campaigns.
Pathway for a Successful Learner	**Estimation of the Job/Occupation Demand:** As the global focus on waste reduction and sustainable innovation intensifies, the demand for professionals who can drive solutions for leather waste reduction within the fashion industry is expected to grow. Key roles include: - Sustainability Coordinators and Managers

	- Environmental Compliance Specialists - Sustainable Fashion Designers, - Waste Management and Recycling Experts, - Corporate Social Responsibility (CSR) Specialists - Environmental Impact Assessors - Eco-Friendly Product Development Managers - Sustainable Fashion Consultants **By the end of this course,** students will have the knowledge and skills necessary to contribute to the development and implementation of sustainable practices, making them valuable assets to any fashion-related organization committed to reducing waste.

Annex 16. CE_MC16 – Sustainable Leather Innovation

Developer partner	**FILK- Filk Freiberg Institute Ggmbh**
AIM/Purpose and short description of the course	The purpose of this course is to introduce students into the complexities and dependencies between animal food production and leather production and its implications on the leather's carbon footprint. Environmental challenges associated with leather production will be un-rolled. Students will learn of carbon emission mitigation measures in tanneries, ways to improve circularity in the production and possibilities of cascade use. Different types of leather by-products' recycling routes are presented and the possibilities of their use are discussed and evaluated. Students will learn about successful innovative approaches of recycling and by-product use. Existing Labels for sustainable manufacturing processes will be presented and explained.
Prerequisites for users to start the course	To ensure a successful learning experience in the " Sustainable Leather Innovation" course, participants should meet the following prerequisites: - Familiarity with the fundamental processes involved in leather manufacturing from raw hide to finished leathers and cutting. A basic understanding of the chemistry involved is beneficial.

Workload	Lectures	Seminars	Project Works	Laboratory Practice	Course as-sessments	Total
Teaching hours	15		20	15	5	55
Individual study hours	15		15	15	0	45
Total HOURS						**100**
Number of MICROCREDITS					**Total hours/25=**	**4 ETCS**

Learning outcomes/ skills and competences	**Knowledge:** • Understanding interdependencies between meat/dairy industry and hide production • Basic understanding of leather's carbon footprint. • Recycling of by-products of leather manufacturing and cascade use • Sustainable Leather Labels **Skills/Competences (2-3 skills/competences):** • Ability to differentiate between various impacts of leather production on carbon footprint • Ability to assess the significance of leather labels.
Syllabus	1. **Value of Animal Hides in Meat/Food Processing** • Implication of food production and raw hide production • Value of hides and raw hide quality 2. **Environmental Benefits** • Carbon Footprint for Leather • Strategies for reducing Carbon Footprint in leather production 3. **Recycling and cascades in the leather sector:** • Material use of by-products (utilisation of shavings and leather fibres, hydrolysates) • Energy production of by-products • Recycling of chemicals and water 4. **Case Studies: Examples of Successful Innovation and Integration Models** • Use of residues for biogas production (Südleder)?

	• Use of residues for tanning chemicals (Heller)? • Use of residues for leather board (FILK/ Kuhnt; Salamander?) **5. Improving awareness: Labels for sustainable leather** • Expectations and limits • Overview of labels • Requirements and regulations
Learning/teaching delivery formats	Incorporating innovative delivery formats can greatly enhance students' learning experience and engagement in this course. The learning and teaching delivery formats selected for this course are: • **Initial assessment** • **E-book** • **Case studies in AI-Driven Fashion Design** • **VR experience** • **VR exercises** • **Final assessment**
Type of Final Assessment	✓ **Project-based assessment** – Assign students a final project where they apply the knowledge acquired in this course to solve real-world fashion-related problems ✓ **Case studies** – present students with case studies and ask them to analyse and critique the approaches used, identifying strengths, weaknesses, opportunities, and threats. Encourage students to propose alternatives or improvements. ✓ **Presentations and demonstrations:** students prepare and deliver presentations showcasing their understanding of the theoretical concepts and the ability to communicate innovative ideas ✓ **Written reports on laboratory work/practical exercises** ✓ **Written essay** ✓ **Peer assessment and feedback:** students will critically evaluate their peers' work based on predefined criteria such as technical accuracy, clarity of presentation, and creativity of solutions ✓ **Formal exams and evaluations**
Pathway for a Successful Learner	Knowledge about relationships between hide sourcing, recycling and re-use of by-products on carbon footprint and sustainability in leather production are vital for everyone involved in leather production, e.g., for leather technologists, for communication managers, sustainability managers as well as sales representatives and designers.

Annex 17. CE_MC17- Eco-Design Principles for Footwear

Developer partner	**POLICAZ-POLITECNICO CALZATURIERO SCARL**
AIM/Purpose and short description of the course	The ability to increase the sustainability of the Footwear production process starts in the design phase. In this initial stage, materials and components are evaluated and chosen. The advent of Eco-Design in Footwear production has brought the evaluation of numerous factors, among them the introduction of so-called "Innovative Materials" and of the concept of Recyclability and Longevity of the product. In this course, students will be able to focus on these principles and to see their application to real-life cases, developing their own skills and knowledge in the field of Eco-Design. *Picture generated with AI*
Prerequisites for users to start the course	For deepening the knowledge about Eco-Design principles applied to footwear, it is useful for students to have a prior understanding of design elements such as unity, scale, proportion, balance, symmetry, space, form, texture, colour, light, shade and congruence and their application into practice.

Workload	Lectures	Seminars	Project Works	Laboratory Practice	Course assessments	Total
Teaching hours	15		20	15	5	55
Individual study hours	15		15	15	0	45
Total HOURS						**100**
Number of MICROCREDITS					Total hours/25=	**4 ETCS**

Learning outcomes/ skills and competences	**Knowledge:** • Recognition of the ecological concerns related to footwear production and the importance of recycling. • Capability to recognise suitable materials and components based on their influence on the footwear style and characteristics, properties and manufacturability. **Skills/Competences:** • Ability to recognise the importance of using materials and components in the manufacturing process and their influence on a company's environmental performance. • Understanding the importance of measuring the different levels of durability and quality of specific materials used in footwear

	● Ability to incorporate include the concepts of repairability, personalization and longevity in footwear design.
Syllabus	1. **Choosing Materials for Footwear** ● How to measure the environmental performance of Materials ● Misconceptions of environmental benefits: durability, repairability, biodegradability, recyclabillity and end-of-life ● EU Ecodesign principles ● Traditional Materials vs other Materials in Footwear production 2. **Designing for Repairability: Creating Shoes That Can Be Easily Repaired and Maintained** ● How to include Repairability in Footwear Design ● Benefits and Challenges of Repairability in Footwear ● Best Cases and Examples of Repairability in Footwear 3. **Modular Design: Creating Interchangeable Components for Customization and Upgrades** ● What is Modular Design? ● How Interchangeable Components Can Influence Customization and Upgrades in Footwear ● Challenges in Applying Interchangeable Components in Footwear Production 4. **Designing for Durability: Longevity and Quality in Footwear** ● New Strategies for Boosting Longevity and Quality in Footwear Production ● New Materials and Designs for fostering Durability in Footwear ● How Durability Can Impact Sustainability in the Footwear Industry
Learning/teaching delivery formats	Incorporating innovative delivery formats can greatly enhance students' learning experience and engagement in this course. The learning and teaching delivery formats selected for this course are: ● **Initial assessment** ● **E-book** ● **Case studies in AI-Driven Fashion Design** ● **VR experience** ● **VR exercises** ● **Final assessment**
Type of Final Assessment	✓ **Project-based assessment** – Assign students a final project where they apply the knowledge acquired in this course to solve real-world fashion-related problems ✓ **Quizzes** ✓ **Presentations and demonstrations:** students prepare and deliver presentations showcasing their understanding of the theoretical concepts and the ability to communicate innovative ideas ✓ **Reports on best practices/project-based assessment** ✓ **Others**
Pathway for a Successful Learner	**Estimation of the job/occupation demand:** the ability to include sustainable principles in the designing phase of footwear production will become increasingly relevant in the coming years. The ability to include aspects of durability, new materials, new functionalities in footwear design will be an essential skill. **By the end of this course**, the students will have a deep understanding of the relevance of the concepts of recyclability, durability and repairability. They will also be able to assess how innovative materials can be included in the design phase of footwear production, evaluating their impact on product development and performance.

Annex 18. CE_MC18- Sustainable Footwear Production Processes

Developer partner	**PFI- PRUF-UND FORSCHUNGSINSTITUT PIRMASENS EV**
AIM/Purpose and short description of the course	This course provides an in-depth overview of sustainable practices in the footwear industry, focusing on circular production systems, sustainable construction methods, and effective monitoring tools and practices. Students will explore the principles and challenges of transitioning to circular economy practices in footwear manufacturing, including waste reduction, recycling, and product lifecycle management. They will learn about approaches for constructing footwear sustainably, ensuring functionality, durability, and minimal environmental impact. The course also covers essential planning and monitoring processes for efficient and sustainable production, along with the latest monitoring techniques and tools. Additionally, students will study quality control measures to ensure products meet both functional and environmental criteria. *Picture generated with AI*
Prerequisites for users to start the course	Before delving into the topic of sustainable footwear manufacturing and the implementation of circular economy practices, it is important to have knowledge about the basics of sustainability, ethical and environmental issues in the fashion industry, footwear design, materials, production processes, the supply chain and the life cycle of footwear. With this foundational knowledge, students can better understand and engage with the concepts and practices taught in a course on sustainable footwear processes.

Workload	Lectures	Seminars	Project Works	Laboratory Practice	Course assessments	Total
Teaching hours	15		20	15	5	55
Individual study hours	15		15	15	0	45
					Total HOURS	**100**
				Number of MICROCREDITS	**Total hours/25=**	**4 ETCS**

Learning outcomes/ skills and competences	**Knowledge** • A fundamental understanding of production processes in the shoe industry and how they relate to circular economy such as associated challenges, available technologies, and ongoing research • Good understanding of construction methods for footwear that ensure functionality, durability, and a lower environmental impact.

	• Knowledge about planning and monitoring processes crucial for efficient and sustainable footwear production, including the use of advanced monitoring tools and techniques. **Skills/Competences** • Ability to consider circular economy principles in the design of the shoe and its manufacturing processes. • Skills in planning, monitoring, and optimizing production processes to achieve efficient and sustainable footwear manufacturing practices.
Syllabus	**1. Circular Footwear Production Systems** • Principles of circular economy and its importance in the footwear industry. • Key strategies for implementing circular production systems. • Case studies of circular footwear initiatives. **2. Footwear Sustainable Construction Methods and The Functionality of The Shoe** • Overview of sustainable materials used in footwear construction. • Techniques for designing functional, durable, and sustainable footwear and compliance with Ecodesign Regulation (EU) 2024/1781 • Impact of construction methods on the environment and product lifecycle. **3. Footwear Production: Planning and Monitoring** • Evolution of footwear production from handmade to industrial processes • Steps in production planning from demand forecasting to scheduling, budgeting and quality planning **4. Footwear Production Monitoring Techniques and Tools** • Monitoring techniques such as Real-time monitoring, quality control inspection, statistics and KPIs and production optimization methodologies • Monitoring tools such as Enterprise Resource Planning (ERP), Manufacturing Execution Systems (MES), Quality Management Systems (QMS), Inventory Managment Systems, Project Managment, Automated Inspections, IoT Sensors, Dashboards **5. Quality Controls in the Footwear Sustainable Processes** • Material sourcing and verification • Chemical risk management • Environmental impact management • Product lifecycle analysis, Consumer information and End-of-Life management
Learning/teaching delivery formats	• Incorporating innovative delivery formats can greatly enhance students' learning experience and engagement in this course. The learning and teaching delivery formats selected for this course are: • **Initial assessment** • **E-book** • **Case studies in AI-Driven Fashion Design** • **VR experience** • **VR exercises** • **Final assessment**
Type of assessment	✓ **Project-based assessment** – Assign students a final project where they apply the knowledge acquired in this course to solve real-world fashion-related problems ✓ **Case studies** – present students with case studies and ask them to analyse and critique the approaches used, identifying strengths, weaknesses, opportunities, and threats. Encourage students to propose alternatives or improvements. ✓ **Presentations and demonstrations:** students prepare and deliver presentations showcasing their understanding of the theoretical concepts and the ability to communicate innovative ideas ✓ **Written reports on laboratory work/practical exercises** ✓ **Written essay**

	✓ **Peer assessment and feedback:** students will critically evaluate their peers' work based on predefined criteria such as technical accuracy, clarity of presentation, and creativity of solutions ✓ **Formal exams and evaluations**
Pathway for a Successful Learner	**Estimation of the job/occupation demand:** There is a long tradition of optimizing and monitoring the quality of production processes from an economic point of view. These methods and tools can now also be used to achieve sustainability goals, and as the circular economy gains momentum, it is crucial for employees to understand where the challenges and opportunities lie in terms of the necessary adjustments and changes in production planning and processes. They need an open mind and the ability to look for new technologies and opportunities to optimize processes. **By the end of this course**, the students will have the knowledge and skills necessary to navigate challenges and recognize opportunities associated with the circular economy manufacturing processes, as well as having an understanding of available monitoring and quality control tools.

Annex 19. DF_MC1- Digitalisation in the Fashion Industry

Developer partner	**CITEVE- CENTRO TECNOLOGICO DAS INDUSTRIAS TEXTIL E DO VESTUARIO DE POR-TUGAL**
AIM/Purpose and short description of the course	Digitalisation in the fashion industry is transforming design, production, and retail. Advanced technologies like Artificial Intelligence (AI), 3D printing, and Virtual Reality (VR) enable personalised shopping experiences and efficient supply chains. Brands use data analytics to predict trends and optimise inventory, as well as reducing waste. E-commerce platforms and social media enhance customer engagement and broaden market reach. Virtual fitting rooms and Augmented Reality (AR) apps allow consumers to visualise clothing before purchase, improving satisfaction and reducing returns. This digital shift fosters innovation, sustainability, and a more connected, responsive fashion ecosystem, aligning with modern consumer expectations and environmental considerations. *Pictures generated with AI*
Prerequisites for users to start the course	Basic knowledge about the fashion industry, namely, textiles, clothing, footwear and leather. It is also important to have a general understanding of marketing fundamentals and digital channels.

Workload	Lectures	Seminars	Project Works	Laboratory Practice	Course assessments	Total
Teaching hours	15		20	15	5	55
Individual study hours	15		15	15	0	45
				Total HOURS		**100**
				Number of MICROCREDITS	Total hours/25=	**4 ETCS**

| Learning outcomes/ skills and competences | **Knowledge**
Digital Transformation: A fundamental understanding of the evolution and significance of the digital transformation in the fashion industry.
E-commerce systems: Basic digital architecture and commercial transactions for trading products or services conducted via Internet, e-mail, mobile devices, social media, etc.

Skills/Competences:
Keeping up with digital transformation of industrial processes: Updating the digital innovations applicable to thse processes. Integrating this transformation in the company's processes aiming for competitive and profitable business models. |

	Collaborating through digital technologies: Using digital tools and technologies for collaborative processes, and for co-construction and co-creation of resources and knowledge. Digital communication and collaboration: Communicating in digital environments, sharing resources through online tools, collaborating through digital tools, interacting with and participating in communities and networks, and cross-cultural awareness.
Syllabus	1. **Digital Transformation: Evolution and Trends in the Fashion Industry** • Historical Evolution • Digital Transformation • Digital Trends 2. **Digital storytelling and brand storytelling** • Brand Narrative Construction • Consumer Segmentation and Profiling • Practical Success Cases 3. **Online Retail Revolution: E-commerce's Influence on Fashion Business Models** • State of the Art • Digital Business Models • Future Perspectives, e.g., Metaverse 4. **Social Media Marketing and Influencer Culture: Digital Branding in Fashion** • Social Media and Different Platforms • Influencers: Engagement Techniques • Metrics and impact Analysis 5. **Sustainable Fashion in the Digital Age: Balancing Innovation and Responsibility** • Sustainable Fashion Evolution (instead: Evolution of Sustainability in Fashion • Digital Technologies for Sustainability • Digital Product Passport (DPP) for facilitating Traceability and Transparency
Learning/teaching delivery formats	Incorporating innovative delivery formats can greatly enhance students' learning experience and engagement in this course. The learning and teaching delivery formats selected for this course are: • **Initial assessment** • **E-book** • **Case studies in AI-Driven Fashion Design** • **VR experience** • **VR exercises** • **Final assessment**
Type of Final Assessment	✓ **Project-based assessment:** Assign students to a final project where they must apply the knowledge acquired in this course to solve real-world fashion-related problems. ✓ **Quizzes** ✓ **Presentations and demonstrations:** Students prepare and deliver presentations showcasing their understanding of the theoretical concepts and the ability to communicate innovative ideas ✓ **Reports on laboratory work/practical exercises**
Pathway for a Successful Learner	**Estimation of the job/ occupation demand:** The Digital Transformation continues to disrupt and transform the fashion industry. Nowadays, it has significant shifted with different 75merging technologies of enormous potential. Professionals with expertise in digital transformation applications in fashion will be in high demand. **By the end of this course**, students will have the knowledge and skills necessary to navigate this dynamic landscape, which will empower them to drive innovation, efficiency, and sustainability in the fashion industry through digital transformation.

Annex 20. DF_MC2- Artificial Intelligence (AI) in Fashion

Developer partner	**TUIASI- UNIVERSITATEA TEHNICA GHEORGHE ASACHI DIN IASI**
AIM/Purpose and short description of the course	The fashion industry is constantly evolving and driven by innovation and creativity. In recent years, Artificial Intelligence (AI) has emerged as a powerful tool that reshapes various aspects of the fashion business, from design and production to marketing and retail. This course aims to provide students with a comprehensive understanding of how AI technologies are revolutionising the Fashion Industry and equipping them with the knowledge and skills to leverage AI effectively in their careers. By incorporating innovative delivery formats, the course will provide students with dynamic and engaging learning experiences in the **Metaskills4TCLF METAVERSE** environment that leverages cutting-edge technology and pedagogical approaches. *Pictures generated with AI*
Prerequisites for users to start the course	Before diving into the world of AI in fashion, it's helpful for learners to have a foundation in fashion-related concepts. Therefore, a general understanding of the fashion industry, including trends, consumer behaviour, and business processes, will provide context for applying AI techniques effectively in this domain.

Workload	Lectures	Seminars	Project Works	Laboratory Practice	Course assessments	Total
Teaching hours	15		20	15	5	55
Individual study hours	15		15	15	0	45
				Total HOURS		**100**
			Number of MICROCREDITS	**Total hours/25=**		**4 ETCS**

| Learning outcomes/ skills and competences | **Knowledge***:*
• A fundamental understanding of AI concepts such as historical context, available technologies, driven tools for AI-generated designs and personalised fashion for marketing and retail. Being a susceptible topic, sometimes controversial, the learner must be aware of the ethical and social implications of using various AI tools.

Skills/Competences*:*
• practice on how to work with datasets and AI tools, and extract meaningful insights is essential for AI applications in the Fashion Industry |

Co-funded by the European Union

	• ability to analyse problems critically and think creatively to develop AI solutions tailored to fashion-related challenges is essential. • experiment with and exposure to popular AI tools and libraries would be beneficial for AI practical implementation in the Fashion Industry
Syllabus	**1. Introduction to AI in Fashion** • Overview of AI technologies and their applications in the fashion industry. • Historical context and evolution of AI in fashion: future trends and innovations in AI for fashion. • Importance of AI for driving innovation, efficiency, and sustainability in fashion. **2. AI-Driven Fashion Design** • Generative adversarial networks (GANs) and their role in creating virtual designs and prototypes. • AI-powered trend forecasting and predictive analytics for design inspiration. • Personalised fashion design using machine learning algorithms. **3. Supply Chain Optimisation with AI** • AI-enabled demand forecasting and inventory management. • Optimisation of production processes through AI-driven automation and robotics. • Sustainable sourcing and ethical supply chain practices with AI. **4. Enhancing Customer Experience** • Personalised recommendations and virtual styling powered by AI. • Visual search and image recognition for improved product discovery. • AI-driven virtual try-on experiences and sizing recommendations. **5. Ethical and Social Implications. Overview of EU legal framework governing AI** • Ethical considerations in AI-driven fashion, including data privacy and bias mitigation. Legal and regulatory aspects. • Impact of AI on labour practices and job roles in the fashion industry. • Sustainability and responsible innovation in AI applications for fashion.
Learning/teaching delivery formats	Incorporating innovative delivery formats can greatly enhance students' learning experience and engagement in this course. The learning and teaching delivery formats selected for this course are: • **Initial assessment** • **E-book** • **Case studies in AI-Driven Fashion Design** • **VR experience** • **VR exercises** • **Final assessment**
Type of Final Assessment	✓ **Project-based assessment** – Assign students a final project where they apply the knowledge acquired in this course to solve real-world fashion-related problems ✓ **Quizzes** ✓ **Presentations and demonstrations:** students prepare and deliver presentations showcasing their understanding of the theoretical concepts and the ability to communicate innovative ideas ✓ **Reports on laboratory work/practical exercises**
Pathway for a Successful Learner	**Estimation of the job/occupation demand:** As AI continues to disrupt and transform the fashion industry, professionals with expertise in AI applications in fashion will be in high demand. **By the end of this course**, the students will have the knowledge and skills necessary to navigate this dynamic landscape, which will empower them to drive innovation, efficiency, and sustainability in the fashion industry through AI.

Annex 21. DF_MC3- Virtual and Augmented Reality in Fashion Industry

Developer partner	CTCP-CENTRO TECNOLOGICO DE CALCADO DE PORTUGAL
AIM/Purpose and short description of the course	Virtual Reality (VR) and Augmented Reality (AR) are immersive technologies that enhance or alter our perception of the real world. Both technologies have rapidly evolved and are increasingly integrated into various aspects of daily life and industry, transforming how we interact with digital content and the world around us. While VR offers a fully immersive experience by creating a completely virtual environment and therefore requires specialized equipment for interaction within the virtual world – VR headsets like the Oculus for instance, AR enhances the real world with additional digital content and can often be experienced with everyday devices like smartphones. VR is used in various fields providing a fully immersive experience, allowing users to interact with and explore environments that are not physically present. AR is widely used in industrial applications, providing real-time data to technicians). Overall, VR and AR are revolutionizing how fashion is presented, sold, and experienced, making it more interactive and accessible. Virtual and Augmented Reality (VR and AR) are making significant impacts on the fashion industry in various ways: ▪ Virtual Try-Ons: AR allows customers to try on clothes virtually using their smartphones or AR glasses. This helps them see how different items will look on them without physically trying them on. ▪ Virtual Fashion Shows: Designers and brands can use VR to create immersive fashion shows that people can attend from anywhere in the world. This can reach a broader audience and provide a unique experience. ▪ Enhanced Shopping Experience: AR can overlay digital information on physical products, providing details about materials, fit, and care instructions. This can make the shopping experience more informative and engaging. ▪ Virtual Stores: Brands can create virtual stores where customers can browse and shop as if they were in a physical store, but from the comfort of their homes. ▪ Design and Prototyping: Designers can use VR to visualize and tweak their designs in a 3D space before creating physical prototypes. This can streamline the design process and reduce waste. ▪ Personalization: AR can help in creating personalized fashion recommendations by analysing a customer's preferences and previous purchases, and then suggesting items that match their style. This course aims to explore the transformative impact of Virtual Reality (VR) and Augmented Reality (AR) on the fashion industry, focusing on how these technologies enhance design, prototyping, production, and commercialization processes. It seeks to equip students with the skills and knowledge to leverage VR and AR in creating innovative fashion experiences and optimizing various stages of fashion development. The students will be given a comprehensive overview of how VR and AR technologies are revolutionizing the fashion industry. Students will learn how to use VR for immersive design and prototyping, explore AR applications for enhanced customer experiences and virtual try-ons, and understand the role of these technologies in streamlining production and commercialization. The course combines theoretical knowledge with practical skills, including hands-on projects and case studies, to prepare students for the dynamic intersection of fashion and cutting-edge technology.

Source: https://www.digitalfablab.eu, https://shoesyourlife.eu, https://aestar.com.ua

Prerequisites for users to start the course	To thrive and succeed in the course "Virtual and Augmented Reality in the Fashion Industry," students should ideally have the following prerequisites: ▪ Basic understanding of fashion industry, from design, prototyping, production, commercialization ▪ Familiarity with the principles of fashion design, including design concepts, garment construction, and trends. ▪ Introductory knowledge of VR and AR at the level of basic concepts and technologies, including how they work and their applications. ▪ Familiarity with 3D modelling and design software and VR/AR development platforms will be of much help, as well as understanding of basic programming concepts ▪ Problem-solving and creative thinking ▪ Project management principles to effectively handle design projects and collaborate with others. ▪ Communication skills for presenting ideas, collaborating with peers, and conveying design concepts and technology applications. ▪ A keen interest in technology and fashion innovation and a willingness to explore new and emerging trends in the industry.

Workload	Lectures	Seminars	Project Works	Laboratory Practice	Course assessments	Total
Teaching hours	15		20	15	5	55
Individual study hours	15		15	15	0	45
					Total HOURS	**100**
				Number of MICROCREDITS	**Total hours/25=**	**4 ETCS**

Learning outcomes/ skills and competences	Knowledge: ▪ VR and AR Technology ▪ User Experience Design – Techniques for designing engaging and interactive virtual shopping experiences. ▪ Examples of successful VR shopping experiences and how they were developed. ▪ Try-on solutions for clothing, footwear and accessories ▪ Design principles for virtual fitting rooms, including user interface and user experience considerations. ▪ Techniques to create and host virtual fashion shows using VR technology. ▪ Principles for designing engaging virtual runway experiences and enhancing viewer interaction. ▪ Strategies for attracting and engaging audiences in virtual fashion shows. ▪ Technical requirements for streaming and broadcasting virtual fashion events. ▪ 3D Design and visualization. ▪ Techniques for using VR to create and test virtual prototypes

	▪ Tools and methods for collaborating on fashion design projects in a virtual environment. ▪ Integrate of VR into existing design workflows and processes. ▪ Future Trends and Innovations in AR/VR Fashion Integration ▪ Emerging Technologies ▪ Market Trends ▪ Creative VR and AR Applications in fashion Skills/competences At the end of the course, students will be able to: ▪ Create and perform immersive virtual shopping experiences using VR technology. ▪ Assess and optimize user interactions and engagement within VR shopping platforms. ▪ Identify and apply the technical requirements needed for developing VR shopping experiences. ▪ Design and implement augmented reality applications for virtual try-on and fitting rooms. ▪ Create user-friendly interfaces for AR try-on applications that improve the shopping experience. ▪ Integrate AR technology with existing e-commerce platforms to enhance virtual shopping. ▪ Plan and execute virtual fashion shows and runway events using VR technology. ▪ Create immersive and interactive virtual runway experiences that captivate audiences. ▪ Handle the technical requirements for streaming and broadcasting virtual fashion shows. ▪ Apply VR technology to create and test virtual fashion designs and prototypes. ▪ Use VR tools to collaborate effectively on fashion design projects with remote teams. ▪ Integrate VR into existing fashion design workflows to streamline the design and prototyping process. ▪ Recognize and analyse emerging trends and innovations in AR and VR within the fashion industry. ▪ Develop and apply innovative AR and VR solutions to address future challenges and opportunities in fashion. ▪ Assess how future trends in AR and VR will impact the fashion industry and consumer behaviour.
Syllabus	1. **Virtual Reality in Fashion: Immersive Shopping Experiences** • Introduction to VR Technology – basics on hardware and software, development platforms and tools • Design principles for creating engaging and user-friendly VR environments • User interface (UI) and User Experience (UX) in VR – enhancing user interaction and immersion, analyse and optimize user feedback and behaviour • Case studies and examples / lessons learned from industry leaders 2. **Augmented Reality for Try-On and Virtual Fitting Rooms** • Introduction to AR technology – basics on hardware and software, development platforms and tools • Techniques for developing AR try-on solutions accurate virtual fitting rooms • Integration with existing e-commerce platforms • User interface (UI) and User Experience (UX) in AR • Case studies and examples – successful AR try-on implementations, challenges and solutions in AR fitting rooms 3. **Virtual Fashion Shows and Runway Experiences**

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- Introduction to virtual fashion shows – technical aspects requirements and VR technology including streaming and broadcasting technologies
- Designing virtual fashion shows and runway experiences
  - Creating immersive and interactive virtual environments, enhancing audience engagement and interaction
- Managing virtual event logistics and production
- Case studies and examples – notable virtual fashion shows and virtual runway experiences and their impact

4. **AR/VR Applications in Fashion Design and Prototyping**
- VR in fashion design and virtual prototyping
  - Using VR for 3D fashion visualization and design
- Tools and techniques for virtual design
- Creating and testing virtual prototypes
- Collaborative design in VR
  - Tools for remote collaboration on fashion design projects
- Case studies and examples
  - Successful applications of VR in fashion design
  - Innovations in virtual prototyping

5. **Future Trends and Innovations in AR/VR Fashion Integration**
- Emerging AR/VR technologies – Overview of the latest advancements in AR and VR and innovative integration in fashion projects
- Case studies of cutting-edge AR/VR fashion projects
- Predicting future trends
  - Analysing current trends and their potential evolution
  - Identifying future opportunities and challenges in AR/VR fashion
  - Exploring creative and unconventional applications
  - Assessing market and consumer trends for future innovations
- Strategic planning for AR/VR Integration

Learning/teaching delivery formats	Incorporating innovative delivery formats can greatly enhance students' learning experience and engagement in this course. The learning and teaching delivery formats selected for this course are: • **Initial assessment** • **E-book** • **Case studies in AI-Driven Fashion Design** • **VR experience** • **VR exercises** • **Final assessment**
Type of assessment	✓ Project-based assessment – Assign students a final project where they apply the knowledge acquired in this course to solve real-world fashion-related problems ✓ Quizzes ✓ Exercises (consolidation of learning outcomes acquired) ✓ Presentations and demonstrations: students prepare and deliver presentations showcasing their understanding of the theoretical concepts and the ability to communicate innovative ideas ✓ Reports on real-life application and successful stories ✓ Project-based challenge (presential, to be assessed by the trainer / tutor, physically, for credits/certification) ✓ Others
Pathway for a Successful Learner	**Estimation of the job/occupation demand:** The fashion industry's investment in AR and VR is expected to drive strong job growth across multiple disciplines, especially in design, development, retail, and event management. As more fashion brands adopt these technologies, the demand for skilled professionals in AR/VR will increase, creating a range of career opportunities and driving job creation

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at a rapid pace. The overall job growth in AR/VR fashion-related roles is estimated to grow by 20-30% annually over the next 5-10 years, as these technologies become mainstream in the industry.
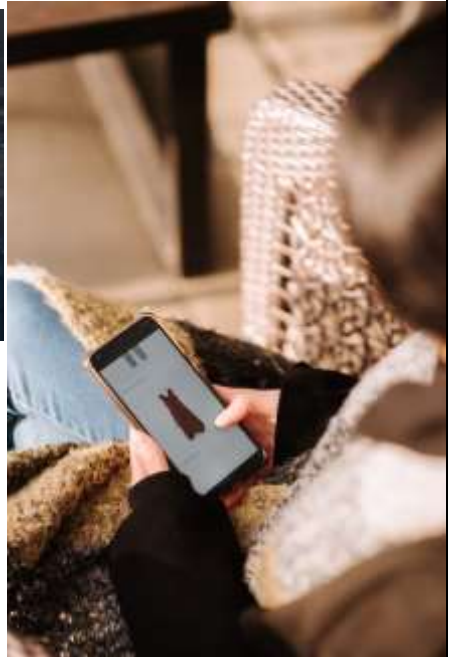
The demand for jobs and occupations related to Virtual and Augmented Reality (VR/AR) in the Fashion Industry is therefore expected to grow significantly as more fashion companies adopt these technologies.

Below is an estimation of the key occupations and job roles that would be in demand, correlated with the skills and knowledge from the course:

- VR/AR Fashion Designer – fashion brands increasingly use VR for immersive fashion design and virtual prototyping, and AR for virtual try-ons and retail experiences. Therefore, the demand for designers skilled in both fashion and immersive technology is expected to rise as well.
- VR/AR Developer – the rise of virtual stores, virtual fashion shows, and immersive shopping experiences will create a need for specialized VR/AR developers in fashion.
- Digital Fashion Show/Event Producer – the shift to virtual runway shows and fashion events requires skilled producers who can manage the technical and creative aspects of these experiences. As virtual fashion shows become more common, the need for producers skilled in both fashion and immersive technology is expected to increase more and more in the coming years.
- Fashion (Technology) Project Manager – the need for project managers with AR/VR knowledge will grow together with the complexity of integrating these technologies into fashion increases.

By the end of this course, the learners will have a well-rounded understanding of how VR and AR can be applied to various aspects of the fashion industry, from design and prototyping to shopping experiences and fashion shows. Students will gain practical skills and theoretical knowledge to effectively apply VR and AR technologies in various aspects of the fashion industry, from enhancing shopping experiences to revolutionizing design and production processes.

Annex 22. DF_MC4- Digital Marketing and E-commerce for Fashion Industry

Developer partner	**PIN-SOC.CONS. A R.L. – SERVIZI DIDATTICI E SCIENTIFICI PER L UNIVERSITA DI FIRENZE**
AIM/Purpose and short description of the course	We are experiencing a real digital revolution that is changing the way we live, work, and shop, causing companies to change their marketing activities and business models. This course is set within this context, and aims to provide a comprehensive understanding of the radical changes that are taking place in the fashion industry thanks to digital technology.

The course aims to explore the rise of e-commerce and its impact on consumer behavior in the fashion industry, to provide an overview of key digital marketing strategies that can be used by fashion companies, to Illustrate the key concepts of omnichannel retailing and its role in creating unified shopping experiences, to explain the importance of data in the fashion industry and how to use it to optimize marketing and sales activities, to offer insight into the future of digital fashion marketing, highlighting emerging trends and technological innovations.

By incorporating innovative delivery formats, the course will provide students with dynamic and engaging learning experiences in the *Metaskills4TCLF METAVERSE* environment that leverages cutting-edge technology and pedagogical approaches.

Source: Pexels and Pixabay |
| Prerequisites for users | Before beginning the course, it would be helpful to have basic marketing knowledge; it is important to have a general understanding of marketing fundamentals, such as market segmentation, branding, and the marketing mix.
Users should be familiar with digital channels a basic knowledge of the main digital channels (social media, search engines, e-commerce) is essential for understanding online market dynamics.
In addition, users must have an interest in the fashion industry because it can facilitate learning and understanding the challenges and opportunities specific to this market. |
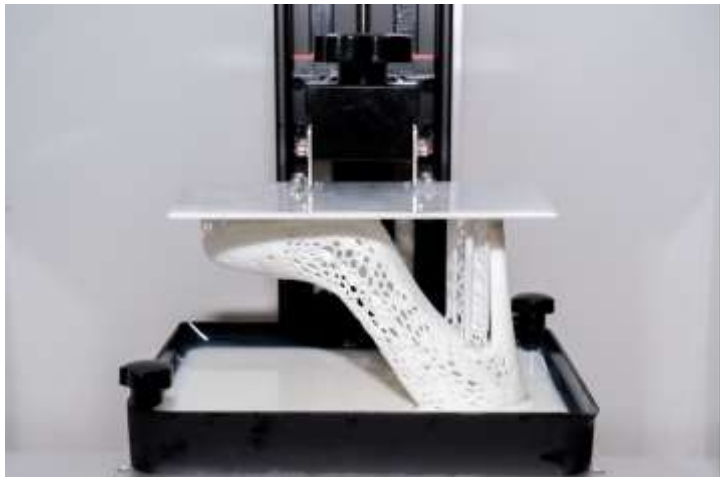
Workload	Lectures	Seminars	Project Works	Laboratory Practice	Course assessments	Total
Teaching hours	15		20	15	5	55
Individual study hours	15		15	15	0	45

Total HOURS		**100**
Number of MICROCREDITS	**Total hours/25=**	**4 ETCS**

Learning outcomes/ skills and competences	**Knowledge**: • E-commerce systems: Basic digital architecture and commercial transactions for trading products or services conducted via Internet, e-mail, mobile devices, social media, etc. **Skills/Competences**: • Digital marketing techniques: The marketing techniques used on the web to reach and engage with stakeholders, customers and clients. • Plan digital marketing: Develop digital marketing strategies for business purposes, create websites and deal with mobile technology and social networking. • Make data-driven decisions: Collect data such as Key Performance Indicators (KPIs) for an organisation, and use the information to formulate actions and strategies.
Syllabus	1. **The Digital Transformation of Fashion Retail: the Rise of E-Commerce and the Evolution of Consumer Behaviour** • The impact of digital transformation on the fashion retail • Consumer behaviour in the Digital Age • The rise and the impact of e-commerce on the fashion industry 2. **Digital Marketing Strategies: Social Media, Influencer Marketing, Online Advertising, And Content Creation** • Social media marketing: the main platforms and tools used by fashion brands • Influencer marketing and brand partnership • Online advertising: techniques for reaching a targeted audience • Content marketing and storytelling in fashion 3. **Omnichannel Retailing: Creating Seamless Customer Experience** • The importance of omnichannel retailing • From offline to online and back: customer journey and touchpoints • 360° personalization: how to reach the modern customer 4. **Data-Driven Decision Making: Analytics and Insights To Optimize Marketing And Sales in e-Commerce** • The role of data in Fashion Retail • Tools, technologies, and metrics for collecting and managing data • Data and insights to optimise marketing and e-commerce strategies 5. **The Future of Digital Fashion Marketing: Innovations and Emerging Trends** • Emerging technologies in fashion retail • The metaverse and virtual fashion: enhancing the shopping experience • The future consumer and new business models: challenges and opportunities

Learning/teaching delivery formats	Incorporating innovative delivery formats can greatly enhance students' learning experience and engagement in this course. The learning and teaching delivery formats selected for this course are: • **Initial assessment** • **E-book** • **Case studies in AI-Driven Fashion Design** • **VR experience** • **VR exercises** • **Final assessment**
Type of Final Assessment	✓ **Project-based assessment** – Assign students a final project where they apply the knowledge acquired in this course to solve real-world fashion-related problems ✓ **Quizzes** ✓ **Presentations and demonstrations:** students prepare and deliver presentations showcasing their understanding of the theoretical concepts and the ability to communicate innovative ideas ✓ **Reports on laboratory work/practical exercises** ✓ **Others**
Pathway for a Successful Learner	**Estimation of the job/occupation demand:** The fashion industry is undergoing a rapid digital transformation, creating a surge in demand for professionals with expertise in e-commerce, digital marketing, and data analytics. As the fashion industry continues to evolve, the demand for professionals with a strong understanding of digital technologies and consumer behavior is expected to grow significantly. **By the end of this course**, students will be able to understand the impact of digital transformation on the fashion retail industry, develop and implement effective digital marketing strategies, utilize data analytics to optimize marketing and sales performance, identify and leverage emerging trends and technologies in the fashion industry.

Annex 23. DF_MC5- 3D Printing and Fashion Production

Developer partner	CTCP-CENTRO TECNOLOGICO DE CALCADO DE PORTUGAL
AIM/Purpose and short description of the course	The integration of 3D printing (3DP) technology into the fashion industry is revolutionizing traditional manufacturing processes. By offering unparalleled precision, customization potential, and efficiency, 3DP is reshaping how fashion products are prototyped, tooled, and produced. This innovative approach not only accelerates the development cycle but also opens new possibilities for design and functionality, enabling designers and manufacturers to push the boundaries of creativity. From creating intricate prototypes that accurately reflect final products to developing specialized tools that enhance manufacturing accuracy, 3DP is setting a new standard in the industry. Additionally, the adoption of 3DP in production processes promises to streamline operations, reduce waste, and bring about a new era of sustainability and scalability in fashion manufacturing. This exploitation delves into the transformative impact of 3DP across prototyping, tooling, and production, highlighting its potential to drive growth and innovation in the fashion sector. Transposing the benefits of 3D printing (3DP) in the fashion sector to education and training involves creating a curriculum that integrates practical, hands-on experience with cutting-edge technology. By incorporating 3DP into educational programs, students can gain invaluable skills that are directly applicable to the modern fashion industry. By integrating 3D printing into education and training programs, we can equip the next generation of fashion designers and manufacturers with the skills and knowledge needed to excel in a rapidly evolving industry. The actual curriculum aims at developing all necessary skills/competences to enable fashion industry technicians to use 3D Printing technology on the support of prototyping tooling and production. This approach not only enhances their technical capabilities but also fosters innovation, creativity, and sustainability, ensuring they are well-prepared for the future of fashion production. *Source: CTCP*

Prerequisites for users to start the course	To start this course, learners generally need to have some foundational knowledge and skills in the following areas:
	
	Basic Computer Skills
	    ▪ Ability to use design software and general computer navigation.
	    ▪ Familiarity with file types, saving, exporting, and transferring files for 3D printers.
	3D Modelling Software Experience

	▪ Basic understanding of 3D modelling programs such as AutoCAD, Blender, Tinkercad, Rhino, or CLO 3D. This knowledge helps in designing objects for 3D printing.
	Fashion Design Basics
	  ▪ Understanding basic fashion design concepts like pattern-making, textiles, and garment construction.
	  ▪ Knowledge of how fashion pieces are typically designed and produced.
	Interest in Technology and Innovation
	  ▪ Curiosity about merging fashion with cutting-edge technology like 3D printing.
	  ▪ Willingness to explore how new materials and production methods influence fashion design.
	Some Understanding of Materials
	  ▪ Basic knowledge of fabrics, plastics, and other materials used in 3D printing for fashion.

Workload	Lectures	Seminars	Project Works	Laboratory Practice	Course as-sessments	Total
Teaching hours	15		20	15	5	55
Individual study hours	15		15	15	0	45
Total HOURS						**100**
Number of MICROCREDITS				**Total hours/25=**		**4 ETCS**

Learning outcomes/ skills and competences	Knowledge:
	  ▪ General knowledge on 3D Printing: technology, printing methods, materials, applications
	  ▪ Printing strategies of objects, weather final products or tools
	  ▪ Design requirements for 3D Printing
	  ▪ Available Software
	  ▪ Post-processing operations
	  ▪ Quality Control in 3D printing
	  ▪ Design Thinking methods
	
	Skills:
	  ▪ To be able to select the adequate 3D Printing technology and techniques to specific materials for the development of single pieces or components for prototyping and/or preparation of tools for the Leather Goods sector.
	  ▪ To be able to draft adequate printing strategies for each case, according to the technology and materials selected and the purpose of the final product and/or tool.
	  ▪ To be able to select and apply adequate post-processing operations according to materials, performance / functionality of the printed pieces/products.
	  ▪ To be able to apply the adequate available software for the design and processing of 3D printing flowchart.
	  ▪ To be able to apply quality control procedures and criteria towards the printed objects and the overall process.
	  ▪ To be able to apply Design Thinking methods and/or other project-based methodology to create innovative projects and products.

Syllabus	**1. 3D Printing Technology in Fashion: Past, Present, and Future**
	  • Basic concepts of 3D printing and comparison with other methods of manufacturing
	  • How 3D printing is disrupting traditional manufacturing processes
	  • Technologies for the 3D printing (additive manufacturing) - FDM, SLA, SLS, etc.;
	  • Materials for additive manufacturing and correspondent applications - plastics, res-ins, metals, and textiles, etc.;

Co-funded by the European Union

- Software and integration with other 3D digital tools;
- Industrialization and workflow of 3D printing technologies;

2. Applications of 3D Printing in Fashion Design and Prototyping

- Potential application of different 3D Printing technologies in Fashion industry: Textile, Clothing, Leather and Footwear
- Product design limitations for each family of additive manufacturing 3D printing technologies
- Relationship between 3D printing technologies, materials used in 3D printing and printing parameters;
- Available Software
- Impact on the supply chain and overall business models
- Case-studies

3. Sustainable Practices: Environmental Benefits of 3D Printing in Fashion Sustainability

- Introduction to Sustainability in Fashion
- How 3D printing can contribute to sustainable fashion by reducing waste and over-production:
  - Types of 3D Printing and Their Environmental Impact: FDM, SLA, SLS, and their applications in fashion.
  - Waste Reduction and On-Demand Production
  - Customization as a Sustainable Practice - the role of on-demand production in minimizing environmental impact.
- Sustainable Materials in 3D Printing:
  - Exploring biodegradable and recycled materials for personalized 3D-printed products.
- Energy Efficiency and Carbon Footprint
- End-of-Life Considerations for 3D-Printed Fashion

4. Customisation and Personalisation: Empowering Consumers with 3D Printing

- Introduction and different definitions to Customization and Personalization
  - The growing demand for personalized products in fashion, accessories, and beyond
  - Consumer Empowerment through 3D Printing
  - Examples of industries utilizing 3D printing for consumer personalization, beyond TCLF (e.g., footwear, eyewear, jewelry, prosthetics).
  - Case studies of brands and companies leading in customized 3D-printed products (e.g., Nike, Adidas, …….).
- Design for Customization
  - Introduction to parametric design: enabling users to modify product dimensions.
  - How to incorporate consumer preferences in design (color, size, texture, functionality).
  - Consumer Data and Personalization
  - Ethical considerations in collecting and using personal data for product customization.
  - Role of AI and machine learning in automating customization.
- Mass Customization with 3D Printing - How 3D printing enables scalable customization in mass production
  - Traditional mass production vs. mass customization through additive manufacturing.
- Consumer Interaction and Co-Creation
  - Platforms for co-creation: how consumers can become part of the design process.
  - Digital tools that allow consumers to design their own products online.

o Social and psychological aspects of consumers designing their own products.
- Future Trends in 3D Printing for Customization
  o Innovations in materials, technology, and software that will shape the future of personalized products.
  o The rise of distributed manufacturing and local production hubs.

5. **Challenges and Opportunities: Integrating 3D Printing into Fashion Industry Processes**
- Design for 3D printing:
  o Organic design vs parametric design
  o Design rules for objects to be printed;
  o Design for printing technology;
  o Design to optimize the use of material and support structures
  o Design to optimize the performance/functionality of the final products
- Basic concepts of generative design and topology optimization
- Software and integration with other 3D digital tools;
- Post-processing in additive manufacturing:
  o Support removal.
  o Surface finishing techniques and materials, including texturing.
  o Heat treatment.
  o Machining operations (milling, drilling/perforation, cutting, etc.)
  o Surface coating
  o Chemical treatment
  o Assembling parts
- Optimizing the construction of the pieces to print: single pieces or assembling of different pieces
- Challenges and opportunities in creating mass-customized products.
- Quality inspection: visual inspection, dimensional measurement, mechanical testing, calibrations of equipment

Learning/teaching delivery formats	Incorporating innovative delivery formats can greatly enhance students' learning experience and engagement in this course. The learning and teaching delivery formats selected for this course are: • **Initial assessment** • **E-book** • **Case studies in AI-Driven Fashion Design** • **VR experience** • **VR exercises** • **Final assessment**
Type of assessment	✓ Project-based assessment - Assign students a final project where they ap-ply the knowledge acquired in this course to solve real-world fashion-related problems ✓ Quizzes ✓ Exercises (consolidation of learning outcomes acquired) ✓ Presentations and demonstrations: students prepare and deliver presentations showcasing their understanding of the theoretical concepts and the ability to communicate innovative ideas ✓ Reports on real-life application and successful stories ✓ Project-based challenge (presential, to be assessed by the trainer / tutor, physically, for credits/certification) ✓ Others
Pathway for a Successful Learner	**Estimation of the job/occupation demand:** The demand for jobs and occupations related to 3D Printing and Fashion Production is growing steadily due to advancements in technology and the shift toward more sustainable, personalized, and efficient manufacturing processes. 3D printing is seen as a more sustainable alternative, allowing reducing waste and

embracing on-demand production, there will be increased demand for professionals who can integrate these practices into fashion production. As 3D printing technology becomes more sophisticated, there will be a need for professionals who can leverage these advancements in fashion design and production. The luxury fashion sector is increasingly experimenting with 3D printing to offer unique, high-end, and customized pieces, further fuelling demand for specialists in this area. Startups and Innovation Hubs are focused on 3D-printed fashion, wearables, and accessories are emerging, further driving job creation in this niche.

Possible new occupation may emerge in a near future in the 3D Printing and Fashion Production:

3D Fashion Designer combining traditional fashion design skills with 3D modelling software to create digital patterns and garments that can be 3D printed.

3D Printing Technician who operates with 3D printers and performs post-production operations, ensuring quality control and the smooth production of high-quality fashion items.

Fashion 3D Product Developer who oversees the entire production cycle from design to final product, integrating 3D printing technologies into the development process.

By the end of this course, the students will have the knowledge and skills necessary to use 3D Printing technology on the support of prototyping, tooling and production in fashion industry, fostering innovation, creativity, and sustainability, ensuring they are well-prepared for the future of fashion production.

Annex 24. DF_MC6- Interactive Digital Technologies in the Fashion Industry

Developer partner	**TUIASI- UNIVERSITATEA TEHNICA GHEORGHE ASACHI DIN IASI**
AIM/Purpose and short description of the course	The fashion industry must rise to the challenge of using consumer engagement and experiences through design collaboration and content/product creation. This new approach should be completed by digital technology to evolve new business models, goods, services, and processes to avoid further declining growth, the possibility of losing ground to competitors, and losing relevance in an international market. How fashion is designed, advertised, produced and traded will be completely transformed by technology, from AI-driven design tools to virtual fitting rooms. This course aims to provide students with a thorough understanding of how interactive experiences and digital technologies are transforming the apparel and fashion industry, as well as the information and skills necessary to recognise the importance of these technologies to their future careers. The course provides students with dynamic and engaging learning experiences in the ***Metaskills4TCLF METAVERSE*** environment, which uses cutting-edge technology and pedagogical approaches by incorporating creative delivery formats. *Source: https://www.freepik.com/premium-ai-image/woman-dress-is-standing-front-display-clothing-store_59579055.htm* *Source: https://www.freepik.com/premium-ai-image/futuristic-wardrobe-walkin-closet-automated-racks-smart-mirrors-seamless-fashion-sanctuary_53588100.htm*
Prerequisites for users to start the course	In order to recognise the impact and role of digital technologies in the fashion world, it is helpful for learners to know the key processes and concepts in this field. A general understanding of the fashion industry, including trends, consumer behaviour, and business processes, provides the context for understanding the use of digital technologies in this dynamic field.

Workload	Lectures	Seminars	Project Works	Laboratory Practice	Course assessments	Total
Teaching hours	15		20	15	5	55
Individual study hours	15		15	15	0	45
				Total HOURS		**100**
			Number of MICROCREDITS	**Total hours/25=**		**4 ETCS**

Learning outcomes/ skills and competences	**Knowledge:** • A basic understanding of using various digital technologies to solve specific fashion problems. The learner needs to be aware of the benefits of such tools in their professional life and their ethical and social implications, especially related to Artificial Intelligence (AI) tools, in everyday life. **Skills/Competences:** • Practice digital tools for collaboration, content creation, product design, and problem-solving; • Openness to learning, the ability to accept and adapt to change and to acquire various soft skills; • Experiment with technical skills, ICT skills, innovation and creativity to solve specific tasks in the fashion industry.
Syllabus	**1. Digital Transformation and Innovation in the Fashion Industry** • Digital transformation of the fashion industry: trend or necessity? • Historical context and evolution of digital technologies for the clothing and fashion industry • Value chain of digital fashion. **2. Virtual Fitting Rooms and Virtual Styling** • General details about Virtual Fitting Rooms. • Guide for developing a measuring Augmented Reality (AR) app necessary for virtual fitting rooms. • Virtual styling- a sustainable solution for the co-creation process **3. Interactive in-Store Experiences: Virtual Try-On, Mirrors and Interactive Display** • Innovative experiences in-store: Smart Mirrors • Virtual try-on→ The future retail • Interactive display→a revolutionising retail **4. Enhancing Customer Engagement and Retention** • Customer engagement and retention→ a key to business success. • Strategies to develop and increase customer engagement • Tools to evaluate customer engagement and retention **5. Case studies and Best Practices: Successful Implementation of Digital Technologies in the Fashion Industry** • Best practices for adopting digital technologies in a fashion business • Additional technological innovations→ a source for a positive change • Successful digital transformation (case studies) • AI challenges across the fashion design lifecycle **6. Gaming Experiences in Fashion** • High-end fashion and gaming tools • Digital fashion for avatars used in the gaming industry • A new trend in e-commerce: Buying digital high-end fashion products - Just a trend? Why? Who? What purpose? • Serious Games for fashion education
Learning/teaching delivery formats	Incorporating innovative delivery formats can greatly enhance students' learning experience and engagement in this course. The learning and teaching delivery formats selected for this course are: • **Initial assessment** • **E-book** • **Case studies in AI-Driven Fashion Design** • **VR experience** • **VR exercises** • **Final assessment**

Type of Final Assessment	✓ **Project-based assessment** - Assign students a final project in which they apply the knowledge gained in this course to solve selected problems related to fashion. ✓ **Quizzes** ✓ **Presentations and demonstrations:** students prepare and deliver presentations in which they demonstrate their understanding of theoretical concepts and their ability to communicate innovative ideas
Pathway for a Successful Learner	**Estimation of the job/occupation demand:** Digital transformation is a reality for all manufacturing industries and domains, including fashion. Digital expertise in fashion will be in high demand because it offers creativity, communication, quick solutions to various problems, diversity, social inclusion, and sustainability. **By the end of this course**, participants will have the knowledge and skills necessary to navigate this dynamic landscape, enabling them to drive innovation, efficiency and sustainability in the digital fashion industry.

Annex 25. DF_MC7- Leadership and Management in Fashion Industry

Developer partner	**CTCP-CENTRO TECNOLOGICO DE CALCADO DE PORTUGAL**
AIM/Purpose and short description of the course	The fashion industry is a dynamic and fast-paced environment where creativity, innovation, and trendsetting meet business strategy and operational excellence. To thrive in such a competitive and ever-evolving landscape, effective leadership and management are essential. This course is designed to equip emerging and established leaders in the fashion industry with the skills needed to manage teams, nurture talent, and make informed decisions that drive business success.
	Fashion is not just about design; it is also about collaboration, vision, and execution. Effective leaders in fashion must balance creative aspirations with commercial viability, managing teams that span a wide range of specialties, from designers and merchandisers to marketers and supply chain experts. In this context, the ability to manage diverse talents, foster teamwork, and make strategic decisions becomes critical for ensuring long-term success.
	The fashion industry thrives on creativity, and leaders must be adept at identifying, nurturing, and retaining top talent. This section explores strategies for managing creative professionals, fostering innovation while ensuring alignment with business goals, and creating a culture that supports growth and development.
	Building cohesive, high-performing teams is crucial in fashion, where collaboration between different departments, such as design, marketing, and production, can make or break a project. The course addresses the challenges of leading multidisciplinary teams, fostering collaboration across cultural and functional boundaries, and creating an inclusive and innovative work environment.
	Leaders in the fashion industry often face high-stakes decisions, whether related to market trends, production timelines, or brand strategy. This segment equips students with decision-making frameworks and tools, emphasizing data-driven approaches while also considering intuition, creativity, and risk management. Participants will explore case studies and real-world scenarios to develop a strategic mindset.
	The course provides a practical, industry-focused exploration of leadership and management principles within the specific context of fashion. The topics provide a comprehensive exploration of leadership and management within the unique context of the fashion industry, helping to cover all key aspects.
	Overall, this course provides a holistic understanding of leadership and management in the fashion industry, preparing students to lead with confidence, manage diverse teams effectively, and make decisions that align with both creative and business objectives. By the end of the course, participants will be well-prepared to lead in an industry that demands both vision and pragmatism.
	Source: https://cakecreationcravings.blogspot.com/
Prerequisites for users to start the course	To ensure students will be well-positioned to thrive in the course and maximize their benefit from the course and succeed, the following prerequisites are recommended:

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- Basic understanding of the Fashion Industry: prior knowledge or experience in the fashion industry is essential, in areas such as design, production, marketing, or even retail, being familiarized with the specific dynamics, roles, and challenges to the fashion industry to better understand the context of leadership and management in this field.
- Basic knowledge in business or management: a basic understanding of management concepts (e.g., team dynamics, organizational structures, or business strategy) is helpful, though not mandatory to be more easily related to the course content, focused on leadership, team building, and decision-making in a fashion context. Recommended experience in a Leadership role, leading or managing teams in any capacity (internships, projects, or full-time roles).
- Interest in talent management and team building, managing creative teams, fostering innovation, and guiding talent within the fashion industry.
- Willingness to participate in group projects and case studies. The course will involve real-world scenarios and group exercises, requiring students to collaborate and apply leadership and management theories in practical settings.
- Basic analytical and critical thinking skills are helpful, especially for the decision-making component of the course to solve complex problems involving team dynamics, market trends, and business challenges.
- Commitment to personal and professional growth, to develop leadership and management skills, specifically tailored to the fashion industry. The course will focus on self-reflection, leadership styles, and personal growth as a leader, making it important for students to be committed to their own development.

Workload	Lectures	Seminars	Project Works	Laboratory Practice	Course as-sessments	Total
Teaching hours	15		20	15	5	55
Individual study hours	15		15	15	0	45
				Total HOURS		100
			Number of MICROCREDITS	Total hours/25=		4 ETCS

Learning outcomes/ skills and competences	By the end of the course, participants will have gained a comprehensive understanding of leadership and management practices in the fashion industry, from leading creative teams and managing talent to strategic decision-making and adapting to industry disruptions. They will be equipped to apply these skills in various roles within the fashion ecosystem, whether in established brands, startups, or their own ventures. Knowledge: ▪ Fashion company's structure ▪ Role of leadership in fashion ▪ Core management and leadership principles ▪ Time management, resource allocation, and operational efficiency tailored to fashion companies ▪ Fashion's global marketplace ▪ Communication, decision-making, and conflict resolution skills, tailored for fashion's creative and operational environments ▪ Leadership styles and strategies ▪ Strategies for recruiting talented people and keeping them engaged ▪ Strategies for fostering collaboration across departments ▪ Techniques for a creative Work Culture ▪ Conflict Management ▪ Diversity and Inclusion ▪ Market trend analysis

- Data-driven decision making
- Scenario planning
- Risk management
- Sustainability in decision-making
- Budgeting and resource allocation
- Innovation and creativity

Skills/Competences:

- Understand the structure and key functions of the fashion industry, including design, production, marketing
- Recognize the role of leadership in balancing creativity with business goals in fashion companies.
- Acquire foundational management skills necessary to lead fashion businesses, including time management, resource allocation, and operational oversight.
- Differentiate between leadership and management roles and how each contributes to fashion business success.
- Identify different organizational structures in fashion companies and their impact on leadership approaches.
- Develop essential leadership skills such as effective communication, conflict resolution, and decision-making tailored to fashion environments.
- Understand the complexities of leading both creative and operational teams in the fashion industry.
- Analyse various leadership styles (transformational, transactional, servant, etc.) and their applications within the fashion industry.
- Adapt leadership approaches to suit different team dynamics, project requirements, and evolving market conditions.
- Develop strategies to lead fashion teams through periods of industry change, including digital transformation and sustainability challenges.
- Learn how to lead effectively during crises or major disruptions in the fashion supply chain or market.
- Understand how to attract, retain, and nurture top talent in the fashion industry, focusing on creativity and innovation.
- Build high-performing, cross-functional teams that can work collaboratively across design, marketing, production, and retail functions.
- Develop strategies for creating a creative and inclusive work culture that fosters innovation and engagement.
- Learn techniques for managing conflicts within creative teams and between departments, fostering collaboration and resolving disputes.
- Implement diversity and inclusion practices to build a more innovative and balanced workforce.
- Analyse fashion market trends and consumer behaviours to inform business strategies and product decisions.
- Use data-driven decision-making techniques to make informed choices in the fast-paced fashion industry.
- Develop and execute long-term strategic plans that balance short-term needs with long-term business growth.
- Incorporate sustainability and ethical considerations into strategic decisions while maintaining profitability.
- Learn how to allocate resources efficiently and manage budgets in fashion product development and marketing.
- Examine successful leadership strategies used by iconic fashion brands and designers to inspire innovation and business growth.
- Learn from sustainability leaders in the fashion industry and explore how integrating ethical practices enhances brand value.
- Study the leadership approaches of companies that have embraced digital disruption and innovation, leveraging technology and e-commerce to dominate the market.

	▪ Apply insights from real-world fashion leadership cases to develop your own leadership style and strategy for leading teams and driving business success.
Syllabus	**1. Fundamentals of Leadership and Management in the Fashion Industry** • Fashion Business Ecosystem: key players, market segments, and business models • Roles and Responsibilities of Leaders in Fashion: balancing creativity with business • Leadership vs. Management: key functions and approaches • Organizational Structures in Fashion Companies: from startups to global corporations • Leading Creative Teams: challenges and strategies for creative environments • Core Management Skills for Fashion Leaders: Time management, delegation, and communication • Ethical Leadership in Fashion: Corporate social responsibility, sustainability, and transparency **2. Leadership Styles and Strategies: Adapting to the Changing Landscape of Fashion** • Transactional Leadership: performance-based leadership and its role in fashion • Servant Leadership: supporting creative talent and team growth • Situational Leadership: adapting styles based on team dynamics and circumstances • Collaborative Leadership: encouraging teamwork and cross-functional collaboration • Leadership in Crisis: managing disruptions, including supply chain issues and market downturns • Emerging Trends in Leadership: leading in a fast-paced, digitalized fashion world **3. Talent Management and Team Building in Fashion Companies** • Attracting and Retaining Top Talent: Recruiting in fashion's competitive environment to attract and Retain Top Talent • Building and Sustaining Creative Cultures as a tool to foster innovation and collaboration • Motivating Creative Professionals: Incentive schemes, recognition, and career development • Diversity and Inclusion in Fashion Industries: strategies for a more inclusive workplace • Conflict Resolution and Mediation: managing interpersonal challenges in creative teams • Team Development: skills assessments, training, and mentoring in fashion companies • Collaboration Across Departments: integrating design, production, marketing, and finance teams **4. Strategic Planning and Decision-Making in Fashion Business** • Understand market trends and consumer behaviour - data-driven decision-making • Business models in fashion: luxury, fast fashion, and sustainable fashion strategies • Planning through scenarios: anticipating industry shifts and preparing for future trends • Resource allocation and budgeting: managing costs in product development and production • Risk Management • Decision-Making Frameworks: analytical tools for making strategic choices in fashion

	• Sustainability as a strategic priority: balancing profitability with environmental and social goals 5. **Case Studies: Leadership Success Stories in Fashion** • Visionary leadership in fashion: the rise of brands like Chanel, Gucci • Iconic fashion leaders: leadership lessons from industry figures (e.g., Tom Ford) • Brand turnarounds: successful leadership in reviving struggling fashion houses (e.g., Burberry) • Sustainable leadership in fashion: (e.g., Stella McCartney, Patagonia) • Digital leadership in fashion: the impact of e-commerce and social media influencers (e.g., Fashion Nova, ASOS) • Global expansion and leadership: managing international growth (e.g., Zara, H&M) • Innovation and disruption: leadership in fast fashion, tech integration, and direct-to-consumer models
Learning/teaching delivery formats	Incorporating innovative delivery formats can greatly enhance students' learning experience and engagement in this course. The learning and teaching delivery formats selected for this course are: • **Initial assessment** • **E-book** • **Case studies in AI-Driven Fashion Design** • **VR experience** • **VR exercises** • **Final assessment**
Type of assessment	✓ **Quizzes** ✓ **Exercises** (consolidation of learning outcomes acquired) ✓ **Presentations and demonstrations**: students prepare and deliver presentations showcasing their understanding of the theoretical concepts and the ability to communicate innovative ideas ✓ **Reports** on real-life application and successful stories ✓ **Project-based challenge** (presential, to be assessed by the trainer / tutor, physically, for credits/certification) - Assign students a final project where they apply the knowledge acquired in this course to solve real-world fashion-related problems ✓ **Others** to be defined
Pathway for a Successful Learner	**The job and occupation demand** for the demand for skilled leaders and managers in the fashion industry is growing due to the sector's evolving complexities and increasing global reach. With the rise of digital technologies, sustainability concerns, and the need for agile business strategies, professionals who possess leadership, team management, and decision-making skills are highly sought after in various roles across the fashion ecosystem. The course impacts on the following emerging occupations: ▪ Creative Directors ▪ Brand Managers ▪ Production Managers ▪ Human Resources (HR) and Talent Managers in Fashion ▪ Sustainability and Corporate Social Responsibility (CSR) Leaders ▪ Marketing Director ▪ Entrepreneurs and Founders of Fashion Startups ▪ Fashion Consultants and Advisors For aspiring entrepreneurs, the course provides the foundation to successfully lead their own fashion ventures, from team management to strategic decision-making. **By the end of this course**, the learners will will experience several impactful outcomes that enhance their professional and personal growth, positioning them for success in the fast-evolving fashion industry. The course will offer both practical skills and strategic insights tailored to the unique challenges of leadership in fashion.

Annex 26. DF_MC8- Process and Material Traceability in Fashion Industry

Developer partner	**ITECH LYON- INSTITUT TEXTILE ET CHIMIQUE DE LYON**
AIM/Purpose and short description of the course	The primary purpose of this course is to equip participants with the comprehensive knowledge and practical skills necessary to implement and manage traceability in the fashion industry. Students will explore the principles and challenges of traceability, including the material and process traceability during production. By completing this course, participants will learn the tools and technologies used to track materials and processes, be able to identify and address challenges in maintaining traceability, and stay informed about future trends and innovations in the field. The course will provide students with dynamic and engaging learning experience with gamification around research on the traceability of a fashion product. *Pictures generated with AI*
Prerequisites for users to start the course	Before delving into the topics of process and material traceability in the fashion industry, it's beneficial —but not mandatory— for learners to have a basic understanding of the fashion-related industry. With this preliminary knowledge, students can better understand and engage with the concepts and practices taught in a course on process and material traceability in the fashion industry.

Workload	Lectures	Seminars	Project Works	Laboratory Practice	Course assessments	Total
Teaching hours	15		20	15	5	55
Individual study hours	15		15	15	0	45
Total HOURS						**100**
Number of MICROCREDITS					Total hours/25=	4 ETCS

Learning outcomes/ skills and competences	Knowledge : • Understanding of traceability principles and their application to supply chain management. • Insight in material and process traceability solutions and labelling Skills/Competences (2-3 skills/competences): • Ability to identify and to use the traceability tools • Ability to optimize the supply chain traceability and quality in the fashion industry.
Syllabus	**1. Introduction to Traceability in Manufacturing** • Traceability definition, importance in the fashion industry

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	- Consumers awareness and transparency - Understanding the supply chain from raw materials to finished product (example footwear VR) **2. Implementing Traceability Systems - Ensuring Factory-Level Compliance** - Steps to implement a traceability system in fashion factories - Common challenges and barriers to implementation - Compliance standards and regulations: global and regional perspectives **3. Material Traceability in Production** - Overview of traceability tools for textiles materials (RFID…) - Overview of traceability tools for leathers - Traceability and Blockchain technology **4. Process Traceability and Quality Control** - Eco-design and digital product passport European project - Labelling and certifications for quality control of the supply chain **5. Case Studies and Best Practices** - Footwear: 4.0 industry, automated sport shoes factory in France - On luxury market: Vertical project, from raw material to final customer (garment and leather goods)
Learning/teaching delivery formats	Incorporating innovative delivery formats can greatly enhance students' learning experience and engagement in this course. The learning and teaching delivery formats selected for this course are: **Initial assessment** **E-book** **Case studies in AI-Driven Fashion Design** **VR experience** **VR exercises** **Final assessment**
Type of assessment	✓ **Project-based assessment** - Assign students a final project where they apply the knowledge acquired in this course to solve real-world fashion-related problems ✓ **Case studies** – present students with case studies and ask them to analyse and critique the approaches used, identifying strengths, weaknesses, opportunities, and threats. Encourage students to propose alternatives or improvements. ✓ **Presentations and demonstrations:** students prepare and deliver presentations showcasing their understanding of the theoretical concepts and the ability to communicate innovative ideas ✓ **Written reports on laboratory work/practical exercises** ✓ **Written essay** ✓ **Peer assessment and feedback:** students will critically evaluate their peers' work based on predefined criteria such as technical accuracy, clarity of presentation, and creativity of solutions ✓ **Formal exams and evaluations**
Pathway for a Successful Learner	**Estimation of the job/occupation demand:** With advancements in technology and the increasing emphasis on sustainability and ethical practices, there is also a growing demand for professionals who can integrate traceability into supply chains, ensuring transparency and accountability. After completing this course on "Process Traceability and Quality Control," individuals can pursue various job opportunities across the fashion industry where quality management and traceability are critical. **By the end of this course**, the students will have the knowledge and skills necessary to understand traceability in the fashion industry, contributing to more transparent, sustainable, and responsible supply chains.

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Annex 27. DF_MC9 - Quality Control and Assurance Solutions Based on Sensing and Artificial Vision

Developer partner	LIT- SIEC BADAWCZA LUKASIEWICZ - LODZKI INSTYTUT TECHNOLOGICZNY
AIM/Purpose and short description of the course	This course aims to equip participants with the knowledge and skills necessary to implement quality control and assurance solutions leveraging sensing technologies and artificial vision systems in industrial settings. Quality Control and Assurance Solutions Based on Sensing and Artificial Vision" provides a comprehensive exploration of cutting-edge technologies and methodologies for ensuring product quality and consistency in manufacturing processes. Participants will delve into the principles of sensing and artificial vision, understanding how these technologies can revolutionize quality control practices. Through a combination of theoretical insights and practical applications, learners will gain proficiency in utilizing sensors and vision systems to detect defects, assess product characteristics, and optimize production efficiency. From understanding the fundamentals of sensor-based quality monitoring to implementing advanced artificial vision algorithms, this course empowers participants to enhance product quality, reduce waste, and drive operational excellence in diverse industrial settings.
Prerequisites for users to start the course	Participants should have a basic understanding of quality control principles and access to the necessary technology and software, including hardware like sensors and cameras, for hands-on experimentation. Additionally, strong motivation and commitment to learning and applying sensing and artificial vision solutions in quality control are essential for success in the course.

Workload	Lectures	Seminars	Project Works	Laboratory Practice	Course assessments	Total
Teaching hours	15		20	15	5	55
Individual study hours	15		15	15	0	45
					Total HOURS	**100**
				Number of MICROCREDITS	**Total hours/25=**	**4 ETCS**

Learning outcomes/ skills and competences	The learners will acquire skills and competences in the following aspects: • Proficiency in analyzing materials, components, and final products using relevant quality criteria. • Ability to compare products to standards, conduct laboratory tests, and define corrective measures. • Expertise in managing and improving company quality systems, including creating quality manuals, implementing quality policies, and ensuring continuous improvement. • Familiarity with national and international quality standards, specifications, and guidelines to ensure products and processes meet the required quality levels. • Competence in fostering internal and external communication regarding quality assurance, with a focus on achieving customer satisfaction and continuous improvement.
Syllabus	**1. Introduction to Quality Control in Fashion Manufacturing** • Overview of quality control principles • Importance of quality control in fashion industry • Historical perspectives and evolution of quality control practices in fashion manufacturing

	2. Sensing Technologies for Quality Assurance in Fashion • Introduction to sensing technologies • Types of sensors used in fashion manufacturing • Applications of sensing technologies for quality assurance in fashion **3. Artificial Vision Systems for Defect Detection in Fashion** • Fundamentals of artificial vision systems • Image acquisition techniques in fashion industry • Image processing algorithms for defect detection **4. Automated Inspection Systems for Quality Control in Fashion** • Role of automation in fashion manufacturing • Implementation of automated inspection systems • Integration of sensors and vision systems for automated quality Control **5. Future Trends in Quality Control for Fashion Industry** • Advancements in quality control technologies • Industry 4.0 and its impact on fashion manufacturing • Predictive analytics and AI-driven quality control solutions for fashion industry
Learning/teaching delivery formats	Incorporating innovative delivery formats can greatly enhance students' learning experience and engagement in this course. The learning and teaching delivery formats selected for this course are: • **Initial assessment** • **E-book** • **Case studies in AI-Driven Fashion Design** • **VR experience** • **VR exercises** • **Final assessment**
Type of Final Assessment	✓ **Project-based assessment** - Assign students a final project where they apply the knowledge acquired in this course to solve real-world fashion-related problems ✓ **Quizzes** ✓ **Presentations and demonstrations:** students prepare and deliver presentations showcasing their understanding of the theoretical concepts and the ability to communicate innovative ideas ✓ **Reports on laboratory work/practical exercises**
Pathway for a Successful Learner	Upon completing the course, learners will gain expertise in designing and implementing sensor-based quality control systems, deploying artificial vision solutions for defect detection, and optimizing quality assurance processes in fashion manufacturing. **By the end of this course**, the students will develop the ability to troubleshoot and maintain these systems, adapt to emerging technologies, and contribute to improved product quality and operational efficiency.

Annex 28. DF_MC10 - Industry 5.0

Developer partner	**POLICAZ-POLITECNICO CALZATURIERO SCARL**
AIM/Purpose and short description of the course	The revolution of Industry 5.0 is already underway, and the companies operating in the Fashion Industry must be prepared to remain competitive in the near future. This course will explore the new possibilities offered by Industry 5.0, its technologies and how they can be applied to the Fashion sector. The students will discover the pillars on Industry 5.0 and the tools that will change the way fashion products are designed, produced and personalised. Additionally, they will learn how to stay updated with the latest fashion trends and consumer preferences. *Pictures generated with AI*
Prerequisites for users to start the course	Before starting this course, students should have at least some basic knowledge of recent technological tools and developments related to the Fashion Industry. In particular, they should understand Big Data Analytics and the Internet of Things. Some familiarity with basic concepts of Cybersecurity is also recommended.

Workload	Lectures	Seminars	Project Works	Laboratory Practice	Course assessments	Total
Teaching hours	15		20	15	5	55
Individual study hours	15		15	15	0	45
					Total HOURS	**100**
				Number of MICROCREDITS	**Total hours/25=**	**4 ETCS**

Learning outcomes/ skills and competences	**Knowledge:** • A fundamental understanding of how to analyse and make decisions based on raw data collected from various sources, including the use of algorithms to derive insights or trends that support decision-making processes. • Knowledge of best practices related to ICT systems, networks, computers, devices, services and processes for avoiding unauthorised access, modification, and/or denial of service related to the fashion sector. **Skills/Competences:** • Practice on how to collect and evaluate large quantities of numerical data, particularly for identifying patterns and trends;

	• Ability to use tools and technologies for communicating, interacting and collaborating with robots and cobots; • Proficiency in using technological tools and software to investigate trends and developments in fashion and anticipate their evolution based on current or future market and business conditions.
Syllabus	**1. Introduction to Industry 5.0** • What is Industry 5.0: context and definition; • Application of Industry 5.0 to the Fashion Sector. **2. Human-Machine Collaboration in Industry 5.0** • What is Human-Machine Collaboration; • The impact of Human-Machine Collaboration in the Fashion Industry; • Benefits and Challenges in implementing Human-Machine Collaboration in the Fashion Industry. **3. Internet of Things and Big Data Analytics in Fashion** • Definition and application of the Internet of Things (IoT); • What is Big Data Analytics and how it can be applied to the Fashion Industry; • Impact of IoT and Big Data Analytics to the business models and production processes of the Fashion Industry. **4. Cloud Computing Solutions for Fashion Data Management** • What is Fashion Data Management and why it is important; • How Cloud Computing Solution can impact Fashion Data Management; • Benefits and Challenges of implementing Cloud Computing Solution. **5. Cybersecurity in Fashion Industry** • What is Cybersecurity: definition and fields of application; • Why and How Cybersecurity can be applied to the Fashion Industry.
Learning/teaching de-livery formats	Incorporating innovative delivery formats can greatly enhance students' learning experience and engagement in this course. The learning and teaching delivery formats selected for this course are: • **Initial assessment** • **E-book** • **Case studies in AI-Driven Fashion Design** • **VR experience** • **VR exercises** • **Final assessment**
Type of Final Assess-ment	✓ **Project-based assessment** - Assign students a final project where they apply the knowledge acquired in this course to solve real-world fashion-related problems. ✓ **Quizzes** ✓ **Presentations and Demonstrations:** Students prepare and deliver presentations showcasing their understanding of the theoretical concepts and the ability to communicate innovative ideas ✓ **Reports on real-life Application and Success Stories** ✓ **Others**
Pathway for a Success-ful Learner	**Estimation of the job/occupation demand:** the revolution of Industry 5.0 has already begun and it will be fundamental for businesses in the Fashion Industry to have personnel already trained about the key concepts of Industry 5.0. **By the end of this course**, students will have the knowledge and skills necessary to navigate Industry 5.0, with a clear vision of its new and revolutionary technological tools and their applications in the Fashion sector. They will be prepared to contribute to companies in the Fashion Industry, helping them remain competitive in the near future

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Annex 29. DF_MC11 - Digital Solutions in Textile Production

Developer partner	TUIASI- UNIVERSITATEA TEHNICA GHEORGHE ASACHI DIN IASI
AIM/Purpose and short description of the course	Now more than ever, the textile industry needs a new approach to technological change in product design, manufacturing, operations, supply chain management, and business processes as an application of Industry 4.0 in the textile sector and as a transition to Industry 5.0 and Industry 6.0 for new connected technologies in the factory. Overall, digital solutions and systems that utilise communication technologies must provide strong technical and practical added value in various contexts for collaboration, content creation, and sustainable problem-solving to improve efficiency, quality, productivity, and customer satisfaction. In addition to the development of Industry 4.0 and Industry 5.0 (with features such as big data, AI, ML, robotics, and simulation), Textile Industry 5.0 is key to competitiveness through interoperability, decentralization of information, real-time data collection, and increased flexibility for textile technology, the textile process and textile manufacturing from the spinning mill to the final products as a whole. Many features of Industry 5.0 can play an important role with customized tools to impact the textile industry, considering the role cyber-physical systems (CPS), cloud computing and IIoT will have on manufacturing processes. This course aims to provide participants with a comprehensive understanding of how digitalization has brought about a change in the textile industry and how it can be used to solve technological problems in practice by improving automation and connectivity with CPS for successful fabric development and manufacturing, supply chain, and quality control. It also aims to raise participants' awareness of how digitalization is supporting the emergence of disruptive technologies for textile dyeing and printing and the benefits the new technologies offer. *Pictures generated with AI*
Prerequisites for users to start the course	Before starting the Digital Solutions in Textile Production course, learners should have a foundation in textile manufacturing concepts. In particular, basic knowledge of textile products (raw materials and textile semi-finished products, their properties and functionalities) and how to successfully manufacture a textile product (by planning and monitoring textile production, with the aim of productivity and appropriate quality) would be beneficial. It is also useful for trainees to have a basic knowledge of chemical textile technology, particularly in the areas of textile dyeing and printing. Thus, learners will be able to recognize the evolution from Textile Industry 4.0 to Textile Industry 5.0 and Industry 6.0 with newly introduced digital solutions to improve interoperability, decentralization of information, real-time data collection, and increased flexibility for textile technology as a whole.

Workload	Lectures	Seminars	Project Works	Labora-tory Prac-tice	Course as-sessments	Total
Teaching hours	15		20	15	5	55
Individual study hours	15		15	15	0	45
					Total HOURS	**100**
				Number of MICROCREDITS	**Total hours/25=**	**4 ETCS**

Learning outcomes/ skills and competences	**Knowledge***:* • A fundamental understanding of textile manufacturing processes in line with the features of Industry 5.0 & Industry 6.0, with textile trends and digital solutions as results of research and innovation processes. • All this information requires an awareness of two challenging topics in the development of the textile industry - efficiency and sustainability. **Skills/Competences***:* • The ability to take a constructive approach when dealing with the challenges of the latest developments in the field of textile fabrics, textile technologies, and the digital transformation of industrial processes. • The ability to follow developments in textile manufacturing and develop creative ideas that consider the suitability, effectiveness, and cost of implementing Industry 5.0 and 6.0 solutions by selecting the essential applications. • The ability to generate meaningful insights for knowledge transfer to develop solutions to practical problems encountered in a variety of contexts along textile supply chains. • Practical experience in ensuring responsible sourcing in textile supply chains faced with the associated challenges of compliance with sustainability, labour, and environmental regulations.
Syllabus	**1. Textile Digital Transformation Challenges and Solutions** • The current context of the textile industry is to understand the characteristics of digital transformation that drive innovation and competitiveness in a rapidly evolving global market. • Overview of the digital transformation in the textile industry: from Industry 4.0 to Industry 5.0. • Approach to the challenges of digital transformation in the textile industry about traditional textile manufacturing and supply chain processes. **2. Innovative Processes in Textile Manufacturing** • Today's challenging topics - efficiency and sustainability in line with the latest developments in the textile industry. • Innovative processes and novel solutions in textile production to promote efficiency, quality, productivity, and customer satisfaction. • Innovative processes as a result of creative and innovative thinking to improve networked technologies in textile manufacturing and general entrepreneurial engagement. **3. Digital Solutions for Materials Sourcing** • The context and evolution of SCM in line with the emergence of Industry 4.0 & 5.0 & 6.0 in the textile industry. • Developing digital solutions to conceptual, practical, or operational problems encountered in the various phases of textile supply chains. • Responsible sourcing in textile supply chains to ensure that all activities that transform raw materials into finished goods are sustainable and fully compliant with labour and environmental laws.

	4. **Digital Fabric Printing and Dyeing** • Overview of current textile dyeing and printing processes and their environmental impact. Moving towards computer-aided technology. • Computer-aided printing: methods and techniques, selection of dyes and fabrics, ink formulation for digital printing, advantages and drawbacks compared with conventional printing. • Digitally controlled processes and equipment for textile dyeing, selection of dyes and textile fibers and forms, performances and limitations of digital textile dyeing. 5. **Case Studies of Successful Implementation of Digital Solutions in Textile Production** • Background information on the practical application of digital solutions in textile production. • Case studies on the successful implementation of IR 4.0 solutions in the textile industry- in yarn manufacturing, weaving and knitting. • Case studies on the successful implementation of IR 5.0 solutions in the textile industry - in fabric development and manufacturing, fashion forecasting, supply chain and quality control. 6. **Case Studies in Digital Fabric Printing and Dyeing** • Choosing the right printing method and machinery when implementing digital textile printing technology. • Digital printing on apparel, a feasible choice for customized clothing businesses. • Fully software-controlled nanodroplet technology for fabric dyeing.
Learning/teaching delivery formats	Incorporating innovative delivery formats can greatly enhance students' learning experience and engagement in this course. The learning and teaching delivery formats selected for this course are: • **Initial assessment** • **E-book** • **Case studies in AI-Driven Fashion Design** • **VR experience** • **VR exercises** • **Final assessment**
Type of Final Assessment	✓ **Project-based assessment** - Assign students a final project where they apply the knowledge acquired in this course to solve real-world fashion-related problems ✓ **Quizzes** ✓ **Presentations and demonstrations:** students prepare and deliver presentations showcasing their understanding of the theoretical concepts and the ability to communicate innovative ideas ✓ **Reports on laboratory work/practical exercises** ✓ **Others**
Pathway for a Successful Learner	**Estimation of the job/occupation demand:** The textile industry's business strategy towards Industry 4.0 and 5.0 is gaining momentum and offers many advantages, especially in terms of innovative processes in textile manufacturing through quality, flexibility, efficiency, safety and customer satisfaction. Therefore, professionals with expertise in digital solutions in textile production will be in high demand. **By the end of this course**, students will have the necessary knowledge and skills to master the challenges of the latest developments in the digital transformation of the textile industry. They will be able to assess the relevance, effectiveness and costs of implementing Industry 4.0 and 5.0 solutions by selecting the essential applications in line with a business strategy in the textile industry.

Annex 30. DF_MC12 - Technological Transfer and Data Management in Textile Industry

Developer partner	TUIASI- UNIVERSITATEA TEHNICA GHEORGHE ASACHI DIN IASI
AIM/Purpose and short description of the course	At a time of rapid technological progress in all areas, the textile industry is also undergoing a profound transformation that is significantly changing the way textile products are designed, manufactured, and marketed. Understanding the latest technological innovations and their transfer to industrial processes within the textile sector is crucial for textile companies to remain sustainable, competitive, and profitable in an extremely challenging economic environment. This course aims to provide students with a comprehensive understanding of how technology transfer and data management can enhance creativity and innovation in the textile industry through the sharing of knowledge, skills, and intellectual property across organisations and sectors. *Pictures generated with AI*
Prerequisites for users to start the course	Students enrolling in this course should have a basic understanding of the textile industry, including knowledge of raw materials, processes, products, and technologies. Familiarity with digital solutions for textile production is advantageous. With this background knowledge, participants will be able to understand how technology transfer and data management can drive innovation and support the application of scientific and technical discoveries across different areas of the textile industry while ensuring compliance with data protection and intellectual property regulations.

Workload	Lectures	Seminars	Project Works	Laboratory Practice	Course assessments	Total
Teaching hours	15		20	15	5	55
Individual study hours	15		15	15	0	45
Total HOURS						**100**
Number of MICROCREDITS					Total hours/25=	4 ETCS

Learning outcomes/ skills and competencies	**Knowledge:** • Understand the basic concepts related to technology transfer and data management in the context of digital transformation, including their processes, applications and benefits; • Gain knowledge of emerging technologies applicable to textile industry processes, and the importance of innovative ecosystems for the development of textile companies. **Skills/Competences:** • Ability to identify and critically analyse new technologies, evaluating their potential for implementation in textile industry processes; • Develop strategies for the implementation of innovative technologies that enhance textile manufacturing processes, product quality and efficiency, while considering relevant regulations; • Acquire practical experience in adapting new technologies to the specific needs of textile companies.
Syllabus	**1. Importance of Technology Transfer in the Textiles** • Overview of technology transfer, its applications, and benefits; • The role of technology transfer in fostering innovation and technological development in the textile industry; • Challenges of technology transfer for digital solutions in the textile industry. **2. Emerging Technologies in Textile Manufacturing** • Current trends, developments, and innovations in textile technology; • Sustainable technologies and digital solutions for textile production; • Overcoming challenges and developing strategies for the implementation of new technologies such as biotechnology, AI, and robotics in the textile industry. **3. Innovation Ecosystems in Textile Technology Transfer** • Innovation ecosystems and their role in the development of companies in a technology-based economy; • Key factors for the development of a digital ecosystem in textile production, including creativity, innovative solution , and alternative thinking; • Ecosystem integration solutions to increase value creation through technology transfer in the textile industry. **4. Data Governance and Compliance in Textile Data Management** • The importance of data governance and compliance in corporate data management; • Insights into the data governance framework for enforcing data protection regulations and maintaining data consistency between different departments within an organisation; • Strategic planning for balancing innovation, security and competitiveness in a global textile market. **5. Challenges and Strategies for Implementing Data Management Solutions in the Textiles Industry** • Overview of an effective data management system; • Evaluating and improving data management processes to meet evolving business needs, enabling informed decisions and technological advancement in the manufacturing industry; • Best practices in data management to an efficient organisation of textile production, and data management strategies to obtain consistent information on customer behaviour, market trends, and business performance;
Learning/teaching delivery formats	Incorporating innovative delivery formats can greatly enhance students' learning experience and engagement in this course. The learning and teaching delivery formats selected for this course are:

	• **Initial assessment** • **E-book** • **Case studies in AI-Driven Fashion Design** • **VR experience** • **VR exercises** • **Final assessment**
Type of Final Assessment	✓ **Project-based assessment:** students will be assigned a final project where they apply the knowledge acquired in this course to solve real-world fashion-related problems ✓ **Quizzes** ✓ **Presentations and demonstrations:** students will prepare and deliver presentations showcasing their understanding of the theoretical concepts and the ability to communicate innovative ideas ✓ **Reports on laboratory work/practical exercises** ✓ **Others**
Pathway for a Successful Learner	**Estimation of the job/occupation demand:** With the constant emergence of new technologies and rapid advancements in the textile industry—particularly those focused on increasing sustainability, efficiency, quality, and productivity—professionals with experience in technology transfer and data management will be in high demand across various sectors of the textile industry. **By the end of this course,** students will have the knowledge and skills required to identify, critically analyse, and evaluate emerging technologies and their potential for transfer to the textile industry. They will also be aware of the importance of data management systems for ensuring business success.

Annex 31. DF_MC13 - Digital Design and Prototyping in Clothing

Developer partner	**CITEVE- CENTRO TECNOLOGICO DAS INDUSTRIAS TEXTIL E DO VESTUARIO DE PORTUGAL**
AIM/Purpose and short description of the course	This course introduces aspiring fashion designers to the innovative world of digital design and prototyping. Students will explore cutting-edge technologies and software used in the fashion industry to create, visualise, and refine their design concepts. The curriculum covers essential skills in digital sketching, 3D modelling, and virtual prototyping, enabling students to bring their creative visions to life with precision and efficiency. Participants will engage in hands-on projects and real-world applications, learning how to use digital tools to streamline the design process, from initial concept to final prototype. Emphasis will be placed on sustainable design practices, rapid prototyping, and the integration of digital techniques with traditional fashion design methods. *Pictures generated with AI*
Prerequisites for users to start the course	• Proficiency in basic computer skills; • Solid understanding of fundamental design principles; • Competence in drawing and illustration skills.

Workload	Lectures	Seminars	Project Works	Laboratory Practice	Course assessments	Total
Teaching hours	15		20	15	5	55
Individual study hours	15		15	15	0	45
Total HOURS						**100**
Number of MICROCREDITS					Total hours/25=	4 ETCS

| Learning outcomes/ skills and competences | **Knowledge:**
 • A fundamental understanding of the evolution and significance in digital design in fashion, including new technological advancements, trends, main principles of prototyping, digital pattern making and grading techniques;
 • Ability to collaborate and integrate digital design workflows in clothing design and prototyping.
 Skills/Competences:
 • Staying up to date on the latest technological advancements, software and techniques in Fashion Design;
 • Using analytical thinking and creative models to systematically apply and interpret upcoming trends in fashion and lifestyles;
 • Promoting more sustainable ways of fashion design development. |

Syllabus	**1. Introduction to Digital Design in Fashion: Evolution and Significance** • Early Beginnings; • Technological Advancements; • Currents Trends; • Sustainability; **2. CAD (Computer-Aided Design) Software in Clothing Design** • Overview of CAD in Fashion; • Pattern Drafting; • Virtual Fitting; • Customisation. **3. Virtual Prototyping: Simulation and Visualisation in Fashion Design** • Concept of Virtual Prototyping; • Benefits of Virtual Prototyping; • Application in Fashion Design. **4. Digital Pattern Making and Grading Techniques** • Digital Pattern Making; • Grading Techniques; • Integration with Manufacturing. **5. Collaboration and Integration: Digital Workflows in Clothing Design and Proto-typing** • Collaborative Design Process; • Integration with Other systems; • Benefits of Digital Workflows.
Learning/teaching delivery formats	Incorporating innovative delivery formats can greatly enhance students' learning experience and engagement in this course. The learning and teaching delivery formats selected for this course are: • **Initial assessment** • **E-book** • **Case studies in AI-Driven Fashion Design** • **VR experience** • **VR exercises** • **Final assessment**
Type of assessment	✓ **Project-based assessment**: Assign students a final project where they apply the knowledge acquired in this course to solve real-world fashion-related problems ✓ **Presentations and demonstrations:** students prepare and deliver presentations showcasing their understanding of the theoretical concepts and the ability to communicate innovative ideas
Pathway for a Successful Learner	**Estimation of the job/occupation demand:** Expertise in digital design and prototyping tools specific to fashion design will be highly sought after. Graduates will be prepared for advanced studies or careers in fashion design, leveraging digital technology to stay competitive and innovative in the industry. **By the end of this course**, the students will have a comprehensive understanding of how digital technologies are transforming the fashion industry and will be equipped with the skills necessary to excel in this dynamic field. Whether designing for the runway, retail, or custom clients, this course provides the foundation for a successful career in contemporary fashion design.

Annex 32. DF_MC14 - Textile Wearable Technologies

Developer partner	**TUIASI- UNIVERSITATEA TEHNICA GHEORGHE ASACHI DIN IASI**
AIM/Purpose and short description of the course	Wearable textiles (e-textiles) are established niche domain, with a huge potential for making the transition from research to market. It represents one of the most significant research domains in the EU textile sector. Aim: to provide students with basic knowledge and skills on how to design, manufacture and assess wearable textile products. By incorporating innovative delivery formats, the course will provide students with dynamic and engaging learning experiences in the *Metaskills4TCLF METAVERSE* environment that leverages cutting-edge technology and pedagogical approaches. *Source: TUIASI*
Prerequisites for users to start the course	Due to the multidisciplinary character of the course, students should have a strong grasp of textile knowledge – raw materials, fabrics and specific technologies, finishing treatments. Prior understanding and basic knowledge of electronics represent an advantage.

Workload	Lectures	Seminars	Project Works	Laboratory Practice	Course assessments	Total
Teaching hours	15		20	15	5	55
Individual study hours	15		15	15	0	45

Total HOURS		**100**
Number of MICROCREDITS	**Total hours/25=**	**4 ETCS**

| Learning outcomes/ skills and competences | **Knowledge**
Fundamental understanding of the concept of wearable textiles (e-textiles), knowledge regarding specific raw materials and manufacturing technologies, including joining methods to create circuits in textile fabrics.
Students will become familiarised with the main current applications and understand how to evaluate the behaviour of textile e-fabrics.

Skills and competences
• Select raw materials and fabrics to create fabrics with sensorial capacity
• Design a textile circuit and use specific equipment to manufacture it.
• Test the electrical characteristics (resistance and impedance) and analyse experimental data |

	• Critical thinking, problem assessment, team work.
Syllabus	**1. Introduction to Textile Wearables** • The field of smart textiles • Wearable textiles (e-textiles) • The development of wearable textiles (e-textiles) - context and current landscape **2. Wearable Textiles – Raw Materials and Technology** • Raw materials, conductive fibres/yarns, means to generate conductivity in textile fibres/yarns • Integration of conductive raw materials into textile fabrics • Manufacturing of textile circuits - joining technologies and circuit printing **3. Wearable Textiles – Development of Sensors and Antennas** • Types of textile sensors and actuators, representative examples • Types of textile antennas, representative examples • Energy harvesting and storage • IoT Wearables **4. Characterisation Techniques for Wearable Textiles** • Fundamentals for the characterisation of wearable textiles • Electrical characteristics for textile wearables • Assessment of durability of textile wearables **5. Wearable Textiles – Commercial Application** • Current state of the market for wearable textiles • Wearable textiles for healthcare • Wearable textiles for sports and fitness • Other domains of application for textile wearables
Learning/teaching delivery formats	Incorporating innovative delivery formats can greatly enhance students' learning experience and engagement in this course. The learning and teaching delivery formats selected for this course are: • **Initial assessment** • **E-book** • **Case studies in AI-Driven Fashion Design** • **VR experience** • **VR exercises** • **Final assessment**
Type of Final Assessment	✓ **Project-based assessment** - Assign students a final project where they apply the knowledge acquired in this course to solve real-world fashion-related problems ✓ **Quizzes** ✓ **Presentations and demonstrations:** students prepare and deliver presentations showcasing their understanding of the theoretical concepts and the ability to communicate innovative ideas ✓ **Reports on laboratory work/practical exercises**
Pathway for a Successful Learner	**Estimation of the job/occupation demand:** Smart textiles in general, and wearable textiles in particular represent the main field of future development for the textile sector. The course will help young specialists with knowledge and skills to design and manufacture wearable textiles, supporting textile companies to diversify their production and solve the challenges that face this industry. **By the end of this course**, the students will have the knowledge and skills necessary to connect textiles and electronics in order to design, prototype and assess smart fabrics for wearable applications

Annex 33. DF_MC15 - Digital Solutions in Leather Production

Developer partner	**FILK- Filk Freiberg Institute Ggmbh**
AIM/Purpose and short description of the course	The purpose of this course is to provide students with a comprehensive understanding of the solutions for digitalisation of processes in leather manufacture. Incorporating advanced technologies is essential for enhancing productivity, workers safety, sustainability, and competitiveness. This course aims to equip students with the knowledge about improvement of production processes by implementing digital solutions for enhanced effectiveness, quality control, workers safety and thus improving competitiveness of the leather production processes.
Prerequisites for users to start the course	To ensure a successful learning experience in the "Digital Solutions in Leather Production" course, participants should meet the following prerequisites: - Familiarity with the fundamental processes involved in leather manufacturing from raw hide to finished leathers and cutting. A basic understanding of the chemistry involved is beneficial. A basic understanding of principles in automation and measurement control technology helps to understand and apply the concepts of digitalization in leather manufacture.

Workload	Lectures	Seminars	Project Works	Laboratory Practice	Course assessments	Total
Teaching hours	15		20	15	5	55
Individual study hours	15		15	15	0	45
				Total HOURS		**100**
			Number of MICROCREDITS	**Total hours/25=**		**4 ETCS**

Learning outcomes/ skills and competences	**Knowledge:** • Understanding Pros and Cons of digitalisation in leather processing, alternative measures. • Importance of digitalisation for efficiency, productivity, and sustainability in leather manufacturing. • Insight in available technologies in the different leather processing steps **Skills/Competences** Ability to consider digital tools for improvement of leather processing (economic and sustainability impact) • Skills in planning, monitoring, and optimizing production processes
Syllabus	1. **Leather Digital Transformation - Challenges and Solutions** • Advantages in the production process inc. Procurement and warehousing • Challenges in implementation of digitalisation of process technology • State of the art for small and big tanneries 2. **Innovative Processes in Leather Production** • Smart drums • Formulation and Dosing

	• Supervision **3. Digital Solutions for Materials Sourcing** • Failure detection • Cutting and Nesting • Traceability/quality tracking/ digital product pass (batch) **4. Digital Processes for Designing the Leather Surface** • Printing • Embossing • Colour **5. Case Studies of Successful Implementation of Digital Solutions in Leather Production**
Learning/teaching delivery formats	Incorporating innovative delivery formats can greatly enhance students' learning experience and engagement in this course. The learning and teaching delivery formats selected for this course are: • **Initial assessment** • **E-book** • **Case studies in AI-Driven Fashion Design** • **VR experience** • **VR exercises** • **Final assessment**
Type of Final Assessment	✓ **Project-based assessment** - Assign students a final project where they apply the knowledge acquired in this course to solve real-world fashion-related problems ✓ **Case studies** – present students with case studies and ask them to analyse and critique the approaches used, identifying strengths, weaknesses, opportunities, and threats. Encourage students to propose alternatives or improvements. ✓ **Presentations and demonstrations:** students prepare and deliver presentations showcasing their understanding of the theoretical concepts and the ability to communicate innovative ideas ✓ **Written reports on laboratory work/practical exercises** ✓ **Written essay** ✓ **Peer assessment and feedback:** students will critically evaluate their peers' work based on predefined criteria such as technical accuracy, clarity of presentation, and creativity of solutions ✓ **Formal exams and evaluations**
Pathway for a Successful Learner	Advancements in technology and digitalisation require extended knowledge about requirements and challenges in implementing these technologies for increasing effectiveness in leather production. Understanding of the processes and technologies enables the students to make knowledge-based decisions in the respective industry environment. There is a growing demand for professionals who can integrate the possibilities of digitalisation with the knowledge and art of leather making. After completing this course on "Digital Solutions in Leather Production" individuals can pursue various job opportunities across the leather industry where technology implementation, process integration and product management are critical.

Annex 34. DF_MC16 - Technological Transfer and Data Management in the Leather Industry

Developer partner	**UDL- UNIVERSIDAD DE LLEIDA**
AIM/Purpose and short description of the course	The purpose of this course is to provide students with a comprehensive understanding of the principles and practices of technological transfer and data management within the leather industry. As the industry evolves, incorporating advanced technologies and data-driven approaches is essential for enhancing productivity, sustainability, and competitiveness. This course aims to equip students with the knowledge and skills necessary to effectively implement technological innovations and manage data to optimize leather production processes, improve product quality, and support sustainable practices. *Photos created by AI Image*
Prerequisites for users to start the course	To ensure a successful learning experience in the "Technological Transfer and Data Management in Leather Industry" course, participants should meet the following prerequisites: • Familiarity with the fundamental processes involved in leather manufacturing, including raw material sourcing, tanning, and finishing. • Basic understanding of information technology principles, including data collection, storage, and analysis.

Workload	Lectures	Seminars	Project Works	Laboratory Practice	Course assessments	Total
Teaching hours	15		20	15	5	55
Individual study hours	15		15	15	0	45
				Total HOURS		**100**
				Number of MICROCREDITS	**Total hours/25=**	**4 ETCS**

Learning outcomes/ skills and competences	By the end of the "Technological Transfer and Data Management in Leather Industry" course, students will be able to: • Describe the principles of Technological Transfer. • Recognize the importance of data management in optimizing leather production processes and supporting decision-making. • Apply technological advancements to improve efficiency, productivity, and sustainability in leather manufacturing. • Utilize data management tools and techniques to collect, store, analyze, and interpret data relevant to leather production. - Use data-driven insights to optimize production workflows, reduce waste, and enhance product quality. - Ensure ethical practices in data management, including data privacy and security.

Syllabus	1. **Importance of Technological Transfer in the Leather Industry** • Examination of past technological advancements and their impact on the leather industry. • Analysis of the economic gains and environmental improvements resulting from effective technological transfer. • Case Studies of Successful Transfers 2. **Emerging Technologies in Leather Manufacturing** • Automation and Robotics • Advanced Materials and Coatings • Digital and 3D Printing Technologies 3. **Innovative Ecosystems in Leather Technology Transfer** • Collaborative Networks and Partnerships • Incubators and Innovation Hubs • Funding and Investment Strategies 4. **Data Governance and Compliance in Leather Data Management** • Principles of Data Governance • Regulatory Requirements and Standards • Best Practices for Data Security and Privacy 5. **Challenges and Strategies for Implementing Data Management Solutions in the Leather Industry** • Identifying Data Management Challenges • Strategies for Effective Implementation • Tools and Technologies for Data Management 6. **Data Connectivity and Exchange in the Leather Value Chain: Compliance with EU Deforestation Regulation** • Understanding the EU Deforestation Regulation • Data Requirements for Compliance • Implementing Data Connectivity Solutions
Learning/teaching delivery formats	Incorporating innovative delivery formats can greatly enhance students' learning experience and engagement in this course. The learning and teaching delivery formats selected for this course are: • **Initial assessment** • **E-book** • **Case studies in AI-Driven Fashion Design** • **VR experience** • **VR exercises** • **Final assessment**
Type of assessment	✓ **Online quizzes** - Regular assessments to evaluate students' understanding of the material, track their progress, and provide feedback. ✓ **Project-based assessment** - Assign students a final project where they apply the knowledge acquired in this course to solve real-world technological transfer and data management initiatives within the leather industry. ✓ **Case studies** – present students with case studies and ask them to analyse and critique the approaches used, identifying strengths, weaknesses, opportunities, and threats. Encourage students to propose alternatives or improvements. ✓ **Written reports on laboratory work/practical exercises** - Practical sessions where students work on projects related to technological innovation and data management, such as designing data governance frameworks or implementing new technologies in leather manufacturing processes.
Pathway for a Successful Learner	**Estimation of the job/occupation demand:** The "Technological Transfer and Data Management in the Leather Industry" course prepares students for a range of specialized roles that are increasingly in demand as the leather industry evolves to embrace technology and

	data-driven practices as a: Technology Transfer Specialists, Data Analysts and Managers, Production Managers with Technological Expertise, IT and Data Management Consultants, Innovation Managers. **By the end of this course,** the students will have the knowledge and skills necessary to contribute to the analysis of data to optimize operations and drive strategic decision.

Annex 35. DF_MC17- Digital Design and Prototyping in Footwear

Developer partner	CTCP-CENTRO TECNOLOGICO DE CALCADO DE PORTUGAL
AIM/Purpose and short description of the course	Digital design and prototyping play a transformative role in the footwear industry, streamlining the design process and enhancing creativity. By using advanced software tools like 3D modelling and CAD (Computer-Aided Design), designers can conceptualize and visualize footwear designs in real-time, allowing for rapid experimentation with shapes, materials, and colours. The importance of digital design lies in its ability to reduce time-to-market, improve precision, and lower production costs. Unlike traditional methods, digital design allows for quick iterations and adjustments without the need for physical samples, which can be costly and time-consuming. Virtual prototyping enables designers to test various aspects such as fit, comfort, and performance before producing physical prototypes, leading to fewer errors and a more efficient development process. Additionally, digital tools promote sustainability by reducing material waste and energy consumption, as fewer physical prototypes are needed. This technology also facilitates greater collaboration between designers, engineers, and manufacturers, ensuring that designs are optimized for both aesthetics and functionality from the outset. Ultimately, digital design and prototyping allow footwear brands to stay competitive by fostering innovation, speeding up production cycles, and delivering better products to consumers. The course "Digital Design and Prototyping in Footwear" provides students with the knowledge and tools to design innovative footwear using digital technologies. Focusing on industry-standard software and 3D modelling, students will learn the full design process—from concept creation to virtual prototyping. The course covers key topics such as digital sketching, surface modelling, material selection, and the integration of technology in modern footwear design. Participants will also explore sustainability, ergonomics, and fashion trends. Through hands-on projects and real-world case studies, students will gain the skills needed to create functional and aesthetically appealing footwear designs, preparing them for careers in the footwear and fashion industries. *Source: https://mindtech.pt*
Prerequisites for users to start the course	To ensure students can engage with the course material effectively and create innovative, practical designs and succeed in the course, some prerequisites are recommended: ▪ Understanding of Footwear Anatomy – Knowledge of shoe components and construction techniques.

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	▪ Basic Design Knowledge – Understanding of design principles (colour, form, balance, etc.). ▪ Familiarity with footwear modelling / patternmaking / technical development ▪ Familiarity with 3D Modelling Software – Experience with tools like CAD, Rhino, Blender. ▪ Ability to think creatively and develop original design concepts. ▪ Technical Drawing Skills – Basic sketching or digital illustration skills. ▪ Proficiency in using design software and general computer tools. ▪ Strong focus on precision in design elements and measurements and attention to details. ▪ Problem-Solving Skills – Ability to troubleshoot and iterate on designs efficiently. ▪ Interest in Fashion/Footwear Trends ▪ Awareness of current trends and consumer preferences. ▪ Collaboration and Communication – Ability to work well with peers, or in a work team and provide/receive feedback.

Workload	Lectures	Seminars	Project Works	Laboratory Practice	Course as-sessments	Total
Teaching hours	15		20	15	5	55
Individual study hours	15		15	15	0	45

Total HOURS		**100**

Number of MICROCREDITS	Total hours/25=	4 ETCS

Learning outcomes/ skills and competences	Knowledge: ▪ Digital tools in footwear design ▪ Digital transformation in the footwear industry ▪ Industry-standard software (CAD, Rhino, Blender, etc.) ▪ Applications of software in sketching, modelling, and rendering ▪ Virtual Prototyping and Simulation Tools for Footwear Development ▪ Simulation tools for testing fit, performance, and material properties ▪ Digital testing to optimize functionality and aesthetics ▪ 3D printing and other rapid prototyping techniques ▪ Case studies on time and cost savings through digital prototypes ▪ Digital platforms for collaborative design ▪ Digital tools for an efficient communication and project management Skills/Competences: ▪ At the end of the course, the learner will be able to: ▪ Understand the role and impact of digital tools in footwear design and development. ▪ Differentiate between traditional and digital design processes. ▪ Recognize the value of digital innovation in the footwear industry. ▪ Use industry-standard software for digital footwear design. ▪ Apply specific software for sketching, 3D modelling, and rendering footwear designs. ▪ Select appropriate software tools for specific design tasks and objectives. ▪ Use virtual prototyping techniques to create accurate footwear models. ▪ Implement simulation tools to test digitally product fit, materials, and performance. ▪ Analyse virtual prototypes to identify design flaws and improve efficiency. ▪ Create physical prototypes quickly from digital models. ▪ Use rapid prototyping technologies such as 3D printing.

	▪ Evaluate the benefits of rapid prototyping in reducing cost and development time. ▪ Collaborate effectively using digital platforms for team-based footwear design projects. ▪ Integrate digital workflows across design, engineering, and production departments. ▪ Manage digital design projects with streamlined communication and documentation tools.

Syllabus	**1. Introduction to Digital Design and Prototyping in Footwear**
	• Evolution of footwear design: overview of traditional vs. modern design methods and correspondent impact of technology
	• Benefits of digital design in footwear production including speed, accuracy, and efficiency in the design process and cost reduction and sustainability
	• Key concepts in digital prototyping
	    o Introduction to CAD (Computer-Aided Design) and 3D modelling
	    o Digital workflows, from concept to production
	• The Future of Footwear Design:
	    o Emerging trends such as customization, smart footwear, and sustainability
	    o The role of AI, machine learning, and automation
	2. 3D Footwear Design Software: Features and Applications
	• Overview of footwear design software: introduction to key software tools and comparison of different software for various design stages
	• Sketching and digital illustration
	    o Techniques for creating 2D sketches digitally
	    o Best practices for digital concept development
	• Modelling and Surface Design
	    o Basics of 3D modelling and surface creation for footwear
	    o Detailed study of tools for creating forms, patterns, and textures
	• Realistic renderings of footwear designs and visualization
	    o Light, texture, and material simulations in rendering
	3. Virtual Prototyping and Simulation Tools for Footwear Development
	• Introduction to virtual prototyping: definitions and advantages over traditional physical prototypes
	• Digital fit and sizing: simulation of fit, ergonomics, and comfort
	    o Methods and tools for testing digital shoe fit across different sizes
	• Material Simulation and Testing
	    o Methods and tools for simulating material performance (e.g., flexibility, durability, stress, pressure, etc.)
	• Product Performance Simulation
	    o Methods and tools for assessing traction, impact, and performance
	    o Integration of biomechanical simulations
	4. Rapid Prototyping Techniques for Footwear Sample Production
	• Introduction to rapid prototyping - overview of rapid prototyping, its significance in footwear design and techniques (3D printing, CNC machining, automatic cutting/sewing systems)
	• 3D Printing in Footwear – different techniques (SLS, FDM, SLA,…)
	    o Applications of 3D printing for creating moulds and samples
	• Material and Cost Considerations
	    o Selection of materials for rapid prototyping
	    o Cost-effective strategies for prototype production
	• Post-Processing and Finishing
	    o Techniques for finishing 3D-printed prototypes

	o Quality control and preparation for physical testing **5. Collaboration and Integration: Digital Workflows in Footwear Design and Prototyping** • Collaborative platforms and tools o Introduction to digital collaboration tools o Real-time collaboration for global design teams • Integration across design and production teams o Best practices for seamless integration in production workflows • Digital Documentation • Project Management and Communication in Digital Workflows o Tools for efficient project management o Streamlining communication between designers, developers, and manufacturers
Learning/teaching delivery formats	Incorporating innovative delivery formats can greatly enhance students' learning experience and engagement in this course. The learning and teaching delivery formats selected for this course are: • **Initial assessment** • **E-book** • **Case studies in AI-Driven Fashion Design** • **VR experience** • **VR exercises** • **Final assessment**
Type of assessment	✓ Project-based assessment - Assign students a final project where they ap-ply the knowledge acquired in this course to solve real-world fashion-related problems ✓ Quizzes ✓ Exercises (consolidation of learning outcomes acquired) ✓ Presentations and demonstrations: students prepare and deliver presentations showcasing their understanding of the theoretical concepts and the ability to communicate innovative ideas ✓ Reports on real-life application and successful stories ✓ Project-based challenge (presential, to be assessed by the trainer / tutor, phys-ically, for credits/certification) ✓ Others
Pathway for a Successful Learner	**Estimation of the job/occupation demand:** the competencies acquired from this course are highly valued across the footwear industry, especially in companies embracing digital transformation. With the rise of sustainability initiatives, faster product development cycles, and customization trends, there is a robust job demand for these skills, particularly in innovation-driven and performance-based footwear companies. The demand for competencies acquired through this course is growing significantly due to advancements in digital technologies and shifting consumer preferences in the footwear industry. Key sectors and job roles that require these skills include: ▪ Footwear Designer, especially in fashion-forward and sportswear companies seeking innovative designs ▪ 3D Footwear Developer/Prototyper, specially in companies using 3D modelling and rapid prototyping for product development. ▪ Product Development Specialist specially for in brands looking to shorten development cycles and create functional, stylish products. ▪ Footwear Innovation Specialist that is experimenting a growing demand in companies focusing on sustainability, smart footwear, and advanced technologies. ▪ Footwear Manufacturing and Operations Manager who can integrate digital tools into traditional manufacturing processes.

	By the end of this course, students will have acquired a comprehensive skill set in modern footwear design and prototyping techniques. They will gain proficiency in using advanced digital tools and software for creating detailed and innovative footwear designs. Students will learn how to translate conceptual ideas into practical digital prototypes, optimizing both form and function. They will also develop a deep understanding of materials and manufacturing processes, enabling them to make informed decisions about sustainability and performance. The course will emphasize the integration of user feedback into the design process, teaching students how to iterate and refine their prototypes effectively. Additionally, students will become skilled at visualizing and presenting their designs through digital renderings and presentations. Overall, they will be well-equipped to navigate the evolving landscape of footwear design, blending creativity with technical expertise to produce cutting-edge, market-ready products.

Annex 36. DF_MC18- Wearable Technology and Digital Customization in Footwear

Developer partner	POLICAZ-POLITECNICO CALZATURIERO SCARL
AIM/Purpose and short description of the course	The Fashion Industry is following a continuous evolution in each sectors. Specifically in the Footwear Sector, new tools and technologies are becoming increasingly important and are currently creating bridges between areas of intervention. This is the case of wearable technologies, which can be applied to Footwear and giving important real-time data for monitoring health issues, as well as fitness performances. At the same time, mass customization has become, recently, of the most relevant consequences of globalization on Fashion Industry. Referring to the Footwear Sector, thus, it is becoming increasingly relevant to find the appropriate tools for analyzing trends and customers' preferences for companies to remain ahead of the market. *Pictures generated with AI*
Prerequisites for users to start the course	Before diving into the world of werable technology and mass customization, it's helpful for learners to have a foundation in concept related to footwear production. They should've clear the different phase of production process, starting with the design phase with possible choice of materials involved and the different parts and components componing a footwear product.

Workload	Lectures	Seminars	Project Works	Laboratory Practice	Course assessments	Total
Teaching hours	15		20	15	5	55
Individual study hours	15		15	15	0	45

Total HOURS		**100**
Number of MICROCREDITS	**Total hours/25=**	**4 ETCS**

Learning outcomes/ skills and competences	**Knowledge:** • A fundamental understanding Fashion trends, how to analyze and predict them in order to remain updated. • Building a deep understanding of the customer's motivations, behaviours, preferences, and values for commercial purposes. • Having an understanding of the latest environmentally friendly materials and components including leather, textiles and synthetics, materials for soles and midsoles, miscellaneous components and accessories. **Skills/Competences:** • Ability to evaluate the composition, characteristics, and use of materials in order to create new products and applications.

	• Capacity to understand and evaluate the needs of the consumer and analyse the fashion trends, developing innovate footwear concepts from an aesthetic, functional and technological point of view by using a wide range of methods and techniques, selecting materials, components and suitable technologies. • Capacity to adapt new concepts to manufacturing requirements and transforming the new ideas into marketable and sustainable products for mass or customised production.
Syllabus	1. **Wearable Technology: Definition, History, and Current Landscape** • What is Weareble Technology • Development of Wearable Technology from the beginning until today • Current application of Wearable Technology 2. **Types of Wearable Technology in Footwear: Sensors, Smart Fabrics, and Electronics** • Different application of Wearable Technology in Footwear • Benefits and Challenges of Wearable Technology in the Footwear Sector 3. **Applications of Wearable Technology in Fitness and Health Monitoring** • Application of Wearable Technology in Fitness • Application of Wearable Technology in Health Monitoring • Best practices and successful stories 4. **Personalization and Customization Trends in the Footwear Industry** • Mass Customization in the Footwear Industry • Analysis of customization trends in Footwear Industry • Impact of Customization Trends in Footwear production processes 5. **Mass Customization vs. Bespoke Shoemaking: Digital Approaches** • Development of Mass Customization vs Bespoke Shoemaking • A Digital Approach to Mass Customization • Possible future development of the Footwear sector vs Mass Customization
Learning/teaching delivery formats	Incorporating innovative delivery formats can greatly enhance students' learning experience and engagement in this course. The learning and teaching delivery formats selected for this course are: • **Initial assessment** • **E-book** • **Case studies in AI-Driven Fashion Design** • **VR experience** • **VR exercises** • **Final assessment**
Type of Final Assessment	✓ **Project-based assessment** - Assign students a final project where they apply the knowledge acquired in this course to solve real-world fashion-related problems ✓ **Quizes** ✓ **Presentations and demonstrations:** students prepare and deliver presentations showcasing their understanding of the theoretical concepts and the ability to communicate innovative ideas ✓ **Reports on laboratory work/practical exercises** ✓ **Others**...
Pathway for a Successful Learner	**Estimation of the job/occupation demand:** mass customization has become, recently, of the most relevant consequences of globalization on Fashion Industry. The ability to analyze trends and customers' preferences is increasingly becoming an essential skill requested by the market. **By the end of this course**, the students will have the knowledge and skills necessary investigate wearable technologies and their application to the Footwear Sector. Moreover, they will be able to analize current market trends and consumers' preferences before developing their products or building their business plans.

PROJECT NAME Alliance for Cooperation on Digital and Circular Economy Skills for the TCLF sector across Europe

PROJECT ACRONYM
METASKILLS4TCLF

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