META SKILLS 4TCLF

D 4.3 – Annex I

POLITECNICO CALZATURIERO

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SKILLS4SMART CURRICULA EVALUATION

TEXTILE TECHNOLOGYST

1. **Evaluate the following job-related skills and competences.**
    - **Do they reflect the state of the sector?**
    - **Are they still valid, given the state of the sector?**
    - **Are the still valid considering the demands of the sector?**

SC1. Demonstrate a deep understanding on fibres, yarns and fabrics (non-woven, woven, knitted and tufted fabric), their characteristics, properties, costs and their life cycle to conceive processing of fibres/filaments into yarns, and manufacturing of all types of textile fabrics in order to satisfy the fashion market needs, the company strategies and the environmental impacts.

SC2. Apply the knowledge related to the quality control system and protocols for the raw materials and textile products. Apply textile metrology and standards, being able to supervise the measurement, control/evaluation and testing processes for the textile structures.

SC3. Plan, conduct, coordinate and monitor the spinning process and assure it is carried out in a consistent manner and in accordance with specifications. Apply the knowledge related to spinning (including braiding) production process using modern technologies for the development of the products. Understand the new emerging digital technologies. Implement new processes and/or optimise the active ones to improve the quality of the process and products, to achieve cost efficiency and to reduce the environmental impact in the different phases of the process.

SC4. Plan, conduct, coordinate and monitor the weaving process and assure that it is carried out in a consistent manner and in accordance with specifications Apply the knowledge related to weaving production process using modern technologies for the development of the products. Understand the new emerging digital technologies.

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Implement new processes and/or optimise the active ones to improve the quality of the process and products, to achieve cost efficiency and to reduce the environmental impact in the different phases of the process.

SC5. Plan, conduct, coordinate and monitor the knitting process and assure that it is carried out in a consistent manner and in accordance with specifications. Apply the knowledge related to warp and weft knitting production process, using modern technologies for the development of the products. Understand the new emerging digital technologies. Implement new processes and/or optimise the active ones to improve the quality of the process and products, to achieve cost efficiency and to reduce the environmental impact in the different phases of the process.

SC6. Plan, conduct, coordinate and monitor the tufting process and assure that it is carried out in a consistent manner and in accordance with specifications. Apply the knowledge related to tufting production process using modern technologies for the development of the products. Understand the new emerging digital technologies. Implement new processes and/or optimise the active ones to improve the quality of the process and products, to achieve cost efficiency and to reduce the environmental impact in the different phases of the process.

SC7. Plan, conduct, coordinate and monitor the non-woven process and assure that it is carried out in a consistent manner and in accordance with specifications. Apply the knowledge related to manufacturing the non-woven fabrics using modern technologies for the development of the products. Understand the new emerging digital technologies. Implement new processes and/or optimise the active ones to improve the quality of the process and products, to achieve cost efficiency and to reduce the environmental impact in the different phase of the process.

SC8. Suggest, plan and monitor the finishing treatments to assure the quality of the textile process and product. Apply the knowledge related to chemical and mechanical finishing processes (including dyeing, finishes, printing, digital printing etc.) based on modern technologies for the development of the products, including the innovative treatments.

2. **Evaluate the following table related to the curricula.**
    - **Are the Skills and Knowledge still valid in your opinion and coherent with the market requests?**
    - **Do the contents of the sub-units well respond to the market requests?**
    - **Are there some contents of the sub-united that need to be updated? If yes, which of them?**

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
ULO1- Fibres, yarns and fabrics (non-woven, woven and knitted)	• Types of textile fibres • Yarn structure • Types of fabrics and their structure	• Evaluate textile characteristics • Design yarns • Distinguish fabrics	1. Types of fibres • Definition of the term fibre • Types of fibres • The properties and where natural fibres are used • The properties and where man-made fibres are used 2. Textiles yarn classification • Basic definitions • Yarn structure, performance and quality • Spinning system 3. Fabric structure • Basic fabric structure (weaves) • Knitted fabrics • Non-woven fabrics	**Skills and Knowledge: OK** **Contents of sub-units: OK But add some key-figures on world fibre production, fibre market and fibre LCA**
ULO2- Quality control strategies and protocols. Textile metrology and standards	• Metrology for textile products • International standards for textile • Quality control documentations for textile	• Control textile process • Apply quality standards for the textile control • Check quality of products in textile production line	1. Metrology and links to the textile quality control • Essentials about metrology • Metrology versus quality control • The quality of a textile product as a complex concept 2. Standardisation and standards • An overview of the standardisation and standards topics • Standardizing organizations/ bodies. Level of the standardisation • Standards. Classification of standards by outcomes and impact 3. Documented information regarding the quality of a textile product	**Skills and Knowledge: OK** **Contents of sub-units: OK, nothing to add**

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
	• Standards atmosphere conditions for the quality of textile process • Testing and measurements for the quality control system of the textile process		• Qualitative profile of a textile product • Documents issued for the quality of the raw materials/textile products • Documents prescribing the quality of a raw material/textile product • Documents attesting the quality of a raw material/textile product 4. The measurement process: the essentials on the process accuracy and description of its specific structure • Factors affecting the quality of a measurement process • Standard atmospheres for conditioning and testing • Moisture content of the textile products • The measurement process definition and description of specific structure 5. Textile testing: from measurement procedure to practice • Quantities intended to be measured • Units of measurement • Methods of measurement • Measuring devices and instruments • Measurement results and errors • Exemplifying a measurement process structure	

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
ULO3- Spinning (including braiding) production	• Spinning processes • Properties of yarns • Digital technologies in spinning mills • Non-conventional yarns	• Activate and supervise spinning machines • Oversee yarn characterisation and testing • Data analysis management for the yarn production • Select non-conventional yarns	1. Spinning processes • Staple fibre spinning processes • Wool spinning processes • Braiding and twisting processes • Filament and multifilament spinning processes 2. Characterization of yarns • Structures of yarns • Main physical characteristics of yarns and their testing method 3. Quality control and digital technologies in spinning mills • Methods to evaluate the production quality and improve it • New trends in digital quality management of the spinning mill: commercial factory analysis systems • Support for yarn production based on data analysis and artificial intelligence 4. New and non-conventional yarns • Fancy yarns: applications and their production process • New yarns for technical applications	**Skills and Knowledge: OK** **Contents of sub-units: OK, but are texturing and covering included in twisting processes? if not add them**
ULO4- Weaving production process	• Weaving process • Weaving machineries • Control systems	• Use weaving machine technologies • Tend weaving machines • Control textile process	1. Preparation of the weaving process • Introduction: An overview of preparation of the weaving process • Winding process: what is and why is it important? • Warping process: what is it and which are the warping machines? • The importance of the stiffening and the “size”	**Skills and Knowledge: OK** **Contents of sub-units: OK, but add an introduction of the main woven structures (plain, twill, satin…)**

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
	• Weaving architecture • Defects on the weaving process		2. Weaving machines • Introduction the evolution of the weaving machines • The types of the main looms • The main features of the various looms • The production performances of the looms 3. Management and programming of the weaving process • Introduction: The new generation of weaving machines • The main programming functions of the weaving machines • The devices supporting the weaving process • The main controls 4. Optimisation of the weaving process • Introduction: The preparation of each weaving machine • The main parameters concerning the weaving of the fabric • The inputs in the technical sheet for programming the yarn hints of colour • The yield optimization in the weaving process 5. Control systems of the weaving process • The main types of defects in the fabric and along the weaving process • The main types of controls along the weaving process • The elements that determine the good yield • The severity level of defects	
	• Knitting machine technology	• Distinguish knitting technologies and	1. General terms and concepts • What is a knitted structure?	**Skills and Knowledge: OK**

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
ULO5- Warp and weft knitting production process	• Technologies and machineries for the circular weft knitting • Technologies and machineries for the flat weft knitting • Technologies and machineries for the warp knitting • Parameters for knitting process quality control	identify key knitting machine elements • Plan and conduct the circular fabric knitting manufacturing process • Plan and conduct the flat fabric knitting manufacturing process • Plan and conduct warp fabric knitting manufacturing process • Control the quality system for the knitting process	• Weft and warp knitted structures • Terminologies • Main elements of knitting formation • Machines classification 2. Circular Weft Knitting • Circular weft knitting machine • Positive feeding system • Circular fabric knitting manufacturing process • Seamless machine • Seamless manufacturing process • Emerging circular knitting technologies • Emerging digital technologies 3. Flat Weft Knitting • Flat knitting machine • Flat knitting manufacturing process • Seamless flat machine • Emerging knitting technologies • Emerging digital technologies 4. Warp Knitting • Ketten machine and related manufacturing processes • Raschel machine and related manufacturing processes • Seamless raschel machine • Warp knitted structures: pillar stitch, tricot, tuch, satin, samt, atlas • Emerging knitting technologies	**Contents of sub-units: OK, but** **add an introduction of the main weft knitted structures (rib, jersey, interlock…) as it is written for warp knitting sub-units**

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
			• Emerging digital technologies 5. Knitting technical and quality parameters • Raw materials main quality parameters and their influence on knitting quality control: Yarn count, moisture, regularity, friction coefficient, yarn twist, etc. • Process parameters to control and their influence in fabric quality: Yarns tension, take-down tension, speed, etc. • Test methods and standards for process control. • Product parameters to control and their influence/ importance in fabric quality. • Test methods and standards for product control. • Visual inspection of knitted fabrics (gaige and dyed): main defects and origins and preventive measures. • Technical parameters that influence the properties and quality of the knitted fabrics and Technical data sheet	
ULO6- Tufting production process	• Tufting structure • Tufting technology • Patterning systems in tufting • Backing technologies for tufting	• Plan and conduct the tufting process • Plan and conduct the tufting process with patterning systems	1. Tufting: introduction • Construction of a tufted pile carpet • Yarns • Substrate finishing • Types of tufted pile carpet 2. Tufting machine • Operation of the tufting machine • Looppile • Cutpile • Cutloop 3. Patterning systems	**Skills and Knowledge: OK** **Contents of sub-units: OK, nothing to add**

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
	• Parameters of the tufted pile carpet	• Plan and conduct the finishing process of tufted pile carpets • Intervene in the process to obtain the desired quality of the tufted pile carpet	• Lateral movement of the primary backing • Lateral movement of the needle bar • Yarn patterning systems 4. Backing • Precoat • Secondary backing • Finishing line • Bitumen • Hot melts 5. Production parameters • Gauge • Stitch count • Number of tuft or loops • Thickness and height • Mass • Pile density	
ULO7- Manufacturing the non-woven fabrics	• Non-woven fabrics • Web forming techniques for non-woven • Web bonding techniques for non-woven	• Plan and conduct the web forming techniques for non-woven • Plan and conduct the web bonding techniques for non-woven	1. Nonwovens: introduction • What are nonwovens • Applications • Materials • Geometry • Manufacturing processes 2. Web formation techniques • Drylaid • Airlaid • Spunlaid • Meltblown	**Skills and Knowledge: OK** **Contents of sub-units: OK, nothing to add**

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
			• Wetlaid 3. Web bonding techniques • Chemical bonding • Thermal bonding • Mechanical bonding	
ULO8- Dyeing, colouring and finishing processes	• Pre-treatments for the textile finishing process • Dyeing technology • Printing and coating technology • Finishing processes	• Plan and conduct the pre-treatment process • Plan and conduct the dyeing process • Plan and conduct the printing and coating process • Plan and conduct the chemical and mechanical finishing process	1. Pre-treatments for fabric finishing • Pre-treatment processing methods • Fabric preparation processes • Quality control of pre-treatment processes 2. Dyeing processes • Calorimetry • Dyes and pigments • Dyeing processes • Quality control of dyeing processes 3. Textile printing processes • Printing textile processes • Coating textile processes • Quality control of printing and coating processes 4. Finishing processes • Mechanical functional finishing processes • Chemical functional finishing processes • New trends on functional finishing processes	**Skills and Knowledge: OK** **Contents of sub-units: OK, but** **Does "dyeing processes" include the 3 following points: dyeing technologies, machines and bath formulations?, if not should be completed** **Same remark for "printing processes" and "coating processes"** **Is the environmental impact of finishing treatments and the chemical products discussed in this unit?**

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3. **Evaluate the following table.**
   - **Given the Skills and Knowledge contained in the table before, observed the following ones and indicate the ones that could improve the contents.**
   - **Do the following Skills and Knowledge well respond to the needs of the labour market? If yes, which of them?**

CE_MC11 - Sustainable Textile Innovation	
SKILLS	**KNOWLEDGE**
• 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, the EU strategy for sustainable and circular textiles.	• 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 minimize the negative impact of textiles on the environment, throughout their life cycle.
CE_MC12 - Eco-friendly Dyeing and Finishing for the Textiles Industry	
SKILLS	**KNOWLEDGE**
• Dyeing and finishing goods in a sustainable manner throughout the product lifecycle which involves promoting social responsibility, conserving resources, and minimizing negative environmental impacts.	• 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,

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• 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.	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.
DF_MC11 - Digital Solutions in Textile Production	
SKILLS	**KNOWLEDGE**
• 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.	• 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.

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• Practical experience in ensuring responsible sourcing in textile supply chains faced with the associated challenges of compliance with sustainability, labour, and environmental regulations.	
DF_MC12 - Technological Transfer and Data Management in Textiles Industry	
SKILLS	**KNOWLEDGE**
• 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.	• 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.

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SKILLS4SMART CURRICULA EVALUATION

TEXTILE TECHNOLOGYST

1. **Evaluate the following job-related skills and competences.**
    - **Do they reflect the state of the sector?**
    - **Are they still valid, given the state of the sector?**
    - **Are the still valid considering the demands of the sector?**

SC1. Demonstrate a deep understanding on fibres, yarns and fabrics (non-woven, woven, knitted and tufted fabric), their characteristics, properties, costs and their life cycle to conceive processing of fibres/filaments into yarns, and manufacturing of all types of textile fabrics in order to satisfy the fashion market needs, the company strategies and the environmental impacts.

SC2. Apply the knowledge related to the quality control system and protocols for the raw materials and textile products. Apply textile metrology and standards, being able to supervise the measurement, control/evaluation and testing processes for the textile structures.

SC3. Plan, conduct, coordinate and monitor the spinning process and assure it is carried out in a consistent manner and in accordance with specifications. Apply the knowledge related to spinning (including braiding) production process using modern technologies for the development of the products. Understand the new emerging digital technologies. Implement new processes and/or optimise the active ones to improve the quality of the process and products, to achieve cost efficiency and to reduce the environmental impact in the different phases of the process.

SC4. Plan, conduct, coordinate and monitor the weaving process and assure that it is carried out in a consistent manner and in accordance with specifications Apply the knowledge related to weaving production process using modern technologies for the development of the products. Understand the new emerging digital technologies.

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Implement new processes and/or optimise the active ones to improve the quality of the process and products, to achieve cost efficiency and to reduce the environmental impact in the different phases of the process.

SC5. Plan, conduct, coordinate and monitor the knitting process and assure that it is carried out in a consistent manner and in accordance with specifications. Apply the knowledge related to warp and weft knitting production process, using modern technologies for the development of the products. Understand the new emerging digital technologies. Implement new processes and/or optimise the active ones to improve the quality of the process and products, to achieve cost efficiency and to reduce the environmental impact in the different phases of the process.

SC6. Plan, conduct, coordinate and monitor the tufting process and assure that it is carried out in a consistent manner and in accordance with specifications. Apply the knowledge related to tufting production process using modern technologies for the development of the products. Understand the new emerging digital technologies. Implement new processes and/or optimise the active ones to improve the quality of the process and products, to achieve cost efficiency and to reduce the environmental impact in the different phases of the process.

SC7. Plan, conduct, coordinate and monitor the non-woven process and assure that it is carried out in a consistent manner and in accordance with specifications. Apply the knowledge related to manufacturing the non-woven fabrics using modern technologies for the development of the products. Understand the new emerging digital technologies. Implement new processes and/or optimise the active ones to improve the quality of the process and products, to achieve cost efficiency and to reduce the environmental impact in the different phase of the process.

SC8. Suggest, plan and monitor the finishing treatments to assure the quality of the textile process and product. Apply the knowledge related to chemical and mechanical finishing processes (including dyeing, finishes, printing, digital printing etc.) based on modern technologies for the development of the products, including the innovative treatments.

2. **Evaluate the following table related to the curricula.**
    - **Are the Skills and Knowledge still valid in your opinion and coherent with the market requests?**
    - **Do the contents of the sub-units well respond to the market requests?**
    - **Are there some contents of the sub-united that need to be updated? If yes, which of them?**

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
ULO1- Fibres, yarns and fabrics (non-woven, woven and knitted)	• Types of textile fibres • Yarn structure • Types of fabrics and their structure	• Evaluate textile characteristics • Design yarns • Distinguish fabrics	1. Types of fibres • Definition of the term fibre • Types of fibres • The properties and where natural fibres are used • The properties and where man-made fibres are used 2. Textiles yarn classification • Basic definitions • Yarn structure, performance and quality • Spinning system 3. Fabric structure • Basic fabric structure (weaves) • Knitted fabrics • Non-woven fabrics	• Do they reflect the state of the sector? Yes • Are they still valid, given the state of the sector? Yes • Are the still valid considering the demands of the sector? Yes
ULO2- Quality control strategies and protocols. Textile metrology and standards	• Metrology for textile products • International standards for textile • Quality control documentations for textile	• Control textile process • Apply quality standards for the textile control • Check quality of products in textile production line	1. Metrology and links to the textile quality control • Essentials about metrology • Metrology versus quality control • The quality of a textile product as a complex concept 2. Standardisation and standards • An overview of the standardisation and standards topics • Standardizing organizations/ bodies. Level of the standardisation • Standards. Classification of standards by outcomes and impact 3. Documented information regarding the quality of a textile product	**• Do they reflect the state of the sector?** **Yes** **• Are they still valid, given the state of the sector?** **Yes** **• Are the still valid considering the demands of the sector?** **Yes**

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
	• Standards atmosphere conditions for the quality of textile process • Testing and measurements for the quality control system of the textile process		• Qualitative profile of a textile product • Documents issued for the quality of the raw materials/textile products • Documents prescribing the quality of a raw material/textile product • Documents attesting the quality of a raw material/textile product 4. The measurement process: the essentials on the process accuracy and description of its specific structure • Factors affecting the quality of a measurement process • Standard atmospheres for conditioning and testing • Moisture content of the textile products • The measurement process definition and description of specific structure 5. Textile testing: from measurement procedure to practice • Quantities intended to be measured • Units of measurement • Methods of measurement • Measuring devices and instruments • Measurement results and errors • Exemplifying a measurement process structure	

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
ULO3- Spinning (including braiding) production	• Spinning processes • Properties of yarns • Digital technologies in spinning mills • Non-conventional yarns	• Activate and supervise spinning machines • Oversee yarn characterisation and testing • Data analysis management for the yarn production • Select non-conventional yarns	1. Spinning processes • Staple fibre spinning processes • Wool spinning processes • Braiding and twisting processes • Filament and multifilament spinning processes 2. Characterization of yarns • Structures of yarns • Main physical characteristics of yarns and their testing method 3. Quality control and digital technologies in spinning mills • Methods to evaluate the production quality and improve it • New trends in digital quality management of the spinning mill: commercial factory analysis systems • Support for yarn production based on data analysis and artificial intelligence 4. New and non-conventional yarns • Fancy yarns: applications and their production process • New yarns for technical applications	• **Do they reflect the state of the sector?** **Yes** • **Are they still valid, given the state of the sector?** **Yes** • **Are the still valid considering the demands of the sector?** **Yes**
ULO4- Weaving production process	• Weaving process • Weaving machineries • Control systems	• Use weaving machine technologies • Tend weaving machines • Control textile process	1. Preparation of the weaving process • Introduction: An overview of preparation of the weaving process • Winding process: what is and why is it important? • Warping process: what is it and which are the warping machines? • The importance of the stiffening and the “size”	• **Do they reflect the state of the sector?** **Yes** • **Are they still valid, given the state of the sector?** **Yes** • **Are the still valid considering the demands of the sector?**

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
	• Weaving architecture • Defects on the weaving process		2. Weaving machines • Introduction the evolution of the weaving machines • The types of the main looms • The main features of the various looms • The production performances of the looms 3. Management and programming of the weaving process • Introduction: The new generation of weaving machines • The main programming functions of the weaving machines • The devices supporting the weaving process • The main controls 4. Optimisation of the weaving process • Introduction: The preparation of each weaving machine • The main parameters concerning the weaving of the fabric • The inputs in the technical sheet for programming the yarn hints of colour • The yield optimization in the weaving process 5. Control systems of the weaving process • The main types of defects in the fabric and along the weaving process • The main types of controls along the weaving process • The elements that determine the good yield • The severity level of defects	Yes
	• Knitting machine technology	• Distinguish knitting technologies and	1. General terms and concepts • What is a knitted structure?	• **Do they reflect the state of the sector?**

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
ULO5- Warp and weft knitting production process	• Technologies and machineries for the circular weft knitting • Technologies and machineries for the flat weft knitting • Technologies and machineries for the warp knitting • Parameters for knitting process quality control	identify key knitting machine elements • Plan and conduct the circular fabric knitting manufacturing process • Plan and conduct the flat fabric knitting manufacturing process • Plan and conduct warp fabric knitting manufacturing process • Control the quality system for the knitting process	• Weft and warp knitted structures • Terminologies • Main elements of knitting formation • Machines classification 2. Circular Weft Knitting • Circular weft knitting machine • Positive feeding system • Circular fabric knitting manufacturing process • Seamless machine • Seamless manufacturing process • Emerging circular knitting technologies • Emerging digital technologies 3. Flat Weft Knitting • Flat knitting machine • Flat knitting manufacturing process • Seamless flat machine • Emerging knitting technologies • Emerging digital technologies 4. Warp Knitting • Ketten machine and related manufacturing processes • Raschel machine and related manufacturing processes • Seamless raschel machine • Warp knitted structures: pillar stitch, tricot, tuch, satin, samt, atlas • Emerging knitting technologies	**Yes** **• Are they still valid, given the state of the sector?** **Yes** **• Are the still valid considering the demands of the sector?** **Yes**

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
			• Emerging digital technologies 5. Knitting technical and quality parameters • Raw materials main quality parameters and their influence on knitting quality control: Yarn count, moisture, regularity, friction coefficient, yarn twist, etc. • Process parameters to control and their influence in fabric quality: Yarns tension, take-down tension, speed, etc. • Test methods and standards for process control. • Product parameters to control and their influence/ importance in fabric quality. • Test methods and standards for product control. • Visual inspection of knitted fabrics (gaige and dyed): main defects and origins and preventive measures. • Technical parameters that influence the properties and quality of the knitted fabrics and Technical data sheet	
ULO6- Tufting production process	• Tufting structure • Tufting technology • Patterning systems in tufting • Backing technologies for tufting	• Plan and conduct the tufting process • Plan and conduct the tufting process with patterning systems	1. Tufting: introduction • Construction of a tufted pile carpet • Yarns • Substrate finishing • Types of tufted pile carpet 2. Tufting machine • Operation of the tufting machine • Looppile • Cutpile • Cutloop 3. Patterning systems	**• Do they reflect the state of the sector?** **Yes** **• Are they still valid, given the state of the sector?** **Yes** **• Are the still valid considering the demands of the sector?** **Yes**

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
	• Parameters of the tufted pile carpet	• Plan and conduct the finishing process of tufted pile carpets • Intervene in the process to obtain the desired quality of the tufted pile carpet	• Lateral movement of the primary backing • Lateral movement of the needle bar • Yarn patterning systems 4. Backing • Precoat • Secondary backing • Finishing line • Bitumen • Hot melts 5. Production parameters • Gauge • Stitch count • Number of tuft or loops • Thickness and height • Mass • Pile density	
ULO7- Manufacturing the non-woven fabrics	• Non-woven fabrics • Web forming techniques for non-woven • Web bonding techniques for non-woven	• Plan and conduct the web forming techniques for non-woven • Plan and conduct the web bonding techniques for non-woven	1. Nonwovens: introduction • What are nonwovens • Applications • Materials • Geometry • Manufacturing processes 2. Web formation techniques • Drylaid • Airlaid • Spunlaid • Meltblown	**• Do they reflect the state of the sector?** **Yes** **• Are they still valid, given the state of the sector?** **Yes** **• Are the still valid considering the demands of the sector?** **Yes**

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
			• Wetlaid 3. Web bonding techniques • Chemical bonding • Thermal bonding • Mechanical bonding	
ULO8- Dyeing, colouring and finishing processes	• Pre-treatments for the textile finishing process • Dyeing technology • Printing and coating technology • Finishing processes	• Plan and conduct the pre-treatment process • Plan and conduct the dyeing process • Plan and conduct the printing and coating process • Plan and conduct the chemical and mechanical finishing process	1. Pre-treatments for fabric finishing • Pre-treatment processing methods • Fabric preparation processes • Quality control of pre-treatment processes 2. Dyeing processes • Calorimetry • Dyes and pigments • Dyeing processes • Quality control of dyeing processes 3. Textile printing processes • Printing textile processes • Coating textile processes • Quality control of printing and coating processes 4. Finishing processes • Mechanical functional finishing processes • Chemical functional finishing processes • New trends on functional finishing processes	**• Do they reflect the state of the sector?** **Yes** **• Are they still valid, given the state of the sector?** **Yes** **• Are the still valid considering the demands of the sector?** **Yes**

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3. **Evaluate the following table.**
   - **Given the Skills and Knowledge contained in the table before, observed the following ones and indicate the ones that could improve the contents.**
   - **Do the following Skills and Knowledge well respond to the needs of the labour market? If yes, which of them?**

CE_MC11 - Sustainable Textile Innovation		
SKILLS	**KNOWLEDGE**	**NOTES**
• 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	• 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 minimize the negative impact of textiles on the environment, throughout their life cycle.	

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regulations, the EU strategy for sustainable and circular textiles.		
CE_MC12 - Eco-friendly Dyeing and Finishing for the Textiles Industry		
SKILLS	**KNOWLEDGE**	
• 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.	• 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 flat-bed 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.	
DF_MC11 - Digital Solutions in Textile Production		
SKILLS	**KNOWLEDGE**	

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• 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	• 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.	

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supply chains faced with the associated challenges of compliance with sustainability, labour, and environmental regulations.		
DF_MC12 - Technological Transfer and Data Management in Textiles Industry		
SKILLS	**KNOWLEDGE**	
• 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.	• 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.	

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SKILLS4SMART CURRICULA EVALUATION

CLOTHING CAD PATTERN MAKER

1. **Evaluate the following job-related skills and competences.**
   - **Do they reflect the state of the sector?**

     Yes, most competencies align with the sector's needs, particularly the use of CAD tools, digital pattern-making, and virtual prototyping.

     Partially:

     SC1: While manual pattern-making remains relevant in niche contexts, its industrial importance has declined due to the increasing dominance of digital workflows. The curriculum should reflect this shift by emphasising digital techniques over manual methods.

     SC2: The emphasis on textile materials and garment manufacturing processes is valid, but the lack of focus on sustainable materials and innovative production methods (e.g., automation) could limit its applicability in the modern sector.

   - **Are they still valid, given the state of the sector?**

     Yes, the core skills remain critical for the clothing industry. The competencies related to CAD tools, prototyping, and pattern adjustments are indispensable for efficient production.

     Partially:

     SC1: Manual techniques are less critical in industrial applications where speed and precision are prioritised. Adding a stronger focus on digital workflows would increase relevance.

     SC2: While the outlined competencies are useful, the absence of topics on automation, smart textiles, and sustainability strategies does not fully align with current advancements in the field.

   - **Are they still valid considering the demands of the sector?**

     Yes, the competencies address core demands such as efficient pattern-making, virtual prototyping, and material optimisation.

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Partially:
SC2: The increasing demand for sustainable and eco-friendly clothing highlights the need for updated content on sustainable materials and manufacturing methods.
SC6: Although making a design tech pack remains a crucial skill, the inclusion of modern tools like PLM systems would ensure the curriculum meets current industry practices for collaborative and efficient production processes.

SC1. Understand the process of collection design and development for clothing industry. Fashion cycle, the consumer, collections (fashion trends and forecasting, range planning, prototyping, production. Set up design specifications for manufacturing. Analyse a drawing and / or a model from the perspective of the design and technical parameters for manufacturing. Overview on pattern-making fundamentals and industrial pattern-making – study of basic patterns, draw manually and in the correct proportion design lines and model details, adding seam values and marks, in order to produce paper patterns for all the different parts of the garment.

SC2. Demonstrate knowledge on textile materials and processes in clothing industry Materials - structure, characteristics and performance in clothing manufacturability according to the model destination and its design requirements. Understand the process of garment manufacturing – from cutting and cutting specifications, to garment construction and sewing, to finishing specifications.

SC3. Perform 2D CAD pattern making for clothing– Create/design2D patterns for all the pieces of the garment model, adapt the designs to suit to productions methods and level of equipment (if necessary). Make a new basic pattern or adapt an existing pattern taking into account the type of fabric material, the fashion image, and sizes. Draw design lines and model details in the correct proportion, adding seam values, marks. Produce patterns for linings and interlinings.

SC4. Understand the 3D CAD software tools for clothing design. Create and/or adjust an avatar using 3D CAD software. Positioning the pattern parts on the avatar to visualize the prototype. Assess the virtual prototype with the stylist. Transform the 3D models into 2D patterns in order to be further engineered. Demonstrate knowledge on human body anthropometry and its movements in order to understand the fitting and fabric's draping issues in 3Dmodelling and simulations. Apply rendering technology for clothing.

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SC5. Follow the prototype (physical or virtual) to validate the design and prepare the patterns for production. Improve the pattern and make digital adjustments. Grade the model with CAD / CAM software in order to obtain the entire range of sizes. Produce laying variants using various CAD nesting software and material consumption modules. Generate the bill of materials and garment costs estimation.

SC6. Make the design tech pack with all needed information for producing the clothing model/ collection. Work out an instruction sheet or a technical file in view of the production of a model (material sheet, technical drawing of the model, seam symbols, size chart, quality requirements, etc.). Classify and archive the patterns and technical documents.

2. **Evaluate the following table related to the curricula.**
   - **Are the Skills and Knowledge still valid in your opinion and coherent with the market requests?**
   - **Do the contents of the sub-units well respond to the market requests?**
   - **Are there some contents of the sub-units that need to be updated? If yes, which of them?**

Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
ULO1-Collection design and development for clothing industry	• Clothing product design • Clothing process design • Fashion tendencies of the circular economy and	• Apply different systems of conceptual clothing design • Distinguish process models for clothing design • Apply circular economy and	1. The conceptual design of fashion product • Definition of conceptual design • Conceptual design features of fashion products • Principles and methods for conceptual design of fashion products • Creativity in fashion -analysis of some major dimensions namely, “the domain”, “the product”, “the person”, and “the process” 2. The fashion design process and its implications	**Are the Skills and Knowledge still valid in your opinion and coherent with the market requests?** Yes **Do the contents of the sub-units well respond to the market requests?**

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
	sustainability for clothing • Apparel product development for clothing • Clothing product models	sustainability design strategies • Distinguish the apparel manufacturing characteristics • Plan and conduct a product development for clothing	• Design process models: context of design problems, design processes and users in the conceptual design domain • Phases of the design processes: investigation, interaction, development and evaluation • Development of collection based on the conceptual fashion design process models 3. New tendencies and approaches in fashion design • How to reduce the negative environmental impact caused by garments? • Developing and implementing sustainable design strategies • Design to disassemble • Design for waste minimisation • Design for user participation 4. Apparel product development • Apparel manufacturing industry has its own specific characteristics • Apparel product development process • Seasonal, and flexible product-oriented lines • Product development is an interdisciplinary activity that requires contributions from marketing, design and manufacturing 5. Product development models • Product development models	Yes, however integrating digital collaboration tools (e.g., cloud-based design platforms) could improve the applicability **Are there some contents of the sub-units that need to be updated? If yes, which of them?** Add emerging collaborative tools and methods, such as AI-assisted fashion design.

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
			• Wholesale brand, private label or store brand, licensed brand or customised • Sequence of core stages of a product development process	
ULO2- Textile materials and processes in clothing industry	• Types of textile fibres • Fabric types • Commercial clothing glossary • Garment accessories • Manufacturing of made-up textile articles	• Distinguish fabrics • Define the textile structure • Deal fabrics with the supply chain companies • Distinguish accessories	1. Fabric selection based on the model • Types of fibres and their quality properties • Textile process: from the fibres to the finished fabric • Fabric quality control 2. Structures of the fabrics • Textile structures used in the clothing sector • Woven fabric: heddle fabrics and jacquard fabrics • Knitting fabrics: weft-knit fabrics and warp-knit fabrics • The non-woven fabrics 3. Commercial glossary • Introduction – The most used fabrics in the clothing • The wool fabrics • The cotton fabrics • The silk fabrics 4. Garment accessories • The most used material for the manufacture of garments • Types of garment accessories: Interfacings; Linings; Buttons, Zippers and Hooks 5. Clothing manufacturing process • Introduction to the garment manufacturing technology • New technology for cutting	**Are the Skills and Knowledge still valid in your opinion and coherent with the market requests?** Yes **Do the contents of the sub-units well respond to the market requests?** Yes **Are there some contents of the sub-units that need to be updated? If yes, which of them?** Add about: - circular textile processes - recycled fibres - smart textiles

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
			• Sewing and finishing • Garment treatments	
ULO3- 2D CAD pattern making for clothing	• 2D CAD for garment manufacturing • Properties of fabrics • Clothing pattern modifications	• Create patterns for garments • Adjust patterns based in fabrics • Adapt an existing pattern	1. Making a basic pattern • Understand the body measurements and body shapes • Reading and working with the European size measurements for Woman • Preparing the size measurements table and formulas • Apply this in a 2D Woman's basic corsage with bust darts 2. Adjusting the pattern for different fabrics • Characteristics of the fabrics and background • Test methods • Adapting the patterns 3. Adapting an existing pattern • Analysis and checking the patterns • Chance the pattern parts into the new style • Keeping an overview of all patterns	**Are the Skills and Knowledge still valid in your opinion and coherent with the market requests?** Yes, however, market demands increasingly incorporate 2D-3D integration and waste-reduction techniques. **Do the contents of the sub-units well respond to the market requests?** Yes **Are there some contents of the sub-units that need to be updated? If yes, which of them?** Yes, Include advanced 2D-3D CAD integration for efficient production workflows.
ULO4- 3D CAD software tools	• Avatar 3D • Clothing 3D CAD prototype	• Analyse scanned data of the body	1. Human body anthropometry in 3D CAD software • Types of anthropometric tables of female and male body in 3D CAD software • The process of creating the avatar in 3D CAD software	**Are the Skills and Knowledge still valid in your opinion and**

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
for clothing design	• Clothing 3D prototype and evaluation tools	• Develop the 2D pattern parameters in order to visualize in 3D avatar and use the rendering technologies • Analyse and adjust the 3D prototype	• Creating the body movement of an avatar in 3D CAD software • Possibilities and limitations in creating of an avatar in 3D CAD software 2. Visualization of the prototype on the avatar • Preparation of 2D templates for visualization on the 3D avatar • Checking the correct positioning of elements on the 3D avatar • Choosing the order of the layers of clothing • Rendering technology for clothing 3. Evaluation for correction of the virtual prototype • Tools to evaluate the prototype visualization on the 3D avatar • Evaluation of the prototype visualization • Correction of the patterns clothing elements	**coherent with the market requests?** Yes **Do the contents of the sub-units well respond to the market requests?** Yes, but there's room to include more advanced technologies for collaborative virtual prototyping and real-time adjustments **Are there some contents of the sub-units that need to be updated? If yes, which of them?** - Incorporate advanced rendering tools and VR integration. - Introduce AI-enhanced simulations for fit and fabric behaviour analysis.
ULO5- Prototyping. Validate the design and prepare the	• Prototyping in the wearing apparel industry	• Prepare production prototypes • Grade patterns for wearing apparel	1. Prototype validation • Introduction • The prototype elaboration process. • Validate the design. Production patterns 2. Grade the garment model with CAD software	**Are the Skills and Knowledge still valid in your opinion and coherent with the market requests?**

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
patterns for production	• CAD software for grade the garment • Clothing CAD/CAM software for material consumption • Draft Bill of Materials (BOM)	• Estimate the material consumption • Plan and conduct a Bill of Materials (BOM)	• Computer grading techniques • Grade dart suppression • Construct grade tables 3. Produce laying variants using various CAD/ CAM nesting software • Introductive notions about the laying process • Computerised lay process • Material consumption modules 4. Generate the bill of materials (BOM) and estimate the costs • General information • BOM preparation (garment industry) • Garment costs estimation	Yes **Do the contents of the sub-units well respond to the market requests?** Yes **Are there some contents of the sub-units that need to be updated? If yes, which of them?** - Add methods for reducing waste during prototyping. - Include traceability systems, such as blockchain, for material and production tracking.
ULO6- Design tech pack	• Clothing tech pack structure • Clothing product specifications • Materials and accessories specifications for clothing • Clothing inspection and packing specifications	• Apply the different rules to elaborate a detailed tech pack • Determine the design rules of the product • Apply and conduct a list of tech pack materials and accessories	1. General terms and concepts • Know more about design tech pack • Tech pack organization • A better and more detailed • Teck pack 2. Product identification and specifications • Detailed sketch of the product • Colourway specs • Sample sizes and measurements • Conception rules and details 3. Materials and accessories specifications	• **Are the Skills and Knowledge still valid in** your opinion and coherent with the market requests? Yes • Do the contents of the sub-units well respond to the market requests? Yes • Are there some contents of the sub-units that need to

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
		• Inspect wearing apparel products	• Materials and accessories • Stitches and seams • Artwork specs • Label specs 4. Inspection and packing specifications • Measurement specs • Points of Measure (POM) • Folding instructions • The package - instructions and information	be updated? If yes, which of them? No

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3. **Evaluate the following table.**
   - **Given the Skills and Knowledge contained in the table before, observed the following ones and indicate the ones that could improve the contents.**
   - **Do the following Skills and Knowledge well respond to the needs of the labour market? If yes, which of them?**

CE_MC13 - Eco-Design Principles for Clothing		
SKILLS	**KNOWLEDGE**	**NOTES**
• 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.	• Eco-Design principles for Clothing: principles of sustainability and the life cycle of apparels in order to design new eco-friendly garments.	These skills and knowledge respond well to labour market needs, as eco-design is a growing demand across the fashion industry. However, including knowledge about regulatory frameworks for sustainable practices in different regions would further strengthen its relevance.
CE_MC14 - Sustainable Clothing Production Processes		
SKILLS	**KNOWLEDGE**	**NOTES**

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• 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.	• 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.	• Perhaps adding knowledge about automation and smart technologies as well as more focus on traceability tools could improve the module's relevance
DF_MC13 - Digital Design and Prototyping in Clothing		
SKILLS	**KNOWLEDGE**	
• 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 to interpret upcoming trends in fashion and life Styles; • Promoting more sustainable ways of fashion design development.	• Understanding of the evolution and significance in digital design in fashion, including new technological advancements, trends, main principles of proto-typing, digital pattern making and grading techniques; • Collaborating and integrating digital design workflows in clothing design and prototyping.	Expanding knowledge about virtual reality tools would reflect technological advancements

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DF_MC14 - Wearable Technology and Digital Customization in Clothing		
SKILLS	**KNOWLEDGE**	
• 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.	• 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. • Being familiar with the main current applications and understand how to evaluate the behaviour of textile e-fabrics.	Expand on emerging use cases for wearable technology, such as medical textiles and smart sportswear, and include integration with IoT systems.

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SKILLS4SMART CURRICULA EVALUATION

3D CAD FOOTWEAR DEVELOPER

1. **Evaluate the following job-related skills and competences.**
    - **Do they reflect the state of the sector?**
    - **Are they still valid, given the state of the sector?**
    - **Are the still valid considering the demands of the sector?**

SC1. Demonstrate a deep understanding of the footwear product design and styling process - concepts, market research, trends and forecasting, styling, design and footwear collections (mood/concept board, colour palettes, materials, drawings and sketches), design specifications for manufactured products, footwear prototypes and samples for presentation, design evaluation and analysis.

SC2. Demonstrate a deep understanding of the footwear manufacturing chain. Overview on the specific footwear manufacturing stages and technology. Company structure and organization, layout of the departments of a footwear company. Footwear materials and components. Footwear quality and testing. Footwear specialities (casual, high end, professional, sportive, healthcare etc.).

SC3. Perform footwear 3D CAD modelling and virtual prototyping - scanning/digitising and importing lasts in 3D environment, computer aided 3D artistic design of footwear, designing 3D model lines, transferring and controlling 3D lines with 2D drawings, creating panels, adding texture, stitches and decorative elements, virtual prototyping the footwear concept and developing a collection line or creations of models variants, 3D modelling of sole/heel, rendering.

SC4. Perform all activities related to 2D CAD pattern engineering - exporting 2D lines from 3D lines in the digital model, 2D digitising, technical flattening of the surfaces, 2D pattern engineering of uppers, 2D pattern engineering of bottom components (e.g. insole), obtaining working patterns including technical/sewing/assembling allowances, nesting and calculating the material consumption, grading the patterns, preparing technical sheets, creating and exporting files for

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all types of devices/equipment (plotter cutting, 3D printers, production machinery etc.) , making templates for controlling the shape of the cutting devices. Accompany the prototypes and the samples during the production phase and keep the interrelation with the line managers in order to observe and to capture difficulties in production and to provide adjustments to the models.

SC5. Perform all activities related to CAD 2D/3D Lasts - 3D modelling of lasts for mass production/ for customization, converting physical last models into CAD models, computer aided design of lasts, technical drawing, grading the last and obtaining the size series (only for mass production), preparing technical specification sheets for manufacturing, making templates for controlling the shape of the new last.

SC6. Perform all activities related to CAD 2D/3D Soles and Heels - computer aided design of soles/heels, grading and obtaining the size series, preparing technical specifications for manufacturing, computer aided design of moulds for vulcanised/ injected soles or heels.

SC7. Demonstrate a deep understanding of rapid prototyping processes and technologies in footwear industry- Additive Manufacturing & 3D printing processes, designing for 3D printing, operating the 3D printing equipment.

2. **Evaluate the following table related to the curricula.**
   - **Are the Skills and Knowledge still valid in your opinion and coherent with the market requests?**
   - **Do the contents of the sub-units well respond to the market requests?**
   - **Are there some contents of the sub-united that need to be updated? If yes, which of them?**

Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
ULO1- Footwear product	• Fashion trends for footwear • Marketing and competition for	• Select, interpret and re-interpret fashion models according to fashion trends	1. Fashion trends • Overview of the history of fashion • Importance of fashion phenomena, study of society and consumers • Fashion styles	Are the Skills and Knowledge still valid in your opinion and coherent with the market requests? **YES**

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
design and styling process	the footwear design process • Management of the footwear design process • Footwear collection development	• Identify target markets for designs • Apply the footwear collection plan	• Fashion trends 2. Marketing and competition for the design process • Marketing and its main tools • The 4P's of marketing: Product, Price, Promotion, Place • Strategic planning: structuring a marketing, communication and retail plan for a footwear/fashion company • Analysis of the market and the target audience • Competition analysis • Study of the target market 3. Set-up and coordination of the footwear collection • Company scenario, business objectives related to collection design and management of design process • Cycle of the creative process: briefing, brainstorming, material research design, drawings, prototyping, fitting, industrialization and launch of the collection, commercial presentation • Planning and finalizing the Collection, launch of the Collection production, update of the technical data sheet, accessories for the industrial phase • Timing of the creative process, flows and knowledge of the industrial process necessary to better manage the collection process • Collection control and technical presentation 4. Creative design and collection development • Conceptual design, graphic design	Do the contents of the sub-units well respond to the market requests? **YES** Are there some contents of the sub-united that need to be updated? - **In p.1(Fashion trends) I would add trend analysis/ trend watcher)** - **In. P.4 using AI in Shoes Design**

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
			• Mood board development: preparation of a mood, graphic creation of the collection, section of materials, preparation of a colour palette • Mode of representation of the different types of footwear, components and accessories on the sheet • Development of the collection plan Case-study on different types of structures	
ULO2- Over-view on the specific foot-wear manufac-turing stages and technology	• Footwear company structure and organization • Footwear materials • Footwear components • Quality and visual inspection procedures for footwear • Footwear manufacturing overview	• Analyse various types of footwear and their functionalities in direct relation to sizing systems and costs. • Estimate the material consumption of a given shoe model in design stage • Perform visual quality control tests	1. Company structure and organization • General organization of a footwear factory – functional organisation chart • Management of resources – factors to consider, examples/case studies/good practices 2. Types of footwear and their functionalities • Types of footwear and their functionalities • Different elements included in different footwear models • Size systems & measures • Brief approach to budgeting 3. Footwear materials and components • Footwear materials - characteristics, behaviour regarding footwear manufacturing process • Footwear components • Innovative materials 4. Footwear quality and testing • Introduction - Quality in the footwear organization (rational) • General knowledge of quality principals, standards and procedures	Are the Skills and Knowledge still valid in your opinion and coherent with the market requests? **YES** Do the contents of the sub-units well respond to the market requests? **YES** Are there some contents of the sub-united that need to be updated? **YES -Design and production based on eco design principles**

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
			• Different quality control tests in materials, components and finished footwear • General knowledge of visual quality inspection procedures (external appearance of footwear). • Quality standards 5. Footwear manufacturing overview • Footwear manufacturing process from raw-materials to packing: cutting, pre-stitching, stitching, pre-assembly, assembly, finishing, packing – equipment, processes, operations • Different types of construction and their functionality: Cemented, Goodyear, Blake, Moccasin, Injection, Stitch and Turn, etc. Approach to lead time / case studies	
ULO3- Foot-wear CAD 3D modelling and virtual proto-typing	• Digitalisation of the last • 3D CAD modelling of footwear • 3D texturing • Rendering process applied to footwear	• Use CAD for lasts • Create 3D CAD footwear prototypes • Obtain virtual 3D footwear models by operating with materials and textures • Render 3D images	1. Digitalisation of the last • The digitisation process • Formats of the digital last • Basic operations with the last and flattening 2. Development of shell and pieces in the footwear virtual model • Obtaining the shell on the digital last • Obtaining the virtual pieces and stitches • Additional operations with virtual pieces 3. Development of accessories and components in the footwear virtual model • Main operations for the creation of accessories	Are the Skills and Knowledge still valid in your opinion and coherent with the market requests? **YES** Do the contents of the sub-units well respond to the market requests? **YES**

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
			• Developing accessories for the virtual model • Main operations for the development of components • Developing components for the virtual model 4. Development of materials and textures in the virtual model • Creation of materials and use of materials library. • Creation of textures on the footwear surfaces. • Combinations 5. Presentation of a realistic model by rendering and PBR • Selecting the scene for rendering • Rendering process PBR process	
ULO4- Footwear CAD 2D pattern engineering	• Footwear 3D and 2D CAD systems • Footwear 2D pattern engineering • Pattern grading • Footwear nesting and consumption of materials	• Apply digitalisation and technical flattening of the surfaces • Develop a footwear model (upper) with a 2D CAD system • Operate the 2D CAD systems in order to obtain the size series	1. CAD systems: from 3D to 2D • Introduction to specific CAD software for pattern-making • From 3D lines to 2D lines • Digitisation systems of the surfaces • Technical flattening of surfaces 2. 2D pattern engineering • From manual pattern-making to CAD pattern-making: advantages, improvements • From the flattened surface to the model of the upper • Technical pattern-making of the insole 3. Grading and allowances • Definition of technical allowances • Definition of the size grading of the upper	Are the Skills and Knowledge still valid in your opinion and coherent with the market requests? **YES** Do the contents of the sub-units well respond to the market requests? **YES**

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
	• Technical sheets for footwear manufacturing	• Estimate the material consumption in footwear design stage • Prepare technical sheets	• Functions of grading of the patterns 4. Nesting and consumption of materials • Introduction to the implementation of nesting • Optimisation of material consumptions • Calculation of material consumptions 5. From pattern-making to production • Preparation of the moulds and of the file for exportation (cutting phase) • Preparation of the model technical envelope Technical sheets: types and detailed information	
ULO5- CAD 2D/3D Lasts	• Data base of lasts • Geometry of lasts in CAD systems • Last grading with CAD systems • Last measurements with 3D CAD software	• Create lasts for footwear based on previous geometry • Perform grading operations for footwear lasts • Control and measure the last using CAD system	1. Data base of lasts • Different types of lasts • Last characterisation. Main measures • Basic work environment 2. Creation of new lasts from previous last geometries • Adaptation of the body of the last • Adaptation of the toe of the last • Assistant for modifications 3. Last grading • International grading systems • Grading, verification and pilling uP operations • Heel, toe and sole templates 4. Last measurements	Are the Skills and Knowledge still valid in your opinion and coherent with the market requests? **YES** Do the contents of the sub-units well respond to the market requests? **YES** Are there some contents of the sub-united that need to be updated? **YES - Designing specialist, orthopedic lasts. Custom-made lasts**

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
	• 3D printing and milling of lasts		• Main points in the last to be measured • Calculation of perimeters, length and heights • Export of measurements in different formats 5. 3D Printing and milling of last • Manufacturing of physical lasts by 3D additive printing • Configuration of a CNC last machine. Subtractive method. Verification of final measures in the physical last	
ULO6- CAD 2D/3D Soles and Heels	• Bottom components for footwear: insoles, soles and heels • 3D CAD of soles • 3D CAD of heels • Pattern grading • Moulds for soles or heels	• Analyse various structures of soles and heels in order to link their construction type with footwear comfort • Use CAD for soles • Use CAD for heels • Obtain the size series for bottom components • Identify/select various construction types of mould for footwear	1. Bottom components for footwear: insoles, soles and heels • The role of the bottom components in footwear comfort • Insoles • Soles • Heels 2. Other components 3D CAD of soles • Preparatory steps for 3D CAD of soles: Last positioning. Basic curves. Creating surfaces. Importing and exporting components. • 3D CAD of the outsole • 3D CAD of outsoles with heel flap/platform/wedge 3. Creating design elements and accessories on the surface of the sole 3D CAD of heels • Preparatory steps for 3D CAD of heels: Last positioning. Basic curves. Creating surfaces. Importing and exporting components. • 3D CAD of flat heels 4. Topic 3. 3D CAD of high heels Grading and obtaining the size series for bottom components	Are the Skills and Knowledge still valid in your opinion and coherent with the market requests? **YES** Do the contents of the sub-units well respond to the market requests? **YES**

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
			• Size series and grading of the bottom components • CAD grading of insoles • CAD grading of soles and heels 5. Moulds for soles or heels • Moulds for vulcanised soles • Moulds for injected soles • Moulds for heels	

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3. **Evaluate the following table.**
   - **Given the Skills and Knowledge contained in the table before, observed the following ones and indicate the ones that could improve the contents.**
   - **Do the following Skills and Knowledge well respond to the needs of the labour market? If yes, which of them?**

CE_MC17 - Eco-Design Principles for Footwear		
SKILLS	**KNOWLEDGE**	**NOTES**
• Ability to recognise the importance of using of 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 the concepts of repairability, personalization and longevity in footwear design.	• 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.	Important topics in the industry. No specific solutions for industry. Eco design is in its early stages
CE_MC18 - Sustainable Footwear Production Processes		
SKILLS	**KNOWLEDGE**	**NOTES**
• Ability to consider circular economy principles in the design of the shoe and its manufacturing processes.	• A fundamental understanding of production processes in the shoe industry and how they relate to circular	A very important issue that can be considered

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• Skills in planning, monitoring, and optimizing production processes to achieve efficient and sustainable footwear manufacturing practices.	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.	
DF_MC17 - Digital Design and Prototyping in Footwear		
SKILLS	**KNOWLEDGE**	
• 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.	• 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	Yes imporant. Prototyping made easy thanks to printing and modern technologies in construction.

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• 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.	• Case studies on time and cost savings through digital prototypes • Digital platforms for collaborative design • Digital tools for an efficient communication and project management	
DF_MC18 - Wearable Technology and Digital Customization in Footwear		
SKILLS	**KNOWLEDGE**	
• 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	• Understanding Fashion trends, how to analyse and predict them in order to remain updated. • Building a deep understanding of the customer's motivations, behaviours, preferences, and values for commercial purposes.	

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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.	• Understanding the latest environmentally friendly materials and components including leather, textiles and synthetics, materials for soles and midsoles, miscellaneous components and accessories.	

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SKILLS4SMART CURRICULA EVALUATION

LEATHER TECHNOLOGIST

1. **Evaluate the following job-related skills and competences.**
    - **Do they reflect the state of the sector?**
    - **Are they still valid, given the state of the sector?**
    - **Are the still valid considering the demands of the sector?**

SC1. Demonstrate a deep understanding on the whole leather processing chain, including conservation of raw hide/skin, from fresh/salted state until their entrance in the production process, beamhouse, tanning, post-tanning and finishing of leather. Demonstrate a general understanding of all steps of wet processing (beamhouse, tanning and post-tanning), mechanics & machine handling, crust drying and finishing operations.

- **Do they reflect the state of the sector?**
  Yes

- **Are they still valid, given the state of the sector?**
  Yes

- **Are the still valid considering the demands of the sector?**
  Yes

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SC2. Demonstrate knowledge in chemicals, materials and leather chemistry to conceive processing recipes/formulations, to develop the processing chain for a required leather product and to run clean technologies at production level. Manage the chemical products used in the leather making process, as concerns inventory, tracking, safe use and disposal, housekeeping capacity and responsibility for the efficient and effective use of resources and materials. Track and trace of processed leather in batches and connect them correctly with the supplies of hides or skins.

- **Do they reflect the state of the sector?**
  Yes

- **Are they still valid, given the state of the sector?**
  Yes

- **Are the still valid considering the demands of the sector?**
  Yes, *but traceability back to the birth of animal may need to be adapted to the regulatory needs of the EU.*

SC3. Apply knowledge of leather processing in beamhouse operations: soaking, unhairing, liming, fleshing and splitting, deliming, bating and pickling. Plan, conduct, coordinate and monitor the beamhouse operations and assure that all of them are carried out in a consistent manner and in accordance with specifications. Demonstrate knowledge in the identification of the causes of defects which might be produced at the farm, during transport, during stunning and flaying in the slaughterhouse, and/or triggered during the beamhouse processes; apply appropriate corrective measures. Demonstrate knowledge of all safety and health preventive measures in the beamhouse workplaces.

- **Do they reflect the state of the sector?**
  Yes

- **Are they still valid, given the state of the sector?**
  Yes

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- **Are the still valid considering the demands of the sector?**
  Yes

SC4. Apply knowledge of leather processing in tanning and post tanning operations. Plan, conduct, coordinate and monitor the tanning and post tanning operations (neutralisation, re-tanning, degreasing & fatliquoring and dyeing and post-tanning mechanical operations; shaving, sammying, buffing and drying), assuring that all of them are carried out in a consistent manner and in accordance with specifications. Tanning operations will be adapted to the client expectations: wet-blue, wet-white (or chrome-free) and vegetable tanning operations. Usually, the tanneries are specialised in one-two types of leather tanning (wet-blue and wet-white or vegetable tanning and wet-white). Post-tanning operations will be dependent of the final expected leather article: colour, degree of softness, fullness, touch and other technical properties according to the client expectations. Ensure that tanning and post-tanning recipes and chemicals used are changed depending on the tanning process applied (mineral, vegetal or synthetic) and the technical expectations required for the product. The final leather will have to meet the requirements of the final leather destination (footwear, upholstery, clothing or leather goods). Demonstrate knowledge to identify the causes of defects during the tanning and post-tanning processes; apply appropriate corrective measures. Demonstrate knowledge of all safety and health preventive measures in the tanning and posttanning workplaces.

- **Do they reflect the state of the sector?**
  Yes

- **Are they still valid, given the state of the sector?**
  Yes

- **Are the still valid considering the demands of the sector?**
  Yes

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SC5. Apply knowledge of leather finishing operations. Plan, conduct, coordinate and monitor the finishing operations and assure that all of them are carried out in a consistent manner and in accordance with specifications required. Identify the leather patterns according to the customers' demand, quality of leather and types of finishing processes. Obtain a determinate finishing colour by mixtures of dyeing agents according to the clients' demand (colour fastness, softness of touch, degree of glazing, etc.). Establish the finishing operations, which are directly dependent of the final technical expectations (impregnation, pre-coats, coats, top-coats); select chemicals for specific leather coats (pigments, resins, auxiliaries, lacquers, aqueous or solvent based coats topcoats). Establish operations of painting (e.g. roller, spraying machine), drying and ironing between different coats, glazing or polishing to reach specific shade on the leather. Demonstrate knowledge to identify the causes of defects that are produced either by the quality of the crust leather or by a defect triggered during finishing operations; apply the appropriate corrective measures.

- **Do they reflect the state of the sector?**
  Yes

- **Are they still valid, given the state of the sector?**
  Yes

- **Are the still valid considering the demands of the sector?**
  Yes

SC6. Perform materials evaluation, quality control and quality assessment throughout the entire production process and apply where required corrective actions. Perform quality assessment of finished leather, including grading and assignment for different product applications and destinations of use. Analyse technical characteristics and requirements of the leather depending on their market destination: footwear, automotive and furniture upholstery, leather goods and clothing. Apply clean technologies and waste management measures according to the rules, regulations and company directives. Know the main product quality regulations, chemical risk monitoring systems and parameters. Understand noncompliances and false positives in materials and substance testing, in particular for substances of very high concern. Apply health and safety knowledge to assure the proper conditions of the workplace.

- **Do they reflect the state of the sector?**

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We should verify whether this unit is updated with the latest restrictions adopted at the EU level. In particular, we should anticipate the restriction on skin sensitizers or indicate how to identify ECHA restriction proposals.

- **Are they still valid, given the state of the sector?**
  Yes

- **Are the still valid considering the demands of the sector?**
  Yes

SC7. Demonstrate digital skills by operating various software applications and systems related to the usage of computer-controlled machinery and equipment for leather processing, operate database and process management software, including but not limited at: Data Management, ERP systems, to be aware of the batch production processes from raw material to finished leather and traceability of leather lots.

- **Do they reflect the state of the sector?**
  Yes

- **Are they still valid, given the state of the sector?**
  Yes

- **Are the still valid considering the demands of the sector?**
  Yes, *but traceability back to the birth of animal may need to be adapted to the regulatory needs of the EU.*

2. **Evaluate the following table related to the curricula.**
   - **Are the Skills and Knowledge still valid in your opinion and coherent with the market requests?**
   - **Do the contents of the sub-units well respond to the market requests?**

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- **Are there some contents of the sub-united that need to be updated? If yes, which of them?**

Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	**Skills**		
ULO1- Leather processing chain	• Basics on Leather • Preservation of raw material in leather processing • Leather Technology 1 - From beamhouse to tanning • Leather Technology 2 - From post-tanning to finishing	• Distinguish the different types of hides and leather • Select the suitable type of preservation system for each type of leather • Plan and conduct the operations of beamhouse and tanning • Plan and conduct the operations of post-tanning and finishing	1. What is leather? • Hides and skins: the raw materials for leather manufacture • General outline of the leather manufacturing process • General properties of leather • Main leather types and their areas of use 2. Preservation of raw hides and skins • Purpose of hides and skins preservation • Methods for hides and skins curing - procedures, equipment and chemicals • Clean technologies for hides and skins preservation • Defects in hides and skins preservation 3. Operations of the leather processing chain (1) • Classification of operations for leather production • Operations and equipment in the beamhouse • Operations and equipment in the tanyard 4. Operations of the leather processing chain (2) • Operations and equipment in the dyehouse • Operations and equipment for dry finishing • Operations and equipment for coat finishing	**Are the Skills and Knowledge still valid in your opinion and coherent with the market requests?** *Yes* **Do the contents of the sub-units well respond to the market requests?** *Yes* **Are there some contents of the sub-united that need to be updated? If yes, which of them?** *We should verify if at each level the corresponding PPE (personal protection equipment) is indicated.*

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
ULO2- Chemicals, materials and leather chemistry	• Leather Chemistry of hides and skins • Leather manufacturing chemicals • Management of chemicals • Clean technologies in leather production	• Apply the conception rules of amino acids groups of collagen • Select the suitable chemicals for each process • Apply and conduct a list of chemicals to be used in leather processes. • Select the suitable clean technologies for each process	1. Some facts about chemistry of hides and skins • Chemical composition of hides and skins • Collagen protein, the major component of hides and skins • Chemical and physical behaviour of collagen in aqueous solutions 2. Chemicals and materials for leather manufacturing • Overview of chemicals and materials commonly used in tanneries • Tanning agents • Dyes, fillers and fat liquors • Finishing auxiliaries and formulations • Eco-friendly chemicals for leather processing • Recipes and process sheets for leather manufacturing 3. Chemicals management and housekeeping • Rules of good housekeeping in tanneries • Elements of a chemical management system • Regulations and restrictions for chemicals used in tanneries • Restricted substances and the leather market 4. Clean technologies in tanneries • What are clean technologies? • Clean technologies in the beam house • Clean technologies in the tan yard • Clean technologies in the dyehouse • Clean technologies in leather finishing	**Are the Skills and Knowledge still valid in your opinion and coherent with the market requests?** Yes **Do the contents of the sub-units well respond to the market requests?** Yes **Are there some contents of the sub-united that need to be updated? If yes, which of them?** *With regard to the point 4: Verify if this section refers to the latest BAT (Best Available Techniques) outlined in the BREF for tanneries under the IED (Industrial Emissions Directive).*

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
ULO3- Leather processing in beamhouse operations	• Soaking operation of leather manufacturing • Unhairing and liming processes of leather manufacturing • Mechanical operations during beamhouse • Deliming and bating processes of leather manufacturing	• Plan and conduct the soaking operation • Plan and conduct the unhairing and liming operations • Plan and conduct the fleshing and splitting operations • Plan and conduct the deliming and bating operations	1. The Soaking process of raw material • From preservation to the soaking process • Soaking purpose and mechanism • Soaking chemicals and processing time • Next beamhouse processes and cleaner technologies 2. Beamhouse operations: Unhairing and liming • Starting the unhairing and liming with soaked pelts • Unhairing and liming purpose and mechanism • Unhairing and liming chemicals and clean technologies • Next beamhouse processes: mechanical operations 3. Mechanical beamhouse operations: Fleshing and splitting • Configuration of fleshing and splitting machinery in the tannery • Grain and split uses and destination • Clean technologies of fleshing and splitting • Next Beamhouse processes: deliming and bating 4. Beamhouse operations: Unhairing and liming • Deliming and bating chemicals and mechanism • Deliming and Bating: quality control of the pelt • Clean technologies of deliming and bating • Next processes: pickling and tanning operations	**Are the Skills and Knowledge still valid in your opinion and coherent with the market requests?** **Yes** **Do the contents of the sub-units well respond to the market requests?** **Yes** **Are there some contents of the sub-united that need to be updated? If yes, which of them?** **No**
ULO4- Leather processing in tanning and	• Pickling and tanning operations of leather manufacturing	• Plan and conduct the pickling and tanning operations • Select the most suitable type of	1. The tanning process: pickling and chrome leather tanning • Tanning features and mechanism: pickling, tanning, basification and chrome fixation. Quality control of tanned leather • Tanned leather called as wet-blue leather: destination	**Are the Skills and Knowledge still valid in your opinion and coherent with the market requests?**

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
post tanning operations	• Typologies of leather tanning operation • Post-tanning operations of leather manufacturing • Post-tanning mechanisations of leather manufacturing	tanning for each leather good. • Plan and conduct the retanning, greasing and dyeing operations. • Plan and conduct sammying, drying, conditioning and staking operations	• Mechanical operations: sammying to eliminate the water excess from the leather structure and shaving to reach the desired thickness • Post-tanning operations or wet finishing: brief description 2. Tanning technologies: wet-blue tanning, vegetable tanning and wet-white tanning • Chrome, vegetable and wet-white tanning: differences and properties of tanned leather • Vegetable tanning recipes: tanning mechanism, general recipe • Wet-white tanning recipes: tanning mechanism, general recipe • Automotive, furniture, shoe upper and leather goods leather markets: relation with the type of tanning 3. Post-tanning operations: retanning, greasing and dyeing • Crust leather after post-tanning operations: types and features • Retanning operation: recipes and types of chemicals depending on the leather market • Greasing operation: types of greasing agents and their chemical compatibility, adding greasing agents during post-tanning • Dyeing agents: types and introduction of chemicals during post-tanning recipes • Quality control of crust leather 4. Post-tanning mechanisations: sammying, drying, conditioning and staking of the leather • Sammying and setting out • Drying, toggling and conditioning equipment • Staking and trimming	**Yes** **Do the contents of the sub-units well respond to the market requests?** **Yes** **Are there some contents of the sub-united that need to be updated? If yes, which of them?** **No**

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
			• Sorting of crust leather for leather finishing	
ULO5- Leather finishing operations	• Leather finishing technologies • Coating layers and leather destination • Chemicals used in the finishing of leather • Leather finishing technologies • VOC emissions during leather finishing operations and VOC free finishing alternatives	• Plan and conduct finishing operations • Select the most suitable type of finishing for each leather good. • Select the most suitable chemical products for finishing for each type of leather good. • Plan and conduct painting, drying, ironing operations. • Adjust finishing processes to avoid VOC emissions.	1. General features of leather finishing • Purpose of finishing operation • Coating stages description and relation with leather appearance and the end product market • Aniline, semi-aniline and corrected grain: from the simplest coat to the finishing with more chemical load • **Use of toxic substances during finishing: which are the most compromising steps?** 2. Finishing products: binders and polymers, colouring agents, cross-linkers, lacquers and auxiliaries • Binding agents: types of polymers depending on their chemical nature and applicability, protein binders • Colouring agents: organic and inorganic pigments and dyes • Cross-linking agents, lacquers and auxiliaries • Preparation of finishing emulsions. Durability and preservation 3. Typical coating layers and their relation with the final leather use • Coating stages during finishing: function and chemistry involved • Quality of finished leather is dependent on the raw hide quality and/or crust leather quality • Definition of final articles depending on the crust leather quality 4. Machinery for painting, drying and ironing. Auxiliary machines for finishing of leather • Mechanical operations applied during finishing according to the marketable product	**Are the Skills and Knowledge still valid in your opinion and coherent with the market requests?** **Yes** **Do the contents of the sub-units well respond to the market requests?** **Yes** **Are there some contents of the sub-united that need to be updated? If yes, which of them?** *Yes, with regard to point 1 "general features of leather finishing": We need to verify whether the term "toxic" is accurate, as some substances may be more appropriately classified as "dangerous substances." Additionally, we*

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
			• Painting operation: spraying, curtain and roller machines • Ironing and pattern making 5. Emissions of pollutants from finishing: VOC and new free of VOC clean technologies • What are the most common sources of VOCs? • VOCs emissions in leather finishing • VOCs emissions in the tannery How is VOC measured?	*should check if the PPE (Personal Protective Equipment) is properly indicated and suitable for the substances mentioned.*
ULO6- Quality monitoring and control	• Quality control in leather production • Leather quality assessment • EU legislation for leather • Quality regulations and risks monitoring • Health and safety in the workplace	• Plan and conduct standardised chemical, physical and fastness methods of assay • Select the most suitable list of recommendations • Select the appropriate standardised method of assay • Plan and conduct a list of parameters to control the quality of leather and the chemical risk	1. Quality control along production process • Types of standards, international standards of assay and quality requirements • Physic, chemical and fastness standardized methods • Variables to control during production process: pickled pelt and semi-processed leather (wet-blue, wet-white) • Interpretation of results 2. Quality assessment of finished leather • Requirements and quality control on finished leather for leather goods, footwear and automotive upholstery • Standardised methods of analysis (physical, chemical and fastness properties of leather) 3. Technical characteristics and requirement of leather for different usages • Flexibility • Elasticity and plasticity properties • Delamination resistance • Bendability	**Are the Skills and Knowledge still valid in your opinion and coherent with the market requests?** **Yes** **Do the contents of the sub-units well respond to the market requests?** **Yes** **Are there some contents of the sub-united that need to be updated? If yes, which of them?** *Yes, with regard to point 5 "Health and safety at the*

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
		• Plan and conduct an inspection to assure a healthy and safety work	• Temperature resistance • Water vapour permeability and absorption • Water resistance • Others (colour fastness, hazardous substances) • News leather materials (chrome-free biodegradable and disintegrable; water resistant properties; organic leather. 4. Quality regulations and chemical risk monitoring • Legal framework • Management system standards applied • Critical substances (very high concern, subject to authorisation, restricted) • Lists of restricted substances **5. Health and safety in the workplace** • EU legislation on HSW • Corporate HSW (planning, implement, supervise/control) • Process risks in leather industry • Harmful substances in the workplace - regulation and control	*workplace": In the sub-unit on PPE, a reference to the RA risk assessment tool must be added, while specifying the various types of PPE (Personla Protective Equipment) commonly used in the tanning industry.*

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3. **Evaluate the following table.**
   - **Given the Skills and Knowledge contained in the table before, observed the following ones and indicate the ones that could improve the contents.**
   - **Do the following Skills and Knowledge well respond to the needs of the labour market? If yes, which of them?**

CE_MC15 - Innovative Solutions for Leather Waste Reduction		
SKILLS	**KNOWLEDGE**	**NOTES**
• (1)Describe the various stages of leather production and consumption and explain how each stage contributes to waste generation. • **(2)Recognize the different types of leather waste and their environmental impacts.** • (3)Assess the environmental impacts of various textile and leather production processes. • (4)Analyse the environmental consequences and economic implications of leather waste within the industry. • (5)Evaluate current leather waste management practices and identify areas for improvement. • (6)Implement practical solutions such as recycling, upcycling, and sustainable manufacturing processes to reduce leather waste. • **(7) Formulate and propose effective strategies for reducing leather waste, integrating principles of the circular economy.**		The leather technologist should have the general understanding about "recognise the different types of leather waste and their environmental impacts" & 7. But for the other skills and knowledge a separate profile would normally be used.
CE_MC16 - Sustainable Leather Innovation: Best Practices and Techniques for Eco-friendly Production		
SKILLS	**KNOWLEDGE**	**NOTES**

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• (1) Ability to differentiate between various impacts of leather production on carbon footprint • (2) Ability to assess the significance of leather labels.	• (3) Understanding interdependencies between meat/dairy industry and hide production • (4) Basic understanding of leather's carbon footprint. • (5) Recycling of by-products of leather manufacturing and cascade use • (6) Sustainable Leather Labels	1 & 4 are useful; 2 &3 are useful for other profiles, 5 & 6 are not useful at all.
DF_MC15 - Digital Solutions in Leather Production		
SKILLS	**KNOWLEDGE**	
• Ability to consider digital tools for improvement of leather processing (economic and sustainability impact) • Skills in planning, monitoring, and optimizing production processes	• 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	These skills & knowledge are good to know but not indispensable for the Leather Technologist.
DF_MC16 - Technological Transfer and Data Management in Leather Industry		
SKILLS	**KNOWLEDGE**	
• 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.		These skills & knowledge are good to know but not

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• 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.	indispensable for the Leather Technologist.

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SKILLS4SMART CURRICULA EVALUATION

LEATHER TECHNOLOGIST

1. **Evaluate the following job-related skills and competences.**
    - **Do they reflect the state of the sector?**
    - **Are they still valid, given the state of the sector?**
    - **Are the still valid considering the demands of the sector?**

SC1. Demonstrate a deep understanding on the whole leather processing chain, including conservation of raw hide/skin, from fresh/salted state until their entrance in the production process, beamhouse, tanning, post-tanning and finishing of leather. Demonstrate a general understanding of all steps of wet processing (beamhouse, tanning and post-tanning), mechanics & machine handling, crust drying and finishing operations.

SC2. Demonstrate knowledge in chemicals, materials and leather chemistry to conceive processing recipes/formulations, to develop the processing chain for a required leather product and to run clean technologies at production level. Manage the chemical products used in the leather making process, as concerns inventory, tracking, safe use and disposal, housekeeping capacity and responsibility for the efficient and effective use of resources and materials. Track and trace of processed leather in batches and connect them correctly with the supplies of hides or skins.

SC3. Apply knowledge of leather processing in beamhouse operations: soaking, unhairing, liming, fleshing and splitting, deliming, bating and pickling. Plan, conduct, coordinate and monitor the beamhouse operations and assure that all of them are carried out in a consistent manner and in accordance with specifications. Demonstrate knowledge in the identification of the causes of defects which might be produced at the farm, during transport, during stunning and flaying in the slaughterhouse, and/or triggered during the beamhouse processes; apply appropriate corrective measures. Demonstrate knowledge of all safety and health preventive measures in the beamhouse workplaces.

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SC4. Apply knowledge of leather processing in tanning and post tanning operations. Plan, conduct, coordinate and monitor the tanning and post tanning operations (neutralisation, re-tanning, degreasing & fatliquoring and dyeing and post-tanning mechanical operations; shaving, sammying, buffing and drying), assuring that all of them are carried out in a consistent manner and in accordance with specifications. Tanning operations will be adapted to the client expectations: wet-blue, wet-white (or chrome-free) and vegetable tanning operations. Usually, the tanneries are specialised in one-two types of leather tanning (wet-blue and wet-white or vegetable tanning and wet-white). Post-tanning operations will be dependent of the final expected leather article: colour, degree of softness, fullness, touch and other technical properties according to the client expectations. Ensure that tanning and post-tanning recipes and chemicals used are changed depending on the tanning process applied (mineral, vegetal or synthetic) and the technical expectations required for the product. The final leather will have to meet the requirements of the final leather destination (footwear, upholstery, clothing or leather goods). Demonstrate knowledge to identify the causes of defects during the tanning and post-tanning processes; apply appropriate corrective measures. Demonstrate knowledge of all safety and health preventive measures in the tanning and posttanning workplaces.

SC5. Apply knowledge of leather finishing operations. Plan, conduct, coordinate and monitor the finishing operations and assure that all of them are carried out in a consistent manner and in accordance with specifications required. Identify the leather patterns according to the customers' demand, quality of leather and types of finishing processes. Obtain a determinate finishing colour by mixtures of dyeing agents according to the clients' demand (colour fastness, softness of touch, degree of glazing, etc.). Establish the finishing operations, which are directly dependent of the final technical expectations (impregnation, pre-coats, coats, top-coats); select chemicals for specific leather coats (pigments, resins, auxiliaries, lacquers, aqueous or solvent based coats topcoats). Establish operations of painting (e.g. roller, spraying machine), drying and ironing between different coats, glazing or polishing to reach specific shade on the leather. Demonstrate knowledge to identify the causes of defects that are produced either by the quality of the crust leather or by a defect triggered during finishing operations; apply the appropriate corrective measures.

SC6. Perform materials evaluation, quality control and quality assessment throughout the entire production process and apply where required corrective actions. Perform quality assessment of finished leather, including grading and assignment for different product applications and destinations of use. Analyse technical characteristics and requirements of the leather depending on their market destination: footwear, automotive and furniture upholstery, leather goods and clothing. Apply clean technologies and waste management measures according to the rules, regulations and company directives. Know the main product quality regulations, chemical risk monitoring systems and parameters. Understand noncompliances and false positives in materials and substance testing, in particular for substances of very high concern. Apply health and safety knowledge to assure the proper conditions of the workplace.

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SC7. Demonstrate digital skills by operating various software applications and systems related to the usage of computer-controlled machinery and equipment for leather processing, operate database and process management software, including but not limited at: Data Management, ERP systems, to be aware of the batch production processes from raw material to finished leather and traceability of leather lots.

2. **Evaluate the following table related to the curricula.**
   - **Are the Skills and Knowledge still valid in your opinion and coherent with the market requests?**
   - **Do the contents of the sub-units well respond to the market requests?**
   - **Are there some contents of the sub-united that need to be updated? If yes, which of them?**

Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
ULO1- Leather processing chain	• Basics on Leather • Preservation of raw material in leather processing • Leather Technology 1 - From beamhouse to tanning • Leather Technology 2 -	• Distinguish the different types of hides and leather • Select the suitable type of preservation system for each type of leather • Plan and conduct the operations of beamhouse and tanning • Plan and conduct the operations of	1. What is leather? • Hides and skins: the raw materials for leather manufacture • General outline of the leather manufacturing process • General properties of leather • Main leather types and their areas of use 2. Preservation of raw hides and skins • Purpose of hides and skins preservation • Methods for hides and skins curing - procedures, equipment and chemicals • Clean technologies for hides and skins preservation • Defects in hides and skins preservation 3. Operations of the leather processing chain (1) • Classification of operations for leather production	**Are the Skills and Knowledge still valid in your opinion and coherent with the market requests?** Yes, they are. But still there are some missing points, when dealing with point 3 and 4 we would add and highlight the failures that may arise, to talk about each failure for each operation, apart from dealing with the future possibilities of one failure in the process.

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
	From post-tanning to finishing	post-tanning and finishing	• Operations and equipment in the beamhouse • Operations and equipment in the tanyard 4. Operations of the leather processing chain (2) • Operations and equipment in the dyehouse • Operations and equipment for dry finishing • Operations and equipment for coat finishing	**Do the contents of the sub-units well respond to the market requests?** Yes, they all respond to the current market requests. **Are there some contents of the sub-united that need to be updated? If yes, which of them?** Yes, as we have discussed in the first question.
ULO2- Chemicals, materials and leather chemistry	• Leather Chemistry of hides and skins • Leather manufacturing chemicals • Management of chemicals • Clean technologies in	• Apply the conception rules of amino acids groups of collagen • Select the suitable chemicals for each process • Apply and conduct a list of chemicals to be used in leather processes.	1. Some facts about chemistry of hides and skins • Chemical composition of hides and skins • Collagen protein, the major component of hides and skins • Chemical and physical behaviour of collagen in aqueous solutions 2. Chemicals and materials for leather manufacturing • Overview of chemicals and materials commonly used in tanneries • Tanning agents • Dyes, fillers and fat liquors • Finishing auxiliaries and formulations • Eco-friendly chemicals for leather processing • Recipes and process sheets for leather manufacturing	**Are the Skills and Knowledge still valid in your opinion and coherent with the market requests?** Yes, it's all correct and relevant. **Do the contents of the sub-units well respond to the market requests?**

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
	leather production	• Select the suitable clean technologies for each process	3. Chemicals management and housekeeping • Rules of good housekeeping in tanneries • Elements of a chemical management system • Regulations and restrictions for chemicals used in tanneries • Restricted substances and the leather market 4. Clean technologies in tanneries • What are clean technologies? • Clean technologies in the beam house • Clean technologies in the tan yard • Clean technologies in the dyehouse • Clean technologies in leather finishing	Yes, they all respond the market request. **Are there some contents of the sub-united that need to be up-dated? If yes, which of them?** Not in this case.
ULO3- Leather processing in beamhouse operations	• Soaking operation of leather manufacturing • Unhairing and liming processes of leather manufacturing • Mechanical operations during beamhouse	• Plan and conduct the soaking operation • Plan and conduct the unhairing and liming operations • Plan and conduct the fleshing and splitting operations	1. The Soaking process of raw material • From preservation to the soaking process • Soaking purpose and mechanism • Soaking chemicals and processing time • Next beamhouse processes and cleaner technologies 2. Beamhouse operations: Unhairing and liming • Starting the unhairing and liming with soaked pelts • Unhairing and liming purpose and mechanism • Unhairing and liming chemicals and clean technologies • Next beamhouse processes: mechanical operations 3. Mechanical beamhouse operations: Fleshing and splitting • Configuration of fleshing and splitting machinery in the tannery • Grain and split uses and destination	**Are the Skills and Knowledge still valid in your opinion and coherent with the market requests?** Yes, they are all coherent. **Do the contents of the sub-units well respond to the market requests?** Yes, they are all relevant.

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
	• Deliming and bating processes of leather manufacturing	• Plan and conduct the deliming and bating operations	• Clean technologies of fleshing and splitting • Next Beamhouse processes: deliming and bating 4. Beamhouse operations: Unhairing and liming • Deliming and bating chemicals and mechanism • Deliming and Bating: quality control of the pelt • Clean technologies of deliming and bating • Next processes: pickling and tanning operations	**Are there some contents of the sub-united that need to be up-dated? If yes, which of them?** Not in this case.
ULO4- Leather processing in tanning and post tanning operations	• Pickling and tanning operations of leather manufacturing • Typologies of leather tanning operation • Post-tanning operations of leather manufacturing • Post-tanning mechanisations of leather manufacturing	• Plan and conduct the pickling and tanning operations • Select the most suitable type of tanning for each leather good. • Plan and conduct the retanning, greasing and dyeing operations. • Plan and conduct sammying, drying, conditioning and staking operations	1. The tanning process: pickling and chrome leather tanning • Tanning features and mechanism: pickling, tanning, basification and chrome fixation. Quality control of tanned leather • Tanned leather called as wet-blue leather: destination • Mechanical operations: sammying to eliminate the water excess from the leather structure and shaving to reach the desired thickness • Post-tanning operations or wet finishing: brief description 2. Tanning technologies: wet-blue tanning, vegetable tanning and wet-white tanning • Chrome, vegetable and wet-white tanning: differences and properties of tanned leather • Vegetable tanning recipes: tanning mechanism, general recipe • Wet-white tanning recipes: tanning mechanism, general recipe • Automotive, furniture, shoe upper and leather goods leather markets: relation with the type of tanning 3. Post-tanning operations: retanning, greasing and dyeing • Crust leather after post-tanning operations: types and features	**Are the Skills and Knowledge still valid in your opinion and coherent with the market requests?** As we have argued, better development of the content (as highlighted in the first UOL1) **Do the contents of the sub-units well respond to the market requests?** Yes, are relevant.

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
			• Retanning operation: recipes and types of chemicals depending on the leather market • Greasing operation: types of greasing agents and their chemical compatibility, adding greasing agents during post-tanning • Dyeing agents: types and introduction of chemicals during post-tanning recipes • Quality control of crust leather 4. Post-tanning mechanisations: sammying, drying, conditioning and staking of the leather • Sammying and setting out • Drying, toggling and conditioning equipment • Staking and trimming • Sorting of crust leather for leather finishing	**Are there some contents of the sub-united that need to be up-dated? If yes, which of them?** Not in this Traning Unit.
ULO5- Leather finishing operations	• Leather finishing technologies • Coating layers and leather destination • Chemicals used in the finishing of leather • Leather finishing technologies	• Plan and conduct finishing operations • Select the most suitable type of finishing for each leather good. • Select the most suitable chemical products for finishing for each type of leather good.	1. General features of leather finishing • Purpose of finishing operation • Coating stages description and relation with leather appearance and the end product market • Aniline, semi-aniline and corrected grain: from the simplest coat to the finishing with more chemical load • Use of toxic substances during finishing: which are the most compromising steps? 2. Finishing products: binders and polymers, colouring agents, cross-linkers, lacquers and auxiliaries • Binding agents: types of polymers depending on their chemical nature and applicability, protein binders • Colouring agents: organic and inorganic pigments and dyes	**Are the Skills and Knowledge still valid in your opinion and coherent with the market requests?** Yes, all are coherent. **Do the contents of the sub-units well respond to the market requests?**

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
	• VOC emissions during leather finishing operations and VOC free finishing alternatives	• Plan and conduct painting, drying, ironing operations. • Adjust finishing processes to avoid VOC emissions.	• Cross-linking agents, lacquers and auxiliaries • Preparation of finishing emulsions. Durability and preservation 3. Typical coating layers and their relation with the final leather use • Coating stages during finishing: function and chemistry involved • Quality of finished leather is dependent on the raw hide quality and/or crust leather quality • Definition of final articles depending on the crust leather quality 4. Machinery for painting, drying and ironing. Auxiliary machines for finishing of leather • Mechanical operations applied during finishing according to the marketable product • Painting operation: spraying, curtain and roller machines • Ironing and pattern making 5. Emissions of pollutants from finishing: VOC and new free of VOC clean technologies • What are the most common sources of VOCs? • VOCs emissions in leather finishing • VOCs emissions in the tannery How is VOC measured?	Yes, they all respond. **Are there some contents of the sub-united that need to be up-dated? If yes, which of them?** No, they are all correct.
ULO6- Quality monitoring and control	• Quality control in leather production • Leather quality assessment	• Plan and conduct standardised chemical, physical and fastness methods of assay	1. Quality control along production process • Types of standards, international standards of assay and quality requirements • Physic, chemical and fastness standardized methods • Variables to control during production process: pickled pelt and semi-processed leather (wet-blue, wet-white) • Interpretation of results	**Are the Skills and Knowledge still valid in your opinion and coherent with the market re-quests?**

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
	• EU legislation for leather • Quality regulations and risks monitoring • Health and safety in the workplace	• Select the most suitable list of recommendations • Select the appropriate standardised method of assay • Plan and conduct a list of parameters to control the quality of leather and the chemical risk • Plan and conduct an inspection to assure a healthy and safety work	2. Quality assessment of finished leather • Requirements and quality control on finished leather for leather goods, footwear and automotive upholstery • Standardised methods of analysis (physical, chemical and fastness properties of leather) 3. Technical characteristics and requirement of leather for different usages • Flexibility • Elasticity and plasticity properties • Delamination resistance • Bendability • Temperature resistance • Water vapour permeability and absorption • Water resistance • Others (colour fastness, hazardous substances) • News leather materials (chrome-free biodegradable and disintegrable; water resistant properties; organic leather. 4. Quality regulations and chemical risk monitoring • Legal framework • Management system standards applied • Critical substances (very high concern, subject to authorisation, restricted) • Lists of restricted substances 5. Healthy and safety in the workplace • EU legislation on HSW	Yes, but in this training unit we would highlight as well to take into account in the 3rd point that leather is a very good material for its resistance to abrasion and light Also we would remark its biodegrability, versus other products that we may find, as plastic. **Do the contents of the sub-units well respond to the market requests?** Yes, they all respond to the market requests. **Are there some contents of the sub-united that need to be updated? If yes, which of them?**

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
			• Corporate HSW (planning, implement, supervise/control) • Process risks in leather industry • Harmful substances in the workplace - regulation and control	Yes as we have specified in the first question.

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3. **Evaluate the following table.**
   - **Given the Skills and Knowledge contained in the table before, observed the following ones and indicate the ones that could improve the contents.**
   - **Do the following Skills and Knowledge well respond to the needs of the labour market? If yes, which of them?**

CE_MC15 - Innovative Solutions for Leather Waste Reduction		
SKILLS	**KNOWLEDGE**	**NOTES**
• 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.		**Given the Skills and Knowledge contained in the table before, observed the following ones and indicate the ones that could improve the contents.** - 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

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	and their environmental impacts. - Assess the environmental impacts of various textile and leather production processes - Evaluate current leather waste management practices and identify areas for improvement. **Do the following Skills and Knowledge well respond to the needs of the labour market? If yes, which of them?** Yes, the ones specified in the first question.

CE_MC16 - Sustainable Leather Innovation: Best Practices and Techniques for Eco-friendly Production		
SKILLS	**KNOWLEDGE**	**NOTES**
• Ability to differentiate between various impacts of leather production on carbon footprint • Ability to assess the significance of leather labels.	• Understanding interdependencies between meat/dairy industry and hide production • Basic understanding of leather's carbon footprint.	**Given the Skills and Knowledge contained in the table before, observed**

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	• Recycling of by-products of leather manufacturing and cascade use • Sustainable Leather Labels	**the following ones and indicate the ones that could improve the contents.** - Ability to differentiate between various impacts of leather production on carbon footprint. - Ability to assess the significance of leather labels - Understanding independencies between the meat/dairy industry and hide production **Do the following Skills and Knowledge well respond to the needs of the labour market? If yes, which of them?** Yes, the ones specified in the first question.

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DF_MC15 - Digital Solutions in Leather Production		
SKILLS	**KNOWLEDGE**	
• Ability to consider digital tools for improvement of leather processing (economic and sustainability impact) • Skills in planning, monitoring, and optimizing production processes	• 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	**Given the Skills and Knowledge contained in the table before, observed the following ones and indicate the ones that could improve the contents.** - Ability to consider digital tools for improvement of leather processing (economic and sustainability impact) - Skills in planning, monitoring, and optimizing production processes. - Understanding Pros and Cons of Digitalization in leather processing, alternative measures. **Do the following Skills and Knowledge well respond to the needs of the labour**

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		market? If yes, which of them? Yes, the ones specified in the first question.
DF_MC16 - Technological Transfer and Data Management in Leather Industry		
SKILLS	**KNOWLEDGE**	
• 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.		**Given the Skills and Knowledge contained in the table before, observed the following ones and indicate the ones that could improve the contents.** - Describe the principles of Technological Transfer. - Recognize the importance of data management in optimizing leather production processes and supporting decision – making.

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	- Apply technological advancements to improve efficiency, productivity, and sustainability in leather manufacturing. **Do the following Skills and Knowledge well respond to the needs of the labour market? If yes, which of them?** Yes, as discussed above.

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SKILLS4SMART CURRICULA EVALUATION

SUPPLY CHAIN ANALYST

1. **Evaluate the following job-related skills and competences.**
    - **Do they reflect the state of the sector?**
    - **Are they still valid, given the state of the sector?**
    - **Are the still valid considering the demands of the sector?**

SC1. Demonstrate an understanding on how the Product Lifecycle Management (PLM) varies in each subsector of the TCLF industry.

SC2-Maintain the registration systems that identify and operate big amount of data regarding the traceability of the materials and other supplies/components during the procurement process, production, and product delivery to the customer.

SC3. Apply the supply chain strategies of the TCLF companies including procurement, sourcing, packaging and storage, inventory and warehousing activities, transportation and delivery.

SC4. Maintain the inventory of materials and supplies in T/C/L/F company by tracking the stock and their usage in the manufacturing process, and ordering new materials and supplies when the stock is empty.

SC5. Implement the warehouse management system. Select, plan and optimise the warehouse layouts according to the specific conditions of the T/C/L/F company.

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SC6. Analyse the production logistics inside the T/C/L/F company in order to schedule, streamline and control the flow through value adding manufacturing processes in respect of quality, flexibility, sustainability, efficiency and innovation.

SC7. Gather and analyse data, identify problematic areas and suggest improvements by implementing supply chain optimization projects in the T/C/L/F company.

SC8. Demonstrate digital skills by operating various software applications and systems for supply chain management in order to plan and track the movement of materials and products inside and outside the company.

2. Evaluate the following table related to the curricula.

- **Are the Skills and Knowledge still valid in your opinion and coherent with the market requests?**
- **Do the contents of the sub-units well respond to the market requests?**
- **Are there some contents of the sub-united that need to be updated? If yes, which of them?**

Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
ULO1-Product Lifecycle Management and Supply Chain Management in TCLF industries	• Product Lifecycle Management (PLM) • PLM systems for TCLF industry • Supply Chain Management	• Identify the tools that support the PLM system in TCLF companies • Identify the benefits of using PLM systems in the TCLF company	1. What is Product Lifecycle Management (PLM)? • Product lifecycle in TCLF industry • Tools of PLM system -Product and Portfolio Management (PPM), • Tools of PLM system - Manufacturing Process Management (MPM) • Tools of PLM system - Product Data Management (PDM). • How Product Lifecycle Management (PLM) helps companies accelerate innovation, design for supply, and agile manufacturing.	• Are the Skills and Knowledge still valid and coherent with the market requests? **YES** • Do the contents of the sub-units well respond to the market requests? **YES** • Are there some contents of the

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
	• Benefits of Supply Chain Management (SCM)for the TCLF companies	• Identify the components of the SCM in TCLF companies • Identify the benefits of implementing SCM in TCLF companies	2. How to implement PLM software systems in TCLF companies? • PLM software solutions for TCLF companies • Benefits of using PLM systems for TCLF industry (time to market, product costs, drive innovation, quality of the product, productivity etc.) • Implementation of PLM systems in a TCLF company- study cases 3. What is Supply Chain Management (SCM)? • Components of the Supply Chain Management • SCM focused on sourcing (materials & components) • SCM focused on productivity and efficiency in manufacturing • SCM focused on delivery and logistics • SCM focused on the return system for defective or used products 4. How to implement Supply Chain Management (SCM) in TCLF companies? • SCM and business strategy • Benefits of Supply Chain Management for TCLF companies • How to implement SCM in TCLF companies?	sub-united that need to be up-dated? **NO** • If yes, which of them?
ULO2- Traseability of materials supplies and components	• Applications and benefits of traceability • Traceability system in the	• Define the cost/benefit ratio of traceability • Identify key processes of the	1. Definition of traceability, its applications and benefits. • Definition of traceability • The historical evolution of traceability • Traceability and Security • Internal Traceability and External Traceability • Identify the cost/benefit ratio of traceability.	• Are the Skills and Knowledge still valid in your opinion and coherent with the market requests? **NO, sustainabie and circular materials indentification and**

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
	TCLF company • Product identification and transportation means according to the process. • Traceability in quality management	traceability system in a company • Collect data and saving • Identify a reliable system to preserve the documented information necessary to allow the traceability of products and services	2. Implement a traceability system in your company. • Learning about design, implementation, execution and control of a traceability program in companies • The structure of a traceability plan and the documentation it needs. • Legislation and regulations. Implement the legal requirements related to traceability. • The European Regulation on traceability • Main advantages and disadvantages of traceability 3. Product identification and transportation means according to the process. • Identify the features of a product or service. Relate the traceability and consumers • Methods that allow knowing the route of a product or service. Product identification: Label, Barcode Technology, RFID. • Transportation means in each process, before the product reaching the final consumer. Conveyor belt, Packaging, Pallet, Container. • Labelling and Expiration Date of a product • Manage various specific traceability technologies (coding of traceable units, coding of bundles, records, databases, etc.). 4. Traceability in quality management • Identification and traceability in the Quality Management Standard ISO-9.001	**sourcing, should be included** • Do the contents of the sub-units well respond to the market requests? **YES** • Are there some contents of the sub-united that need to be updated? **YES** • If yes, which of them? - Using AI tools in order to improve traceability control - Costing issues related to traceability implementation

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
			• Review of the processes to identify the outflow and ensure the conformity of the products and services • Risk analysis, control points and measurement frequency in each of the key processes • Establish the requirements to be met at the exit of each of the key processes • Determine a reliable system to preserve the documented information necessary to allow the traceability of products and services	
ULO3-Supply chain strategies in TCLF companies	• Definition and application of the supply chain • Logistical approach in the supply chain strategy: purchasing, transport and waste management • Sustainable approach in the supply chain strategy	• Manage the key elements of a supply chain • Manage the logistic approach of a supply chain strategy • Manage a sustainable supply chain strategy in TCLF companies	1. Definition and application of the supply chain • Definitions of supply chain and supply chain management • Management of the key elements of the supply chain • Participants in the supply chain Management of social, environmental, and economic impacts inside the supply chain 2. A comprehensive logistical approach: purchasing, Logistic, transport and waste management • The main objective of the logistics • Elements of logistics • Management of transport processes • Warehouse management waste management and waste management 3. Manage supply chain with a focus on sustainability/Developing sustainable supply chain strategy • Ingredients of a sustainable supply chain strategy • Hot to develop an interactive approach to develop a sustainable	• Are the Skills and Knowledge still valid in your opinion and coherent with the market requests? **YES** • Do the contents of the sub-units well respond to the market requests? **YES** • Are there some contents of the sub-united that need to be updated? **NO** • If yes, which of them?

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
			supply chain strategy	
ULO4- Inventory of materials and supplies	• Inventory management rules • Minimum stock allowed • Material and supplies control • New technologies on stock management • Permanent inventory - legal requirements	• Manage inventory • Manage ERP functionalities to track supplies and obtain data • Evaluate the implementation of new technologies applied to stocks management	1. Basics on stocks • Basics on stocks' management • Classification / types of stocks • Qualitative, quantitative and financing approach 2. Minimum stock allowed • Definitions • Different parameters to take into consideration and their influence on the costs of supply • Calculation of MSA • Influence of the supplier's performance on the stocks management and the minimum stock allowed 3. Materials and supplies control • Monitoring and control techniques for materials and supplies • ERP architecture • ERP functionalities in the stocks control - tracking supplies in manufacturing process • Use of ERP to produce/obtain data on the stocks. 4. New technologies on stocks management • i4.0 technologies applied to stocks management • RFID • Automatic logistic systems 5. Permanent inventory - legal requirements • Basics on permanent inventory • Legal obligations of updated data	• Are the Skills and Knowledge still valid in your opinion and coherent with the market requests? **YES** The element of cost of inventory, is very minimal covered, despite being one of the most important ones. • Do the contents of the sub-units well respond to the market requests? **YES** • Are there some contents of the sub-united that need to be updated? **NO** • If yes, which of them?

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
ULO5- Warehouse management system	• Characteristics of a warehouse • Implementation of a Warehouse Management System (WMS) • Characteristics of Warehouse Management System (WMS) • WMS in the fashion system	• Identify main documents for warehouse management • Identify software and integrated technologies for Warehouse Management System (WMS) • Manage a Warehouse Management System (WMS)	1. General characteristics of a warehouse • Definition of a warehouse and the importance of its management • Main flows • Documents to manage • Company staff involved • Warehouse security 2. Definition and implementation of a WMS • Management with a software • Main distinctions between WMS • Modules and functions • Integrated technologies • Types of WMS providers 3. WMS in the Fashion system • WMS in the Fashion sectors • Main characteristics of WMS in Textile companies • Main characteristics of WMS in Leather companies • Main characteristics of WMS in Clothing companies • Main characteristics of WMS in Footwear companies	• Are the Skills and Knowledge still valid in your opinion and coherent with the market requests? **YES** • Do the contents of the sub-units well respond to the market requests? **YES** • Are there some contents of the sub-united that need to be updated? **NO** • If yes, which of them?
ULO6- Production logistics inside the TCLF companies	• Internal production logistic approach • Lean management	• Implement efficiency plans for logistics operations • Apply LEAN management and	1. Internal production logistic approach • Identification of internal production logistics activities • General description about principal logistics activities • Management and control of logistics activities 2. Lean management and Kaizen principles applied to production	• Are the Skills and Knowledge still valid in your opinion and coherent with the market requests? YES • Do the contents of the sub-units

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
	and Kaizen principles applied to production logistics • Sustainability and innovation in production logistics	Kaizen tools to production logistics activities in TCLF companies • Identify good practices about sustainability and innovation in production logistics	logistics inside • Concepts about Lean Management and Kaizen Principles (JIT, MUDA, ...) • Identification of principal tools used in Lean Management • General description about principal tools used in the process • How to apply those tools to production logistics activities 3. Sustainability and Innovation in production logistics inside • Concepts about sustainability and innovation • General description of different typologies of Innovation • General description of different sustainability fields • Examples /good practices about sustainability and innovation in production logistics activities	well respond to the market requests? YES • Are there some contents of the sub-united that need to be updated? NO • If yes, which of them?

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3. **Evaluate the following table.**
   - **Given the Skills and Knowledge contained in the table before, observed the following ones and indicate the ones that could improve the contents.**
   - **Do the following Skills and Knowledge well respond to the needs of the labour market? If yes, which of them?**

CE_MC8 - Reducing Material Waste in Production		
SKILLS	**KNOWLEDGE**	**NOTES**
• 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 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.	• 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	Reducing waste has become a major issue for TCLF companies especially since circular economy and sustainability have become mainstream issues. Need to focus more on presentation of real-life cases as well as to include information about costing issues and KPIs for measuring and improving waste results. In addition, using new technologies and AI systems for better planning is important. It is not clear, how the third skill of "Acquiring…..meeting customer requirement profitably"

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		is related to the scope-title of the unit
DF_MC2 - Artificial Intelligence in the Fashion Industry		
SKILLS	**KNOWLEDGE**	
• Practice on how to work with datasets and AI tools, and extract meaningful insights is essential for AI applications in the Fashion Industry • 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	• 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.	AI is affecting all aspects of operation of businesses. The utilization of AI for supply chain management in order to improve efficiency and effectiveness in the supply chain is of utmost importance for any company, especially in such a competitive world. Emphasis should be placed on: • Specific AI technologies and their implementation • Case studies of successful AI integration • Cost-benefit analysis of AI solutions • Training requirements and programs • Integration challenges and solutions • Performance measurement systems • Future trends and developments

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SKILLS4SMART CURRICULA EVALUATION

SUSTAINABILTY TECHNICIAN

1. **Evaluate the following job-related skills and competences.**
    - **Do they reflect the state of the sector?**
    - **Are they still valid, given the state of the sector?**
    - **Are the still valid considering the demands of the sector?**

SC1. Demonstrate a deep understanding of how the environmental (wastewater, solid waste, air, noise, energy, water, chemicals) and social (worker's rights, occupational health & safety, product safety,) legislation and policy have to be applied in TCLF companies.

SC2. Apply the knowledge related to sustainability concepts, including circular economy, consumer safety (included REACH) eco labels and eco-design, green procurement, occupational health & safety regulations, corporate social responsibility standards etc. for the particular case of the TCLF companies in order to perform internal and external assessment, to advice about environmental, labour or other risks and to identify possible solutions.

SC3. Measure and communicate to staff and business partners **the life cycles environmental performance** of the TCLF products and organisations. Assess the environmental impact of the products and manufacturing processes in TCLF companies by using specific tools for Life Cycle Assessment and Environmental Footprint. Propose legally admissible environmental claims for designating new ecofriendly products and technologies/processes.

Commentato [CA1]: Due to the relevance of sustainability policy and legislation, it might be worth to make 2 chapters out of number 2. There are many concepts in this chapter.

Commentato [CA2]: Their relevance cannot be compared with the other topics to be analysed because of their low use, better to underline the digital product passport for instance

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SC4. Eco-friendly materials and sustainable technologies in the **Textile industry**. Implement new solutions to reduce the environmental impacts by choosing sustainable materials and processes. Assess the potential re-use of products /materials. Identify new solutions for waste valorisation. Apply procedures /testing control to verify the compliance of specific requirements. Demonstrate an understanding of the manipulation of chemicals, applying safety and preventive measures during the production processes related with its use in textile companies, in order to perform internal assessment, to advice about personnel security risks and to identify possible solutions.

SC5. Eco-friendly materials and sustainable technologies in the **Clothing industry**. Implement new solutions to reduce the environmental impacts by choosing sustainable materials and processes. Assess the potential re-use of products /materials. Identify new solutions for waste valorisation. Apply procedures /testing control to verify the compliance of specific requirements. Demonstrate an understanding of the manipulation of chemicals, applying safety and preventive measures during the production processes related with its use in clothing companies, in order to perform internal assessment, to advice about personnel security risks and to identify possible solutions.

SC6. Eco-friendly materials and sustainable technologies in **Footwear industry**. Implement new solutions to reduce the environmental impacts by choosing sustainable materials and processes. Assess the potential re-use of products /materials. Identify new solutions for waste valorisation. Apply procedures /testing control to verify the compliance of specific requirements. Demonstrate an understanding of the manipulation of chemicals, applying safety and preventive measures during the production processes related with its use in footwear companies, in order to perform internal assessment, to advice about personnel security risks and to identify possible solutions.

SC7 Sustainable supplies and technologies in **Leather industry**. Implement new solutions to reduce the environmental impacts by choosing sustainable materials, chemicals and processes. Assess the potential re-use of products and scraps, by identifying new solutions for waste valorisation. Apply procedures /testing control to verify the compliance of specific and technical requirements. Demonstrate an understanding of the manipulation of chemicals, applying safety and preventive measures during the production processes related with its use in leather companies, in order to perform internal assessment, to advice about personnel security risks and to identify possible solutions.

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SC8. Demonstrate digital skills by operating various software applications and systems in order to plan and implement specific sustainability methodologies whose aim is to be **able to monitor the social and environmental performance** of the company and of its supply chain, as well as to increase the environmental and social performance of the textile/clothing/footwear/leather company.

SC9. Demonstrate an understanding of **Risk Management procedures**, applying concepts and solutions provided by the most important related standards (such as for example the ISO 31000). This implies assessment of the initial level of risk, identification of risk mitigation measures, monitoring of results, identification of residual levels of risk.

2. **Evaluate the following table related to the curricula. In your opinion,**
   - **Are the Skills and Knowledge still valid and coherent with the market requests?**
   - **Do the contents of the sub-units well respond to the market requests?**
   - **Are there some contents of the sub-united that need to be updated? If yes, which of them?**

Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
ULO1- Environmental and social policies and legislation impacting TCLF sectors	• Environmental legislation in textile, clothing, leather and footwear sectors • ~~Environmental regulations in textile, clothing, leather and footwear sectors~~	• Operate with legislative databases and search engines on environmental issues in textile, clothing, leather and footwear companies. • Ensure compliance with EU and	1. Environment legislation • European legislation – fundamentals • Horizontal Legislation and EU environmental policy • Main EU directives and regulations • Legislative databases and search engines 2. Parameters associated to environmental regulations • Emissions to the atmosphere (legal framework, concepts, management plan and control) • Water consumption (consumption, management, sustainable practices	Contains useful knowledge and skills, as well as content in the sub-units. The 1st Sub-unit to be revised: - EU legislative Acts- fundamentals - EU industrial and textiles policies - EU environmental legislation - Legislative databases and search engines To consider the EU Deforestation Regulation, because if leather continues under

Commentato [CA3]: The structure of this ULO should be first the policy part and then the legislation.
The content includes social and enviornmental policies and legislation. Wheeas the environamental topic is extensively covered, when it comes to social, the content is narrowed to CSR (CSDD & CSRD), but we might also mention for ex. Health and Safety at work (it is addressed below).

Commentato [CA4]: A regulation is one of the legislative acts, No need to repeat

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
	• Environmental policy • Corporate Social Responsibility	national environmental legislation in textile, clothing, leather and footwear companies. • Minimize the risks associated to environmental responsibility of textile, clothing, leather and footwear companies. • Apply corporate social responsibility (CSR) practices in textile, clothing, leather and footwear companies.	• Water protection and liquid effluents discharge (management options, values, treatments, sustainable practices • Waste (concepts, values, management options and their implementation, valorisation) • Noise (legislations, concepts, effects, prevention and minimization best practices) • Energy efficiency (management options and best practices) 3. Environmental responsibility • Legal framework and concepts • Applicability • Preventive and remedial actions • Financial guarantees 4. Corporate Social Responsibility • Concepts, Legal background and Standards • Social responsibility for Environmental sustainability • Corporate HSW policy and Strategies • Community involvement • Ethic in Business • SCR Plan	scope, we might have, to include a reference in the training depending on the impact. Sub-units focusing on waste need to include packaging waste as well as new concepts from the proposed revision to the Waste Framework Directive including **Extended Producer Responsibility** and eco-modulation as applicable to apparel and footwear products
ULO2- Sustainability concepts in TCLF	• People safety and sustainability in in textile, clothing, leather		1. The three pillars of sustainability: people • Occupational health & safety regulations • Consumer safety (REACH, Safety gate) • Corporate Social Responsibility	On REACH, attention to diisacyonates and the Directive restricting its use.

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
	and footwear sector • Circular economy and sustainability in textile, clothing, leather and footwear industries • Sustainability and profit in textile, clothing, leather and footwear industries		2. The three pillars of sustainability: planet • Circular economy • Eco-design • Examples of market products. 3. The three pillars of sustainability: profit • Green procurement (public entities, private enterprises and final consumer) • Savings derived from eco-design • Improvement of the company's image	Sub-units focusing on waste would also need to include packaging waste as well as new concepts from the proposed revision to the Waste Framework Directive including extended producer responsibility (Sub-unit on end of life?), and eco-modulation as applicable to apparel and footwear products. Important as well is to address the circularity as such: dismantling, recycling (existing methodologies and processes, etc.) In point 3.3, there should be a reference to fighting greenwashing as a technique to improve the company's image (and obtain more profit) and the 2 directives : one more focused on addressing companies – Green Claims Directive (2023/0085(COD)) –and the other on consumers' rights – Directive on Empowering Consumers for the Green Transition (2024/825).
ULO3- Life cycle environmental performance of the TCLF products	• Life Cycle Assessment in textile, clothing, leather and footwear sector • Product Environmental	• Asses the life cycle of products in textile, clothing, leather and footwear sector • Calculate/operate with the product	1. Quantifying the impacts of fashion industry: Life Cycle Assessment • Environmental impact indicators • Basis of LCA • Open and Proprietary LCA software and databases 2. The European Product Environmental Footprint pilots	Contains useful knowledge and skills, as well as content in the sub-units. On point 3, need to emphasise both Directives on Greenwashing. Need to include the reference to the PEFCR as a tool for evidence base.

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
and organizations.	Footprint in textile, clothing, leather and footwear sector • Green claims in textile, clothing, leather and footwear products	environmental footprint in textile, clothing, leather and footwear sector Avoid false green claim in textile, clothing, leather and footwear sector.	• How does this evaluation work? • Which products have been evaluated? • How it will be transmitted to end customers 3. Green claims, how to do them? • Green washing: examples of bad practices. • How to detect sustainable aspects of your enterprise and claim them. • Eco-labels	Remember the need to emphasise the durability aspect.
ULO4- Eco-friendly materials and sustainable technologies in the Textile industry	• Environmental impact – materials and processes • Textile by-products and wastes • Health and safety in the textile industry • Sustainability requirements for textile	• Implement the circular economy principles • Assess solutions to textile by-products/ wastes recovery • Apply measures to minimise health and safety risks in company Comply with sustainability	1. Solutions to reduce the textiles environmental impact – materials and processes • Environmental impact concept and assessment • Eco-design concept and principles applied to textiles • Circular economy principles applied in textile materials • BAT (Best Available Techniques) concept and textile BREF • Practical examples 2. Recovery of textile by-products and wastes • Concepts of by-product and wastes considering textiles • Type of waste and European waste codes in textile industry • Solutions for textile by-products/ wastes recovery – reuse and recycling • Practical examples 3. Health and safety risks in textile industry	Sub-units focusing on waste would also need to include the Packaging Waste as well as new concepts from the proposed revision to the Waste Framework Directive. To include: - The Extended Producer Responsibility (clothing and footwear are considered priority products) and - The Digital Product Passport requirements.

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
		requirements in company	• Health and safety risks assessment considering the textile industry • General measures to minimize health and safety risk in textile industry • Specific measures related with chemicals manipulation in textile industry • Practical examples 4. Textile sustainability compliance requirements - procedures/ testing control • Characterisation of sustainability compliance requirements relevant to textile industry • Procedures/ testing controls related with environmental monitoring in textile industry • Procedures/ testing controls related with occupational health & safety monitoring in textile industry Procedures/ testing controls related with textile sustainable materials	
ULO5- Eco-friendly materials and sustainable technologies in Clothing industry	• Environmental impact in clothing industry • Sustainable manufacturing technologies and processes in clothing industry	• Implement new solutions to reduce the environmental impact of materials in clothing industry • Apply procedures and regulations for eco-labelling in clothing industry	1. Solutions to reduce the environmental impact of materials in clothing industry • Environmental impact of the clothing industry: water usage, chemical treatments, disposal of used/unsold clothing • Eco- friendly materials for clothing industry • How to reduce the environmental impact by selecting sustainable materials in design stage (zero waste, zero toxicity, biodegradable materials, recycling, upcycling and reuse, etc.)	Needs to be updated as the disposal of unsold clothing is no longer allowed (see EPR). Sub-units focusing on waste would also need to include packaging waste as well as new concepts from the proposed revision to the Waste Framework Directive. To include:

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
	• Eco-label in clothing industry • Health and safety risks in clothing industry	• Apply measures to minimize health and safety risks in clothing company	2. Sustainable manufacturing technologies and processes in clothing industry • Clean technologies in clothing industry • How to minimise the wastes generated by the manufacturing process in clothing? • How to optimise the use of resources in the manufacturing process? • Ethical production and Corporate Social Responsibility (CSR) in clothing companies 3. Eco-labelling in clothing industry • REACH and hazardous chemicals and materials in clothing industry • EU children's clothing regulations • EU labelling rules for clothing • How to apply for EU Ecolabel? 4. Health and safety risks in clothing industry • Health and safety risks assessment in clothing companies • How to minimize health and safety risk in clothing company? How to manipulate chemicals in clothing company?	- The Extended Producer Responsibility, EPR (clothing and footwear are considered priority products), and the concept of eco-modulation fees, and - The Digital Product Passport requirements. Regarding the EU Ecolabel, is it working for clothing? It does not really work in footwear because of the multiple requirements and the difficulty to get it. I believe the EC is no longer pushing for such a concept. It might be worth to eliminate it from the lesson.
ULO6- Eco-friendly materials and sustainable technologies in	• Sustainable materials and components for footwear	• Use sustainable materials and components for footwear	1. Sustainable materials and components for footwear • Concepts • Leather • Textiles and synthetics • Soles and midsoles • Miscellaneous components and accessories	Sub-units focusing on waste would also need to include packaging waste as well as new concepts from the proposed revision to the Waste Framework Directive. To include:

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
Footwear industry	• Footwear Eco labelling and Eco certification • Quality control and requirements on using hazardous substances • Sustainable manufacturing for footwear • Sustainable production management in footwear companies	• Evaluate and control the hazardous substances in footwear materials and final product • Apply sustainable technologies to footwear manufacturing • Act to reduce environmental impact of footwear manufacturing	2. Eco labelling and eco certification of materials and footwear products • EU footwear ecolabel • Other certification systems 3. Quality control and requirements • Physical properties • Chemical properties • REACH Regulation and CADS list 4. Sustainable manufacturing technologies and processes • Product development • Cutting department. Cutting machines • Preparation department • Stitching (closing) department • Making department – shoe assembly department • Bottoming department • Finishing department 5. Production management in a sustainable framework • Process organization • Production planning • Methods to achieve and maintain a sustainable production process • Management tools •	- The Extended Producer Responsibility, EPR (clothing and footwear are considered priority products), and the concept of eco-modulation fees, and - The Digital Product Passport requirements. Regarding the EU Ecolabel, it does not really work in footwear because of the multiple requirements and the difficulty to get it. I believe the EC is no longer pushing for such a concept. It might be worth to eliminate it from the lesson.

Commentato [CA5]: In 2025, it is foreseen more changes in Reach regulation.
It is also expected legal restrictions on the use of MICROPLASTICS

Commentato [CA6]: I presume there will be an explanation of what is CADS (a private initiative from various German footwear comapanies focusing on sustainable topics. The reference is made here to CADS lis of restrictive substances. Or you migt just include the list without going deeper into CADS because I said before, it is just a private initiative as many others

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
ULO7- Sustainable supplies and technologies in Leather industry	• The origin of leather • Animal well fair and leather • Sustainable production for tanning	•	1. The origin of leather • From hide to leather • Types of leather • Environmental aspects of leather production and use 2. Animal wellfare and Leather in the in the 21st century • Animal wellfare and traceability • Current production processes • Technical and Chemical requirements for leather 3. Sustainable production • Sustainable production (materials, chemicals and processes). • Closing the loop: leather • The future of leather	Leather is under the Deforestation Regulation, and the unit should consider what would be the impact on the knowledge and skills required to collect and assess information. Need to emphasise the durability aspect of leather vs other materials.

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3. **Evaluate the following table.**
   - **Given the Skills and Knowledge contained in the table before, observe the following ones and indicate the ones that could improve the contents.**
   - **Do the following Skills and Knowledge well respond to the needs of the labour market? If yes, which of them?**

CE_MC2 - Carbon Footprint of the Fashion Industry		
SKILLS	**KNOWLEDGE**	**NOTES**
• 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.		Extensive approach to the topic adopted in this course as it tackles a wide array of issues from production lifecycles, supply chains, consumer habits, and sustainable materials and practices.
DF_MC4 - New materials and equipment for circular economy		
SKILLS	**KNOWLEDGE**	

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• 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.	• 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	Fits with right to repair and ecodesign by including key concepts such as disassembly, modularity, repairability, recyclability, circular design, upcycling, and remanufacturing.
DF_MC7 - Design Thinking for Circular Fashion		
SKILLS	**KNOWLEDGE**	
• 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.	• 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 • Personalisation and Customisation • Engaging Consumers in Sustainability • Upcycling Techniques	Fits with right to repair and ecodesign by including key concepts such as disassembly, modularity, repairability, recyclability, circular design, upcycling, and remanufacturing. Attention as well to ecodesign criteria. Make sure that packaging waste is addressed and the new concepts of extended producer responsibility and eco-

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• 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 personalised, 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.	• Remanufacturing Practices • Repair and Maintenance Design • Modular Design • Lifecycle Assessment • Innovative Circular Fashion Brands • Circular Design Processes • Scaling Circular Innovation • Measuring Impact	modulation from the proposed Waste Framework Directive are included. To consider all requirements of the future Ecodesign guidelines (both the horizontal and the specific product related for apparel and footwear).

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DF_MC8 - Reducing Material Waste in Production		
SKILLS	**KNOWLEDGE**	
• 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 strengthening environmental sustainability in the workplace. • Acquiring basic ability to manage processes by defining, measuring, controlling and improving processes with the goal of meeting customer requirements profitably.	• 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.	Make sure that packaging waste is addressed and the new concepts of extended producer responsibility and eco-modulation from the proposed Waste Framework Directive are included. A short reference to the Regulation on Waste Shipments that entered into force on 21/05/24 might be worth in relation to the need to reduce waste in production (the regulation introduces stronger rules on waste exports to tackle illegal waste shipments). It could be another argument to convince companies of the relevance to reduce waste.

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SKILLS4SMART CURRICULA EVALUATION

SUSTAINABILTY TECHNICIAN

1. **Evaluate the following job-related skills and competences.**
    - **Do they reflect the state of the sector?**
    - **Are they still valid, given the state of the sector?**
    - **Are the still valid considering the demands of the sector?**

SC1. Demonstrate a deep understanding on how the environmental (wastewater, solid waste, air, noise, energy, water, chemicals) and social (worker's rights, occupational health & safety, product safety,) legislation and policy have to be applied in the TCLF companies.

SC2. Apply the knowledge related to sustainability concepts, including circular economy, consumer safety (included REACH) eco labels and eco-design, green procurement, occupational health&safety regulations, corporate social responsibility standards etc. for the particular case of the TCLF companies in order to perform internal and external assessment, to advice about environmental, labour or other risks and to identify possible solutions.

SC3. Measure and communicate to staff and business partners the life cycles environmental performance of the TCLF products and organisations. Assess the environmental impact of the products and manufacturing processes in TCLF companies by using specific tools for Life Cycle Assessment and Environmental Footprint. Propose legally admissible environmental claims for designating new ecofriendly products and technologies/processes.

SC4. Eco-friendly materials and sustainable technologies in Textile industry. Implement new solutions to reduce the environmental impacts by choosing sustainable materials and processes. Assess the potential re-use of products /materials. Identify new solutions for waste valorisation. Apply procedures /testing control to verify the compliance of specific requirements. Demonstrate an understanding for the manipulation of chemicals, applying safety and preventive

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measures during the production processes related with its use, for the particular case of the textile companies, in order to perform internal assessment, to advice about personnel security risks and to identify possible solutions.

SC5. Eco-friendly materials and sustainable technologies in Clothing industry. Implement new solutions to reduce the environmental impacts by choosing sustainable materials and processes. Assess the potential re-use of products /materials. Identify new solutions for waste valorisation. Apply procedures /testing control to verify the compliance of specific requirements. Demonstrate an understanding for the manipulation of chemicals, applying safety and preventive measures during the production processes related with its use, for the particular case of the clothing companies, in order to perform internal assessment, to advice about personnel security risks and to identify possible solutions.

SC6. Eco-friendly materials and sustainable technologies in Footwear industry. Implement new solutions to reduce the environmental impacts by choosing sustainable materials and processes. Assess the potential re-use of products /materials. Identify new solutions for waste valorisation. Apply procedures /testing control to verify the compliance of specific requirements. Demonstrate an understanding for the manipulation of chemicals, applying safety and preventive measures during the production processes related with its use, for the particular case of the footwear companies, in order to perform internal assessment, to advice about personnel security risks and to identify possible solutions.

SC7 Sustainable supplies and technologies in Leather industry. Implement new solutions to reduce the environmental impacts by choosing sustainable materials, chemicals and processes. Assess the potential re-use of products and scraps, by Identifying new solutions for waste valorisation. Apply procedures /testing control to verify the compliance of specific and technical requirements. Demonstrate an understanding for the manipulate on of chemicals, applying safety and preventive measures during the production processes related with its use, for the particular case of the leather companies, in order to perform internal assessment, to advice about personnel security risks and to identify possible solutions.

SC8. Demonstrate digital skills by operating various software applications and systems in order to plan and implement specific sustainability projects whose aim is to be able to monitor the social and environmental performance of the company and of its supply chain, as well as to increase the environmental and social performance of the textile/clothing/footwear/leather company.

SC9. Demonstrate an understanding in the Risk Management procedures, applying concepts and solutions provided by the most important standards of the fields (such as for example the ISO 31000). This implies assessment of the initial level of risk, identification of risk mitigation measures, monitoring of results,

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identification of residual levels of risk.

2. **Evaluate the following table related to the curricula.**
   - **Are the Skills and Knowledge still valid in your opinion and coherent with the market requests?**
   - **Do the contents of the sub-units well respond to the market requests?**
   - **Are there some contents of the sub-united that need to be updated? If yes, which of them?**

Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
ULO1- Environmental and social legislation and policy applied in TCLF companies	• Environmental legislation in textile, clothing, leather and footwear sector • Environmental regulations in textile, clothing, leather and footwear sector • Environmental policy • Corporate Social Responsibility	• Operate with legislative databases and search engines on environmental issues in textile, clothing, leather and footwear companies. • Ensure compliance with environmental legislation regulations and restrictions in textile, clothing, leather and footwear companies.	1. Environment legislation • European Legislation – fundamentals • Horizontal Legislation and EU environmental policy • Main EU directives • Legislative databases and search engines 2. Parameters associated to environmental regulations • Emissions to the atmosphere (legal framework, concepts, management plan and control) • Water consumption (consumption, management, sustainable practices • Water protection and liquid effluents discharge (management options, values, treatments, sustainable practices • Waste (concepts, values, management options and their implementation, valorisation) • Noise (legislations, concepts, effects, prevention and minimization best practices) • Energy efficiency (management options and best practices)	ON UNIT 1 “ENVIRONMENT LEGISLATION” Legislation should be updated (if not present yet) to reflect the new directives and regulations that have recently entered the EU scenario, like: • Directive (EU) 2022/2464 - Corporate Sustainability Reporting Directive (**CSRD**) • Regulation (EU) 2024/1781 - Ecodesign for Sustainable Products Regulation (**ESPR**) • Proposal for a “**Green Claims Directive**” • Directive (EU) 2024/1760 - Corporate Sustainability Due Diligence Directive (**CSDDD**)

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
		• Minimize the risks associated to environmental responsibility of the textile, clothing, leather and footwear companies. • Apply corporate social responsibility (CSR) practices in textile, clothing, leather and footwear companies.	3. Environmental responsibility • Legal framework and concepts • Applicability • Preventive and remedial actions • Financial guarantees 4. Corporate Social Responsibility • Concepts, Legal background and Standards • Social responsibility for Environmental sustainability • Corporate HSW policy and Strategies • Community involvement • Ethic in Business • SCR Plan	• Regulation (EU) 2023/1115 on deforestation-free products (**EUDR**) • Directive (EU) 2024/825 - Empowering Consumers Directive • Proposal for a revision to the Waste Framework Directive to introduce mandatory and harmonised Extended Producer Responsibility (EPR) schemes for textiles • Directive (EU) 2024/1799 on common rules promoting the repair of goods • Forced Labour Regulation (formally adopted by the Council) • Review of Regulation (EU) 1007/2011 – Textile Labelling Regulation ON UNIT 2: We could expand the parameters, like: • Biodiversity • Traceability • Chemicals • Animal welfare

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
ULO2- Sustainability concepts in TCLF	• People safety and sustainability in in textile, clothing, leather and footwear sector • Circular economy and sustainability in textile, clothing, leather and footwear sector • Sustainability and profit in textile, clothing, leather and footwear sector		1. The three pillars of sustainability: people • Occupational health & safety regulations • Consumer safety (REACH, Safety gate) • Corporate Social Responsibility 2. The three pillars of sustainability: planet • Circular economy • Eco-design • Examples of market products. 3. The three pillars of sustainability: profit • Green procurement (public entities, private enterprises and final consumer) • Savings derived from eco-design • Improvement of the company's image	
ULO3- Life cycle environmental performance of the TCLF products and organizations.	• Life Cycle Assessment in textile, clothing, leather and footwear sector • Product Environmental	• Asses the life cycle of products in textile, clothing, leather and footwear sector • Calculate/operate with the product	1. Quantifying the impacts of fashion industry: Life Cycle Assessment • Environmental impact indicators • Basis of LCA • Open and Proprietary LCA software and databases 2. The European Product Environmental Footprint pilots • How does this evaluation work?	ON UNIT 2: Product Environmental footprint (PEF) is being updated so I think the information there are quite old.

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
	Footprint in textile, clothing, leather and footwear sector • Green claims in textile, clothing, leather and footwear sector	environmental footprint in textile, clothing, leather and footwear sector Avoid false green claim in textile, clothing, leather and footwear sector.	• Which products have been evaluated? • How it will be transmitted to end customers 3. Green claims, how to do them? • Green washing: examples of bad practices. • How to detect sustainable aspects of your enterprise and claim them. • Eco-labels	
ULO4- Eco-friendly materials and sustainable technologies in Textile industry	• Textiles environmental impact – materials and processes • Textile by-products and wastes • Health and safety in the textile industry • Sustainability requirements for textile	• Implement the circular economy principles in textile • Assess solutions to textile by-products/ wastes recovery • Apply measures to minimize health and safety risks in textile company Comply with sustainability requirements in textile company	1. Solutions to reduce the textiles environmental impact – materials and processes • Environmental impact concept and assessment in textile industry • Eco-design concept and principles applied to textiles • Circular economy principles applied in textile materials • BAT (Best Available Techniques) concept and textile BREF • Practical examples 2. Recovery of textile by-products and wastes • Concepts of by-product and wastes considering textiles • Type of waste and European waste codes in textile industry • Solutions for textile by-products/ wastes recovery – reuse and recycling • Practical examples 3. Health and safety risks in textile industry	There might be some outdated slides here. There is a lot in terms of legislations and things might have evolved

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
			• Health and safety risks assessment considering the textile industry • General measures to minimize health and safety risk in textile industry • Specific measures related with chemicals manipulation in textile industry • Practical examples 4. Textile sustainability compliance requirements - procedures/ testing control • Characterisation of sustainability compliance requirements relevant to textile industry • Procedures/ testing controls related with environmental monitoring in textile industry • Procedures/ testing controls related with occupational health & safety monitoring in textile industry Procedures/ testing controls related with textile sustainable materials	
ULO5- Eco-friendly materials and sustainable technologies in Clothing industry	• Environmental impact in clothing industry • Sustainable manufacturing technologies and processes in clothing industry	• Implement new solutions to reduce the environmental impact of materials in clothing industry • Apply procedures and regulations for eco-labelling in clothing industry	1. Solutions to reduce the environmental impact of materials in clothing industry • Environmental impact of the clothing industry: water usage, chemical treatments, disposal of used/unsold clothing • Eco- friendly materials for clothing industry • How to reduce the environmental impact by selecting sustainable materials in design stage (zero waste, zero toxicity, biodegradable materials, recycling, upcycling and reuse, etc.)	There might be some outdated slides here. There is a lot in terms of legislations and things might have evolved

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
	• Eco-label in clothing industry • Health and safety risks in clothing industry	• Apply measures to minimize health and safety risks in clothing company	2. Sustainable manufacturing technologies and processes in clothing industry • Clean technologies in clothing industry • How to minimise the wastes generated by the manufacturing process in clothing? • How to optimise the use of resources in the manufacturing process? • Ethical production and Corporate Social Responsibility (CSR) in clothing companies 3. Eco-labelling in clothing industry • REACH and hazardous chemicals and materials in clothing industry • EU children's clothing regulations • EU labelling rules for clothing • How to apply for EU Ecolabel? 4. Health and safety risks in clothing industry • Health and safety risks assessment in clothing companies • How to minimize health and safety risk in clothing company? How to manipulate chemicals in clothing company?	
ULO6- Eco-friendly materials and sustainable technologies in Footwear industry	• Sustainable materials and components for footwear • Footwear Eco labelling and Eco certification	• Use sustainable materials and components for footwear • Evaluate and control the hazardous	1. Sustainable materials and components for footwear • Concepts • Leather • Textiles and synthetics • Soles and midsoles • Miscellaneous components and accessories	There might be some outdated slides here. There is a lot in terms of legislations and things might have evolved

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
	• Quality control and requirements on using hazardous substances • Sustainable manufacturing for footwear • Sustainable production management in footwear companies	substances in footwear materials and final product • Apply sustainable technologies to footwear manufacturing • Act to reduce environmental impact of footwear manufacturing	2. Eco labelling and eco certification of materials and footwear products • EU footwear ecolabel • Other certification systems 3. Quality control and requirements • Physical properties • Chemical properties • REACH Regulation and CADS list 4. Sustainable manufacturing technologies and processes • Product development • Cutting department. Cutting machines • Preparation department • Stitching (closing) department • Making department – shoe assembly department • Bottoming department • Finishing department 5. Production management in a sustainable framework • Process organization • Production planning • Methods to achieve and maintain a sustainable production process • Management tools •	
	• The origins of leather	•	1. The origins of leather • From hide to leather	There might be some outdated slides here. There is a lot in terms

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
ULO7- Sustainable supplies and technologies in Leather industry	• Animal well fair and leather • Sustainable production for tanning •		• Types of leather • Environmental issues of leather production and use 2. Animal wellfair and Leather in the in the 21st century • Animal wellfair and traceability • Current production processes • Technical and Chemical requirements for leather 3. Sustainable production • Sustainable production (materials, chemicals and processes). • Closing the loop: leather • The future of the leather	of legislations and things might have evolved

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3. **Evaluate the following table.**
   - **Given the Skills and Knowledge contained in the table before, observed the following ones and indicate the ones that could improve the contents.**
   - **Do the following Skills and Knowledge well respond to the needs of the labour market? If yes, which of them?**

CE_MC2 - Carbon Footprint of the Fashion Industry		
SKILLS	**KNOWLEDGE**	**NOTES**
• 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.		The skills and knowledge that could improve the previous curricula are marked in yellow.
DF_MC4 - New materials and equipment for circular economy		
SKILLS	**KNOWLEDGE**	**NOTES**

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• 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.	• 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	The skills and knowledge that could improve the previous curricula are marked in yellow.
DF_MC7 - Design Thinking for Circular Fashion		
SKILLS	**KNOWLEDGE**	
• 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.	• 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 • Personalisation and Customisation • Engaging Consumers in Sustainability • Upcycling Techniques	All applicable as this is a new concept not present in the previous curricula

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• 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 personalised, 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.	• Remanufacturing Practices • Repair and Maintenance Design • Modular Design • Lifecycle Assessment • Innovative Circular Fashion Brands • Circular Design Processes • Scaling Circular Innovation • Measuring Impact	

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DF_MC8 - Reducing Material Waste in Production		
SKILLS	**KNOWLEDGE**	
• 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 strengthening environmental sustainability in the workplace. • Acquiring basic ability to manage processes by defining, measuring, controlling and improving processes with the goal of meeting customer requirements profitably.	• 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.	The skills and knowledge that could improve the previous curricula are marked in yellow.

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SKILLS4SMART CURRICULA EVALUATION

DIGITAL MARKETING PROFESSIONAL

1. **Evaluate the following job-related skills and competences.**
   - **Do they reflect the state of the sector?**
   - **Are they still valid, given the state of the sector?**
   - **Are the still valid considering the demands of the sector?**

SC1. Understand how digital and web technology can be used for marketing to maximise e-commerce and online shopping. Fundamental principles of e-commerce and marketing. Distinguish between the traditional and digital approaches in order to be able to collaborate with internal teams/agencies and guarantee appropriate solutions, costs and delays., such as: Commerce Management Systems (CMS), and their basic and backend operations; IT systems for CRM, ERP, content management, SEO (Search Engine Optimisation), SEA (Search Engine Advertising), SEM (Search Engine Marketing); Data analytics - data management; Content marketing, content creator and content writer; Web Strategy Assessment (Google Analytics, SEO – Search Engine Optimisation, Online Usability with Think Aloud Test Methodology, Social Network Analysis, Online Campaign Analysis).

SC2. Understand and operate in the new shopping environment for a new consumers' generation with an online lifestyle. Implement the Omni-channel strategy in order to ensure the best customer experience. Monitor consumers' trends and their search and buying behaviour (customer journey), collecting relevant information and data (customer profile, personal details, search and buying behaviour, etc.). Identify, monitor and analyse competitors. Analyse and interpret TCLF trends. Perform forecasting and market & consumer research. Rely on neuro marketing for user experience and optimises the conversion.

SC3. Demonstrate knowledge and perform e-marketing and e-sales activities related to the electronic trade in textiles, clothing, leather and footwear products. Use technical knowledge on Customer Relationship Management (CRM), e-mail marketing, marketing automation, online sales management, channel management, e-merchandising. Have knowledge of legislation such as online sales, promotions, protection of privacy, and data management.

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SC4. Demonstrate knowledge on digital communication over Internet and perform Social Media activities related to online shopping, promotion and advertising f the textiles, clothing, leather and footwear products, interaction with communities. Build and optimise advertising campaigns (Facebook/ Instagram ads, programmatic campaign, and affiliate network), integration of social media and other online tools.

SC5. Implement digital marketing strategies and e-commerce activities in textile and clothing industries in order to increase the revenue and improve the customer engagement. Product profiles in terms of fitting shape and size, focus on product knowledge, colour and style advice, maintenance, extra service, origin, traceability and environmental sensitivity. Apply the national rules, standards and regulation for textile materials and labelling and use the textile technical terminology to ensure a transparent communication. Examples of e-commerce (B2C) and/or e-business (B2B) activities. Business website and e-platforms. Integrated web apps integrated operating systems and platforms.

SC6. Implement digital marketing strategies and e-commerce activities in footwear and leather industries in order to increase the revenue and improve the customer engagement. Product profiles in terms of fitting shape and size, focus on product knowledge, colour and style advice, fit, maintenance, extra service, origin, traceability and environmental sensitivity. Apply the national rules, standards and regulation for leather materials and labelling and use the leather technical terminology to ensure a transparent communication. Examples of e-commerce (B2C) and/or e-business (B2B) activities. Websites and web shops. Integrated web apps integrated operating systems and platforms.

2. **Evaluate the following table related to the curricula.**
    - **Are the Skills and Knowledge still valid in your opinion and coherent with the market requests?**
    - **Do the contents of the sub-units well respond to the market requests?**
    - **Are there some contents of the sub-united that need to be updated? If yes, which of them?**

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
ULO1- Web technology for e-commerce, marketing and online sales in TCLF companies	• Digital marketing techniques • Content marketing strategy • Search Engine Optimization techniques (SEO) • Google ads campaign techniques • Web strategy assessment	• Implement digital marketing strategy • Design contents for marketing strategy • Conduct search engine optimisation • Plan Google ads campaign • Conduct web strategy assessment and measure digital strategy results	1. Digital Marketing Strategy • Digital transformation • Digital marketing strategy • Marketing mix • Digital marketing funnel • Digital marketing activities 2. Content Marketing Strategy • Content marketing strategy • Creating a content media plan • Lead generation & nurturing • Content distribution through a content management system (cms) 3. SEO (Search Engine Optimization) • SEO strategy • On-page SEO basics techniques • Off-page SEO basics techniques 4. SEM (Search Engine Marketing) • SEM Strategy • Google ads campaign types • Google ads keywords • Best practices to create effective text ads • Quality score 5. Web Analytics for Web Strategy Assessment • Web Analytics • Traffic source metrics	• **Do they reflect the state of the sector?** **Yes** • **Are they still valid, given the state of the sector?** **Yes** • **Are the still valid considering the demands of the sector?** **Yes**

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
			• User profiling metrics • Conversion • E-commerce metrics	
ULO2- Shopping environment for a new generation with an online lifestyle	• TCLF online sales channels marketing and omni-channel techniques • Consumer behaviour analysis • Neuromarketing techniques • Marketing & consumer research techniques • Competitive analysis	• Identify the best online sales channels in TCFL sectors and Implement omni-channel strategy • Analyse consumer buying trends • Implement neuromarketing techniques • Conduct marketing and consumer research Conduct online competitive analysis	1. The new shopping environment in TCFL sectors • TCLF market trends • TCLF sales channels • A new shopping experience: how to plan and create an omni-channel strategy 2. Consumer behaviour • Online consumer behaviour • Consumer profiling • Customer journey • Online community and tribal marketing 3. Neuromarketing for user experience • Principles of neuromarketing • Principles of user experience • How neuromarketing could optimise user experience and improve conversions? 4. Marketing & consumer research • Marketing research • Secondary data collection and analysis • How to conduct a survey through Survey Monkey? • Web listening	• **Do they reflect the state of the sector?** **Yes** • **Are they still valid, given the state of the sector?** **Yes** • **Are the still valid considering the demands of the sector?** **Yes**

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
			5. Competitor analysis • How to conduct an online competitive analysis? • Products and services analysis • Website analysis • Social media analysis (organic)	
ULO3- E-marketing and E-sales activities in TCLF	• E-merchandising techniques in TCLF sectors • Customer relationship management • E-mail marketing techniques • Marketing automation Data protection regulation	• Organise e-commerce structure • Improve customer satisfaction • Execute email marketing • Optimise marketing productivity Apply information security policies	1. E-merchandising • Why e-Commerce merchandising matters • How to design a perfect product sheet; • The Importance of A/B Testing 2. The importance of the CRM (Customer Relationship Management) • What is a CRM (Customer Relationship Management) and how does it work? • CRM benefits? • RFM segmentation, analysis & model 3. E-mail marketing • E-mail marketing campaigns • E-mail marketing A/B testing • List building • E-mail copywriting • E-mail marketing KPIs 4. Marketing automation	• **Do they reflect the state of the sector?** **Yes** • **Are they still valid, given the state of the sector?** **Yes** • **Are the still valid considering the demands of the sector?** **Yes**

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
			• What is marketing automation and how does it work? • Lead scoring • Marketing automation platforms • Marketing automation goals 5. GDPR and protection of privacy • What is the GDPR? • Key actors under the GDPR and their role • What do I need to do to comply with the GDPR? •	
ULO4- Digital communications and Social Media in TCLF	• Social media marketing techniques • Social media marketing campaign Web marketing and branding in fashion	• Apply social media marketing • Plan marketing campaign Develop e-marketing strategies for the fashion industry	1. Digital communication – new channels new rules • Digital communication- rules • Digital communication- tools • How to manage Social media tools 2. Key elements and strategies for a digital advertising campaign • Key elements to build and optimize digital advertising campaign • Basic rules, strategies and risks of a digital campaign • Social media marketing in fashion – bloggers and influencers 3. Web marketing and branding in fashion industry • Digital branding in fashion • Tips for digital marketing and e-commerce in the textile and clothing sectors • Digital marketing strategies and e-commerce in footwear and leather sectors	• **Do they reflect the state of the sector?** **Yes** • **Are they still valid, given the state of the sector?** **Yes** • **Are the still valid considering the demands of the sector?** **Yes**

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
ULO5- Digital marketing strategies and e-commerce activities in textile and clothing industry	• Textile marketing techniques • E-commerce techniques in textile and clothing sectors • B2B and B2C strategies in textile and clothing sectors Basic web portal design and transparent communication in textile and clothing sectors	• Textile and clothing goods digital marketing planning • Organise an online store in textile and clothing sectors • Implement B2B and B2C strategies in textile and clothing sectors Design web portal in textile and clothing sectors and transparently communicates goods labels	1. Digital marketing strategies in textile and clothing sectors • Marketing strategies for textile and clothing products • Emotional marketing in textile and clothing sectors • Focus on textile strategies • Focus on clothing strategies 2. E-commerce and customer care • E-commerce in Europe for textile and clothing sectors • Product profile • Purchase support • Extra services • New evolutions in the field (e.g. AR, VR) 3. B2B & B2C • Characteristics of B2B and B2C - general and textile and clothing overview • Examples in textile • Examples in clothing 4. Website and web shops • How to design and create web portals • Special focus on GDPR and laws • Web apps: management, pros and cons • Platforms • Quality labels	• **Do they reflect the state of the sector?** **Yes** • **Are they still valid, given the state of the sector?** **Yes** • **Are the still valid considering the demands of the sector?** **Yes**

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
ULO6- Digital marketing strategies and e-commerce activities in footwear and leather industry	• Footwear and leather marketing techniques • E-commerce techniques in footwear and leather sectors • B2B and B2C strategies in footwear and leather sectors Basic Web portal design and transparent communication in footwear and leather sectors	• Footwear and leather goods marketing planning • Organise an online store in footwear and leather sectors • Implement B2B and B2C strategies in footwear and leather sectors Design web portal in footwear and leather sectors and transparently communicates goods labels	1. Digital marketing strategies in footwear and leather sectors • Marketing strategies for footwear and leather products • Emotional marketing in footwear and leather sectors • Focus on footwear strategies • Focus on leather strategies 2. E-commerce and customer care • E-commerce in Europe for footwear and leather sectors • Product profile • Purchase support • Extra services • New evolutions in the field (eg. AR, VR) 3. B2B & B2C • Characteristics of B2B and B2C - general and footwear and leather overview • Examples in footwear • Examples in leather 4. Website and web shops • How to design and create web portals • Special focus on GDPR and laws • Web apps: management, pros and cons • Platforms • Quality labels	• **Do they reflect the state of the sector?** **Yes** • **Are they still valid, given the state of the sector?** **Yes** • **Are the still valid considering the demands of the sector?** **Yes**
ULO1- Web technology for e-commerce, marketing and	• Digital marketing techniques	• Implement digital marketing strategy	6. Digital Marketing Strategy • Digital transformation • Digital marketing strategy • Marketing mix	• **Do they reflect the state of the sector?** **Yes** • **Are they still valid, given the state of the sector?**

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				Yes • **Are the still valid considering the demands of the sector?** **Yes**

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
online sales in TCLF companies	• Content marketing strategy • Search Engine Optimization techniques (SEO) • Google ads campaign techniques • Web strategy assessment •	• Design contents for marketing strategy • Conduct search engine optimisation • Plan Google ads campaign • Conduct web strategy assessment and measure digital strategy results	• Digital marketing funnel • Digital marketing activities 7. Content Marketing Strategy • Content marketing strategy • Creating a content media plan • Lead generation & nurturing • Content distribution through a content management system (cms) 8. SEO (Search Engine Optimization) • SEO strategy • On-page SEO basics techniques • Off-page SEO basics techniques 9. SEM (Search Engine Marketing) • SEM Strategy • Google ads campaign types • Google ads keywords • Best practices to create effective text ads • Quality score 10. Web Analytics for Web Strategy Assessment • Web Analytics • Traffic source metrics • User profiling metrics • Conversion • E-commerce metrics •	• **Do they reflect the state of the sector?** **Yes** • **Are they still valid, given the state of the sector?** **Yes** • **Are the still valid considering the demands of the sector?** **Yes**

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1. **Evaluate the following table.**
   - **Given the Skills and Knowledge contained in the table before, observed the following ones and indicate the ones that could improve the contents.**
   - **Do the following Skills and Knowledge well respond to the needs of the labour market? If yes, which of them?**

CE_MC5 - Strategies for eco-conscious branding and marketing		
SKILLS	**KNOWLEDGE**	**NOTES**
• Design brand guidelines: develop and implement guidelines for strategic brand handling by all stakehol- ders; discuss relevant content such as future expectations and brand guidelines; be prepared to face chal- lenges. • Promote sustainability contents: develop the concept of sustainability and contents through marketing and digital marketing campaigns. • Support responsible consumer behaviour: unders- tand and connect with consumers from different cultu- res, countries and ideologies to create their commit- ment to the sustainability challenge.	• Communication techniques to create, communi- cate and provide value and awareness to custo- mers of fashion products and services, enhancing the sustainable approach to production.	To date, there is no clear legislation that defines what it means to produce sustainably. For this reason, it is essential to build a clear communication policy that positions the company with respect to environmental, economic and social sustainability, keeping these 3 values together. Communicating sustainability is not just a matter of public relations and sharing information, but is a strategic necessity for companies, which must make known their sustainable materials, energy-saving processes, and fashion proposals capable of meeting the needs of consumers who are more attentive to the environment and ethics. Sustainability narratives can be shaped to communicate with different targets, to ensure that sustainability communication is also capable of inspiring action and change. The art of storytelling can transform the perception of sustainability from a series of boring data to an engaging narrative. Telling success stories, overcome challenges or innovative projects can create an emotional bond with the audience. It is essential to focus on real characters, use clear and evocative language and structure the narrative so that it culminates in a solution or a call to action. A well-crafted story not only informs but inspires and motivates action, making abstract concepts of sustainability tangible.

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DF_MC1 - Digitalization in the Fashion Industry		
SKILLS	**KNOWLEDGE**	**NOTES**
• 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.	• 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	The transition to a circular economy, where products are designed to be reused, recycled and valorized, requires radical innovations and creative solutions. It also requires knowledge: knowing the new materials, finding them available in digital libraries, accompanied by exhaustive product sheets is one of the keys to the new design of collections, alongside 3D software or those that help manage excess inventory by placing them on the market, reducing the impact of production on the planet.

DF_MC4 - E-commerce and Digital Marketing for Fashion Industry		
SKILLS	**KNOWLEDGE**	
• 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	• E-commerce systems: Basic digital architecture and commercial transactions for trading products or services conducted via Internet, e-mail, mobile devices, social media, etc.	Omnichannel is the key. Better payment systems and home deliveries, better prices and a wide range of offers, innovative sites and augmented reality, push consumers towards online stores. A customer journey paradigm that straddles the two worlds is increasingly gaining ground: the challenge is integration.

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SKILLS4SMART CURRICULA EVALUATION

PROCESS & PRODUCTION TIMELINE ANALYST

1. Evaluate the following job-related skills and competences.

- **Do they reflect the state of the sector?**
- **Are they still valid, given the state of the sector?**
- **Are the still valid considering the demands of the sector?**

SC1. Demonstrate knowledge on Production Management and Process Control in TCLF companies with a deep understanding on the following issues: New business models (organizational models), Quality Management systems, Process re-engineering and performance assessment, Cost analysis, Lean production, Data management system, Business intelligence.

Do they reflect the state of the sector?

Yes, new business models have increasingly been adopted by TCLF companies to address challenges such as labor cost reduction, supply chain complexities, and sustainability. The industry has seen a shift toward **agile supply chains**, **direct-to-consumer (DTC) models**, and **omnichannel retailing**. Companies are increasingly adopting **digital-first models**, leveraging e-commerce platforms and data analytics to directly engage with consumers.

Are they still valid, given the state of the sector?

These new models are still highly relevant. The pandemic accelerated the transition to e-commerce and digital transformation. The integration of Industry 4.0 technologies, including automation, AI, and the Internet of Things (IoT), supports the optimization of production processes and customer engagement. In addition, the rise of sustainable and circular business models is key, with companies focusing on eco-friendly production, recycling, and product life cycle management.

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Are they still valid considering the demands of the sector?

Yes, as demand for faster fashion cycles, increased customization, and sustainability grows, companies must embrace flexibility and responsiveness. These new business models are designed to be more customer-centric, efficient, and responsive to market trends.

SC2. Perform process & production timeline analysis in textile companies. Overview on textile technology, equipment and machinery. Ergonomics and solutions for organising the workplaces in textile company. Planning for textile production, and equipment/machinery maintenance. Analyse and monitor the production processes for knitted, woven and non-woven fabrics in order to assess the failures, weaknesses or/and technical problems in the production process. Production and productivity calculation methods for textile. Techniques of work measurement and their applications for textile production.

Do they reflect the state of the sector?

Yes, process and production timeline analysis is an essential tool for managing production flow in textile companies. It helps in identifying bottlenecks, optimizing lead times, and improving resource allocation. In a highly competitive sector like textiles, where speed-to-market and cost-efficiency are key, process and timeline analysis are critical for ensuring streamlined operations.

Are they still valid, given the state of the sector?

Yes, production timeline analysis remains highly relevant, but companies are increasingly using **digital tools** such as **Enterprise Resource Planning (ERP)** software, **Manufacturing Execution Systems (MES)**, and **Advanced Planning and Scheduling (APS)** systems to optimize production timelines. These tools provide real-time data, enable quicker adjustments, and enhance decision-making.

Are they still valid considering the demands of the sector?

Yes, they are crucial for meeting the growing demands for faster production cycles, shorter lead times, and high-quality output. By performing accurate timeline analysis, textile manufacturers can better forecast demand, plan production schedules, and align supply chain activities, ensuring they meet market needs efficiently.

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SC3. Perform process & production timeline analysis in clothing companies. Overview on clothing technology, equipment and machinery. Ergonomics and solutions for organising the workplaces in clothing company. Planning for clothing manufacturing/production, and equipment/machinery maintenance. Analyse and monitor the production processes in clothing departments in order to assess the failures, weaknesses or/and technical problems in the operation. Production and productivity calculation methods for clothing. Techniques of work measurement and their applications for clothing production.

Do they reflect the state of the sector?

Yes, process and production timeline analysis are fundamental in companies to optimize workflows, minimize production delays, and ensure deadlines are met. This involves mapping out the entire production cycle—from fabric sourcing, cutting, sewing, and finishing to final packaging. In the fast-paced fashion industry, especially in **fast fashion**, meeting tight timelines is crucial to staying competitive.

Are they still valid, given the state of the sector?

Yes, production timeline analysis is still highly valid. However, the sector has evolved with **digital technologies** like **Enterprise Resource Planning (ERP)** systems, **Manufacturing Execution Systems (MES)**, and **real-time production tracking software**. These digital tools allow for greater visibility into production schedules and real-time adjustments, which helps to streamline workflows and improve efficiency.

Are they still valid considering the demands of the sector?

Yes, the growing demand for **speed-to-market**, **customization**, and **efficient production** means that a detailed process and timeline analysis is more critical than ever. Companies need to continuously monitor and adjust timelines to keep pace with rapid changes in consumer demand, seasonal trends, and supply chain disruptions.

SC4. Perform process & production timeline analysis in footwear companies. Overview on footwear manufacturing, processes and technology. Ergonomics and solutions for organising the workplaces in footwear companies. Planning for footwear manufacturing/ production, and equipment/machinery maintenance. Analyse and monitor the production processes in cutting/closing/assembling/finishing room in order to assess the process & production data. Production and productivity calculation methods for footwear. Techniques of work measurement and their applications for footwear production.

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Do they reflect the state of the sector?

Yes, process and production timeline analysis is crucial for footwear companies, where manufacturing processes can be complex, involving multiple steps from material cutting to finishing. In the footwear sector, the production timeline is often divided into distinct stages: **cutting**, **closing**, **assembling**, **finishing**, and **packing**. Each stage has its own time requirements, and a comprehensive timeline analysis helps identify bottlenecks, plan resources efficiently, and ensure timely delivery.

Are they still valid, given the state of the sector?

Yes, production timeline analysis remains valid. However, the increasing complexity and demand for **fast fashion** and **customization** require more agile production timelines. In modern footwear production, the integration of **real-time production monitoring** through **smart factory technologies** and **ERP systems** makes timeline management more dynamic and responsive to changes in consumer demand and supply chain disruptions.

Are they still valid considering the demands of the sector?

Yes, given the growing emphasis on **speed-to-market**, **customization**, and **high-quality output**, the need for accurate production timeline analysis is more important than ever. Technologies like **IoT sensors** and **real-time data analytics** are helping footwear manufacturers improve **production flexibility** and optimize timelines for various types of footwear—whether mass-produced or customized for specific customer segments.

SC5. Perform process & production timeline analysis in leather companies. Overview on leather technology in direct relation to the parameterisation of the operations involved in the leather production process, including wet-processes, mechanics & machine handling and finishing operations. Planning for leather production, and equipment/machinery maintenance. Analyse new production processes to be implanted to the industrial scale by taking in consideration the expected time, machinery and new chemicals in order to increase the process performance. Production and productivity calculation methods for leather. Productivity versus quality in leather manufacturing. Working time measurement/time study for leather production.

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Do they reflect the state of the sector?

Yes, process and production timeline analysis is highly relevant in leather manufacturing, where the production process can be lengthy and involves multiple stages. Leather production involves several complex steps, such as **preparation (e.g., soaking, liming, and deliming)**, **tanning (e.g., vegetable tanning, chrome tanning)**, **wet-finishing** (e.g., dyeing, fatliquoring), and **dry-finishing** (e.g., buffing, polishing). Each of these steps must be carefully planned to optimize production flow and minimize downtime.

Are they still valid, given the state of the sector?

Yes, timeline analysis remains valid in leather manufacturing, but it must now be integrated with **advanced scheduling software** and **real-time production tracking systems**. The sector has also seen a shift toward more **sustainable production methods**, which can affect timelines due to the longer durations involved in natural tanning processes and the drying or conditioning phases. **Automation** in parts of the process, like **dyeing** or **cutting**, can reduce time and improve overall efficiency.

Are they still valid considering the demands of the sector?

Yes, considering the increasing demand for **high-quality leather** (with less waste) and the need for **shorter lead times** in custom orders, precise production timeline analysis is essential. Companies are under pressure to streamline operations to remain competitive while meeting evolving consumer preferences for faster delivery and sustainable products.

SC6. Demonstrate digital skills by operating various techniques, methods and software applications/systems for process & production timeline analysis in order to perform work planning, organization and methods for T/C/L/F company.

Yes, the use of digital tools and methods in process and production timeline analysis reflects the current state of the sector.

Automation & Digitization: The textile, clothing, leather, and footwear industries are undergoing a significant transformation driven by **Industry 4.0** technologies. These industries have increasingly adopted **smart factories**, **Internet of Things (IoT)** devices, and **AI-driven production analytics**.

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Real-Time Data: Process and production timeline analysis is now heavily reliant on real-time data collection. Tools like **MES**, **ERP systems**, and **cloud-based solutions** help manage large amounts of real-time production data, offering insights that were previously difficult to attain using manual methods.
ERP & MES Systems: ERP systems, such as **SAP**, **Oracle**, or **Microsoft Dynamics**, are widely used across T/C/L/F sectors to manage everything from supply chain logistics to financial data and human resources. MES, on the other hand, helps bridge the gap between the **shop floor** and **enterprise level**, enabling real-time monitoring of production processes, and optimizing workflows.
Advanced Scheduling and Planning: Software for **workforce management** and **capacity planning** allows companies to more efficiently allocate labor and machinery resources, improving production timelines and minimizing downtime.

2. Evaluate the following table related to the curricula

- **Are the Skills and Knowledge still valid in your opinion and coherent with the market requests?**
- **Do the contents of the sub-units well respond to the market requests?**
- **Are there some contents of the sub-united that need to be updated? If yes, which of them?**

Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
ULO1- Production Management and Process Control in TCLF companies	• Production management and process control for systems in the textile, clothing, footwear and leather sectors • Data Management System (DMS) and New business models for textile,	• Select the best methodologies used in management production and process control • Select advanced tools for production and process management • Make use of the data management	1. Production management and process control - advanced methodologies for systems • Production management and process control principles • Quality management System ISO 9001:2015 - Requirements • Performance assessment 2. Production management and process control - advanced methodologies for process	**1. Are the Skills and Knowledge Still Valid and Coherent with Market Requests?** In my opinion, the skills and knowledge outlined in the **ULO1: Production Management and Process Control in TCLF companies** are still **valid** and largely **coherent with market demands**, though there are evolving trends and technologies in the industry that require some adaptation. Let's break down the major areas:

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
	clothing, footwear and leather sectors	system for management and taking decisions •	• Lean Management Tools (VSM, MUDA, JIT, Pull System, 5S's, lean manufacturing, Six Sigma...) • Manufacturing cost characterization • Process re-engineering-methodology and benefits 3. Data Management System (DMS) and new business models • Concepts and definitions • Advantages and benefits of DMS • Innovation system organization • Risk management benefits • Business intelligence benefits	***a. Production Management and Process Control Principles*** • **Relevance:** The fundamental principles of production management and process control remain highly relevant, as companies in the TCLF industries still need to focus on efficiency, cost reduction, quality control, and timely production. • **Market Demand:** The shift towards **smart manufacturing**, **digitization**, and **automation** in production processes (e.g., Industry 4.0) may not be fully covered in traditional principles, but these are extensions of the foundational concepts. ***b. Quality Management System (ISO 9001:2015)*** • **Relevance:** ISO 9001:2015 is still one of the most widely recognized standards for quality management systems in the TCLF sector. The emphasis on customer satisfaction, process optimization, and continuous improvement aligns well with modern industry demands. • **Market Demand:** Companies are increasingly integrating ISO 9001 with **sustainability goals** and **digital tools** (e.g., digital audits, real-time monitoring of quality). Therefore, some aspects of **digital quality management** could be explored further.

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				c. Lean Management Tools • **Relevance:** Lean principles like **5S, JIT (Just in Time), Value Stream Mapping (VSM), and Six Sigma** are still very much applicable. These methodologies continue to be central to achieving **operational efficiency**, **cost reduction**, and **waste minimization**. • **Market Demand:** The **integration of lean with digital technologies** (e.g., real-time data analytics, AI-driven optimization) is gaining traction, and it would be valuable to incorporate **Industry 4.0 principles** and **digital lean** into these sub-units. ***d. Manufacturing Cost Characterization and Process Re-engineering*** • **Relevance:** Understanding **manufacturing costs** and **process re-engineering** remains essential for companies in the TCLF industry to remain competitive. Cost efficiency is still a driving force, especially given the pressures on margins in global supply chains. • **Market Demand:** With **global competition**, **offshoring**, and **supply chain disruption** becoming more common, **cost optimization** through process re-engineering has gained even more importance. There could be an additional focus on **agility** in the re-engineering process to respond to rapid market changes. ***e. Data Management Systems (DMS) and New Business Models***

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
				• **Relevance:** DMS are crucial as companies move towards data-driven decision-making and digital transformation. The integration of **Big Data**, **IoT (Internet of Things)**, and **cloud computing** into production and quality control processes is becoming more prevalent in the TCLF industry. • **Market Demand:** The increasing use of **Business Intelligence (BI)**, **Predictive Analytics**, and **AI** for risk management, inventory control, and demand forecasting is a key industry shift. Companies are also exploring **sustainability-driven business models**, which require real-time data on production efficiency, resource usage, and waste reduction. **2. Do the Contents of the Sub-Units Well Respond to Market Requests?** Overall, the contents of the sub-units align well with the core market demands of the TCLF industries. However, the market is increasingly moving towards **digitization**, **automation**, and **sustainability**, which are not entirely emphasized in the current structure. Let's assess each sub-unit:

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				a. Production Management and Process Control - Advanced Methodologies for Systems • **Response to Market Requests:** This sub-unit addresses core methodologies for production management and control, which remain highly relevant. However, it could better align with current trends by integrating topics like **Digital Twin technology**, **smart sensors** for process control, and **cloud-based production management tools**. • **Update Suggestions:** Adding **Industry 4.0 technologies**, **AI for predictive maintenance**, and **real-time data analytics** would be valuable. ***b. Lean Management Tools and Methodologies*** • **Response to Market Requests:** Lean methodologies are still crucial, but the market now also demands the integration of **lean with digital tools** and **automated systems**. For example, **AI-driven optimization** tools and **real-time process adjustments** are becoming important. • **Update Suggestions:** Including the application of **digital lean manufacturing**, **machine learning for process optimization**, and **automation in lean practices** would make this sub-unit more market-relevant. ***c. Manufacturing Cost Characterization and Process Re-engineering*** • **Response to Market Requests:** Cost optimization and process re-engineering remain key factors in production efficiency. However, companies are focusing on **agile re-**

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
				engineering to quickly adapt to market changes, especially in the face of supply chain disruptions. • **Update Suggestions:** Focus on **agile manufacturing**, **costing in a digital environment**, and **supply chain re-engineering** in response to disruptions. More attention could be given to the use of **AI and data analytics** to drive process re-engineering. ***d. Data Management System (DMS) and New Business Models*** • **Response to Market Requests:** The increasing importance of **data analytics**, **cloud computing**, and **business intelligence** (BI) is well reflected here. However, **data privacy**, **cybersecurity**, and **sustainability** in data management are becoming increasingly important. • **Update Suggestions:** It would be beneficial to include **AI-driven Business Intelligence (BI)**, **cybersecurity** in data management, **sustainability reporting tools**, and **real-time risk management** strategies. **3. Are There Contents of the Sub-Units That Need to Be Updated? If Yes, Which of Them?** Yes, there are several aspects that could be updated or expanded to better reflect the current market trends:

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				a. Industry 4.0 and Digital Technologies • The current focus on traditional methodologies like Lean and Six Sigma could be expanded to include more about **Industry 4.0 technologies**, such as **IoT**, **AI**, and **machine learning**. • **Smart manufacturing tools** (e.g., **digital twins**, **predictive maintenance**, **real-time monitoring**) should be integrated into the production management and process control modules. ***b. Sustainability and Circular Economy*** • The market is increasingly focused on **sustainable manufacturing** and **circular economy** models, especially in the TCLF sectors, where eco-conscious consumer behavior is on the rise. • Consider incorporating **sustainable production practices**, **eco-design principles**, **energy management**, and **circular supply chains** into the process control methodologies. ***c. Agility and Resilience in Supply Chains*** • In response to recent global disruptions, **agility and resilience** have become critical topics for businesses. Incorporating methodologies to make supply chains more resilient, such as **Agile manufacturing**, **demand-driven supply chains**, and **real-time risk management**, would align well with current market needs. ***d. Business Intelligence and AI Integration***

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
				• The **Business Intelligence** section could be expanded to reflect the integration of **AI and machine learning** in decision-making, particularly in areas like **predictive maintenance**, **supply chain optimization**, and **demand forecasting**. **Conclusion** The current **skills and knowledge** in the **Production Management and Process Control in TCLF companies** are largely valid and aligned with market needs, especially in terms of foundational production management, process control, and lean methodologies. However, **digital transformation**, **sustainability**, and **agility** have become key driving factors in the industry. Therefore, **updating the sub-units** to reflect **Industry 4.0** advancements, **sustainable practices**, and **agile methodologies** would make the curriculum even more relevant and future-proof for the TCLF sector.
ULO2- Process & production	• Textile technology, equipment and machinery • Ergonomic workplace design	• Select different textile technologies, equipment and machinery	1. Textile technology, equipment and machinery • Textile Technologies- General identification by different textile operations	Overall, the skills and knowledge outlined in ULO2 are **valid** and **coherent with the market** requests, but some areas may need **updating** to reflect current industry trends and challenges. The textile industry continues to evolve with an increased focus on **digitalization**, **automation**, and **sustainability**. Below is an analysis of each sub-unit:

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
timeline analysis in textile companies	in textile companies • Process performance in textile companies • Work measurement techniques in textile processes •	• Apply ergonomics principles in the workplace • Analyse and identify different types of KPI, production and productivity calculation methods and planning. • Analyse and apply work measurement techniques	• How to implement good practices for equipment management • Types of maintenance in equipment and machinery	**ULO2: Process & Production Timeline Analysis in Textile Companies** This Unit of Learning (ULO) addresses key aspects of **textile production processes**, including **technology, ergonomics**, and **work measurement techniques**. Let's review the relevance and alignment of the skills and knowledge within the context of current market demands, and discuss potential areas for updating or improvement. **1. Are the Skills and Knowledge Still Valid and Coherent with Market Requests?** Overall, the skills and knowledge outlined in ULO2 are **valid** and **coherent with the market** requests, but some areas may need **updating** to reflect current industry trends and challenges. The textile industry continues to evolve with an increased focus on **digitalization**, **automation**, and **sustainability**. Below is an analysis of each sub-unit:

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
				1. Textile Technology, Equipment, and Machinery • **Relevance:** The fundamental understanding of textile technologies, machinery, and maintenance practices is still very relevant. **Textile production** involves complex machinery such as looms, knitting machines, dyeing machines, and finishing equipment. • **Market Demand:** The demand for more **automated, energy-efficient**, and **smart machinery** is growing. There is also an increasing focus on **predictive maintenance** and **Industry 4.0** technologies that leverage data for machine diagnostics and optimization. **Update Suggestions:** ○ **Smart Manufacturing:** Introduce concepts related to **Industry 4.0**, **digital twins**, and **IoT-enabled machines** that provide real-time data analytics for process monitoring and predictive maintenance. ○ **Automation and Robotics:** Increasing use of **robotics** and **automation** in textile production, especially for repetitive tasks, suggests a need to address how these technologies integrate with traditional machinery. ○ **Sustainability in Equipment Management:** Given growing concerns about **sustainability**, consider adding a focus on **energy-efficient**

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
			2. Ergonomics and solutions for organising workplaces • Concepts and definitions • Ergonomics principles in the workplaces • The importance of good solutions for organising workplaces	**machines**, **recyclable materials**, and the role of **eco-design** in selecting equipment. ***2. Ergonomics and Solutions for Organizing Workplaces*** • **Relevance:** Ergonomics and workplace organization are critical for improving worker safety, reducing injuries, and enhancing productivity, especially in a labor-intensive industry like textiles. • **Market Demand:** In recent years, there has been a stronger focus on **workplace wellness** and **employee well-being**, driven by both employee rights and the need to maintain productivity and quality standards. **Update Suggestions:** ○ **Ergonomics and Automation:** As automation takes over more repetitive tasks, ergonomic considerations should also include how **human-machine collaboration** is structured. For example, **collaborative robots (cobots)** are becoming more common in textile factories, and the ergonomics of these systems could be explored. ○ **Posture and Movement Analysis Tools:** Introduce modern tools for **ergonomic assessments**, including **wearable devices** that monitor workers' postures and movement patterns to optimize workstations and reduce strain.

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
			3. Process performance • KPI - identification and characterization applied to textile companies • KPI as an improvement factor to assess the failures, weakness and technical problems in production process -statistical tools (Pareto Diagram, ...)	○ **Sustainability and Ergonomics:** There's an increasing emphasis on **sustainable workplaces** that consider not just the health of the workforce but also the **environmental impact** of production processes. Topics like **sustainable material handling** could be added. ***3. Process Performance*** • **Relevance:** Understanding how to measure and improve **process performance** through **KPIs** and **statistical tools** remains a core competency. Companies are increasingly leveraging these tools to stay competitive by minimizing waste and improving efficiency. • **Market Demand:** The rise of **data-driven decision-making** is reshaping how performance is assessed. Key performance indicators (KPIs) are now often tracked in real-time through **digital dashboards**, and **statistical process control (SPC)** is widely used for continuous improvement. **Update Suggestions:** ○ **Real-time Data and IoT:** Integrating IoT-enabled devices to provide **real-time performance monitoring** would enhance the relevance of this sub-unit. Many textile companies now use **smart sensors** on machines to track metrics like

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
			• Productivity calculation methods • Planning - good practices (production, maintenance, ...)	temperature, pressure, and humidity, which can directly impact quality and performance. ○ **Data Analytics and Predictive Tools:** The integration of **AI and machine learning** for predictive performance assessments, rather than just relying on traditional statistical tools like Pareto diagrams, could be highlighted. ○ **Sustainability KPIs:** With a growing focus on **sustainable manufacturing**, there is an opportunity to introduce **environmental KPIs** that monitor waste, water usage, and carbon footprints. ***4. Techniques of Work Measurement*** • **Relevance:** Work measurement and time study techniques are foundational for **productivity optimization** and **process efficiency** in textile manufacturing. These techniques are essential for identifying bottlenecks and improving overall throughput. • **Market Demand:** While traditional work measurement methods (e.g., time and motion studies) remain relevant, there is an increasing push for **leaner**, **faster**, and **more flexible production systems**, often supported by **digital tools**. **Update Suggestions:**

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
			4. Techniques of work measurement • Work measurement -concepts and definitions • Work measurement - techniques Work measurement benefits for the companies	○ **Automation and AI in Work Measurement:** Introduce **AI-driven work measurement tools** that help analyze worker performance and system efficiency in real time, and automate the process of time studies. ○ **Lean and Agile Work Measurement:** Given the dynamic nature of the textile industry, there is an opportunity to focus on more **agile work measurement systems** that can rapidly adapt to shifting production demands and smaller batch sizes. ○ **Sustainability in Work Measurement:** Sustainability-related metrics (e.g., **energy usage per unit of production**, **material waste per worker**) could be integrated into work measurement systems to ensure not only productivity but also environmental responsibility. **ULO2: Process & Production Timeline Analysis in Textile Companies** This Unit of Learning (ULO) addresses key aspects of **textile production processes**, including **technology, ergonomics**, and **work measurement techniques**. Let's review the relevance and alignment of the skills and knowledge within the context of current market demands, and discuss potential areas for updating or improvement.

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
				1. Are the Skills and Knowledge Still Valid and Coherent with Market Requests? Overall, the skills and knowledge outlined in ULO2 are **valid** and **coherent with the market** requests, but some areas may need **updating** to reflect current industry trends and challenges. The textile industry continues to evolve with an increased focus on **digitalization**, **automation**, and **sustainability**. Below is an analysis of each sub-unit: ***1. Textile Technology, Equipment, and Machinery*** • **Relevance:** The fundamental understanding of textile technologies, machinery, and maintenance practices is still very relevant. **Textile production** involves complex machinery such as looms, knitting machines, dyeing machines, and finishing equipment. • **Market Demand:** The demand for more **automated, energy-efficient**, and **smart machinery** is growing. There is also an increasing focus on **predictive maintenance** and **Industry 4.0** technologies that leverage data for machine diagnostics and optimization. **Update Suggestions:**

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
				○ **Smart Manufacturing:** Introduce concepts related to **Industry 4.0**, **digital twins**, and **IoT-enabled machines** that provide real-time data analytics for process monitoring and predictive maintenance. ○ **Automation and Robotics:** Increasing use of **robotics** and **automation** in textile production, especially for repetitive tasks, suggests a need to address how these technologies integrate with traditional machinery. ○ **Sustainability in Equipment Management:** Given growing concerns about **sustainability**, consider adding a focus on **energy-efficient machines**, **recyclable materials**, and the role of **eco-design** in selecting equipment.
				2. Ergonomics and Solutions for Organizing Workplaces • **Relevance:** Ergonomics and workplace organization are critical for improving worker safety, reducing injuries, and enhancing productivity, especially in a labor-intensive industry like textiles. • **Market Demand:** In recent years, there has been a stronger focus on **workplace wellness** and **employee well-being**, driven by both employee rights and the need to maintain productivity and quality standards.

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
				Update Suggestions: ○ **Ergonomics and Automation:** As automation takes over more repetitive tasks, ergonomic considerations should also include how **human-machine collaboration** is structured. For example, **collaborative robots (cobots)** are becoming more common in textile factories, and the ergonomics of these systems could be explored. ○ **Posture and Movement Analysis Tools:** Introduce modern tools for **ergonomic assessments**, including **wearable devices** that monitor workers' postures and movement patterns to optimize workstations and reduce strain. ○ **Sustainability and Ergonomics:** There's an increasing emphasis on **sustainable workplaces** that consider not just the health of the workforce but also the **environmental impact** of production processes. Topics like **sustainable material handling** could be added.
				3. Process Performance • **Relevance:** Understanding how to measure and improve **process performance** through **KPIs** and **statistical tools** remains a core competency. Companies are increasingly

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
				leveraging these tools to stay competitive by minimizing waste and improving efficiency. • **Market Demand:** The rise of **data-driven decision-making** is reshaping how performance is assessed. Key performance indicators (KPIs) are now often tracked in real-time through **digital dashboards**, and **statistical process control (SPC)** is widely used for continuous improvement. **Update Suggestions:** ○ **Real-time Data and IoT:** Integrating IoT-enabled devices to provide **real-time performance monitoring** would enhance the relevance of this sub-unit. Many textile companies now use **smart sensors** on machines to track metrics like temperature, pressure, and humidity, which can directly impact quality and performance. ○ **Data Analytics and Predictive Tools:** The integration of **AI and machine learning** for predictive performance assessments, rather than just relying on traditional statistical tools like Pareto diagrams, could be highlighted. ○ **Sustainability KPIs:** With a growing focus on **sustainable manufacturing**, there is an opportunity to introduce **environmental KPIs** that monitor waste, water usage, and carbon footprints.

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
				4. Techniques of Work Measurement • **Relevance:** Work measurement and time study techniques are foundational for **productivity optimization** and **process efficiency** in textile manufacturing. These techniques are essential for identifying bottlenecks and improving overall throughput. • **Market Demand:** While traditional work measurement methods (e.g., time and motion studies) remain relevant, there is an increasing push for **leaner**, **faster**, and **more flexible production systems**, often supported by **digital tools**. **Update Suggestions:** ○ **Automation and AI in Work Measurement:** Introduce **AI-driven work measurement tools** that help analyze worker performance and system efficiency in real time, and automate the process of time studies. ○ **Lean and Agile Work Measurement:** Given the dynamic nature of the textile industry, there is an opportunity to focus on more **agile work measurement systems** that can rapidly adapt to shifting production demands and smaller batch sizes.

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
				○ **Sustainability in Work Measurement:** Sustainability-related metrics (e.g., **energy usage per unit of production**, **material waste per worker**) could be integrated into work measurement systems to ensure not only productivity but also environmental responsibility.
				2. Do the Contents of the Sub-Units Well Respond to Market Requests? For the most part, the sub-units in ULO2 address critical areas of textile production, including technology, ergonomics, performance measurement, and work measurement. However, the current market demands in the textile industry are rapidly evolving in response to digitalization, automation, and sustainability. While the foundational content remains solid, there are **gaps** that could be addressed by expanding the curriculum to include: • **Industry 4.0 technologies** (e.g., IoT, automation, AI) • **Sustainability metrics** and **eco-friendly practices** • **Agile methodologies** for performance measurement and work organization • **Predictive analytics** and real-time data collection in process and performance management

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				3. Are There Some Contents of the Sub-Units That Need to Be Updated? Yes, several of the contents could be updated to align with modern industry practices: ***a. Textile Technologies and Equipment Management*** • **Update:** Integrate **smart machines**, **digital monitoring**, and **sustainability-focused equipment**. • **Content to Add:** Discuss **Industry 4.0 technologies** like **digital twins**, **IoT integration**, and **predictive maintenance** tools. ***b. Ergonomics and Workplace Organization*** • **Update:** Focus on ergonomics in the context of **automation**, **robotics**, and **human-machine collaboration**. • **Content to Add:** Include **wearable technologies** for real-time ergonomic assessments and focus on **sustainable workplace designs**. ***c. Process Performance*** • **Update:** Include the use of **real-time data** and **AI tools** to assess process performance. • **Content to Add:** Integrate **environmental KPIs** (e.g., water usage, waste, energy efficiency) as part of performance metrics.

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
				d. Work Measurement Techniques • **Update:** Introduce **AI-driven work measurement** tools and **agile work measurement systems**. • **Content to Add:** Consider **sustainability metrics** for work measurement and incorporate **lean manufacturing principles** to improve workflow efficiency. **Conclusion** The skills and knowledge in **ULO2: Process & Production Timeline Analysis in Textile Companies** are still largely valid and relevant for the current textile industry. However, to stay aligned with the evolving market demands, the content should be updated to incorporate **digitalization**, **automation**, **sustainability practices**, and **data-driven decision-making**. Integrating modern technologies such as **AI**, **IoT**, and **smart manufacturing** tools into the curriculum will ensure that students are well-prepared for the future of textile production
ULO3- Process & production timeline analysis in clothing companies	• Clothing technology, equipment and machinery • Ergonomic workplace design in clothing companies	• Select different clothing technologies, equipment and machinery • Apply ergonomics principles in the workplaces	1. Clothing technology, equipment and machinery • Equipment for the operations in the cutting room • Machines for joining operations • Equipment for finishing operations 2. Ergonomic workplace design in clothing companies	The structure of **ULO3**, focused on process and production timeline analysis in **clothing companies**, addresses core areas of **clothing technology**, **ergonomics**, **planning**, **production monitoring**, and **line balancing**. Let's analyze whether the skills and knowledge are still valid and aligned with current market requests, and identify areas for potential updates to meet the evolving needs of the industry.

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	**Skills**		
	• Planning for clothing manufacturing • Quality control technologies and procedures for clothing process • Work measurement techniques in clothing manufacture	• Define the number of operators and machines • Select quality control technologies and procedures • Measure working time in footwear production	• Principles for human body rational using • Materials and machines layout • Work in sitting and standing position 3. Planning for clothing manufacturing • Manufacture process flow • Dimensioning process operations • Factors that influence the operational time 4. Analyse and monitor the production processes in clothing departments in order to assess the failures, weaknesses or/and technical problems in the operation • Quality control technologies and procedures • Establishing the check points on the clothing line • KPI applied to the clothing companies 5. Line balancing and work efficiency in clothing manufacture • Criteria for technological line design	**1. Are the Skills and Knowledge Still Valid and Coherent with Market Requests?** The skills and knowledge presented in **ULO3** remain relevant to many aspects of clothing manufacturing, but there are **emerging trends** and **technologies** that need to be integrated to keep pace with changes in the industry. Clothing manufacturing is becoming increasingly influenced by **automation**, **digitalization**, and **sustainability**, which may not be fully addressed in the current curriculum. ***Clothing Technology, Equipment, and Machinery*** • **Relevance:** Knowledge of the equipment for cutting, joining, and finishing operations remains critical. These are the backbone of **clothing production** and directly influence efficiency and quality. • **Market Demand:** While traditional machines are still crucial, the industry is increasingly moving toward **automated sewing machines**, **robotic cutters**, and **smart equipment** that enhance precision and reduce manual labor. Additionally, **sustainability** and **resource efficiency** are growing priorities, which influence machinery selection (e.g., energy-efficient or zero-waste machines).

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
			• Rules for establishing the work load for the workplaces of the technological line • Technological line evaluation •	***Ergonomic Workplace Design in Clothing Companies*** • **Relevance:** Ergonomics in clothing manufacturing is still highly relevant. Proper workstation design helps prevent injuries and boosts worker productivity, which is key in a labor-intensive industry. • **Market Demand:** Modern ergonomics is evolving to include **human-machine collaboration** (e.g., collaborative robots, smart machines). Furthermore, the increasing trend of **automation** and **robotics** changes how workstations are designed, with more emphasis on **machine-assisted tasks** and **reducing manual labor**. ***Planning for Clothing Manufacturing*** • **Relevance:** Understanding the **manufacturing process flow**, **dimensioning operations**, and identifying factors that influence operational time are crucial to ensuring efficient and cost-effective production. • **Market Demand:** With **fast fashion** and **just-in-time manufacturing** models, companies require **real-time scheduling**, **demand forecasting**, and **flexible production lines**. Traditional **static planning** must be updated to accommodate dynamic workflows driven by **AI-powered forecasting tools**, **real-time data**, and **responsive production scheduling**.

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				Production Monitoring and Quality Control • **Relevance:** Monitoring production and identifying weaknesses through **quality control** are fundamental to maintaining product quality, reducing defects, and optimizing production processes. • **Market Demand: Data-driven quality control** systems and **smart sensors** that track quality at every stage are increasingly in demand. The rise of **sustainability** concerns also drives quality monitoring for **resource use** (e.g., energy, water) and **waste reduction**. ***Line Balancing and Work Efficiency*** • **Relevance:** Line balancing is critical to ensure that workstations are neither underloaded nor overloaded, maximizing throughput while maintaining product quality. • **Market Demand:** There is a growing focus on **agile manufacturing** and **flexible line balancing** that can quickly adapt to changing demand, product types, and batch sizes. The use of **simulation software** for line balancing and **digital twin models** for real-time line optimization is gaining traction. **2. Do the Contents of the Sub-Units Well Respond to the Market Requests?** The content of the sub-units in **ULO3** addresses many of the fundamental needs of clothing manufacturers but could be expanded to incorporate emerging technologies and trends that

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
				are reshaping the industry. Here's how the current sub-units align with market demands: ***1. Clothing Technology, Equipment, and Machinery*** • **Response to Market Requests:** The focus on equipment in the cutting room, joining operations, and finishing operations remains relevant. However, there's growing interest in **automated machinery**, **smart textiles**, and **sustainable practices** that reduce waste and improve efficiency. • **Update Needed:** The sub-unit could include discussions on **smart machines** that use **AI and IoT** for real-time monitoring and predictive maintenance. Topics like **energy-efficient machinery**, **robotics in garment assembly**, and **circular production processes** should be incorporated. ***2. Ergonomic Workplace Design in Clothing Companies*** • **Response to Market Requests:** Ergonomics is still a core consideration, especially in labor-intensive environments. However, the increasing role of **automation and robotics** is transforming workstation design. • **Update Needed:** The sub-unit could include modern ergonomic considerations for **collaborative robots (cobots)**, which work alongside human operators, and

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
				address the need for **flexible workstations** that adapt to human-machine collaboration. ***3. Planning for Clothing Manufacturing*** • **Response to Market Requests:** This section on process flow, dimensioning operations, and time factors is still fundamental for operational efficiency. However, **dynamic production planning** is becoming essential in response to rapidly changing consumer demands. • **Update Needed:** Introduce **real-time scheduling tools**, **demand forecasting**, and **AI-driven production planning systems** that help manufacturers respond to fluctuations in demand and adapt to new production requirements quickly. **Digital twins** and **supply chain integration** tools could also be discussed to improve planning accuracy. ***4. Analyse and Monitor the Production Processes*** • **Response to Market Requests:** Quality control is vital in clothing manufacturing, but there's a shift towards more **data-driven quality monitoring**. The application of **AI**, **machine learning**, and **smart sensors** is increasing in production monitoring. • **Update Needed:** Incorporate **smart quality control technologies**, such as **AI-based defect detection systems**, **predictive maintenance**, and **real-time performance tracking** using IoT devices. Also, include

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
				sustainability-focused quality monitoring, e.g., energy consumption tracking and waste management. ***5. Line Balancing and Work Efficiency*** • **Response to Market Requests:** Line balancing is a critical concept, but modern production lines are becoming more flexible and adaptive. This is particularly important for **fast fashion** manufacturers that need to rapidly shift between different garment types and production volumes. • **Update Needed:** Introduce **digital tools for line simulation and optimization**, such as **simulation software** and **real-time line balancing algorithms**. Additionally, discuss **agile manufacturing** techniques and **AI-driven optimization** for dynamic line balancing. **3. Are There Some Contents of the Sub-Units That Need to Be Updated? If Yes, Which of Them?** Yes, there are several areas that could benefit from updates to reflect the modern developments in the clothing manufacturing industry: ***a. Clothing Technology, Equipment, and Machinery*** • **Update Needed:** Incorporate **Industry 4.0 technologies**, such as **IoT-enabled machinery**, **smart sensors** for predictive maintenance, **robotic automation** in garment

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
				manufacturing, and **sustainability-driven machinery** (e.g., machines designed to minimize fabric waste, energy consumption, and water use). ***b. Ergonomic Workplace Design*** • **Update Needed:** Include **human-robot collaboration (cobots)** in the ergonomics design. As robotics is increasingly integrated into clothing production, ergonomic principles must account for how workers interact with machines and automated systems. ***c. Planning for Clothing Manufacturing*** • **Update Needed:** Shift towards **real-time dynamic scheduling** and **AI-driven planning tools** that adapt to fluctuations in demand, production timelines, and supply chain disruptions. Mention of **digital twins** and **cloud-based planning tools** would be valuable. ***d. Production Process Monitoring*** • **Update Needed:** Focus on **smart manufacturing technologies** like **AI for quality control**, **data analytics for real-time process monitoring**, and **sustainability-oriented performance metrics** (e.g., energy, material use, and waste reduction).

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
				e. Line Balancing and Work Efficiency • **Update Needed:** Discuss **agile line balancing** and introduce **digital tools** for **line simulation and optimization**. Emphasize how **AI and machine learning** are being used to dynamically adjust line balancing based on real-time data. **Conclusion** The current content in **ULO3** still covers many of the fundamental aspects of **clothing manufacturing**, such as equipment, ergonomics, process planning, production monitoring, and line balancing. However, to remain relevant in a rapidly evolving industry, the curriculum should integrate the following updates: 1. **Smart manufacturing technologies** (IoT, AI, robotics). 2. **Sustainability-driven practices** and resource efficiency. 3. **Real-time data analytics** and **dynamic scheduling tools**. 4. **Agile manufacturing practices** and **flexible production systems**. These additions will ensure that the curriculum is aligned with the **future of clothing manufacturing**, which is becoming increasingly digital, automated, and responsive to market needs.

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
ULO4- Process & production timeline analysis in footwear companies	• Footwear manufacturing technology • Ergonomic workplace organisation in footwear companies • Planning for footwear manufacturing • Footwear production and productivity • Work studies applied to footwear	• Apply the operations flow to each different model. • Apply ergonomics principles in the workplace • Plan footwear manufacture • Calculate the productivity of the production of footwear • Measure working time in footwear and leather goods production	1. Footwear manufacturing processes overview • Footwear manufacturing process from raw-materials to packing: cutting, pre-stitching, stitching, pre-assembly, assembly, finishing, packing – equipment, processes, operations • Different types of construction and their functionality: Cemented, Goodyear, Blake, Moccasin, Injection, Stitch and Turn, etc. • Approach to lead time / case studies 2. Ergonomic and workstation organization • Adjustment and organization of the workplace • New approaches for the workstation organization - 5S's, lean manufacturing, Six Sigma in the footwear sector 3. Planning and monitor footwear production	The structure of **ULO4**, which focuses on process and production timeline analysis in the **footwear industry**, covers key areas such as **footwear manufacturing processes**, **ergonomics**, **planning and monitoring**, **productivity** and **work studies**. Let's analyze the relevance of the skills and knowledge in this curriculum in relation to current market demands and identify areas for potential updates to ensure the course stays aligned with the evolving footwear manufacturing landscape. **1. Are the Skills and Knowledge Still Valid and Coherent with Market Requests?** The core concepts outlined in **ULO4** remain foundational to footwear production, but the industry is evolving in response to **automation**, **sustainability**, **smart manufacturing**, and **data-driven decision-making**. While the basic processes of footwear manufacturing—such as cutting, stitching, and assembly—remain relevant, the industry is rapidly adopting new technologies and business models that the curriculum could better reflect. Here's how the different sub-units align with current market requests: ***Footwear Manufacturing Processes Overview*** • **Relevance:** The steps from **raw materials to packing** (cutting, pre-stitching, stitching, assembly, finishing, packing) remain central to footwear manufacturing. Understanding various construction types (e.g., **Cemented**, **Goodyear**, **Blake**, **Moccasin**, etc.) is also

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
			• Planning techniques applied to footwear industry • Production launch techniques • Production monitoring and control 4. Production and productivity • Concepts of production and productivity • Work studies- Operation methods and timings and their relationship with budgeting, productivity and quality of the footwear • KPI applied to the footwear companies 5. Work studies applied to footwear • Work Studies - Operation methods and timings and their relationship with budgeting, productivity and quality of the footwear • Fundamental concepts on wok system: definition of the elements of work system • Data determination: work measurement; reading system; how to choose a	important as different manufacturing methods offer distinct advantages in terms of durability, comfort, and cost. • **Market Demand:** The demand for **automated processes**, **robotic systems**, and **digital tools** to improve efficiency and reduce human error is increasing. Moreover, **sustainability** concerns are pushing the industry toward using more eco-friendly materials, optimizing waste, and improving production efficiency. **Update Needed:** ○ Add modern **automation technologies** used in footwear manufacturing, such as **robotic stitching**, **automated cutting machines**, and **3D printing** for prototyping. ○ Discuss the importance of **sustainability** in material selection, manufacturing methods, and waste management. Consider the growing trend of **circular production models** in the footwear industry (e.g., **recyclable shoes** or **closed-loop systems**). ***Ergonomic and Workstation Organization*** • **Relevance:** Ergonomics is crucial in the footwear sector, particularly in labor-intensive tasks like stitching and assembly. Well-organized workstations improve worker safety, efficiency, and product quality.

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
			speed system; notions on activity; resting coefficient • Practice on using chronometer • Work studies applications: man power consumption for budgeting; balance establishment; productivity calculation	• **Market Demand: Lean manufacturing**, **5S**, and **Six Sigma** are still widely used in the footwear industry to optimize workflow, reduce waste, and improve quality. However, there is a growing need for designing **flexible workstations** that can accommodate automation and robotics. **Update Needed:** ○ Include ergonomic considerations for **human-robot collaboration** as automation tools (e.g., **collaborative robots (cobots)**) are increasingly used alongside human workers. ○ Highlight the **flexibility** required for workstations in modern footwear manufacturing, where high product variation and short production runs are common. ***Planning and Monitoring Footwear Production*** • **Relevance:** Planning and monitoring are essential for efficient production in the footwear industry. Techniques like **production launch** and **monitoring control** ensure that manufacturing processes run smoothly. • **Market Demand:** The footwear industry is increasingly adopting **AI-powered planning tools**, **real-time data monitoring**, and **demand forecasting systems** to

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
				enhance flexibility and meet fluctuating consumer demands. **Update Needed:** ○ Focus on **digital tools** for **real-time production monitoring**, **demand forecasting**, and **AI-driven production scheduling**. ○ Introduce concepts of **supply chain integration** and **smart production systems**, where data from different parts of the production process (and even supply chain) is used to optimize operations dynamically. ***Production and Productivity*** • **Relevance:** Concepts of **production** and **productivity** are central to any manufacturing process, and footwear is no exception. **Work studies** to measure **operation methods** and **timings** are necessary for optimizing productivity and ensuring quality. • **Market Demand: Automation**, **data analytics**, and **lean manufacturing** are increasingly critical to improving productivity in footwear companies. **Real-time monitoring systems** are being implemented to assess productivity as it happens.

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
				Update Needed: ○ Introduce **AI-driven productivity tools** that automatically adjust production lines based on real-time data (e.g., adjusting to production delays or demand spikes). ○ Expand on the use of **digital metrics** for real-time monitoring of productivity and quality control across the entire production line. ***Work Studies Applied to Footwear*** • **Relevance:** Work studies, including **operation methods** and **timing**, are essential for budgeting, quality control, and productivity improvement in footwear manufacturing. Accurate time studies allow companies to optimize labor costs and reduce inefficiencies. • **Market Demand:** There is an increasing emphasis on **AI** and **IoT** for **work measurement** and performance tracking. Traditional methods like **chronometer-based time studies** are being supplemented by more **data-driven** approaches that capture performance at a granular level. **Update Needed:** ○ Introduce the use of **smart wearables** or **IoT devices** that track **worker performance** in real-

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
				time, providing more accurate data for work studies. ○ Update the curriculum to focus on **digital work measurement tools**, such as **motion capture technology** and **AI-powered work analysis**, which provide better accuracy and more granular insights into time and motion studies. **2. Do the Contents of the Sub-Units Well Respond to Market Requests?** The contents of the sub-units in **ULO4** align well with many core aspects of the footwear manufacturing process, but the **industry is undergoing significant transformation**, especially with the integration of **smart technologies**, **automation**, and **data analytics**. The curriculum responds to traditional market requests for **operational efficiency**, **ergonomics**, and **productivity improvement**, but it would benefit from incorporating modern tools and strategies for: • **Automation** in production lines • **AI-driven production planning** and **real-time monitoring** • **Sustainability** in footwear production (e.g., waste reduction, sustainable material sourcing)

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
				To ensure students are equipped with the skills needed for the modern footwear industry, the curriculum should introduce newer technologies and frameworks, particularly related to **Industry 4.0**. **3. Are There Some Contents of the Sub-Units That Need to Be Updated? If Yes, Which of Them?** Yes, several contents could be updated to reflect the **current trends** in the footwear industry, including **automation**, **AI**, **sustainability**, and **data analytics**: ***a. Footwear Manufacturing Processes Overview*** • **Update Needed:** Introduce **automated stitching**, **robotic cutting**, and **3D printing** as part of the production process. • **Sustainability Aspect:** Discuss eco-friendly materials, closed-loop production systems, and waste reduction strategies in footwear manufacturing. ***b. Ergonomics and Workstation Organization*** • **Update Needed:** Highlight **human-robot collaboration** in the workplace and discuss how **automation** changes ergonomic considerations, including the design of flexible workstations that can easily adapt to different product types.

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				c. Planning and Monitoring Footwear Production • **Update Needed:** Focus on **AI-driven production planning**, **real-time production monitoring systems**, and how data from production lines can be used to **predict delays** and **optimize workflow** dynamically. ***d. Production and Productivity*** • **Update Needed:** Discuss **AI-based tools** for real-time productivity monitoring and how digital systems can help identify bottlenecks and inefficiencies during production. ***e. Work Studies Applied to Footwear*** • **Update Needed:** Incorporate modern tools for **data-driven work measurement**, such as **smart wearables** for real-time tracking of worker performance, and **motion capture** or **AI-powered analysis** tools that provide more accurate data than traditional methods like chronometer-based studies. **Conclusion** The core principles in **ULO4** regarding footwear manufacturing, ergonomics, production planning, and work studies are still highly relevant. However, the industry is rapidly evolving with the rise of **automation**, **AI**, **smart manufacturing**, and **sustainability**. To ensure that the curriculum remains aligned with market demands, updates are needed in the following areas: 1. **Automation and Robotics** in footwear manufacturing.

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
				2. **AI-powered production planning** and **real-time data monitoring**. 3. **Sustainability practices** in material sourcing, manufacturing processes, and waste management. 4. **Digital work studies tools** like **smart wearables** and **motion analysis** systems. By integrating these modern tools and frameworks, the curriculum can better prepare students for the future of footwear manufacturing.
ULO5-Process & production timeline analysis in leather companies	• Leather production • Analysis of production chart in leather companies • Security and adaptation of machinery and equipment into the tannery	• Select different leather machinery • Apply different method for production and productivity calculation • Implement continuous processes adaptation into the tannery	1. Leather production: machinery, continuous and batch operations • Wet processing: batch operations and improvements to continuous line process • How to implement innovative equipment and machinery to improve productivity? • Follow the supply rate and customer's demand along the leather production 2. Analysis of production chart in leather companies	The structure of **ULO5**, focusing on process and production timeline analysis in **leather companies**, addresses critical aspects of **leather production**, **machinery**, **productivity**, **security**, and **workplace organization**. This curriculum emphasizes various areas such as **wet processing**, **production chart analysis**, **KPI definition**, and **machinery adaptation** to improve productivity and meet customer demand. Let's analyze the relevance of these topics in the context of current industry demands, and identify areas where updates could be beneficial. **1. Are the Skills and Knowledge Still Valid and Coherent with Market Requests?** The skills and knowledge outlined in **ULO5** address many of the traditional challenges in leather production, particularly around process optimization, machinery management, and supply chain coordination. However, the leather industry, like many others, is

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
			• How to make a process mapping? • KPI definition in leather companies • Productivity calculation methods: ERP software. • Productivity versus quality requirements and regulations 3. Security and adaptation of machinery and equipment into the tannery • Concepts and definitions • The importance of good solutions for organising workplaces • New continuous process adaptation into the tannery: investment and reorganization of workplaces	increasingly influenced by **automation**, **sustainability**, **data analytics**, and **environmental regulations**. Here's a breakdown of each sub-unit: ***Leather Production: Machinery, Continuous and Batch Operations*** • **Relevance:** The sub-unit covering **wet processing**, batch vs. continuous operations, and the integration of **innovative machinery** is critical, as many leather companies still rely on traditional, labor-intensive processes. Understanding these traditional operations is essential to improving productivity and efficiency. • **Market Demand:** There is growing pressure for the leather industry to modernize and automate its processes. Innovations such as **continuous processing systems**, **automated leather handling**, and **digitally controlled equipment** are transforming production lines. **Update Needed:** ○ Incorporate the latest in **automated leather processing machinery**, such as **robotic systems** for material handling or **AI-driven machinery** that adapts to varying production demands. ○ Emphasize **sustainable practices** and **green technologies** in leather production, such as **waterless tanning** or **zero-waste production**

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
				techniques, which are becoming increasingly important due to environmental concerns. ***Analysis of Production Chart in Leather Companies*** • **Relevance:** The sub-unit on **process mapping**, defining **KPIs**, and calculating productivity is critical for understanding how well a leather company's operations are performing. With the complexity of leather production, clear process mapping and effective KPIs are essential for optimizing output. • **Market Demand:** The use of **ERP software** to track production and manage KPIs is already widespread, but there's growing interest in **real-time data analytics** and **AI-driven systems** that provide deeper insights into productivity, quality, and overall efficiency. **Update Needed:** ○ Discuss the integration of **advanced ERP systems** with **AI and machine learning** capabilities to allow for **predictive analytics**, which can forecast demand and optimize production schedules in real-time. ○ Include **sustainability KPIs**, which have become increasingly relevant in the leather industry, particularly related to **environmental impact**,

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
				waste management, and **resource usage** (e.g., water, chemicals). ***Security and Adaptation of Machinery and Equipment into the Tannery*** • **Relevance:** Ensuring the **safety** of machinery and the **adaptation** of equipment to meet the needs of modern leather production is crucial, particularly with the risks associated with traditional leatherworking processes (e.g., chemical exposure, heavy machinery). • **Market Demand:** The demand for **smarter, safer machinery** is increasing, with more emphasis on **ergonomics**, **safety standards**, and **automated monitoring systems** to prevent workplace injuries. Additionally, there's an ongoing trend to incorporate **sustainable practices** into machinery design, especially concerning energy use and chemical waste. **Update Needed:** ○ Update the curriculum to reflect the increasing **automation** and use of **robotics** in leather processing, which help mitigate safety risks while improving production efficiency. ○ Discuss new **safety technologies** like **automated safety monitoring systems** that track machine health and worker safety in real-time, as well as **sustainable machinery solutions** (e.g.,

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	Knowledge	Skills		
				equipment that uses less energy, reduces chemical waste, or minimizes water usage). **2. Do the Contents of the Sub-Units Well Respond to Market Requests?** The contents of the sub-units in **ULO5** cover many of the key areas of leather production that are still highly relevant, particularly in traditional manufacturing settings. However, the market is shifting toward more **digitized, automated, and sustainable** production processes. To align better with current trends, it would be beneficial to update the curriculum in the following ways: ***1. Leather Production: Machinery, Continuous and Batch Operations*** • **Response to Market Requests:** The curriculum addresses the need for improved productivity through better machinery and process flow. However, the increasing **demand for sustainability** in the leather industry—such as **waterless tanning** or **energy-efficient machinery**—is not fully captured. • **Update Needed:** Focus on **sustainable leather production techniques** (e.g., chemical-free tanning, waterless or closed-loop systems), **advanced machinery** (e.g., **AI-controlled automation**), and **digital process control** systems.

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				2. Analysis of Production Chart in Leather Companies • **Response to Market Requests:** The focus on **process mapping** and **KPIs** is relevant, as **data-driven decision-making** is becoming essential in modern leather manufacturing. However, the increasing reliance on **real-time monitoring systems** and **advanced analytics** (such as **machine learning** for demand forecasting and production optimization) is not emphasized. • **Update Needed:** Introduce more about **real-time data analytics**, **AI-based KPIs**, and **digital twin technologies** for predictive maintenance and real-time production optimization. ***3. Security and Adaptation of Machinery and Equipment into the Tannery*** • **Response to Market Requests:** The curriculum discusses the importance of **good solutions for organizing workplaces** and **adapting machinery**. However, safety and ergonomics are evolving to incorporate **human-machine collaboration**, which is growing in importance in all manufacturing sectors, including leather. • **Update Needed:** Address the role of **robotics** and **human-robot collaboration** in improving safety and efficiency. Include **smart safety systems** and **sustainable machinery**, especially those focused on reducing environmental impact and improving safety standards.

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				3. Are There Some Contents of the Sub-Units That Need to Be Updated? If Yes, Which of Them? Yes, there are a few areas where the sub-units could be updated to better reflect **current market trends** and **technological advancements**: ***a. Leather Production: Machinery, Continuous and Batch Operations*** • **Update Needed:** Include **automation** in leather production lines (e.g., **robotic leather handling**), the rise of **sustainable leather production technologies** (e.g., **waterless tanning**, **chemical-free tanning**), and **smart manufacturing solutions**. ***b. Analysis of Production Chart in Leather Companies*** • **Update Needed:** Integrate **advanced ERP systems** that incorporate **AI and machine learning** for **real-time data analytics**, predictive maintenance, and optimization of production scheduling. Discuss the growing importance of **sustainability metrics** and their integration into ERP systems. ***c. Security and Adaptation of Machinery and Equipment into the Tannery*** • **Update Needed:** Focus more on **human-robot collaboration** in safety and workplace organization, especially given the growing use of **robotics** in the leather

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Title of the Training Unit	Learning outcomes		Structure of the Unit (Sub-units)	Answers/Notes
	Knowledge	Skills		
				industry. Address **smart safety technologies** that can proactively monitor both machinery and worker safety. **Conclusion** The core concepts in **ULO5**—such as **machinery management**, **production optimization**, **workplace organization**, and **process mapping**—are still highly relevant to the leather industry. However, the **industry is rapidly evolving** with new **technologies** and **sustainability trends**, which should be reflected in the curriculum to ensure it stays aligned with market demands. Key updates include: 1. **Automation and Robotics**: The integration of automation and **AI-controlled systems** in leather production should be emphasized. 2. **Sustainability**: Focus on **waterless tanning**, **chemical-free processes**, and **energy-efficient machinery**. 3. **Data Analytics and ERP Systems**: The importance of **real-time data monitoring** and **predictive maintenance** driven by **AI and machine learning** should be highlighted. 4. **Safety Technologies**: Include **smart safety systems** and discuss the impact of **human-robot collaboration** on improving safety. These updates will ensure the curriculum reflects the **future of leather manufacturing**, where **technology**, **efficiency**, and **sustainability** are central.

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3. Evaluate the following table

- **Given the Skills and Knowledge contained in the table before, observed the following ones and indicate the ones that could improve the contents.**
- **Do the following Skills and Knowledge well respond to the needs of the labour market? If yes, which of them?**

CE_MC10 - Fashion products reuse and repair innovation		
SKILLS	**KNOWLEDGE**	**NOTES**
• 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.	• A solid understanding of sustainability concepts, design and production processes, and circular business models. Learners will gain awareness of the fashion industry's impact and the importance of sustainable practices, such as extending the lifespan of the products through reuse and repair.	**1. Do the Following Skills and Knowledge Respond Well to the Needs of the Labour Market?** **Skills Response:** 1. **Practical experience in applying repair and reuse techniques in the Fashion Industry**: ○ **Yes**, this is highly relevant to the current labor market. With increasing consumer demand for **sustainable** and **ethical fashion**, there is a growing need for professionals who can contribute to **circular fashion** initiatives, including **repairing** and **reusing** garments. Repair and reuse skills are in high demand within the fashion industry, especially as brands, small businesses, and consumers seek solutions to **reduce waste** and extend the life cycle of fashion products. These skills can apply across the value chain, from **repair technicians** to **product designers** and **retailers** offering repair services to customers. 2. **The ability to critically analyse problems and think creatively to discover new ways to extend the lifespan of products**:

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		○ **Yes**, creative problem-solving and innovative thinking are essential skills in the fashion industry today. Fashion companies are looking for employees who can not only **repair products** but also **reimagine** how to redesign or repurpose fashion items for longevity. This requires **critical thinking**, **innovation**, and the ability to leverage new technologies like **3D printing**, **fabric recycling**, and **adaptive design** to extend the lifespan of products. This is a highly sought-after skill, as brands increasingly seek to **minimize waste** and embrace **circular economy principles**.
		Knowledge Response: 1. **A solid understanding of sustainability concepts, design and production processes, and circular business models**: ○ **Yes**, this knowledge is essential in today's fashion market. Sustainability is one of the top priorities in the fashion industry as it faces increasing pressure to reduce its environmental impact. Consumers are becoming more aware of the **environmental footprint** of their purchases, and companies are integrating sustainability into their **business models**. Knowledge of **circular business models** (e.g., **take-back schemes**, **repair services**, and **closed-loop production systems**) is critical. Fashion professionals who understand these concepts are well-positioned to contribute to **designing for longevity** and **creating more sustainable products**. 2. **Learners will gain awareness of the fashion industry's impact and the importance of sustainable practices, such**

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		as extending the lifespan of the products through reuse and repair: ○ **Yes**, this knowledge is increasingly crucial for today's workforce. The **fashion industry's impact** on the environment—especially in terms of **waste generation**, **carbon emissions**, and **resource consumption**—has become a focal point. A growing segment of consumers are gravitating towards brands that prioritize **sustainable practices**. This includes practices such as **upcycling**, **repair services**, and **product refurbishment**, which aim to **extend product lifespan**. Professionals with this knowledge will be instrumental in driving the industry towards **sustainability** and meeting consumer demand for **eco-friendly** fashion choices. **2. Which of the Skills and Knowledge Could Be Improved or Expanded?** While the current skills and knowledge align well with the needs of the labor market, there are some areas where the curriculum could be enhanced to better respond to emerging trends and demands within the fashion industry. ***Skills:*** • **Practical experience in applying repair and reuse techniques in the Fashion Industry**: ○ **Expansion Needed:** While repair and reuse skills are highly relevant, there could be an expansion in terms of **technological tools** and **advanced techniques**. For instance, incorporating skills related to **digital repair tools** (e.g., using software for digital alteration),

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		3D printing for garment repairs, or **laser cutting** and **fabric bonding** could add significant value to the skill set. This would prepare students for the increasing trend of **digitally-driven fashion innovation**. ○ **Suggestion:** Include practical experience with **technological innovations** in the repair and reuse space, such as **automated garment repair stations** or **apparel repair apps**. Providing exposure to **industry-grade tools** that brands are adopting for **on-demand repairs** and **customized redesigns** would be beneficial. • **The ability to critically analyse problems and think creatively to discover new ways to extend the lifespan of products**: ○ **Expansion Needed:** Critical thinking and creativity are valuable in redesigning fashion products for longevity. However, a greater focus on **sustainable design principles** (e.g., **modular design**, **multi-functional clothing**, and **design for disassembly**) could improve this aspect. These principles encourage designers to create garments that can be easily **repaired**, **recycled**, or **upcycled**, thus extending their lifespan. ○ **Suggestion:** Add emphasis on teaching students to think creatively within the **circular design framework**. For example, how can designs be **modular**, allowing consumers to repair, update, or replace individual parts of the garment (e.g., replaceable zippers, detachable sleeves)? This would make repairs and upcycling easier, supporting the **reuse economy**.

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		Knowledge:
		
		• **A solid understanding of sustainability concepts, design and production processes, and circular business models**:
		  ○ **Expansion Needed:** The growing importance of **digital technologies** in sustainable fashion could be further emphasized. For example, concepts like **blockchain for transparency**, **digital garment tracing**, and **AI in circular fashion** are becoming integral to the sustainability movement in fashion. By including these topics, learners can better understand how technology can facilitate more sustainable production and consumer practices.
		  ○ **Suggestion:** Introduce more content related to **technological advancements** such as **supply chain transparency tools**, **sustainable material innovation**, and the use of **AI** to design and produce more sustainable fashion.
		• **Learners will gain awareness of the fashion industry's impact and the importance of sustainable practices, such as extending the lifespan of the products through reuse and repair**:
		  ○ **Expansion Needed:** While the focus on repair and reuse is crucial, expanding the scope of sustainable practices to include **upcycling**, **second-hand fashion**, and **fashion rental services** would make this knowledge more comprehensive. Fashion's evolving business models now include not just **repair**, but also **reuse**, **refurbishment**, and **rental services**—all of which contribute to a **circular economy**.
		  ○ **Suggestion:** Expand the content to cover the broader spectrum of **circular economy business models**,

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		including **second-hand retail**, **rental services**, **peer-to-peer exchanges**, and **upcycling platforms**. **Conclusion:** Overall, the **skills and knowledge** outlined in **CE_MC10 - Fashion Products Reuse and Repair Innovation** are **well-aligned with the needs of the labor market**, especially given the growing demand for sustainable and circular fashion practices. Key strengths of the curriculum include: 1. Practical and creative skills for **repairing and reusing** fashion products, which are in high demand as companies move towards sustainable business models. 2. Solid understanding of **sustainability** and **circular business models**, which are increasingly important in the fashion industry. **Suggestions for Improvement:** • Expand practical skills to include **technological innovations** in repair and reuse (e.g., **3D printing**, **digital repair tools**). • Broaden the scope of **creative problem-solving** to include **modular design** and **design for disassembly**. • Integrate more content on **emerging technologies** like **blockchain for transparency** and **AI-driven sustainable fashion solutions**. • Expand the understanding of **circular business models** to include **fashion rental** and **upcycling**. By incorporating these updates, the curriculum can better prepare students for the evolving demands of the fashion industry, ensuring

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		they have the skills and knowledge to **drive sustainable change** in the sector.
DF_MC9 - Quality control and assurance solutions based on sensing and artificial vision		
SKILLS	**KNOWLEDGE**	
• 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.		**1. Do the Following Skills and Knowledge Well Respond to the Needs of the Labour Market?** The skills and knowledge outlined in **DF_MC9** address critical competencies required for **quality control and assurance** roles in industries utilizing **sensing** and **artificial vision technologies**. These skills are highly relevant as the industry increasingly moves towards **automated quality inspection systems**, **AI-based defect detection**, and **data-driven quality improvement processes**. Here's an analysis of each skill and knowledge area in relation to labor market demand: ***1. Proficiency in analyzing materials, components, and final products using relevant quality criteria*** • **Market Demand:** This is a foundational skill in the manufacturing and production sectors. As automation and AI technologies advance, more companies are integrating **AI-driven quality inspection systems**, **vision systems**, and **sensor-based quality monitoring** to improve product quality at all stages of production. The ability to analyze products based on quality criteria, even when using these advanced technologies, remains crucial. • **Labor Market Relevance: High**. In fields like **electronics**, **automotive**, **consumer goods**, and **textiles**, this skill is still

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	essential, especially as products become more complex and require precise quality measurements. ***2. Ability to compare products to standards, conduct laboratory tests, and define corrective measures*** • **Market Demand:** The use of **AI** and **machine learning** in quality control is growing. These technologies help companies not only detect defects but also predict potential quality issues before they arise, which ties directly into corrective measures. **Vision systems** now allow for non-invasive quality control, which is also becoming more prevalent. Still, a solid understanding of how to compare products to standards and test them in a lab environment remains vital. • **Labor Market Relevance: High**. As the demand for **precision engineering** and **high-quality products** increases, this skill ensures that products meet required standards through both **manual testing** and automated solutions. ***3. Expertise in managing and improving company quality systems, including creating quality manuals, implementing quality policies, and ensuring continuous improvement*** • **Market Demand:** With the integration of advanced **sensing** and **vision technologies**, companies need professionals who can design quality systems that can incorporate these new technologies into existing **quality management frameworks**. The emphasis on **continuous improvement** through **real-time data analytics**, including from **machine vision systems**, is an increasing demand in industries such as **automotive manufacturing**, **electronics**, and **textiles**. • **Labor Market Relevance: High**. Companies in regulated industries (e.g., **pharmaceuticals**, **aerospace**, **automotive**)

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	are particularly keen on **quality management systems** that integrate new digital tools to ensure product quality and compliance. ***4. Familiarity with national and international quality standards, specifications, and guidelines to ensure products and processes meet the required quality levels*** • **Market Demand:** Compliance with **ISO** and **industry-specific standards** (e.g., **ISO 9001**, **ISO/TS 16949**) is critical. As companies integrate **AI** and **sensing systems** for quality assurance, they must ensure that these systems are compliant with international standards and that their products are traceable, meeting both **domestic** and **international** regulations. • **Labor Market Relevance: High**. Globalized supply chains and stringent regulatory environments make this knowledge crucial for companies operating in **multiple countries** and industries that require **certifications** and **audits**. ***5. Competence in fostering internal and external communication regarding quality assurance, with a focus on achieving customer satisfaction and continuous improvement*** • **Market Demand:** With the increasing complexity of quality control systems involving **sensors**, **AI**, and **automated vision systems**, clear communication is vital. Stakeholders (including suppliers, customers, and regulatory bodies) need to understand how these systems operate and the role they play in maintaining **quality standards**. Additionally, **customer satisfaction** is increasingly tied to the product's perceived quality, making effective communication around quality assurance a competitive advantage.

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	• **Labor Market Relevance: High**. As companies implement more **automated solutions** for quality, professionals need to bridge the gap between **technology** and **customer needs** to ensure that **quality data** is communicated effectively both internally and externally. **2. Which Skills and Knowledge Could Be Improved or Expanded?** While the current skills and knowledge are well-aligned with market needs, there are areas where the curriculum could be expanded to reflect **emerging trends** in the field of **quality control and assurance**, particularly in **AI**, **sensing technologies**, and **machine vision**. ***Skills:*** 1. **Proficiency in analyzing materials, components, and final products using relevant quality criteria** ○ **Expansion Needed:** As AI and **machine vision** technologies become more prevalent, the skill set should evolve to include **data analysis** and the use of **AI-driven quality inspection systems**. This includes using **sensors** and **vision systems** for real-time defect detection and **predictive quality management**. ○ **Suggestion:** Add practical experience in **AI-assisted quality analysis**, where learners can work with machine vision systems and **AI algorithms** for **automated defect detection**. 2. **Ability to compare products to standards, conduct laboratory tests, and define corrective measures** ○ **Expansion Needed:** Introduce the use of **real-time data** from **sensors** and **vision systems** to not only detect defects but also provide insights into **corrective actions**. AI tools now enable **predictive analysis**,

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	helping teams understand potential quality issues before they become problematic. ○ **Suggestion:** Teach **predictive analytics** and **root cause analysis** using **data collected by AI-driven systems** and **vision inspection technologies**. 3. **Expertise in managing and improving company quality systems** ○ **Expansion Needed:** The integration of **sensing technologies** and **AI-based monitoring** into quality systems can allow for continuous, real-time quality improvements. Expanding this skill to include the **management** and **implementation** of **AI and sensor-based quality assurance systems** will be valuable. ○ **Suggestion:** Focus on **designing quality management systems** that incorporate **machine learning**, **IoT-based sensors**, and **automated vision inspection systems** to continuously monitor and improve product quality. ***Knowledge:*** 1. **Familiarity with national and international quality standards, specifications, and guidelines** ○ **Expansion Needed:** As sensing and vision systems become more integrated into manufacturing, there should be an increased focus on ensuring that **AI-based quality control systems** meet **international quality standards** (such as **ISO 17025** for calibration and testing) and are auditable. ○ **Suggestion:** Include more in-depth knowledge about **compliance standards** related to **AI** and **automated quality systems**. Familiarize learners with how **machine vision** and **sensing technologies** can meet international quality certifications.

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	2. **Competence in fostering internal and external communication regarding quality assurance** ○ **Expansion Needed:** As companies adopt **AI** and **automation** for quality control, effective communication will be critical for ensuring alignment across departments and with external stakeholders. This includes explaining the role of **AI systems** in quality assurance and their potential impact on **customer satisfaction**. ○ **Suggestion:** Expand on **change management** in organizations, focusing on how to effectively communicate about the integration of **AI** and **sensing technologies** in quality systems to all stakeholders, including customers, regulatory bodies, and internal teams. **Conclusion** The **skills** and **knowledge** outlined in **DF_MC9** are highly relevant to the current labor market, as they align with the growing demand for **automated quality control** and **AI-driven** inspection systems in industries like **automotive**, **electronics**, **consumer goods**, and **textiles**. The core skills are aligned with market trends, including **quality standards**, **defect detection**, **continuous improvement**, and **effective communication**. However, to ensure the curriculum fully meets **future labor market demands**, it could be improved by expanding on: • **AI-driven quality systems** and **machine vision technologies**. • **Predictive analytics** for **proactive quality control**.

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- Integrating **real-time sensing technologies** and **data-driven quality assurance** processes into **quality management systems**.

By incorporating these **emerging trends** and focusing on the integration of **AI and automation** in quality control, the curriculum would better prepare students for the rapidly evolving landscape of **smart manufacturing** and **industry 4.0**.
</td></tr>
<tr><td colspan="2">DF_MC2 - Artificial Intelligence in the Fashion Industry</td><td></td></tr>
<tr><td>SKILLS</td><td>KNOWLEDGE</td><td></td></tr>
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- practice on how to work with datasets and AI tools, and extract meaningful insights is essential for AI applications in the Fashion Industry
- 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
</td><td>

- 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.
</td><td>

1. Do the Following Skills and Knowledge Well Respond to the Needs of the Labour Market?

Skills Analysis:

1. **Practice on how to work with datasets and AI tools, and extract meaningful insights for AI applications in the Fashion Industry:**
    - **Market Demand:** The ability to work with datasets and apply AI tools to extract insights is **extremely relevant** in the fashion industry today. Companies in fashion are increasingly using **AI** to make data-driven decisions, whether for **predicting trends**, **personalizing marketing**, **optimizing supply chains**, or **generating designs**. Working with data and using AI for **product recommendations**, **inventory management**, and **market analysis** is in high demand.
    - **Labor Market Relevance: Very high**. Fashion companies, particularly in **e-commerce**, are investing heavily in **AI-powered solutions** to better understand
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		consumer behavior, forecast trends, and optimize inventory management. Therefore, the skill to **analyze datasets** and **extract meaningful insights** using **AI tools** is crucial for modern fashion businesses. 2. **Ability to analyze problems critically and think creatively to develop AI solutions tailored to fashion-related challenges:** ○ **Market Demand:** The fashion industry has unique challenges, such as managing **trend forecasting**, **consumer demand**, and **personalization** at scale. The ability to critically analyze problems and develop **AI-based solutions** tailored to these challenges is a highly sought-after skill. Whether it's creating **AI-powered design tools**, automating **quality control**, or enhancing the **customer experience** through personalized recommendations, creative AI solutions are in demand. ○ **Labor Market Relevance: High**. Fashion brands are looking for professionals who can identify specific problems in the industry (e.g., **inventory overstock**, **slow product cycles**, or **personalized shopping experiences**) and develop targeted AI solutions to address them. **Creative thinking** is essential to develop AI applications that can disrupt traditional fashion business models. 3. **Experiment with and exposure to popular AI tools and libraries for AI practical implementation in the Fashion Industry:** ○ **Market Demand: Practical skills** in using AI tools and libraries like **TensorFlow**, **PyTorch**, **scikit-learn**, or **Keras**, as well as tools for **computer vision**, **natural language processing (NLP)**, and **generative design**, are highly valued in the fashion industry. Companies are actively adopting AI-powered tools to automate

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		design processes, enhance **product recommendations**, and improve **supply chain efficiency**. Practical exposure to these tools enables professionals to apply **machine learning**, **deep learning**, and **AI algorithms** in the fashion industry context. ○ **Labor Market Relevance: Very high**. Practical experience with AI tools and libraries is essential in the current labor market, as companies are increasingly adopting these technologies for various aspects of the fashion business, from **design generation** to **inventory optimization** and **personalization**.
		Knowledge Analysis: 1. **A fundamental understanding of AI concepts such as historical context, available technologies, driven tools for AI-generated designs, and personalized fashion for marketing and retail:** ○ **Market Demand:** Understanding the fundamentals of AI, its historical development, and the key technologies used in the fashion industry is critical for professionals who want to work in this space. The use of **AI-generated designs**, **personalized fashion experiences**, and **AI-driven marketing tools** is growing rapidly. A solid knowledge base helps professionals understand not just how AI works but also where it can have the most significant impact on the fashion industry. ○ **Labor Market Relevance: Very high**. Fashion businesses that want to stay competitive need to adopt the latest AI tools for **personalization**, **consumer**

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		insights, **product development**, and **supply chain management**. Professionals who understand the historical context of AI and the current tools available for **AI-generated design**, **personalized recommendations**, and **predictive analytics** are in high demand. 2. **Awareness of the ethical and social implications of using various AI tools, including privacy concerns and the impact on labor markets and consumers:** ○ **Market Demand:** As AI adoption increases in the fashion industry, there is growing concern about the **ethical implications** of using such technologies. Issues like **data privacy**, the **impact on jobs**, and **bias in AI algorithms** (e.g., in hiring, product recommendations, or consumer profiling) are becoming more prominent. Fashion companies must address these issues as part of their **corporate social responsibility** efforts. Therefore, awareness of the **social implications** and **ethics** surrounding AI is crucial. ○ **Labor Market Relevance: High**. As AI technologies are increasingly integrated into fashion business practices, the industry is also under scrutiny for how these tools impact both **workers** and **consumers**. Professionals who are aware of the **ethical considerations** and can implement AI solutions responsibly will be highly valued, especially in areas related to **consumer data privacy**, **algorithmic fairness**, and **job displacement** concerns.

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		2. Which of the Skills and Knowledge Could Be Improved or Expanded? While the current skills and knowledge are highly relevant to the labor market, there are areas where they could be expanded or refined to better align with emerging trends and demands in the fashion industry. ***Skills Expansion:*** 1. **Practice on how to work with datasets and AI tools, and extract meaningful insights for AI applications in the Fashion Industry:** ○ **Expansion Needed:** While this skill is essential, it could be improved by incorporating hands-on experience with **specific fashion industry datasets**, such as **consumer purchase data**, **style preferences**, **trend forecasting**, and **inventory management**. Students could also be exposed to **real-world case studies** where AI tools were implemented to solve industry-specific problems. ○ **Suggestion:** Include practical projects using **fashion-related datasets** (e.g., product sales data, social media sentiment analysis, or consumer feedback data) and employ **AI tools** to solve fashion-specific challenges (e.g., optimizing product assortments, personalized fashion recommendations, or automated trend forecasting). 2. **Ability to analyze problems critically and think creatively to develop AI solutions tailored to fashion-related challenges:** ○ **Expansion Needed:** While creative problem-solving is a core skill, the curriculum could provide more **focused challenges** that directly tackle issues within

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		fashion, such as **sizing and fit predictions**, **automated design generation**, and **consumer sentiment analysis**. ○ **Suggestion:** Provide students with opportunities to work on real-life challenges like **improving customer engagement** through personalized fashion experiences or developing **AI-generated fashion designs** based on consumer preferences. **Hackathons** or **innovation labs** focused on fashion-related AI solutions could foster more creativity. ***Knowledge Expansion:*** 1. **A fundamental understanding of AI concepts such as historical context, available technologies, driven tools for AI-generated designs, and personalized fashion for marketing and retail:** ○ **Expansion Needed:** This area could benefit from a deeper exploration of **emerging AI technologies**, such as **generative adversarial networks (GANs)** for design, **AI-powered fashion trend forecasting tools**, and **augmented reality (AR)** for virtual try-ons. Additionally, a broader discussion on **sustainability** and the role of AI in promoting more sustainable fashion (e.g., by reducing waste, optimizing supply chains, and promoting ethical production) could be included. ○ **Suggestion:** Include case studies on how **AI** has driven **sustainable fashion practices** (e.g., optimizing material usage, improving supply chain transparency) and how **AI-generated designs** are shaping the future of fashion creativity. Expand coverage of **GANs**, **neural networks**, and **augmented reality (AR)** for **virtual fashion experiences**.

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		2. **Awareness of the ethical and social implications of using various AI tools, including privacy concerns and the impact on labor markets and consumers:** ○ **Expansion Needed:** As AI use increases, a more comprehensive exploration of the **social implications** of AI is needed. This could include discussions on **data privacy** laws (e.g., **GDPR**), **bias in AI algorithms**, the **impact of AI on fashion jobs**, and **digital labor issues** (e.g., the role of AI in automated design and marketing jobs). ○ **Suggestion:** Introduce a more in-depth module on **AI ethics** within the fashion industry, with a focus on **ethical AI design**, **consumer privacy protection**, and **social responsibility**. Discussions could also cover the **future of fashion jobs** and how AI may impact employment in design, retail, and manufacturing. **Conclusion** The **skills** and **knowledge** outlined in **DF_MC2 - Artificial Intelligence in the Fashion Industry** are **highly relevant** to the current and future needs of the labor market. The fashion industry is increasingly adopting **AI** for a range of applications, from **design generation** and **personalization** to **supply chain optimization** and **marketing**. The skills and knowledge covered in this curriculum prepare students well for the evolving **AI-driven fashion ecosystem**. However, expanding the curriculum to include:

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		• More hands-on experience with **fashion-specific datasets** and **AI tools**. • A deeper dive into **emerging AI technologies** like **GANs** for design and **AR** for virtual try-ons. • A broader discussion on **AI ethics**, including **data privacy**, **algorithmic bias**, and the **social impact of AI** on workers. By addressing these areas, the curriculum will be better aligned with both current and future trends in the fashion industry, ensuring that students are equipped with the knowledge and practical skills needed to succeed in an **AI-enhanced fashion world**.

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