



# 01.3 Curriculum

## The “Woodworker 4.0”

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# Introduction

This report finalizes and matches the results of the previous desk research “01.1 - Desk Research: The “Woodworker 4.0”. Market needs, knowledges, skills, and competences required in the context of the Twin Transition (Green and Digital) of the furniture sector” with the main findings of the related Validation Groups, carried out in all Project countries and reported in the report “01.2 – Focus Groups - The “Woodworker 4.0”. Market needs, knowledge, skills and competences required in the context of the Twin Transition (Green and Digital) of the furniture sector”.

The professional Profile of the Woodworker 4.0 combines the traditional complex of Knowledge, Skills and Competences typical for the **Woodworker** in the furniture industry with the new ones required by the twin transition of the furniture sector towards new **Circular Economy business models** and their needed **Green Skills** and towards the **digitization of the processes** along the whole sectoral value chain.

WOODigital considers the Woodworker 4.0 the evolution of the traditional professional profiles correspondent basically to the ESCO profiles **Carpenters and Joiners** (7115), **Furniture Assembler** (8219.4), **Wood Treaters** (7521) and **Cabinet Maker and related workers** (7523) - that includes some sub-profile such as **Furniture Finisher** (7522.5), **Furniture Restorer** (7522.6).

The Curriculum of the Woodworker 4.0 defined below is based on the following principles:

- The “Woodworker 4.0” is a woodworker digitally competent and able to use the technologies already existent in the working environment.
- The “Woodworker 4.0” is a woodworker digitally competent and able to use the disruptive technologies emerging in the wood and furniture sector.
- The “Woodworker 4.0” is a woodworker able to work in a working environment affected by the transition to Circular Economy business models.
- The “Woodworker 4.0” is a woodworker aware of the sustainability principles.
- The Curriculum should be attractive for young people or unemployed people, in terms of content and career perspective.
- The scope of this Curriculum is to increase the digital competence and the knowledge of the fundamentals of the Circular Economy in the furniture sector for the new professional profile of the “Woodworker 4.0”. The training related to the traditional profiles above mentioned is out of the scope of this project.

This curriculum must be consistent with the EU instruments for mobility and transparency ECVET, EQF and EQAVET and will include:



- Information and descriptions related to learning objectives and learning outcomes (LO's),
- A list of the Learning Units (training path)
- The description of the Learning Units content in relation to knowledge, skills, and competencies (KSC's).
- ECVET points will be assigned for each unit (with the support of the ECVET toolkit).

At the end of the Pilot session - including also the feedbacks collected during the onsite and online mobilities – the EQF level of this Curriculum is consistent with the complex of skills, knowledge and competences relevant for the EQF 4.

*UPDATE – 29/08/2022: The following version is the update of the Woodworker 4.0 Curriculum Profile, after the Pilot of the training toolkit, including all the feedbacks collected during the onsite and online mobilities, both from the students/workers and from the teachers/trainers/tutors involved along the whole validation process.*

*According to the ECVET framework, each Learning Unit corresponds to 0.2 ECVET Points and the full training course will assign 1 ECVET Point.*



# 1. Curriculum description

The findings of the desk research and the recommendations coming from the 5 Focus Groups converge towards the same training priorities:

1. **General overview** about the fundamentals of **Industry 4.0** and **Circular Economy**
2. Technical skills: competencies related to the knowledge of the main **software** for design and technical drawing;
3. Technical skills: competencies related to the knowledge of the **automated machines**, robots, and CNC tools;
4. Technical skills: competencies related to the knowledge of the **evolution of the manufacturing processes/techniques** and digitization of the working environment;
5. Green skills: **Circular economy; Eco-design**; Certification and Standard related to the sustainability and Circular Economy.
6. **Transversal skills**: project management and entrepreneurial skills; attitude to problem solving and self-learning; intercultural and communication skills;
7. Skills related to **quality, risk, and safety**;
8. **Corporate Social Responsibility**: respect for the environment, respect for the people, respect for the resources and working environment.

The proposed curriculum is designed and set up considering that **VET providers** can use it as a basis for building up the expected new qualification.

Furthermore, the proposed curriculum is useful for **students, employees, unemployed people** willing to improve their traditional competence in the furniture sector with up-to-date skills and for **employees** or unemployed **people coming from other sectors** – with a solid technical background and a previous knowledge in the field of Industry 4.0 - willing to reroute their career toward the furniture industries.



## 2. Woodworker 4.0 – Content of the Curriculum

In this document we are going to present the definition of the Learning Units and their content, based upon the outcomes of the results of the Report 01.1 “01.1 - Desk Research: The “Woodworker 4.0”. Market needs, knowledges, skills, and competences required in the context of the Twin Transition (Green and Digital) of the furniture sector” and of the main findings of the Focus Groups, carried out in all Project countries and reported in the report “01.2 – Focus Groups - The “Woodworker 4.0”. Market needs, knowledge, skills and competences required in the context of the Twin Transition (Green and Digital) of the furniture sector”.

This version of the Curriculum include also some minor changes after the validation process of the WOODigital training toolkit occurred during the onsite and online mobilities (April – August 2022), with the feedbacks and contributions collected both from students/workers and teachers/trainers/tutors.

The main changes compared to the previous version are the following:

- Reduction of the number of Learning Pills for a greater systematization of contents
- Better definition of the specific content and outcome for each Learning Unit
- A specific Learning Pill devoted to the Case studies included in each Learning Unit

The layout of all the units shapes the specific training path for the Woodworker 4.0 professional profile.

Taking into consideration the official definitions by the European Qualification Framework, we consider that this new joint curriculum will refer to **level 4**, considering that it will require at least:

- Knowledge: **factual and theoretical knowledge** in broad contexts within a field of work or study;
- Skill: a range of **cognitive and practical skills** required to **generate solutions to specific problems** in a field of work or study;
- Competence: **exercise self-management** within the guidelines of work or study contexts that are usually predictable but are subject to change; **supervise the routine work of others**, taking some responsibility for the evaluation and improvement of work or study activities.



## 3. Learning Units: main contents

### Introduction

Learning outcomes are described in relation to the specific knowledge, skills, and competences, in order to ensure that the new curriculum properly matches the evolution of the market and the sectoral twin transition. The training pills developed within O3 followed and specified these defined learning outcomes.

Each Learning Unit of the curriculum is delivered in a comprehensive manner and in relation to other parts. This means that the curriculum provides a coherent and appropriate Learning Path, that shows the ideal sequence of learning activities, allowing the participants to become proficient in the shortest possible time in the topic and properly complete the foreseen tasks by the related occupation.

To make it a more systematic tool, the identified general, technical, and transversal skills are divided into five learning units, according to a sensible training path starting from a general introduction about the revolution of Industry 4.0, to give to the learners a sound basis of knowledge and a proper jargon, until the last learning Unit devoted to the **circular economy, including ecodesign and sustainable materials** together with some fundamentals about the CSR and the ethics principles adequate for a working environment.



## Description of the Units

### **UNIT 1 – INDUSTRY 4.0**

(0,2 ECVET Points)

- **1.1 Main Topics**
  - Introduction to Industry 4.0
  - Transition of the wood and furniture sector towards the Industry 4.0: technologies and tools
  - Examples of Industry 4.0 application for the Wood/Furniture industry
  
- **1.2 Detailed Unit's structure**
  - Introduction to Industry 4.0 and digitized workplaces
  - Industry 4.0 for European SMEs: challenges and opportunities
  - Industry 4.0 in practice
  - Industry 4.0 – Case Studies

### LEARNIG OUTCOMES

At the end of the Unit "Introduction to Industry 4.0" the learner should be able to:

- Understand the definition, development and impact of Industry 4.0
- Have a clear understanding of tools used within Industry 4.0 to optimize the value chain of production
- Describe the opportunities that industry 4.0 brings to SMEs in Europe
- Explain the application of Industry 4.0 in the wood and furniture sectors
- Provide some concrete examples of Industry 4.0 practices in wood and furniture sectors
- Understand the real application of Industry 4.0 in the furniture sector
- Know how this real application allows adapting to new market expectations

### RELATED SKILLS, COMPETENCES, KNOWLEDGE

#### **SKILLS**

- Can manage complex information
- Can recognize the practical application of a theoretical principle
- Can recognize the changes in the working environment due to Industry 4.0
- Can recognize different types of 4.0 technologies and their specific application in the furniture sector
- Can recognize the sequence of manufacturing processes



**KNOWLEDGE**

- Knowledge of the Principles of Industry 4.0
- Knowledge of the principles of automation/digitization in manufacturing processes

**COMPETENCES**

- Great interest in innovation, digitization, new technologies
- Intellectual curiosity, creativity
- Open-mindedness



## UNIT 2 – 4.0 SOFTWARE

(0,2 ECVET Points)

### 2.1 Main Topics

- Introduction to software 4.0
- Software solutions: CAD / CAM / BIM / VR / AR
- Automated Manufacturing
- System information management

### 2.2 Detailed Unit's structure

- Different types of software for the wood and furniture industry
- Elements of Computer Aided Design
- Elements of Computer Aided Manufacturing
- Elements of Building Information Modeling
- Elements of Augmented Reality / Virtual Reality
- 4.0 Software Case-Studies

### LEARNING OUTCOMES

At the end of the Unit “4.0 Software” the learner should be able to:

- Describe the different categories of software used in the furniture industry
- Identify the benefits of using software in the furniture industry
- Understand the basic principles of Computer Aided Design and Manufacturing (CAD/CAM)
- Describe the benefits of using CAD/CAM and Building Information Modeling (BIM)
- Understand the basic principals of Computer Aided Design and Manufacturing
- Understand the possibilities of AR/VR/BIM software in the furniture industry
- Give examples of the practical benefits of using software in the furniture industry
- Understand the benefits of using software in the design process

### RELATED SKILLS, COMPETENCES, KNOWLEDGE

#### SKILLS

- Can recognize and describe the functions and the applications of the main manufacturing and design software and sensorics solutions
- Can recognize and describe the functions and the applications of the main VR/AR solutions



**KNOWLEDGE**

- Knowledge of the principles of software design in manufacturing processes
- Knowledge of the principles of VR/AR
- Knowledge of the principles of automated manufacturing
- Knowledge of the fundamentals of the IT systems integration

**COMPETENCES**

- Responsibility in his/her work
- Autonomous in his/her work, under supervision and proper training
- Great interest in innovation, digitization, new technologies
- Intellectual curiosity, creativity
- Open-mindedness



## UNIT 3 – 4.0 MACHINERY (0,2 ECVET Points)

### 3.1 Main Topics

- 4.0 Machinery
- CNC Routers
- Finishing systems
- Additive technologies

### 3.2 Detailed Unit's structure

- Description of 3 axis/5 axis machines
- Description of finishing lines for flat panels and complex surfaces
- Description of the main finishing products
- Description of Laser cutter technology
- Elements of 3D printing
- 4.0 machinery – Case studies

### LEARNING OUTCOMES

At the end of the Unit “4.0 Machinery” the learner should be able to :

- Recognize the importance of machinery in the wood and furniture industry
- Recognize the importance of automation in the wood and furniture industry
- Recognize the importance of automated finishing lines
- Identify the most important finishing products used in furniture manufacturing
- Recognize the benefits of using additional technologies in the wood and furniture industry
- Have an understanding of the practical uses of 3D printing in the furniture industry

### RELATED SKILLS, COMPETENCES, KNOWLEDGE

#### SKILLS

- Can recognize and describe the functions and the applications of the main CNC Machines
- Can recognize and describe the functions and the applications of the main Laser and cutting tools
- Can recognize and describe the fundamentals of the additive technologies (3D printing)
- Can recognize and describe the main finishing systems



**KNOWLEDGE**

- Knowledge of the main CNC machines and tools for the furniture sector
- Knowledge of the Laser and cutting technologies for the furniture sector
- Knowledge of the fundamentals and functioning of the additive technologies (3D Printing)
- Knowledge of the main finishing systems for the furniture sector

**COMPETENCES**

- Responsibility in his/her work
- Autonomous in his/her work, under supervision and proper training
- Great interest in innovation, digitization, new technologies
- Intellectual curiosity, creativity
- Open-mindedness



## UNIT 4 – MANUFACTURING MANAGEMENT (0,2 ECVET Points)

### 4.1 Main Topics

- Introduction to manufacturing management
- Manufacturing management systems
- Software systems for management
- Quality control

### 4.2 Detailed Unit's structure

- Project Management principles
- Lean Manufacturing principles
- Operation Management
- Quality and standard of the products
- Enterprise resource planning and related systems (ERP)
- Product Lifecycle Management
- Cybersecurity
- Cloud Computing
- Internet of Things
- Manufacturing management: Case studies

### LEARNING OUTCOMES

At the end of the Unit “Manufacturing Management” the learner should be able to:

- Describe the main typical management practices to support optimization of processes
- Define the main principles of total quality management and the methods and tools used
- Define the technical standards for quality and safety of the product
- Define the main technologies and software used in Manufacturing Management
- Understand the application of ERP system in a real SME
- Recognize the main advantages and obstacles of the implementation of a data management system in a real context

### RELATED SKILLS, COMPETENCES, KNOWLEDGE

#### SKILLS

- Can recognize the main phases of a Project



- Can report efficiently on his/her work
- Able to communicate in a proper manner, without missing relevant information
- Able to contribute to the companies' reporting
- Can read and understand a Gantt Chart
- Can read and understand a Canva Chart
- Can recognize and apply the principles of Lean Manufacturing, under supervision and with proper guidelines
- Can recognize and describe the principles of the Product Lifecycle Management
- Can recognize and describe the principles for the resource planning and its related systems
- Can recognize and describe the main solutions and applications of IoT systems

#### **KNOWLEDGE**

- Knowledge of the Project management principles
- Knowledge of a project lifecycle
- Knowledge of the lean manufacturing methodologies

#### **COMPETENCES**

- Time management
- Responsibility in his/her work
- Autonomous in his/her work, under supervision and proper training
- Open-minded and open to continuous self-learning
- Problem solving
- Flexible and adaptive in complex contexts
- Self-management
- Teamwork



## UNIT 5 – CIRCULAR ECONOMY

(0,2 ECVET Points)

### 5.1 Main Topics

- Introduction to Circular Economy
- Eco-design (design for re-use, repair, remanufacture, end of life and durability)
- Sustainable and eco-materials

### 5.2 Detailed Unit's structure

- Sustainability and lifecycle thinking
- Circular economy in the wood/furniture industry
- New circular business models
- Environmental Tools (carbon footprint)
- Life Cycle Analysis
- Ethical procurement
- Ecodesign approaches: Case Studies

### LEARNING OUTCOMES

At the end of the Unit “Circular Economy and Eco-design” the learner should be able to :

- Understand the principles of the circular economy and why there is a need for it
- Describe how circular economy relates to the design and production of modern furniture
- Understand the principles of ecodesign and why it is needed for a circular economy
- Know how ecodesign relates to the reduction of the environmental impact of products in their complete life cycle
- Understand the principles of sustainable materials as an ecodesign approach
- Knowing how the use of sustainable materials can reduce the environmental impact of products in their complete life cycle
- Understand the real application of ecodesign in the furniture sector
- Know how this real application could bring competitive advantage to the companies, by reducing the environmental impact of their products/services

### RELATED SKILLS, COMPETENCES, KNOWLEDGE

#### SKILLS



- Can distinguish good/bad circular practices
- Can distinguish good/bad circular business models
- Can understand/interpret a product organization environmental assessment
- Can recognize and use the innovative materials inspired by the principles of the Circular Economy
- Can recognize and apply the principles of Eco-design, under supervision and with proper guidelines

#### **KNOWLEDGE**

- Knowledge of Circular economy principles and practices
- Knowledge of principles for assessing environmentally materials / products / organizations
- Knowledge of Eco-design principles

#### **COMPETENCES**

- Sustainable sensitivity
- Life cycle approach
- Environmental product/organization assessment
- Environmental product/organization improvement
- Creative thinking
- Ethics



## 4. Teaching methodologies: recommendations

The training methodology must be intuitive and user friendly, designed to accommodate a wide range of learners, with different levels of digital competences. The idea is that innovative and effective training methods will be used, such as online video materials, and each learning pill will be developed using the most suited training method for that specific item and the learning outcomes based on specific learning pill. The methodology can be (in function of the specific content/theme and aims of the training pill):

- Video material with interviews, statements, explanations from experts
- Animated videos or animated graphics, infographics
- Slides, presentations and learning objects
- Case studies (examples / good practice by companies / VET / HE / Research centers)
- Texts and written explanations
- Additional resources such as recommended reading of articles, books, blogs...
- Quizzes and Exercises

It would be recommended to integrate in the training platform a multilingual Virtual room / Forum to enable the direct exchange between the participants and a direct support to all the learners by the Project Tutors and Teachers.

Furthermore, it would be recommended to integrate at the end of each Learning Unit a glossary with the main topic keywords.





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