Factsheet for Mechatronics sector



SHIFTVET

Digital Transformation for Wood and Furniture VET

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Industry / VET Sector Analysed: Mechatronics
VET programme(s) analysed:

- Mechatronics for aerospace industry (EQF 5) (link)
- Robotics, mechatronics and additive manufacturing (EQF 5) (link)
- Mechatronics for mechanics and aerospace Industry 4.0 (EGF 5) (link)

1. Description of the VET Programme

What should be included?

The programmes aim to train highly specialised technicians capable of operating in automated production environments, integrating mechanical, electronic and digital technologies. Students develop competencies in industrial automation, robotics, CAD/CAM design, additive manufacturing, maintenance, quality control and Industry 4.0 technologies. Training combines classroom activities, laboratory practice and extensive work-based learning through internships in manufacturing and aerospace companies. Typical practical activities include component design, machine programming, production process optimisation, prototype development and maintenance of mechatronic systems.

2. Potential Subjects for Transfer

What should be included?

Subject / Module	Applicable Technology	Relevant ShiftVET Exercise	Transfer Potential
CAD/CAM Design and Product Development	3D Scanning	Chair Scanning Exercise	High
Reverse Engineering and Digital Modelling	3D Scanning	Chair Scanning Exercise	High
Quality Control and Dimensional Verification	3D Scanning	Chair Scanning Exercise	Medium
Additive Manufacturing	3D Printing	Stool Joint Printing Exercise	High
Rapid Prototyping	3D Printing	Stool Joint Printing Exercise	High
Product Development and Testing	3D Printing	Stool Joint Printing Exercise	High
CNC Programming	CNC Machining	Pocket Milling Exercise	High
Manufacturing Technologies	CNC Machining	Pocket and Edge Milling Exercise	High
Production Process Optimisation	CNC Machining	Pocket and Edge Milling Exercise	Medium

Technologies:

- 3D Printing
- 3D Scanning

- CNC Machining

3. Transferable ShiftVET Exercises

What should be included?

ShiftVET Exercise	Technology	Transferability
Chair Scanning and Reverse Engineering	3D Scanning	High
Stool Joint Design and 3D Printing	3D Printing	High
Pocket and Edge CNC Milling	CNC Machining	High

The selected ShiftVET exercises show a strong transfer potential to mechatronics programmes because they involve technologies already used in modern manufacturing environments. The chair scanning exercise introduces learners to reverse engineering processes, digital modelling and dimensional verification. The stool joint printing exercise supports the development of competencies related to additive manufacturing, CAD modelling and prototype testing. The CNC milling exercise allows students to acquire practical skills in machine programming, toolpath generation and precision machining. Together, these activities reinforce the integration of design, manufacturing and quality control, which are core elements of mechatronic and Industry 4.0 education

4. Example of application in the New Sector

What should be included?

A possible application of the ShiftVET exercises could be integrated into an additive manufacturing and mechatronics laboratory. Students could first scan an existing mechanical component using a 3D scanner and create a digital model. The model could then be modified using CAD software and a functional prototype produced through 3D printing. Finally, selected parts of the component could be manufactured or refined using CNC machining operations such as pocket milling and edge finishing. This activity would replicate a complete industrial workflow commonly adopted in Industry 4.0 environments, combining digitalisation, prototyping and manufacturing technologies already addressed within the analysed programmes.

5. Required Adjustments

What should be included?

The implementation of the selected ShiftVET exercises would require only limited adaptations because the analysed programmes already include manufacturing and automation technologies.

For the 3D scanning exercise, the scanned chair should be replaced by industrial or mechanical components more closely related to mechatronic applications, such as brackets, housings or machine parts. Learning objectives should focus on reverse engineering, dimensional analysis and quality control.

For the 3D printing exercise, the stool joint could be adapted into a mechanical connector or functional component used in automation systems. Students would focus on CAD modelling, material selection, additive manufacturing parameters and prototype validation.

For the CNC exercise, pocket and edge milling operations could be performed on components commonly used in mechanical assemblies. Learning outcomes would emphasise CNC programming, machining strategies, tolerances and manufacturing efficiency.

Assessment methods could include practical performance observation, product quality evaluation, technical reports and learner feedback surveys conducted within the industrial cluster environment. The overall structure of the exercises can remain substantially unchanged while contextualising tasks to the aerospace, automation and mechatronics sectors.

6. Conclusions

What should be included?

The transfer of ShiftVET results to the mechatronics sector is highly feasible. All three technologies analysed are already aligned with the learning objectives of the selected EQF Level 5 programmes and can support the development of Industry 4.0 competencies.

Among the technologies, 3D Printing presents the highest transfer potential because additive manufacturing is explicitly included within one of the analysed programmes and is increasingly adopted in advanced manufacturing sectors. The easiest exercise to implement would be the Stool Joint Printing Exercise, requiring only minor adaptations to transform the furniture-related component into an industrial or mechanical application.

The ShiftVET exercises can effectively enrich practical training activities and strengthen the connection between digital design, prototyping and manufacturing processes within mechatronics education.

Summary

Overall Transferability Assessment

x High

☐ Medium

☐ Low

Main technology with transfer potential

x 3D Printing

☐ 3D Scanning

☐ CNC Machining

☐ Combination of technologies

Main transferable exercise

Stool Joint Design from ASLAM and 3D Printing Exercise



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