

WorldSkills Standards Specification

Mechatronics

Manufacturing and Engineering Technology



THE WORLDSKILLS STANDARDS SPECIFICATION (WSSS)

GENERAL NOTES ON THE WSSS

The WSSS specifies the knowledge, understanding and specific skills that underpin international best practice in technical and vocational performance. It should reflect a shared global understanding of what the associated work role(s) or occupation(s) represent for industry and business (www.worldskills.org/WSSS).

The skill competition is intended to reflect international best practice as described by the WSSS, and to the extent that it is able to. The Standards Specification is therefore a guide to the required training and preparation for the skill competition.

In the skill competition the assessment of knowledge and understanding will take place through the assessment of performance. There will only be separate tests of knowledge and understanding where there is an overwhelming reason for these.

The Standards Specification is divided into distinct sections with headings and reference numbers added.

Each section is assigned a percentage of the total marks to indicate its relative importance within the Standards Specification. This is often referred to as the “weighting”. The sum of all the percentage marks is 100.

The Marking Scheme and Test Project will assess only those skills that are set out in the Standards Specification. They will reflect the Standards Specification as comprehensively as possible within the constraints of the skill competition.

The Marking Scheme and Test Project will follow the allocation of marks within the Standards Specification to the extent practically possible. A variation of five percent is allowed, provided that this does not distort the weightings assigned by the Standards Specification.

WORLDSKILLS STANDARDS SPECIFICATION

SECTION		RELATIVE IMPORTANCE (%)
1	Work organization and management	10
	<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> Principles and applications of safe working generally and in relation to mechatronics The purposes, uses, care, and maintenance of all equipment and materials, together with their safety implications Environmental and safety principles and their application to good housekeeping in the work environment Principles and methods for work organization, control and management Principles of team working and their applications The personal skills, strengths and needs that relate to the roles, responsibilities and duties of others individually and collectively The parameters within which activities need to be scheduled 	
	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> Prepare and maintain a safe, tidy and efficient work area Prepare self for the tasks in hand, including full regard to health, safety, and environment Schedule work to maximize efficiency and minimize disruption Select and use all equipment and materials safely and in compliance with manufacturers' instructions Apply or exceed the health and safety standards applying to the environment, equipment, and materials Restore the work area to an appropriate state and condition Contribute to team performance both broadly and specifically Give and take feedback and support 	
2	Communication and interpersonal skills	10
	<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> The range and purposes of documentation in both paper and electronic forms The technical language associated with the skill The standards required for routine and exception reporting in oral, written, and electronic form The required standards for communication with clients, team members, and others The purposes and techniques for generating, maintaining, and presenting records 	

	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Read, interpret, and extract technical data and instructions from documentation in any available format • Communicate by oral, written, and electronic means to ensure clarity, effectiveness and efficiency • Use a standard range of communication technologies • Discuss complex technical principles and applications with others • Complete reports and respond to issues and questions arising • Respond to clients' needs face to face and indirectly • Arrange to gather information and prepare documentation as required by the client 	
3	Developing mechatronics systems	15
	<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> • Principles and applications for: <ul style="list-style-type: none"> • Designing, assembling and commissioning a mechatronics system; • The components and functions of hydraulic and pneumatic systems; • The components and functions of electrical and electronic systems; • The components and applications of electrical drives; • The components and applications of robotics and handling systems; • The functions and applications of HMI and Vision Systems device; • The components and functions of PLC systems • Principles and applications of design and assembly of mechanical systems including pneumatic and/or hydraulic systems, their standards, and their documentation • Physical characteristics and applications of fluids and intelligent sensors • Principles and applications for incorporating robots within the system 	
	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Carry out systems design for given industrial applications • Identify and resolve areas of uncertainty within the briefs or specifications • Optimize the design within the parameters of the specification • Assemble machines according to documentation • Connect wires and tubes according to industry standards • Incorporate robots within systems as required • Incorporate HMI devices within the system • Install, set up and adjust as required the mechanical, pneumatics, electrical, and sensor systems to a mechatronic system • Use complex sensors like Vision Systems, colour sensors, incremental systems, and parametrize them with the standard manuals • Commission machines with the use of auxiliary equipment and a PLC, using their standards and documentation 	

4	Using industrial controllers	20
	<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> • The functions, structures, and operating principles of PLCs (industrial controllers) • The configuration of the industrial controller • Industrial networks/bus systems • The different interfaces for special signals like fast counters and also communications to periphery intelligent systems 	
	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Integrate and connect PLCs to mechatronics systems • Set-up an industrial network/bus system for communication between industrial controllers, HMI device, or other distributed devices • Make the necessary configurations of industrial controllers • Configure all aspects of PLCs as required, together with the associated control circuitry for correct operation 	
5	Software programming	20
	<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> • The methods by which software programmes relate to the actions of machinery • How to programme using standard industrial software • How to create HMI interactive graphics • How a software program relates to the action of machinery and systems 	
	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Write programmes to control a mechatronic system • Visualize the process and operation using software • Programme PLCs, including digital and analogue signal processing and industrial field buses • Programme HMI devices 	
6	Circuit schematics	10
	<p>The individual needs to know and understand:</p> <ul style="list-style-type: none"> • The principles, applications, and standards for circuit schematics • Methods for designing and assembling electrical circuits in mechatronic systems 	
	<p>The individual shall be able to:</p> <ul style="list-style-type: none"> • Read and use pneumatic, hydraulic, and electrical circuit schematics • Design the circuits using modern software tools 	

7	Analysis, commissioning, and maintenance	15
	The individual needs to know and understand: <ul style="list-style-type: none"> • Criteria and methods for testing equipment and systems • Strategies for problem solving (fault finding, optimization) • Techniques and options for making repairs • Strategies for problem solving • Principles and techniques for generating creative and innovative solutions • Principles and applications of Total Productive Maintenance (TPM) 	
	The individual shall be able to: <ul style="list-style-type: none"> • Test run individual modules and assembled systems • Review each part of the process against established criteria • Find faults in a mechatronic system using appropriate analytical techniques • Repair components efficiently • Optimize the operation of the mechatronic system through analysis and problem solving • Optimize the operation of each module of the mechatronics system • Optimize the operation of the mechatronic system as a whole • Present the assembly to the client and respond to questions 	
	Total	100

REFERENCES FOR INDUSTRY CONSULTATION

WorldSkills is committed to ensuring that the WorldSkills Standards Specifications fully reflect the dynamism of internationally recognized best practice in industry and business. To do this WorldSkills approaches a number of organizations across the world that can offer feedback on the draft Description of the Associated Role and WorldSkills Standards Specification on a two-yearly cycle.

In parallel to this, WSI consults three international occupational classifications and databases:

- ISCO-08: (<http://www.ilo.org/public/english/bureau/stat/isco/isco08/>)
- ESCO: (<https://ec.europa.eu/esco/portal/home>)
- O*NET OnLine (www.onetonline.org/)

This WSSS (Section 2) appears most closely to relate to *Mechatronics Engineering Technician*:
<http://data.europa.eu/esco/occupation/edf2e989-d7c5-496e-b365-81fc5cb9eb39>

Other adjacent occupations can be explored through these links.