WorldSkills Standards Specification

Mobile Robotics

Manufacturing and Engineering Technology

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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**
	The individual needs to know and understand: • Principles and applications of safe working generally and in relation to manufacturing • 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 of team working and their applications • Personal skills, strengths and needs relative the roles, responsibilities and duties of others individually and collectively • The parameters within which activities need to be scheduled	
	The individual shall be able to: • Prepare and maintain a safe, tidy and efficient work area • Prepare self for the tasks in hand, including full regard to health and safety • Schedule work to maximize efficiency and minimize disruption • Take account of the rules and regulations in force for robotics technician/engineering • 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**
	The individual needs to know and understand: • The range and purposes of documentation and publications in both paper based and electronic forms • The technical language associated with the skill and technology • The standards required for routine and exception reporting in oral, written and electronic form • The required standards for communicating with clients, team members and others • The purposes and techniques for maintaining and presenting records, including financial records	

	The individual shall be able to: • Read, interpret and extract technical data and instructions from documentation in any available format • Use research for problem solving and continuing professional development • 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 • Explain complex technical principles and applications to non-Experts • 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 • Complete reports and respond to issues and questions arising	
3	**Design**	**15**

	The individual needs to know and understand:
	• The principles and applications of project design
	• The nature and formats of project specifications
	• The bases on which the manufactured item will be appraised
	• Design parameters can include the following:
	  • Options appraisal
	  • Selection of components, materials and work processes
	  • Prototype development
	  • Manufacture
	  • Assembly
	  • Refinement
	  • Commissioning
	• Principles and applications for:
	  • Designing, assembling and commissioning mobile robotics systems
	  • The components and functions of electrical and electronic systems
	  • The components and applications of add-ons
	  • The components and applications of mobile robotics systems
	• Principles and applications of design and assembly of mechanical, electrical and electronic systems, their standards and their documentation
	• Principles and methods for work organization, control and management in relation to the product	

	The individual shall be able to: • Analyse the briefs or specifications to identify the required performance characteristics of the mobile robot • Identify and resolve areas of uncertainty within the briefs or specifications • Identify the characteristics of the environment in which the mobile robot is required to operate • Identify hardware requirements to support the mobile robots' performance • Generate designs for the manufacture of a functioning item within given timescales • Generate designs for a tele-operation control system independent of the base unit • Develop strategies to solve mobile robotics tasks including navigation and orientation • Generate innovative solutions to design challenges • Identify and appraise options for selection, purchase and manufacture of materials, components and equipment • Record decisions on the basis of business principles and other essential factors such as health and safety • Prepare documentation for work management and control • Complete the design stage within given limits of purpose, cost and time	
4	**Prototyping**	**10**
	The individual needs to know and understand: • Basic principles of mechanical, electrical and electronics technician/engineering • Principles of fabrication and assembly • Principles and practices of safe manufacture and operation	
	The individual shall be able to: • Fabricate frame parts of the mobile robot • Integrate the structural and mechanical parts of the mobile robot • Integrate the electronic control circuits • Install, set up and make all necessary physical and software related adjustments required for effective use • Install, set up and make all necessary adjustments to the mechanical, electrical and sensor systems • Install, set up and make all necessary adjustments required for effective tele-operation of the mobile robot • Integrate sensors to gain control of the required tasks	

5	**Programming, testing, and adjustment**	**15**
	The individual needs to know and understand: • Manufacturers' control software • How to program using standard industrial software • How a software program relates to the action of machinery and systems • Principles and applications of wireless communications • Robot navigation by orientation and mapping • Sensor integration • Analytical techniques for fault finding • Techniques and options for making adjustments and repairs • Strategies for problem solving • Principles and techniques for generating creative and innovative solutions	
	The individual shall be able to: • Visualize the process and operation using software • Use the manufacturer provided control software to assert effective autonomous control over the manufacturer provided object management systems • Use industrial standard programming software to assert effective autonomous control over the robot's movement • Use tele-operation to assert effective control over systems • Implement programming methodologies to the control systems • Assert robot movement by implementing orientation and mapping capabilities • Implement a navigation strategy • Install and make physical settings adjustments to sensors • Install cameras on the robot and make appropriate adjustments • Test run individual applications and full functionality • Find and document faults using appropriate analytical techniques • Demonstrate basic IT knowledge • Repair or change components efficiently	
6	**Performance Review and Commissioning**	**40**
	The individual needs to know and understand: • Criteria and methods for testing equipment and systems • Criteria and methods for operating test runs • The scope and limits of the technologies and methods used • Strategies for thinking creatively and generating innovation • The possibilities and options for making incremental and/or radical changes	

	The individual shall be able to: • Test each part of the mobile robot against agreed operating criteria • Test the mobile robot's overall performance against agreed operating criteria • Optimize the operation of each part of the system, and the system as a whole, through analysis, problem solving and refinement • Undertake a final test run to commission the system • Review each part of the process of design, fabrication and assembly, and operation, against established criteria, including accuracy, consistency, time and cost • Ensure that all aspects of the design stage meet the required industry standards • Finalize and present a portfolio to the client, the portfolio to include all essential documentation required in a business transaction • Present the mobile robot and portfolio 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.**oneto**nline.org/)

Your competition appears to relate closely to *Robotics Technician*: https://www.onetonline.org/link/summary/17-3024.01

and *Robotics Engineering Technician*: http://data.europa.eu/esco/occupation/7833d5cd-873d-4fdd-b2f8-9762d68494a7

Adjacent occupations can also be explored through these links.