

**MODULE 1 – COLLABORATIVE ROBOTICS BASICS. MODULAR DESIGN & BEHAVIOUR  
(HKA/CETEM)**

Module 1: Importance of the following concepts

	Not important	Important	Very important	Strong
Robotics components		9	8	3
Automation technology and collaborative robots		1	10	9
Ability to read, understand and modify technical designs	3	4	6	6
Ability to quote different softwares suitable for the robot cell's task	2	6	8	4

Module 1: Level to which each skill or competence is developed by training programmes for workers in your field

	Not important	Important	Very important	Strong
Robotics components	2	6	8	3
Automation technology and collaborative robots	1	3	11	4
Ability to read, understand and modify technical designs	3	4	8	4
Ability to quote different softwares suitable for the robot cell's task	3	6	8	2

Module 1: Additional important concepts to consider

- Programming & Electronics
- Benefits of implementing collaborative robots
- Electric components and electro-pneumatics
- Machine learning

- Economic (added) value of improved robotic processes

Module 1: Please rank below the two most important concepts according to your opinion NOW.

	Most important	2 <sup>nd</sup> Most important
Robotics components	4	4
Automation technology and collaborative robots	8	6
Ability to read, understand and modify technical designs	5	5
Ability to quote different softwares suitable for the robot cell's task	1	4

Module 1: Please rank below the two most important concepts according to your opinion IN THE FUTURE.

	Most important	2 <sup>nd</sup> Most important
Robotics components	4	1
Automation technology and collaborative robots	5	6
Ability to read, understand and modify technical designs	5	7
Ability to quote different softwares suitable for the robot cell's task	4	4

Module 1: Please, identify jobs connected to this module in your company.

- Production, innovation department
- Software developer with robotics background
- Technician and R&D Project Development

- Project Development
- IT Responsible, COM (Chief Operational Manager)
- R&D Engineers (Collaborative Robotics)
- Engineering Department. Responsible for implementation, programming and maintenance.

## CONCLUSION

The results for M1 showed at first stage that skills related to technical design and different softwares were not the most important. Then, we could see at the second stage that these points were ranked as Most Important skills (Technical Design, 5) and second most important skill (Different softwares, 4, as well as Robotics components, 4). In this sense, we could ensure that all learning outcomes are of great relevance for this M1.

**MODULE 2 – SUSTAINABILITY & CIRCULAR CECONOMY IN MANUFACTURING  
SECTORS (ATMOTERM/CETEM)**

Module 2: Importance of the following concepts

	Not important	Important	Very important	Strong
Global standards for sustainability reporting		5	8	6
Environmental policy	1	5	6	6
Environmental management monitoring		4	5	10
Corporate social responsibility	1	2	7	9
Circular Economy processes and waste management processes		1	9	9

Module 2: Level to which each skill or competence is developed by training programmes for workers in your field

	Not important	Important	Very important	Strong
Global standards for sustainability reporting	1	3	9	6
Environmental policy		7	7	5
Environmental management monitoring	1	5	5	8
Corporate social responsibility		5	4	10
Circular Economy processes and waste management processes		5	5	9

Module 2: Additional important concepts to consider

- Collaborative Robots on Circular Economy; uses and benefits

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- Reverse logistics operations
- Health and care
- Sustainable development reporting

Module 2: Please rank below the two most important concepts according to your opinion NOW

	Most important	2 <sup>nd</sup> Most important
Global standards for sustainability reporting	4	1
Environmental policy	1	1
Environmental management monitoring	1	6
Corporate social responsibility	3	5
Circular Economy processes and waste management processes	8	3

Module 2: Please rank below the two most important concepts according to your opinion IN THE FUTURE

	Most important	2 <sup>nd</sup> Most important
Global standards for sustainability reporting	4	
Environmental policy	1	1
Environmental management monitoring	3	6
Corporate social responsibility	2	7
Circular Economy processes and waste	7	4

management  
processes

Module 2: Please identify the jobs connected to this module in your company

- Quality Department, Environmental Department
- Technician
- General Direction & Quality
- ESG Responsible
- Project Manager
- Sustainability Manager

## CONCLUSION

According to the first stage results; environmental policy and CSR were the only two rated as 'Non important'. Then, in the second stage that some respondents suggested these as the most important learning outcomes, and as CSR got 5 points while environmental policy just one. On the other side the importance of the concept of environmental policy and CSR were rated from the majority as very important or strong (12 votes responsible 16 votes). In this sense, we consider that having basic environmental policy and CSR knowledge would be a great resource for the learners.

**MODULE 3– LEAN ROBOTICS METHODOLOGY (CETEM/TUWIEN)**

Module 3: Importance of the following concepts.

	Not important	Important	Very important	Strong
Maintain control system for automate equipment		6	9	5
Monitor automated machines	1	5	10	4
Perform machine maintenance	1	4	10	5
Approve and adjust engineering design	1	9	10	

Module 3: Level to which each skill or competence is developed by training programmes for workers in your field

	Not important	Important	Very important	Strong
Maintain control system for automate equipment	1	4	12	2
Monitor automated machines	2	4	11	3
Perform machine maintenance	2	5	9	4
Approve and adjust engineering design	2	7	10	1

Module 3: Additional important concept to consider

None

Module 3: Please rank below the two most important concepts according to your opinion NOW

	Most important	2 <sup>nd</sup> Most important
Maintain control system	10	3

for automate equipment		
Monitor automated machines	3	5
Perform machine maintenance	4	7
Approve and adjust engineering design	2	4

Module 3: Please rank below the two most important concepts according to your opinion IN THE FUTURE

	Most important	2 <sup>nd</sup> Most important
Maintain control system for automate equipment	8	4
Monitor automated machines	5	5
Perform machine maintenance	4	5
Approve and adjust engineering design	2	5

Module 3: Please, identify the jobs connected to this module in your company

- Production, Innovation Department
- Head of Robotics Department
- Production Management
- COO (Chief Operational Officer)
- Researchers and consultants

## CONCLUSION

For this M3 we are pretty sure that all Learning Outcomes are of great relevance. As we could see, almost all outcomes have had one 'Non important' vote, while all of them also have points for 'Most Important' (Maintain control systems) and '2<sup>nd</sup> Most Important' (Triple draw which shows the level of relevance and equality)



**MODULE 4– CIRCULAR BUSINESS MODELS FOR WASTE MANAGEMENT  
(DEUSTO/TUWIEN)**

Module 4: Importance of the following concepts

	Not important	Important	Very important	Strong
Concept of circular business models		3	7	9
Value creation mechanism in circular business model innovation		3	7	9
Circular economy strategies		3	6	10

Module 4: Level to which each skill or competence is developed by training programmes for workers in your field

	Not important	Important	Very important	Strong
Concept of circular business models	1	2	8	8
Value creation mechanism in circular business model innovation	1	2	9	7
Circular economy strategies		3	10	6

Module 4: Additional important concepts to consider

- Cost Model of CE Approach

Module 4: Please rank below the two most important concepts according to your opinion NOW

	Most important	2 <sup>nd</sup> most Important
Concept of circular business models	3	2

Value creation mechanism in circular business model innovation	7	4
Circular economy strategies	6	11

Module 4: Please rank below the two most important concepts according to your opinion IN THE FUTURE

	Most important	2 <sup>nd</sup> most Important
Concept of circular business models	4	2
Value creation mechanism in circular business model innovation	7	5
Circular economy strategies	5	9

Module 4: Please, identify the jobs connected to this module in your company

- Quality Department, Environmental Department
- General Direction
- CEO, CFO
- Researchers and consultants

## CONCLUSION

Module 4 has very relevant outcomes concerning Circular Economy and Business Models Innovation. In this sense, the most important outcomes now were considered value creation mechanisms and circular economy strategies, which highlights the interest from the wide public to know in-depth how to start performing circular business models.

This module's items have the highest scores from the importance perspective. Points 2 and 3 have been considered of great importance both today and in the future. Point 1 has a lower score but it should not be ruled out because it sets the basis for the other points. It should be stressed that both points are related to

practical issues. Point 4 custom, in particular, cost model of CE approach, can be clearly connected to module 2, point 5.

**MODULE 5– CIRCULAR STRATEGY MAPING & VALUE NETWORKS FOR WASTE  
MANAGEMENT (TUWIEN/DEUSTO)**

Module 5: Importance of the following concepts

	Not important	Important	Very important	Strong
Characteristics of Waste		6	9	4
Business management principles		2	10	7

Module 5: Level to which each skill or competence is developed by training programmes for workers in your field

	Not important	Important	Very important	Strong
Characteristics of Waste	1	6	8	4
Business management principles		4	10	5

Module 5: Please rank below the two most important concepts according to your opinion NOW

	Most important	2 <sup>nd</sup> most important
Characteristics of Waste	1	14
Business management principles	14	2

Module 5: Please rank below the two most important concepts according to your opinion IN THE FUTURE

	Most important	2 <sup>nd</sup> most important
Characteristics of Waste	1	15
Business management principles	15	1

Module 5: Please, identify the jobs connected to this module in your company

- Marketing and Business Department
- Researchers and Consultants

## CONCLUSION

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For M5, the analysis is not complex. We have clear definition that business management principles are the most important outcomes while characteristics of waste is the second one. This shows the great interest on how to start performing circular models rather than to know their waste characteristics. The explanation could be that, companies know their waste but they do not know how to manage to extract value from it.

Point 2 receives the highest score but point 1 is clearly connected to it and we consider that to characterize waste is a previous step to define business management principles.

**MODULE 6– PRODUCT DEPLOYMENT CYCLE & ECODESIGN (CETEM/TUWIEN)**

Module 6: Importance of the following concepts

	Not important	Important	Very important	Strong
<b>Socio-economic trends in the sector</b>		7	8	5
<b>Market research</b>		4	7	9
<b>Product life cycle</b>	1	3	9	7
<b>Product comprehension</b>		5	12	3

Module 6: Level to which each skill or competence is developed by training programmes for workers in your field

	Not important	Important	Very important	Strong
<b>Socio-economic trends in the sector</b>	1	5	7	7
<b>Market research</b>	1	6	7	7
<b>Product life cycle</b>	1	4	8	7
<b>Product comprehension</b>		8	8	4

Module 6: Additional important concepts to consider

- Case studies with useful examples

Module 6: Please rank below the two most important concepts according to your opinion NOW

	Most important	2nd most Important
<b>Socio-economic trends in the sector</b>	4	4
<b>Market research</b>	6	6
<b>Product life cycle</b>	6	6
<b>Product comprehension</b>	3	2

Module 6: Please rank below the two most important concepts according to your opinion IN THE FUTURE

	Most important	2nd most Important
<b>Socio-economic trends in the sector</b>	4	4
<b>Market research</b>	5	4
<b>Product life cycle</b>	5	7
<b>Product comprehension</b>	4	3

Module 6: Please, identify the jobs connected to this module in your company

- Quality department, Environmental Department
- Consultants and Researchers

## CONCLUSION

M6 shows that Market research and Product life cycle are both the most and second most relevant learning outcomes for this Module. In this sense, market research could enable companies to access to better materials or renewal materials even recycled materials for performing industrial symbiosis. Then, concerning the product life cycle it will help to ensure sustainability by providing a longer life cycle and design proper to disassembly and recycle the product when necessary.