CROCEMS

TRAINING CONTENT

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0.- Collaborative robotics supporting Circular Economy

- Circular Economy + Sustainability Definition (''Introduction to Circular Economy and Sustainability'')
- Definition collaborative industrial robots (''Introduction to Collaborative Robotics'')
- Collaborative robotics supporting Circular Economy (CRSCE) strategies general
- Collaborative Robotics and Circular Product Design
- From Lean to Circular Processes
- Environmental Issues and Challenges

1.- Collaborative Robotics Basics (Modular Design and Behavior)

Robotics components

- Definition and classification of (collaborative) industrial robots
- Components of a robotic system (Controller, Panel, joints, Links, 6-axis, 7-axis, frames)
- Special features of Collaborative Robots
- Human Robot Collaboration
- Collaborative Robots models

Automation technology and collaborative robots

- Automated Item picking
- Quality control
- Handling process
- Logistic applications
- Assembly

Gripping technologies

- Gripping principles
- Drive type, Opening reserve, gripping reserve and total stroke
- Gripper types
- Construction of a mechanical gripper and gripping strategies and process
- How to choose the correct gripping system and gripper models

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Safety aspects

- Standards
- Safety measures (inherent and external)
- Kinds of safety sensors
- Safety principles in HRC
- Risk assessment

Ability to read, understand and modify technical designs

- Implementation principles and workplace layout
- Integration fo collaborative robot to assesmbly line and assembly line blancing
- Configuration and reconfiguration of assembly line

Ability to quote different softwares suitable for the robot cell's task

- Programming methods
- Movement types
- Drag&Drop softwares
- Programming in XR
- Simulation

2.- Sustainability & Circular Economy in Manufacturing Sectors

Introduction into Standards and Regulation on Circular Economy and Sustainability

- Circular Economy and Sustainability
- The Evolution of the term Circular Economy and Sustainability: Historical and Theoretical Perspectives (Intr)
- Legislative frame on European level
- Standards on Circular Economy and Sustainability
- Economic, Environmental, and Social Benefits of CE
- Circular Economy in Manufacturing Sectors - Challenge or Possibility

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Circular Economy processes and waste management processes

- Circular Economy Strategies
- Collaborative robotics supporting Circular Economy (CRSCE) strategies general
- CRSCE through sorting and dismantling
- CRSCE through remanufacturing and reuse
- CRSCE through recycling

Environmental management monitoring for CRSCE

- Principles of Environmental Monitoring
- Environmental Monitoring Technologies
- Data Collection and Analysis
- Environmental Risk Assessment and Management

Best Practices of CRSCE

- Circular Economy
- Environmental Responsibility
- Social Entrepreneurship
- Corporate Governance

3.- Lean Robotics Methodology

Maintain control system for automated equipment

- Introduction to Lean
- Principles of Lean - Lean supporting CE
- Deployment
- Preparation
- Design

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Monitor automated machines

- Integrate
- Operate
- Reduce waste

Perform machine maintenance

- Risk assessment
- Monitor performance
- Bad system design practices
- Standardize

Approve and adjust engineering design

- Manual task map and layout
- Robotics task map and layout
- Manual-Robotic comparison
- Finalize robotic cell design

4.- Circular Business Models for Waste Management

The concept of (circular) business model

- Understanding Business Models: From Linear to circular business models & the business model canvas
- Business model innovation process: Ideation, Integration; Validation; Implementation
- Economic opportunities and financial implications of circular business model

The value creation mechanisms in circular business model innovation

- Importance of Circular business models in the current economy
- Value creation mechanisms in circular business models
- Innovation in circular business models
- Strategy for implementing circular business models
- Case Studies

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Circular Economy Strategies

- Circular Business strategies according to the value hill and the resource flow
- Tools for creating a Circular Business Model
- Best practice examples for circular business models in waste management

5.- Circular Strategy Mapping & Value Networks for Waste Management

Characteristics of waste

- Waste management and reverse logistics
- Priority waste streams
- EU Waste Legislation – Module 2?
- Integrated Management Systems and Deposit Return Systems - Business model Modul 4?
- Recycling processes. Positive effects and limitations

Business management principles

- Stakeholder Management
- Systems Thinking and Sustainability
- Value Chain Analysis
- Performance Measurement and Evaluation

6.- Product Development Cycle & Ecodesign

Socio-economic trends in the sector

- Sustainable Production and Consumption (I4.0)
- Clean technologies production
- Ethical production

Market research

- Marketing and user-centred approaches
- Circularity status in the Manufacturing sector
- Sector analysis, challenges, opportunities and barriers/threats

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- Transition instruments and case studies

Product life cycle

- Circular/Ecodesign fundamentals
- Product life cycle thinking
- Product development process
- CE Design guidelines - CE Designer
- Design for collaborative robotics (design for automated repair, disassembly, remanufacturing)

Product comprehension

- Circular products to market
- Circular customer value creation
- New customer habits and circular consumption practices

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