Internal documentation for evaluators

MISCE project

Mechatronics for Improving and Standardizing Competences in Engineering

Document: WP2 report

Result of the competencies evaluation

SCOPE

The objective of this brief document is to present the results of the competency evaluation carried out by professionals from the industrial sector:

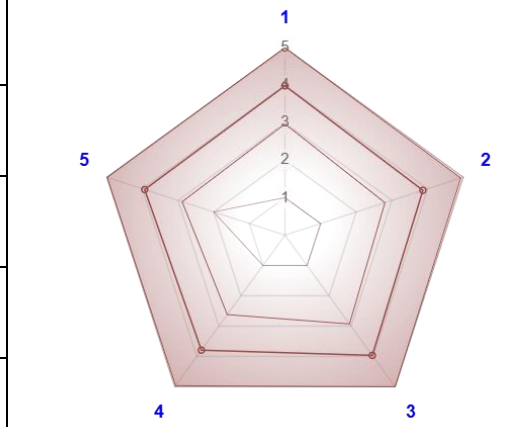
- 20 competencies evaluated.
- 100 skills evaluated.
- For 50 professionals.

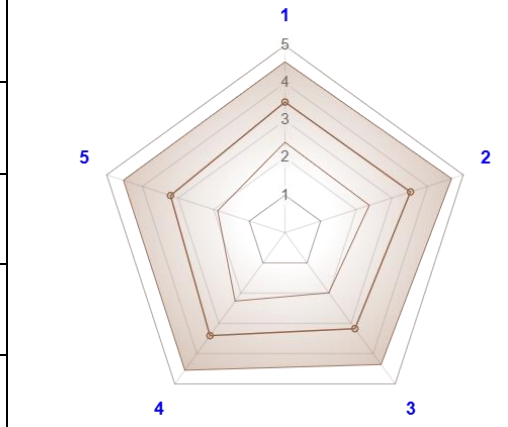
Table I summarizes the results obtained which are also shown on the website of the project[1].

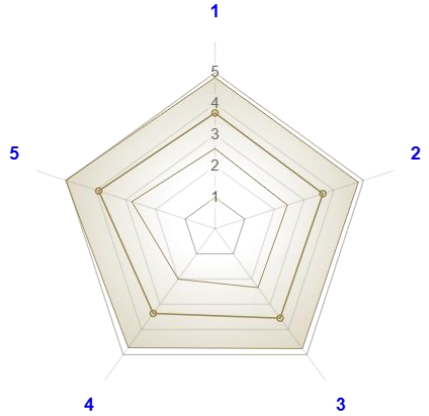
These results were used to determine which platform would be designed and prototyped during the project.

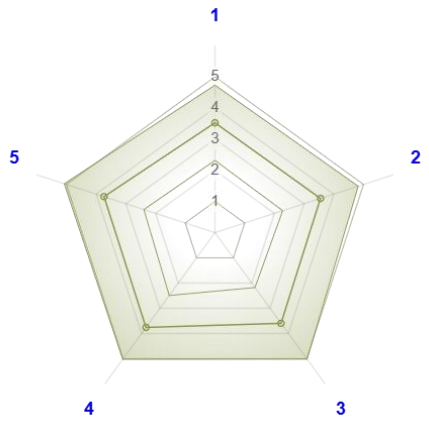
[1] https://uclm-mantis.github.io/misce/assessment/

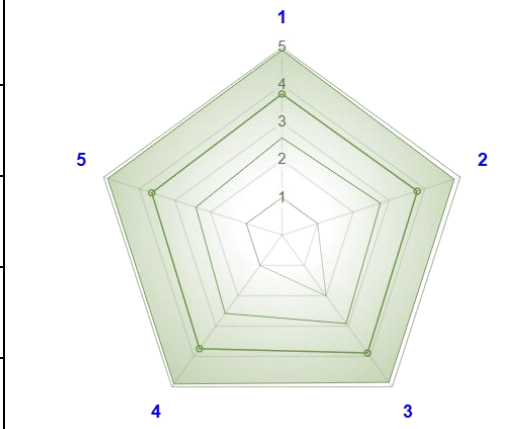
Table I. Result of the competencies evaluation

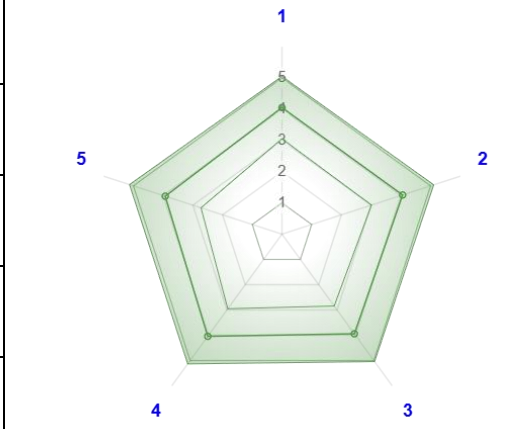
Control engineering		
Understanding the static and dynamic responses of a system		
Proficiency in implementing/utilizing PID-type controllers		
Tuning various controller parameters		
Identifying unknown systems		
Enhancing the dynamic responses of controlled systems		

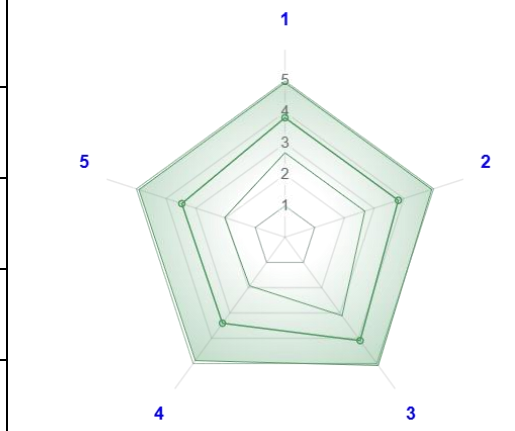
Working with machinery and specialised equipment		
To identify the main funciontal components of equipment		
To understand the functional behaviour of the machinery and equipments		
To design/modify different components of the system		
To know the security rules of the machinery		
To apply the proper maintenance of the machinery		

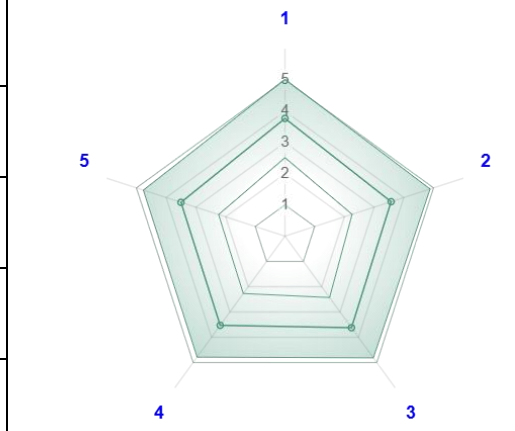
Using precision instrumentation and equipment		
To know the main paremeters of the measument instruments		
To know how to configure/setup the instruments		
To know how to calibrate the equipment		
To maintenance the precision instrumentation and equipment		
To be able to interprete the obtained measurement		

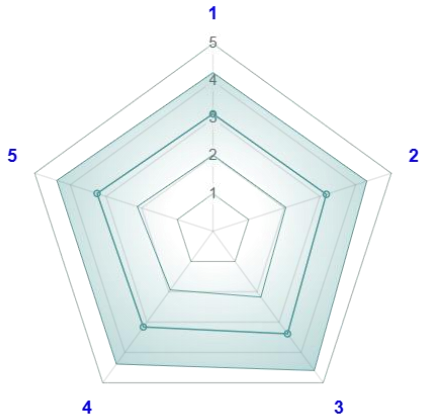
Management skills		
To manage the human resources communication		
To schedule the time planning of the production and the budget planning		
To ensure a proper communication channel between different roles		
To coordinate the available resources		
To manage the conflicts and solve the problems		

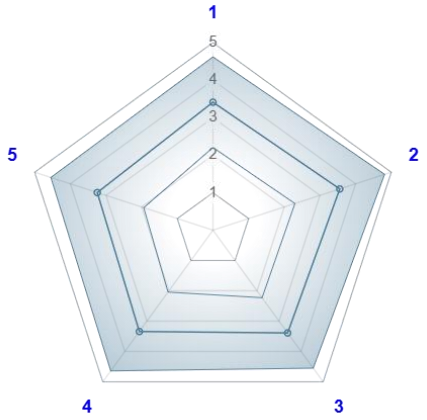
Mechanical engineering		
To know the main mechanical element of a device		
To be able to solve and understand the kinematics and dynamics behaviur		
To know the material properties of the different funcional element of the machine		
To know how to integrate the mechanical parts with other main system		
To design/modify different components of the system		

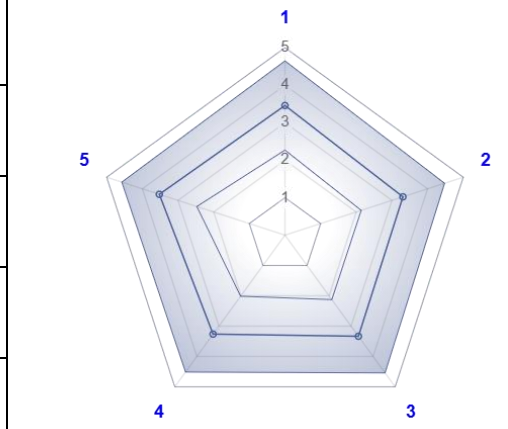
Automation technology		
To know the main electric/pneumatic and hydraulics elements		
To be able to design the functional behavior of the system		
To be able to undertstand the technical documentation of a project/product		
To program the functional behavior of the device		
To debug the final planned behaviour of the system		

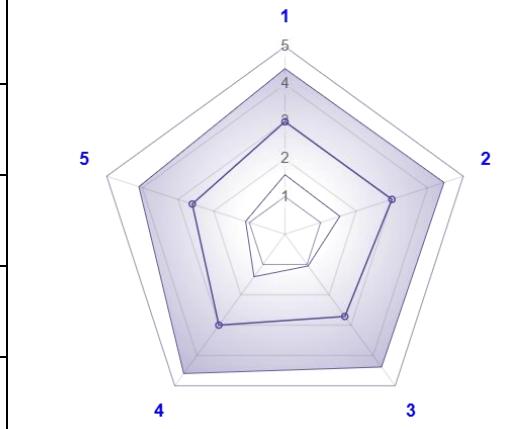
Robotics		
To know the different robotic architectures and their main features/applications		
To understand the main parameters of robotics system		
To understand the inverse kinematic and robot trajectories		
To be able to programm the robot behaviur		
To know security rules to a safety operation		

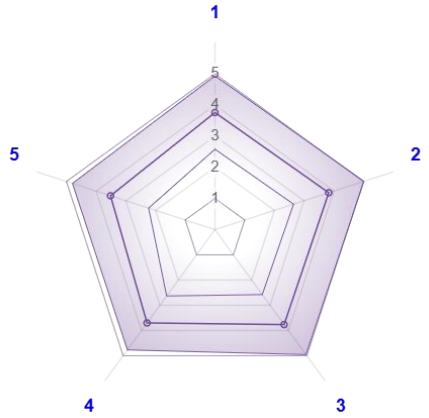
Material mechanics		
To know the main mechanical properties of the materials		
To know the correct application of materials		
To know the procedures the analyse the material properties		
To know the different manufacturing and surface treatment techniques		
To know the response of the materials to different static, dynamic and cycling loads		

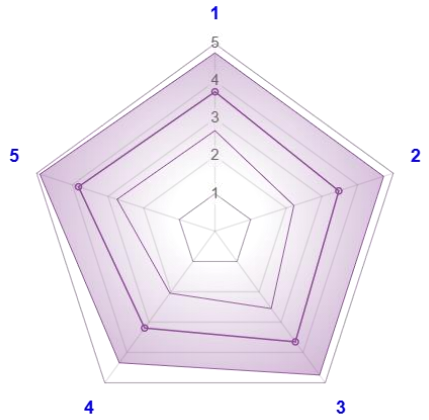
Computer engineering		
To know the main parameters of current computer architectures		
To be able to characterize and evaluate computer performance for a given application		
To understand optimization techniques of current computer architectures		
To understand the implications of application binary interface in software development		
To understand communication issues in computer architectures		

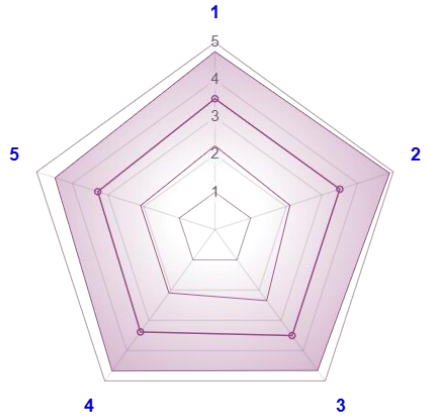
Computer programming		
To be able to use proper data structures		
To be able to develop programs to solve engineering problems		
To be able to characterize the performance of programs		
To be able to debug faulty programs		
To be able to optimize programs		

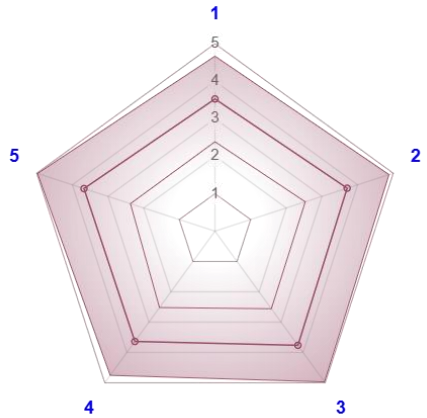
Mechatronics		
To develop an integral design of a mechatronics device		
To design the mechanical/electro-electronics part of the device		
To integrate and program the system behavior		
To design the calibration/maintenance procedures of the device		
To validate the final product/process		

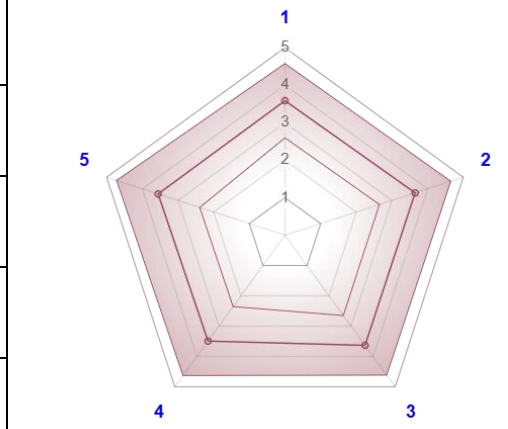
Database and network design and administration		
To develop an integral design of databases and networks		
To design databases and networks		
To know how to ensure the security of databases and networks		
To know how to protect the critical data		
To validate the final databases and network architecture		

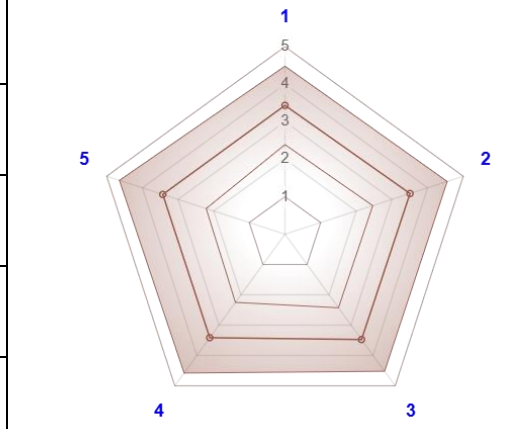
Programmable logic controller		
To know the basics architecture of PLC		
To know how to manage Digital IO		
To know how to manage Analog IO		
To know how to implement the complete functional behaviour of a system		
To integrate PLC into an industrial network		

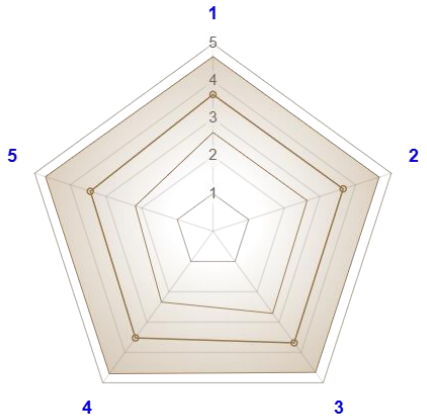
Mechanical systems		
To understand the different energy conversion process to produce movement		
To know to design mechanical system		
To know the different movement transmissions		
To be able to analyse and optimise a mechanical device		
To know the force and torque involved in mechanical systems		

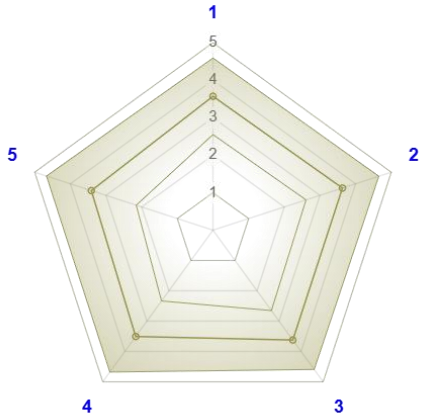
Set up machine controls		
To know the main security rules involved in the machine installation		
To ensure the proper installation process of the machinery		
To know the main functional components of the machine		
To understand the supply requirements for the machine set up		
To be able to modify the set up of the machinery		

CAD software		
To properly select the CAD software according to their main features and the project requirements		
To be able to interprete technical drawings		
To have the basic knowledge necessary to recreate the geometry of machine elements and its modification		
To know how to efficiently use the CAD program to create parametric 2D and 3D technical drawings		
To know how to use CAD systems to design a simple device or mechatronic system according to the given specification		

Communication systems		
To understand the principles of analogue and digital communication		
To design and analyse transmission and reception systems		
To evaluate the performance of modulation and coding schemes		
To apply signal processing techniques for communication systems		
To integrate wireless and wired communication subsystems		

Computer science		
To understand fundamental algorithms and data structures		
To apply computational complexity analysis		
To design efficient software architectures and paradigms		
To understand operating systems and distributed computing concepts		
To apply artificial intelligence and machine learning techniques		

Electronic engineering		
To design and analyse analogue and digital electronic circuits		
To understand semiconductor device behaviour and applications		
To implement and test microcontroller-based systems		
To select and integrate sensors and actuators in electronic designs		
To apply PCB design and signal integrity principles		

Digital technology		
To understand digital logic design and Boolean algebra		
To design systems using programmable logic (FPGA, CPLD)		
To apply embedded systems and IoT concepts		
To evaluate data acquisition and digital signal conversion methods		
To implement secure and reliable digital communication interfaces		