

Preliminary Design Review

MISCE project

Mechatronics for Improving and Standardizing Competences in Engineering



Competence: CAD software

Workgroup: RzuT UNICA, UCLM, UNICAS



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This document is the Preliminary Design Review of the technical competence 'CAD software'. Its briefly contains the experimental platform analysed in MISCE project, to be designed and standardised for improving the acquisition level of this competence on engineering degrees.

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Visit <https://misceproject.eu/> for more information.



Index of contents

1	Competence and skills	2
2	Experimental proposals	2
2.1	Exercise 1 – basic modelling tools, CAD software comparison	2
2.2	Exercise 2 – a design proposal for a simple mechatronic device	3
3	Competence and skills analyses	4
	References	6

Index of figures

Fig. 1.	Selected systems: a) SolidWorks, b) Catia, c) Siemens NX, d) Inventor.....	2
Fig. 2.	Example model to be made in exercise 1.....	3
Fig. 3.	Example model to be made in exercise 2.....	3

Index of tables

Table I.	Skills of CAD software	2
Table II.	Contribution of each proposed exercises to CAD software competence and its corresponding skills	4

1 Competence and skills

The conceptual design presented in this document is referred to the technical competence:

C16. CAD software

which related skills are (see Table I):

Table I. Skills of CAD software

S16.1.	To properly select the CAD software according to their main features and the project requirements
S16.2.	To be able to interpret technical drawings
S16.3.	To have the basic knowledge necessary to recreate the geometry of machine elements and its modification
S16.4.	To know how to efficiently use the CAD program to create parametric 2D and 3D technical drawings
S16.5.	To know how to use CAD systems to design a simple device or mechatronic system according to the given specification

The different conceptual designs presented in this document have been analysed to ensure that can improve the acquisition level of the aforementioned competence.

2 Experimental proposals

2.1 Exercise 1 – basic modelling tools, CAD software comparison

The educational exercise introduces students to CAD environments. Example programs were chosen. The ability to use different programs will make it easier for students to make choices in the future. The student as a future employee will have a wider range of company choices. The selected systems: SolidWorks, Catia, Siemens NX, and Inventor are presented below (Fig. 1). Examples of performing specific tasks are presented in exercise instructions for students. Students can choose any program and should perform similar exercises.

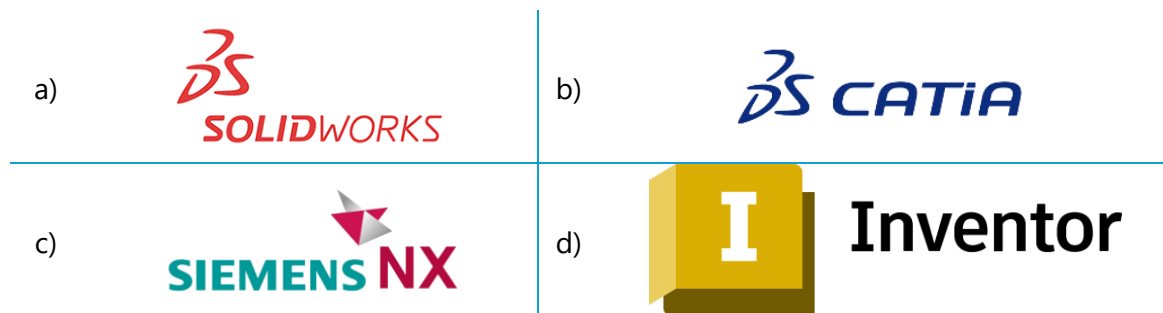


Fig. 1. Selected systems: a) SolidWorks, b) Catia, c) Siemens NX, d) Inventor

The student should create an CAD model and engineering drawing using solid modeling tools. An example of the shape of the part is shown in Figure 2.

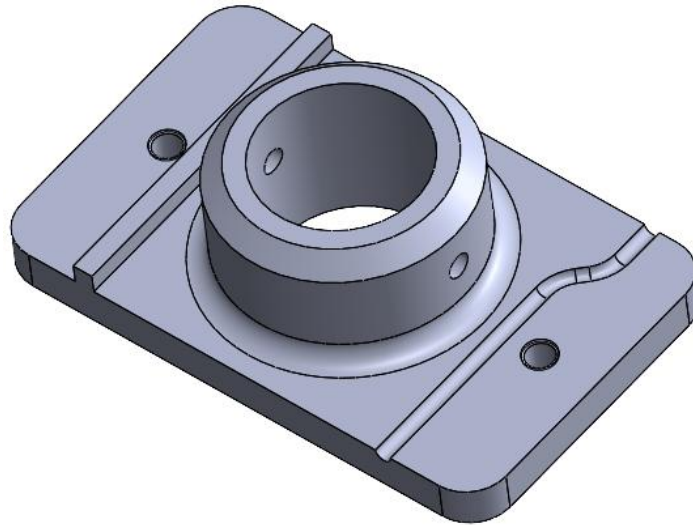


Fig. 2. Example model to be made in exercise 1

The method of making the model and the functions used are presented in the exercise instructions for students. The student model does not have to be exactly as shown in the example, but the features of the proposed program should be used.

2.2 Exercise 2 – a design proposal for a simple mechatronic device

The second exercise introduces the student to making assemblies and parametric modeling issues. The exercise shows a plate simulating a valve system.

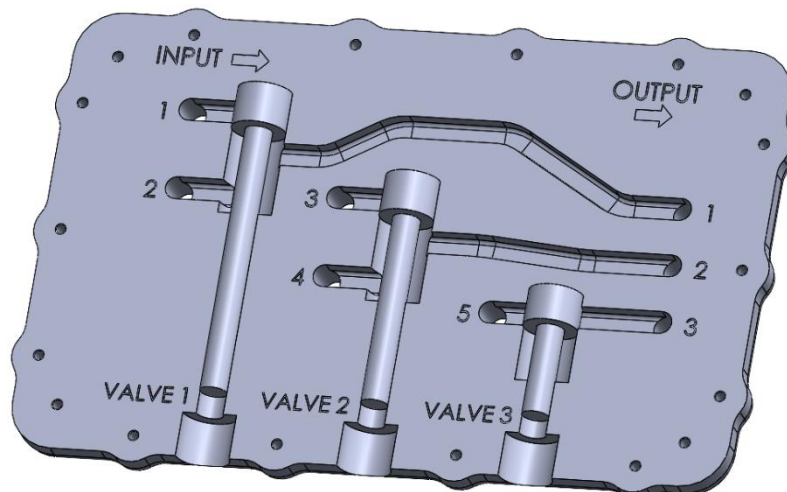


Fig. 3. Example model to be made in exercise 2

A student, knowing the basic tools of solid modeling, should create his own model of parts and assembly or use an example. In the "exercise instructions for students" ways of parametric modeling were presented.



3 Competence and skills analyses

Table II summarises the competence and skills analyses of the proposed exercises attending to the contribution of acquisition of the technical competence 'CAD software' and their corresponding skills in Table I.

Table II. Contribution of each proposed exercises to CAD software competence and its corresponding skills

Platform	S16.1	S16.2	S16.3	S16.4	S16.5	Overall competence contribution
Basic modelling tools, CAD software comparison	★★★★★	★★★★★	★★★★★	★★★★☆☆	★★★★☆☆	★★★★☆ 4.4
	Comparing different programs makes it easier to choose the best one for the student	Making the technical drawing yourself will make it easier to understand it	Making a CAD model yourself will make it easier to understand ways to recreate the geometry of machine elements	Sketch constraints and dimension relationships make CAD part modeling easier	Element models are parts of device assemblies	
A design proposal for a simple mechatronic device	★★★★☆☆	★★★★☆☆	★★★★★	★★★★★	★★★★★	★★★★☆ 4.2
	Completing the exercise in the chosen program will enhance the student's skills	Completing the exercise will improve the student's understanding of technical drawing	Completing the exercise will increase the student's competence in recreating and modifying a solid based on an existing example in a selected CAD program.	The exercise includes parametric modeling of selected elements of the solid	The exercise used a model that simulates a mechatronic system	



Competencies acquired by the students during the CAD software exercises.

CAD software exercises enable students to acquire various competencies related to mechanics and mechatronic systems. Below is an analysis of how the described experiment allows students to gain the competencies listed in Table II.

S16.1. To properly select the CAD software according to their main features and the project requirements

Examples of CAD programs and how they function are presented. Students are given information about the possibility of choosing any of them. Students should select the CAD software according to their desired features and the project requirements.

S16.2. To be able to interpret technical drawings

Students will learn to make and interpret technical drawings by analyzing model examples and selecting the appropriate body features.

S16.3. To have the basic knowledge necessary to recreate the geometry of machine elements and its modification

The exercise provides knowledge about making, recreating, and modifying CAD models of machine elements. Students use basic solid modeling tools. Students will study how different features affect the make-body process.

S16.4. To know how to efficiently use the CAD program to create parametric 2D and 3D technical drawings

Students will analyze and optimize the existing model by selecting and modifying the appropriate initial parameters and controlling the required geometry of the body. Additionally, they will introduce individual parameterized.

S16.5. To know how to use CAD systems to design a simple device or mechatronic system according to the given specification

During the exercise, students will be able to build a mechatronic assembly based on the models prepared.



References

1. https://akpp.pl/remontg6T30E_PL
2. https://akpp.pl/remontgJF010E_PL
3. <https://maktrans.net/GBNR-6R-6L2P>
4. https://akpp.pl/remontgJF011E_PL