Digital Factory for Individualized Mass Products

Already today, mass products can be individualized. The customers can specify their product via internet and control the production by a cloud application. This module gives an introduction into the production of an individualized mass product.

At the end of the successfully completed modules (I-V), the students should have understood and implemented the digitized processes in the production of an individualized mass-produced product. Here, the example "Labeling of a ruler (see figures)" or "Shape design of a spinner" as a project task can be exemplified.

Sequences

Scenario means a narrative scenario which is presented in an authentic situation.

Tasks means the development of the concrete tasks, the work plan, (international) division of work, ways of collaboration.

Problem solving means a multidisciplinary or multinational problem solving, implementation of the tasks.

Assessment means an assessment of training success.

Reflection and evaluation means a meta-cognitive self-reflection and evaluation of the learning process.

Content / Material

Scenario

The following film ([Mobile Bottle](#)) will introduce you to the idea of a customer-oriented, parameterized mass-produced product.

Here you can recognize that the different expertise must be present in order to be able to map the entire process chain.

You will need to familiarize yourself with the following skills, if not already available:

- handling a CD-CAD software,

- programming CNC programs,

- Data transfer and handling of rapid prototyping as well

- The transfer of CAD data to a CAM software.

The following eLearning platform is modularly built. (see Hand Out).

Module 1: Product Development

Module 2: Production

Module 3: Production Data Processing

Module 4: Rapid Prototyping

Module 5: CAM / CAx system

You will find tasks, support tutorials and solutions for each module. They are available in various forms (PDF data, PPT data, videos, CAD data, CNC data, etc.). The order is freely selectable, whereby for modules 4 and 5 the expertise of module 1 and 2 must be present.

We wish you much success.

Tasks

Here you will find all the tasks for the different learning modules.

The files are organized as follows:

[Category] _ [module number] _ [Task / Description]

Example:

Task_Moule_1_3

Information_Modul_1_Drawing

The order in which you edit the tasks you can determine yourself. Make sure that different and / or similar expertise is used in each assignment

Problem Solving

With the help of the various solution materials (tutorials, videos, PDF files, ...) the student can independently work on and review the given task.

Here you will find various links and/or PowerPoint presentations for support:

Modul I: Product development
Solid Edge
https://solidedge.siemens.com/en/solutions/users/students/cad-tutorials/

Inventor
https://knowledge.autodesk.com/support/inventor-products/getting-started/caas/CloudHelp/cloudhelp/2019/ENU/Inventor-Tutorial/files/GUID-25E3BABE-0FF4-4542-854E-AD2F59E4BB4A-htm.html

Solidworks
https://www.solidworks.com/sw/resources/solidworks-tutorials.htm

Modul II: Produktion

CNC Haidenhein

http://www.helmancnc.com/heidenhain/

Siemens

https://www.industry.siemens.com/topics/global/en/cnc4you/pages/videos-tutorials.aspx

Modul III: Production Data Processing

Use the PowerPoint presentation for this module.

Modull IV: Rapid Prototyping

Use the PowerPoint presentation for this module.

http://www.710films.com/TutorialsTips/CG/RapidPrototyping/Chapter1/Chapter1.html

Modul V: CAM/CAx Systems

NX-CAM

https://community.plm.automation.siemens.com/t5/News-NX-Manufacturing/NX-CAM-Software-Self-Study-Tutorials/ba-p/338

https://youtu.be/33_mgQN1nAo

https://youtu.be/0rIQK48LlWc

https://youtu.be/6ddIpprBdC0

Assessment

With the help of the suggested solutions, you can check their results and complete them if necessary. The given solutions are to be regarded as a proposed solution. Of course, there are several ways to work on different tasks and develop an adequate solution.

Please use the following documents (PDF files, videos, CNC programs, CAD data, CAM data, etc.) to compare their solution. These files are organized as follows:

[Category] _ [module number] _ [Task / Description]

Example:

Solver_Moule_1_3

We wish you much success

Reflection and evaluation

Please use the 10 questionnaire for evaluation of the modules. This self-assessment gives you the opportunity to name your strengths and gaps in knowledge concretely. Use the results to intensify the processing of individual modules.

10 Questions (self-reflection)
Questions for an evaluation

How to use it

Scenario

On the basis of the videos (MobileBottle)) the students should be presented the problem of customer-oriented parameterization of mass products. In doing so, the student recognizes that various specialist skills

- Handling a CAD software,
- programming CNC programs,
- Data transfer and handling of rapid prototyping as well
- The transfer of CAD data to a CAM software

needed to solve this task.

The data transfer within the process chain is very important here. The MobielBuottel product is just one of many ways to parametrize a mass-produced product in a customer-oriented manner. Important is the modular design

- Module 1: Product Development
- Module 2: Production
- Module 3: Production Data Processing
- Module 4: Rapid Prototyping
- Module 5: CAM / CAx system

to learn the different skills well.

File: MobileBottle.avi

General Task Description

Discuss with students about a product that can be customized using geometric variables. The students then make a drawing / sketch. To be clear about which dimensions this product should have.

Subsequently, the product should be constructed using a CAD system. Following this, the parameters are set, the variables master the product can be customized. In the next phase, students should define these arameters on their own product and create a link to an Excel spreadsheet. About this Excel table should now be controlled various characteristics. The customer can decide which parameters correspond to his needs.

By way of example, the various products are also to be produced as prototypes in the 3-D printing process. Subsequently, the necessary manufacturing parameters are set to produce the mass product. The existing 3D data can then be transferred to a CNC system. There, the defined production parameters are added and the CNC programs created. After a postprocessor run, the programs are transferred to the machine and the necessary documents, such as tool plan and setup plan, are made available in the network. These programs can then be processed on site.

Subsequently, the data transfer (data formats) is represented by means of a workflow and a suitable data management is discussed and created.

In addition, the video (mass product MobilBottle) can be used for better understanding the parameterization and data transfer.

Problem Solving

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https://knowledge.autodesk.com/support/inventor-products/getting-started/caas/CloudHelp/cloudhelp/2019/ENU/Inventor-Tutorial/files/GUID-25E3BABE-0FF4-4542-854E-AD2F59E4BB4A-htm.html

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https://www.solidworks.com/sw/resources/solidworks-tutorials.htm

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Modul V: CAM/CAx Systems

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https://yout

Assessment

Generating data for the 3d printer in ".stl" format. Transfer the data to the 3D printer and generate the prototype. Derive and print drawings Benefit of the internal simulation of the CNC program.

Reflection and evaluation

With the help of the various solution materials (tutorials, videos, PDF files, ...) the student can independently work on and review the given task.

In addition, the student can reflect and evaluate the various modules passed through using a self-assessment (10 Questions for self-reflections) Microsoft FORMS. The goal is to put a clear focus on skills and knowledge gaps. Thus, the student has the opportunity to perceive his acquired competences and secondly close the perceived knowledge gaps. One of many ways is to do it with the help of a questionnaire. This can be done digitally (e.g., Forms) or, of course, quite analogously. The evaluation is exclusively for the student. In addition, the evaluation can of course also be carried out within a group. Then the use of a digital survey makes more sense, because a very fast evaluation can be created (for example FORMS).

Files:

- 10 Questions for Self-Reflection
- Screen Shoots from FORMS

Tutorial: How to use Forms:

https://www.youtube.com/watch?v=-OzDE6XE0T4