

This action based training was developed
within the Leonardo Da Vinci Transfer of Innovation Project

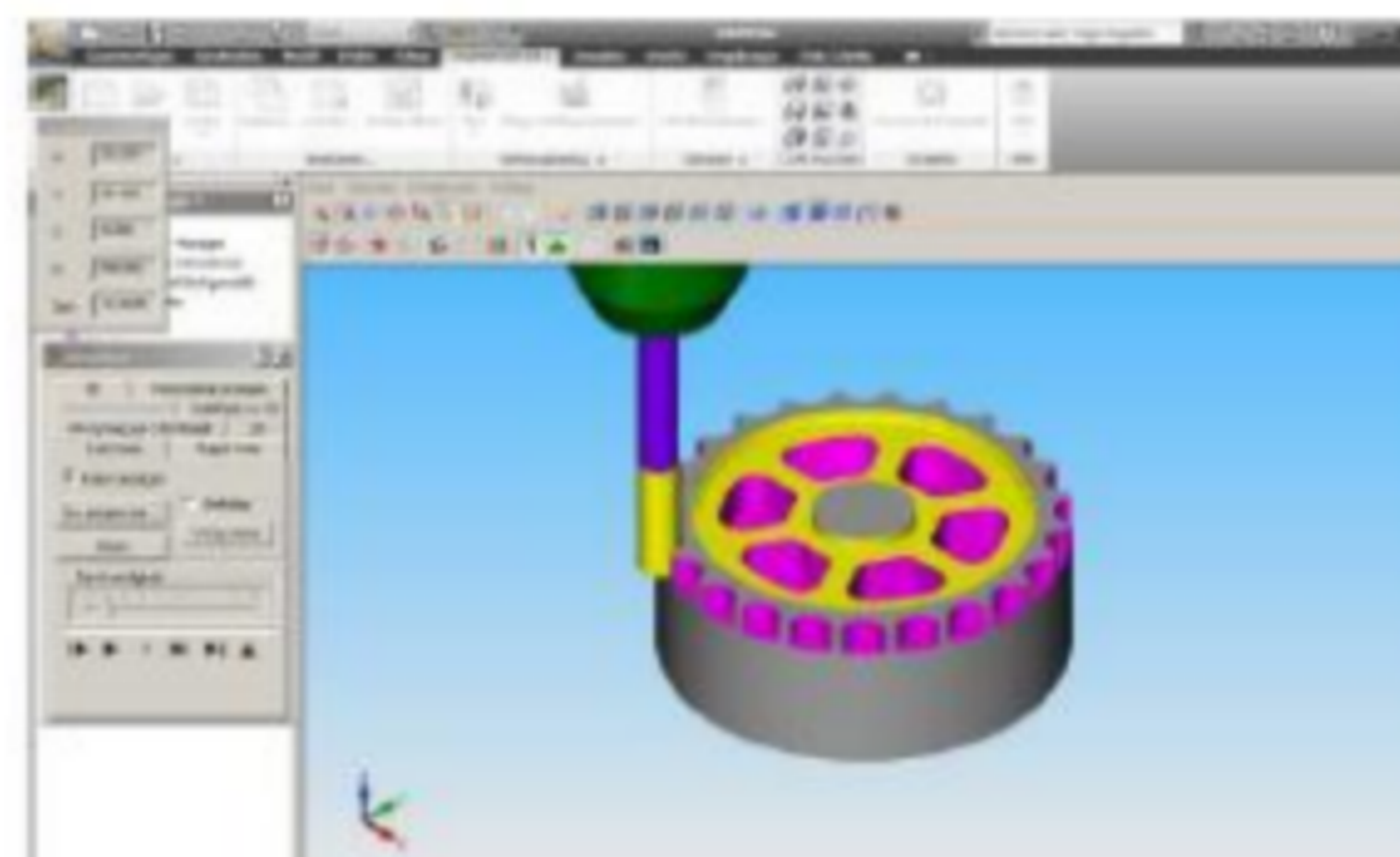
MOVET II

“MODULES FOR VOCATIONAL EDUCATION AND TRAINING
FOR COMPETENCES IN EUROPA”

(PROJECT NUMBER DE/10/LLP-LdV/TOI/147341)

Module CAD/CAM

The aim of the training is to enable the students to develop skills, knowledge and competences according to the competence areas 4.2, 4.3 and 5.4 in the Competence matrix for mechanics in industry.



2. Competence matrix for mechanics in industry – MOVET II

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No	Competence Area						
1	Maintaining tools, equipment and technical systems	1.1 He/ She can perform the basic scheduled maintenance on tools and equipment. (e.g. checking the quality of used cooling liquids, checking the oil-level in the milling machine, checking the cutting edges of tools,...).	1.2 He/ She can master the maintenance procedures for technical systems using service documents and maintenance plans. He/ She performs the correct mounting method for machine elements (e.g. shafts, axles, bearings and shaft seals).	1.3 He/ She understands the function of technical systems, can perform trouble shooting with locating defects and analysing cause for damage. He/ She plans, performs and documents necessary maintenance work.			
2	Installing and dismantling of assemblies, machinery and systems	2.1 He/ She can apply written instructions to install and dismantle individual components (e.g. single parts to an assembly by using machine elements like screw joints or pin connections).	2.2 He/ She can install/ dismantle complex assembly groups and machinery, which could include different technologies. He/ She positions and fixes the components by performing detachable and permanent joining processes (e.g. mount bearings to gearboxes, weld frames ...).	2.3 He/ She understands the function of complex machines or systems. He/ She can build up a system (consisting of e.g. gear drives, chain drives, belt drives, pneumatic or hydraulic components...).	He/ She can adjust the associated parameters and analyse/evaluate the overall function of the system.		
3	Installing and bringing into service of control technology	3.1 He/ She can use written instructions to install and adjust pneumatic or hydraulic or electrical components according to safety rules.	3.2 He/ She can use written instructions to install E-Pneumatic or E-Hydraulic or electrical components according to safety rules.	3.3 He/She can apply an E-Pneumatic or E-Hydraulic solution for simple tasks.	3.4 He/She can apply an E-Pneumatic or E-Hydraulic solution for complex tasks.	3.5 He/She can install and configure programs for hardware and software components as well as set up simple PLC.	
4	Technical communication Preparing and using technical information	4.1 He/ She can read and manually draft simple sketches or technical drawings of single components. He knows the ISO standards for drafts, surface symbols and dimensioning.	4.2 He/ She can correctly apply basic CAD functions for the construction of technical components.	4.3 He/ She correctly apply advanced CAD-functions for the construction of components and assembly groups. (Including screw joints, pin connections ...).	4.4 He/ She develops technical constructions according to the needs of the customer. He/ She can check the functions of complex assembly groups via CAD.		

5	Producing single parts and assemblies	5.1 He/ She can produce simple components by performing manual production methods, (e.g. filing, sawing, bending...).	5.2 He/ she can correctly apply conventional machines for the production of components. He knows the parameters for calculating cutting speed, feed rate...	5.3 He/ She can develop the necessary CNC-program using DIN/ISO programming, simulate the functionality. He/ She can set up the machines and the tools. He/ She can produce single parts using CNC machines (e.g. lathe and milling machines), test and optimize production.	5.4 He/ She can produce parts on CNC machines using CAD/CAM technology up to 3 axes.	5.5 He/ She can produce parts on CNC machines using CAD/CAM technology in complex settings with more than 3 (4) axes.
6	Working according to QM principals/ standards (documenting measuring supervising work)	6.1 He/ She is familiar with methods of testing. He/ She can select the necessary test equipment and check it (e.g. micrometre). He/ She can work according to inspection plans. He/ She can apply inspection equipment correctly.	6.2 He/ She can develop criteria for functional tests. He/ She can prepare inspection plans and documentation. He/ She can evaluate inspection results and identify the cause of quality problems.	6.3 He/ She can develop inspection plans based on QM regulations (also in respect of mass and serial production). He/ She is familiar with tools/methods to support continuous improvement process in order to optimize production process.	6.4 He/ She can control product and process quality. He/ She can carry out inspection on machine and process capability on demand. He/ She can plan the process as well as document and evaluate process data. He/ She can make suggestions for optimizing the quality of process.	
7	Planning, carrying out and optimising technical systems	7.1 He/ She can plan production processes for typical single parts. He/ She can perform and optimize these processes.	7.2 He/ She can plan production and mounting processes for typical assemblies. He/ She can perform and optimize these processes.	7.3 He/ She can provide independent technical solutions for the construction e.g. of production lines. He/ She can assure the functionality of the overall system by using existing and modified standard components. He/ She can check failure-free working systems and production processes concerning their potential for optimization. He/ She can work out suggestions for optimization respecting technical development. He/ She can evaluate and estimate the economic advantage. He/she can carry out the proposal.		

3. List with the learning outcomes

A) Modulpart CAD

Content	Learning Outcome	Page	TaxonomyTable
A1. Introduction Computer Aided Design			
A1.1	Preface of CAD	The student is able to reflect the development and the history of CAD.	1F
A2. Computer Aided Design			
A2.1	Inventor Desktop	The student is able to describe the User-Interface.	1F
A2.2	Singlemodelling	The student is able to describe and apply the process of the Part-Modelling.	1F, 3P
A2.3	Assembly	The student is able to create assembly groups with dependences and insert standard parts in assemblies.	3P, 3Ca, 6F
A2.4	2D Drafting	The student is able to create 2D derivates and work with and modify them.	3P, 4P, 6F

B) Modulpart CAM

Content	Learning Outcome	Page	TaxonomyTable
B1. Introduction Computer Aided Manufacturing			
B1.1	Allgemeines zu CAD-CAM	The student knows the differences between CNC and CAD programming.	1F
B2. CAM-Teil Definition mit Inventor-CAM			
B2.1	CAM-Teil anlegen	The student is able to configure the name and the memory location, select the CNC control unit and define the zero point.	13-25 3Ca
B2.2	Material und Modell	The student is able to define the raw material and the completely machined model.	25-30 3F
B3. Inventor-CAM 2,5D Fräsbearbeitung			
B3.1	Jobs (Bearbeitungsschritte)	The student is able to add contour jobs, drill jobs, pocket jobs, face milling jobs and flute jobs.	31-160 4Ca
B3.2	Geometrie definieren	The student is able to choose machine geometries and the depth of the profiles of the volume model.	37-160 3Ca
B3.3	Werkzeug und Schnittdaten definieren	The student is able to choose the correct milling tools, driving speeds and feeds.	40-44 2Ca
B3.4	Technologieparameter definieren	The student is able to name the milling strategies	47-51 4Ca
B3.5	NC-Programm erzeugen und simulieren	The student is able to develop the according NC-programm and simulate it on the display.	53-160 3F, 3Ca
B3.6	Übungswerkstücke	The student is able to program exercise workpieces by him/herself.	ab 161 3P
B4. Werkstück herstellen			
B4.1	Maschine einrichten	Guided by the teacher, the student is able to clamp and calibrate milling tools and locate the zero point.	3F, 5Ca
B4.2	Werkstück herstellen	Guided by the teacher, the student is able to mill the programed work piece.	3P