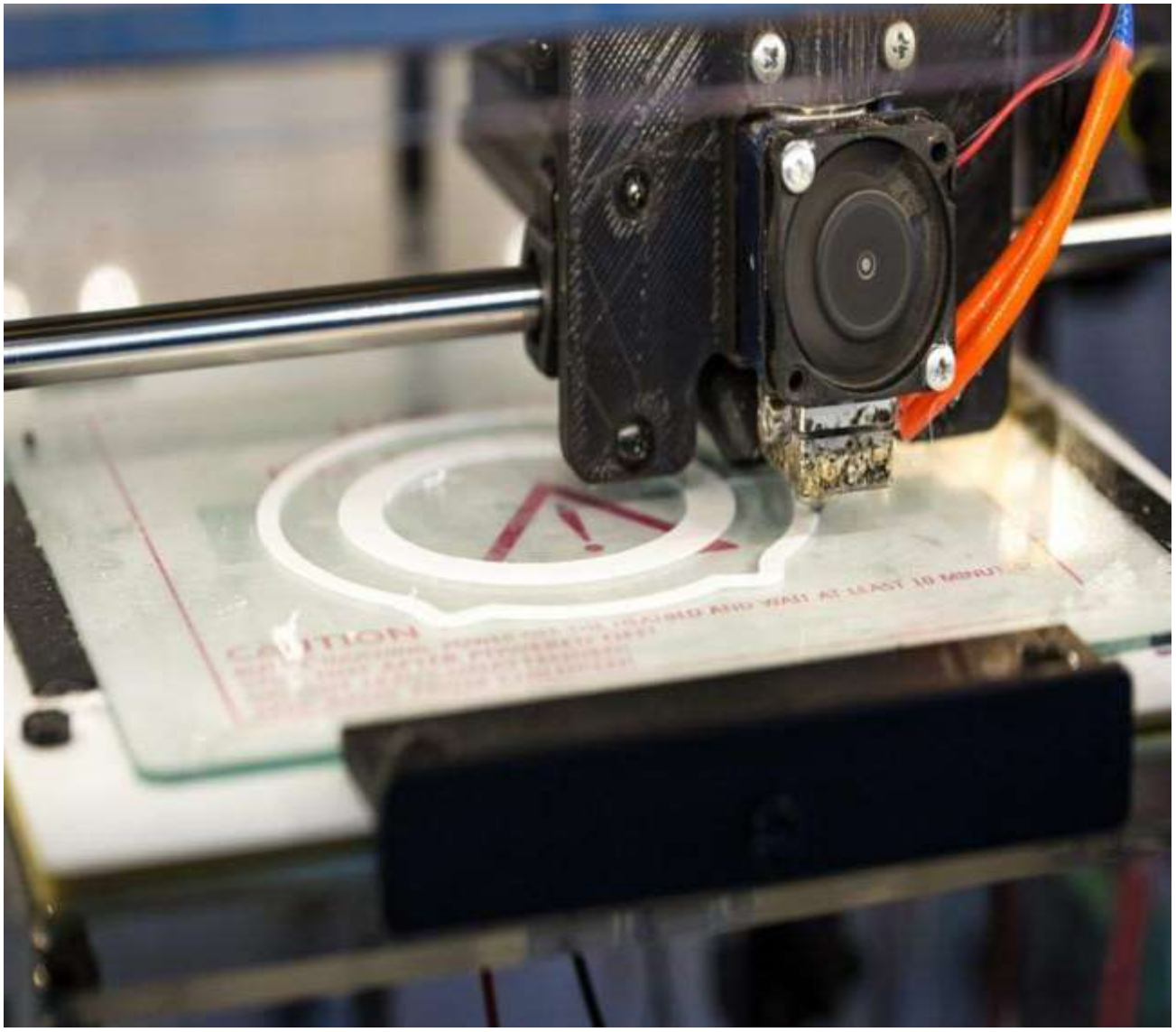
3DP Trainer guidelines



http://3dhelp.euda.eu/

Erasmus+

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Revision History

Revision	Date	Author/Organization	Description
V1.0	11.11.2018.	STSFV	Draft of main content Input regarding module 5
V1.1	14.01.2019	Ludor	Input regarding modules 7 and 8
V1.2	28.03.2019	SIF	Input regarding module 6
V1.3	23.04.2019	STSFV	Review of report/implementing changes
V1.4	25.04.2019	MECB	Review and updates
V1.5	30.04.2019	EuDA	Review and updates
V1.6	12.05.2019.	STSFV	Conclusions, Review and updates

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Content

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1. INTRODUCTION

Purpose of this manual is to help teachers (educators) in organization and implementation classes according to content of curriculum.

Manual is made with intention as a blueprint, content of the lectures can be modified depending on the participants.

The best teaching and training is one that always takes into consider material conditions and abilities of the learner.

Following guidelines are written for educators (trainers) who are going to adjust this manual for use in their 3D HELP training group.

Through this manual, educators will acquire expert knowledge in planning, creation and conducting effective 3D HELP course.

2. QUALIFICATIONS OF TRAINER

2.1. Professional Qualifications of trainer *

- Master of Mechanical Engineering
- Master of Electrical Engineering
- Master of Automation and Systems Engineer
- Master of Electrical Engineering and Computer Engineering
- Expert specialist mechanical engineer
- Expert specialist electrical engineer
- Mechanical engineer
- Electrical Engineer
- Professor of mechanical engineering
- Professor of electrical engineering

It would be desirable for teachers to have a valid certification from the field of additive technologies.

* According European standards

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2.2. Required educator's skills:

- Must be expert in the area and to know goals of content that teaches

-Present knowledge to course participants efficiently

- Understand the needs of the student:

  Why do you want to be involved in the course?

  What do you expect from the course?

- Introduce content to the participants professionally and didactically

- Know how to choose a lecture strategy and evaluate the time for each teaching content, considering the type a group of participants

- Know what knowledge the participants have about the current topic being presented

- Always offer students enough time to show what they have learned

- Motivate students to learn more about the topic content

- Present the content and the learning activities to motivate and focus participants on critical thinking about problem-solving

- Use e-learning communication tools: emails, forums, chat...

At the beginning of the training, a good teacher will try to learn more about their students. Encouraging the students to talk about themselves during the first training sessions is very important. It helps the trainer to know more about the attendants, but also allows the participants to share and compare their experiences. From this, the trainer can learn the predispositions of each individual and what the participants expect from the program.

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3. AN EDUCATOR'S JOURNEY

3.1. Teaching

Teaching takes place through several phases as shown in Figure 1.

Figure 1. Teaching phases

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3.2. Planning

It includes content analysis and goals that are to be achieved. At this stage, trainer is choosing methods and forms of work, schedule of the duration of each content, teaching materials and teaching aids, and environment for realization. It is good that at this stage, the teacher reviews online the latest 3D printing news to keep up with this expanding technology.

3.3. Content presentation

Presenting new teaching contents is one of the basic stages of the teaching process. It establishes an immediate relationship between the participant and teaching content. The teacher will link new teaching content with previous student experience, using the original reality, teaching content, and speaking language to provide the most appropriate cognitive path. It is important to specify precisely: the amount of teaching content, intensity (quality, depth of terms) and structure (logical regularity of facts and generalization). On the well-structured teaching content are based further stages of the teaching process.

3.4. Brief summary

In this faze, participants discuss and debate about the topic in a collaborative environment. The teacher takes on the role of a moderator, but can interfere and clarify or qualify interesting points. This phase will lead to practical activities to encourage and improve learning.

3.5. Practice

This phase has a form of real practical work. The educator (trainer) acts as a mentor, and the students are encouraged to do the exercise so they could understand better the teaching content and to improve and develop their skills. The exercise can be performed in groups, pairs or individually. The educator (trainer) must take care of participant's safety, indicating to the hot spots of the printer, etc.

3.6. Individual work

The best way to learn 3D printing is to practice. All participants should have access to printers and try to solve independently problems that appear. Tasks can be the same for all or different.

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3.7. Evaluation of success of the participants

Successful performance of individual tasks can provide sufficient information about the participant's achievement result. Regardless of the students' score, it is desirable to praise and to motivate them so they could progress better in overcoming the content.

This assessment is the input for planning upcoming teaching contents.

You do not have to strictly adhere to the instructions. The teacher must be open and flexible because the teaching lessons can sometimes develop different directions.

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4. SPECIFIC REQUIREMENTS

UNIT 1. Introduction to 3D printing

Introduction to 3D printing	
Learning outcomes	• Understand why 3D print is nowadays becoming a more and more important technology • Understand core terms • Be aware of advantages and disadvantages of 3D print • Know where 3D printing is being used and know one specific example in detail
Sub-topics to be covered	• Introduction to 3D printing • History of 3D printing • Materials for 3D printing • Advantages and disadvantages of 3D printing • Case study- 3D printing process recap
Number of hours	3
Teaching material	Theory, self-explanatory videos and an illustrative example
Teaching tools	Presentation, computer, videos
Teaching organization	<u>Introduction:</u> Trainer provides an introduction to 3D printing, explains its basic objectives, methods of usage and specifics. Questions for the introduction and interpretation of the content: 1. Have you ever heard of 3D printing before? If yes, what do you know about it? 2. Have you ever seen 3D printing or have you ever used a product which was created by 3D printer? 3. What is your opinion on 3D printing? Content: • What is 3D printing? • Additive x subtractive • What do you need for 3D printing • What is the process? • Fused Deposition Modeling Technology • 3D Modeling • Specifics of 3D printing • Use of 3D printing

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Teaching organization	<u>Content presentation:</u>
	
	Using the presentation of the ppt and the selected video content, the teacher explains in detail about the following topics:
	• History:
	  ○ Infancy : beginnings
	  ○ Adolescence: developments
	  ○ Prime: experimentation and present situation
	• Materials:
	  ○ PLA
	  ○ PETG
	  ○ ABS
	  ○ TPU
	• Consequences of 3D printing:
	  ○ Pros & Cons
	  ○ 3D printing as a miracle?
	
	Using examples, the trainer shows the good examples of 3D questions. The trainer can ask the students about any bad examples in their mind.
	
	• Case study:
	  ○ 3D printing process recap

	<u>Brief summary:</u> This module serves as introduction of 3D printing, some essential aspects and characteristics of it are provided during the presentation, as well as a case study at the end, which will sum up all the content. The presentation uses video examples to demonstrate 3D printing in a more plausible way. The trainer also uses questions about the general knowledge of the student about 3D printing as a way to interact with them.
	<u>Individual work</u> Tell the learners where they can find the quiz + help them with wrongly answered questions
	<u>Evaluation of success of the participants</u> Once the participants have finished the module they will have to self-assessed themselves by answering a test.
Other	
Methods and forms of work	**Methods:** lecture method with usage of explanatory videos **Forms:** frontal form of teaching, lecturing

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Elements and forms of monitoring and evaluation of the participants	**Elements:** Acquisition of program contents, exercises and monitoring of program content (relation to work). Applying knowledge (verbal, written, knowledge checking and skills acquisition on a computer, project assignment) **Forms:** project assignment, verbal exam, written exam, exercise
Literature	Understanding additive manufacturing, Andreas Gebhardt Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing, Springer, SAD, 2010. , Gibson, I., Rosen, D.W., Stucker, B. Engineering Design and Rapid Prototyping , Kamrani, Ali K., Nasr, Emad Abouel Understanding polymer processing, Osswald, T.

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UNIT 2. Available 3D printing technologies

Available 3D printing technologies	
Learning outcomes	• Understanding 3D-P processes and its usage • Knowledge of material and its use and issues • Knowledge of file formats of 3D-P
Sub-topics to be covered	• Available 3D printing technologies • Description of each technology
Number of hours	4
Teaching material	Models printed by using different 3D printing methods, different 3D print materials.
Teaching tools	internet, computers, 3D printer, available software
Teaching organization	**Introduction** Presentation of the different 3D printing technologies. Questions for the introduction and interpretation of the content:
	Content presentation The trainer in detail explains different printing technologies which are listed in the following paragraph. The trainer provides general information behind each (it´s history, main area of usage, etc.) Also, the process of each technology is explained. • Fused Deposition Modeling (FDM) • Stereolithography (SLA) – laser • Digital Light Processing (DLP) – projector • Selective Laser Sintering (SLS) / Binder Jetting • Selective laser melting (SLM) / Metal printing • Electronic Beam Melting (EBM) / Metal printing • Laminated Object Manufacturing (LOM) • Material Jetting
	Brief summary Each technology uses different material and serves different purposes. One differs from the others in the material which it uses, temperature or general purpose. The 3D printing can provide mechanical parts, large laminated objects or even medical supplements for certain body parts, such as bones and joints.

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	Individual work Tell the learners where they can find the quiz + help them with wrongly answered questions
	Evaluation of success of the participants Once the participants have finished the module they will have to self-assessed themselves by answering a test.
Other	
Methods and forms of work	**Methods:** lecture method, demonstration method and research method. **Forms:** frontal form of teaching, exemplary teaching, mentoring, demonstration lessons. Note: The choice of methods and forms of work for each lesson is determined by the teacher in accordance with: the teaching contents, the attitudes of the trainees and the material and other conditions
Elements and forms of monitoring and evaluation of the participants	**Elements:** Acquisition of program contents, exercises and monitoring of program content (relation to work). Applying knowledge (verbal, written, knowledge checking and skills acquisition on a computer, project assignment) **Forms:** project assignment, verbal exam, written exam, exercise
Literature	Understanding additive manufacturing, Andreas Gebhardt Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing, Springer, SAD, 2010. , Gibson, I., Rosen, D.W., Stucker, B. Engineering Design and Rapid Prototyping , Kamrani, Ali K., Nasr, Emad Abouel Understanding polymer processing, Osswald, T.

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UNIT 3. Design with 3D Printing in Mind

Design with 3D Printing in Mind	
Learning outcomes	• Learn how to avoid common design mistakes during CAD modelling that lead to defects in 3D printed parts and understand how sources of inaccuracies during 3D printing can be avoided • Understand important considerations when printing different parts that need to be assembled together • Learn how to best position and orient a 3D model for printing to achieve the best properties
Sub-topics to be covered	• Defects in 3D Printed FDM parts • Printing Parameters and role of model orientation • Design considerations for 3D Printing
Number of hours	4
Teaching material	Theory, Internet, videos, software, 3D-Printer or 3D-Printing samples
Teaching tools	Presentation, computer
Teaching organization	<u>Introduction:</u> Trainer defines content theme and learning outcomes. Questions for the introduction and interpretation of the content: 1. Although 3D Printing looks simple, it is not easy to get perfect parts. Have ever heard/saw defects of 3D printing? 2. Mention typical defects. How can we eliminate these? 3. How can we design parts that are easier to be printed?

	<u>Content presentation:</u>
	
	Using the presentation of the ppt and the selected video content, the teacher explains in detail about the following topics.
	
	• Different sources of defects
	  ○ Data preparation defects
	  ○ Part building defects
	  ○ Post-processing defects
	
	Show them videos/pictures/actual parts with defects, and encourage them to learn how these can avoided in order to avoid unnecessary costs.

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Teaching organization	• Printing Parameters
	  ○ Layer Height
	  ○ Build Size
	  ○ Printer Nozzle
	  ○ Printing Orientation
	  ○ Other settings
	• Design Considerations and 3D CAD modelling
	  ○ Assembly features
	  ○ Overhanging features
	  ○ Wall Features
	  ○ Embossed/Debossed features
	  ○ Ribs, Bosses and Lips
	  ○ Joining features
	  ■ Knurled Insert
	  ■ Embedded & Captive nut
	  ■ Self-tapping screws
	  ■ Cutting threads
	  ■ Printing threads
	Show them videos and live demonstrations on how to best design for 3D printing.

	<u>Brief summary:</u> Allow the students discuss about the topic in a collaborative environment. Provide case studies and ask learners to think what kind of printer parameters have been used. Also question what design modifications could be done in order to improve the parts.
	<u>Individual work</u> Tell the learners where they can find the quiz + help them with wrongly answered questions
	<u>Evaluation of success of the participants</u> Once the participants have finished the module they will have to self-assessed themselves by answering a test.
Other	
Methods and forms of work	**Methods:** lecture method. **Forms:** frontal form of teaching.
Elements and forms of monitoring and evaluation of the participants	**Elements:** Acquisition of programme contents, exercises and monitoring of programme content (relation to work). Applying knowledge (verbal, written, knowledge checking and skills acquisition on a computer, project assignment) **Forms:** project assignment, verbal exam, written exam, exercise
Literature	• The Ultimate 3D Print Troubleshooting Guide 2018 • https://www.3dhubs.com/knowledge-base/ .

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UNIT 4. Slicer software for subsequent 3D-Printing

Slicer software for subsequent 3D-Printing	
Learning outcomes	• Understand what a slicer software is and its importance in 3D printing • How to choose a 3D Slicer software • Get familiar with important slicer settings
Sub-topics to be covered	• What is a Slicer Software? • Important settings • 3D Slicer software
Number of hours	3
Teaching material	Theory, self-explanatory videos, Slicer Software
Teaching tools	Presentation, computer
Teaching organization	<u>Introduction:</u> Trainer defines content theme and learning outcomes. Questions for the introduction and interpretation of the content: 1. What is a slicer-software? The teacher explains that having a 3D Printer and 3D file is not enough to 3D Print a model. 2. What settings can we control? The teacher might show two models of the same file quality, printed with the same printer using different silcer software settings. 3. Mention a 3D slicer software that is used by the industry.

	<u>Content presentation:</u>
	Using the presentation of the ppt and the selected video content, the teacher explains in detail about the following topics.
	• Slicer Software
	• Slicer Software settings
	  ○ Layer height
	  ○ Shell thickness
	  ○ Fill density
	  ○ The Initial Layer
	  ○ Printing speed
	  ○ Supporting Material
	  ○ Platform Adhesion types

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Teaching organization	Show them interesting videos, show them models printed with different slicer software settings, and encourage them to experiment with different settings until the desired quality (vs cost) is obtained.
	• Choosing a Slicer Software
	• Using a Slicer Software
	  ○ NetFabb
	  ○ Cura
	
	Show them how slicer software settings can be changed by giving a demonstration on the available Slicer software.

	<u>Brief summary:</u> Allow the students discuss about the topic in a collaborative environment. Provide case studies and ask learners to think what kind of slicer software settings have been used and what needs to be avoided in order to improve parts, increase strength, and reduce cost and printing time.
	<u>Individual work</u> Tell the learners where they can find the quiz + help them with wrongly answered questions
	<u>Evaluation of success of the participants</u> Once the participants have finished the module they will have to self-assessed themselves by answering a test.
Other	
Methods and forms of work	**Methods:** lecture method. **Forms:** frontal form of teaching.
Elements and forms of monitoring and evaluation of the participants	**Elements:** Acquisition of programme contents, exercises and monitoring of programme content (relation to work). Applying knowledge (verbal, written, knowledge checking and skills acquisition on a computer, project assignment) **Forms:** project assignment, verbal exam, written exam, exercise
Literature	▪3D Printing Height ▪Slicer Software list ▪Choosing a Slicer Software ▪3D Printing Supports ▪Cura In-Depth Tutorial

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UNIT 5. Future of 3D printing technologies

Future of 3D printing technologies	
Learning outcomes	• to understand the potential of 3D printing at the moment and in future • to comprehend directions for 3D printing development in the future
Sub-topics to be covered	• Current and future trends in 3D printing • Innovation of technologies, materials, future areas of application • Interesting future projects
Number of hours	2
Teaching material	Models printed by using different 3D printing methods, different 3D print materials
Teaching tools	internet, computers
Teaching organization	<u>Introduction:</u> Trainer defines content theme and learning outcomes. Questions for the introduction and interpretation of the content: 1. Is 3d printing at the moment a leading technology in some industry branch? 2. What do you think will be in the future? 3. In what areas of technology do you see the greatest 3D printing potential in the future?
	<u>Content presentation:</u> Using the presentation of the ppt and the selected video content, the teacher explains in detail about the following topics. 1. Current and future trends in 3D printing 2. Innovation of technologies, materials, future areas of application 3. Interesting future projects In this part it is important to motivate the participants. Show them interesting videos, show them models printed with different 3D methods and different materials, and encourage them to express their vision of the future of 3D printing.

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Teaching organization	Brief summary: Allow the students discuss about the topic in a collaborative environment. If necessary, encourage debate on type issues: 1. How can 3D printing change the future? 2. Can 3D printing completely remove traditional fabrication processes? 3. What problems improve 3D Printing? In this part of the lesson, it is necessary to clarify and explain any possible concerns of the participants about the exhibited contents.
	Individual work Create worksheets that will be solved by participants or direct them to the website where the online quiz is linked to the processed content.
	Evaluation of success of the participants Review the individual work of your students. Based on their responses, you are planning further activities. Regardless of the results, commend their efforts.
Other	
Methods and forms of work	**Methods:** lecture method, method of dialogue, quiz **Forms:** frontal form of teaching
Elements and forms of monitoring and evaluation of the participants	**Elements:** Acquisition of program contents(verbal, written) **Forms:** verbal exam, written exam
Literature	Understanding additive manufacturing, Andreas Gebhardt Additive Manufacturing Technologies, Rapid Prototyping to Direct Digital Manufacturing, Springer, SAD, 2010. , Gibson, I., Rosen, D.W., Stucker, B. Understanding polymer processing, Osswald, T. ▪ https://www.youtube.com/watch?v=1SK7sptcpNA ▪ https://www.youtube.com/watch?v=DpUn-TuJ_a0

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UNIT 6. Case studies in the industry to show the potential for boosting entrepreneurial spirit, creativity and innovation

Case studies in the industry to show the potential for boosting entrepreneurial spirit, creativity and innovation	
Learning outcomes	• Understanding of 3D-P potential and current impact in various fields of life
Sub-topics to be covered	• 3D-P case studies in education and training • 3D-P case studies in medicine • 3D-P case studies in architecture • 3D-P case studies in technology • 3D-P case studies in engineering
Number of hours	2
Teaching material	Reading, case studies in video
Teaching tools	internet, computers
Teaching organization	<u>Introduction:</u> Trainer defines content theme and learning outcomes. Questions for the introduction and interpretation of the content: 1. What examples of using 3D-P do you already know?
	<u>Content presentation:</u> The teacher presents case studies in the industry to show the potential for boosting entrepreneurial spirit, creativity and innovation by using the presentation of the PowerPoint and the selected video content. It is recommended to bring the real examples of 3D printing to the class as well. Teacher can present own case studies outside of presentation as well according to participants area of interest.
	<u>Brief summary:</u> It is important to motivate the participants to participate actively in the discussions about benefits of using 3D-P. It is recommended to organise a group work and to allow the students discuss about the case studies in a collaborative environment. For example: 1. In what fields of life can 3D-P be used?

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	2. In what fields of life cannot 3D-P be used? In this part of the lesson, it is necessary to moderate the discussions.
	<u>Individual work</u> Students can search the interesting cases of practical usage of 3D-P on themselves and share with peers.
	<u>Evaluation of success of the participants</u> Review the individual work of your students. Quiz
Other	
Methods and forms of work	**Methods:** lecture method, method of dialogue, self direct learning, quiz **Forms:** frontal form of teaching, online learning
Elements and forms of monitoring and evaluation of the participants	**Elements:** Acquisition of Unit content **Forms:** online quiz
Literature	▪ Engineering Design and Rapid Prototyping , Kamrani, Ali K., Nasr, Emad Abouel, Springer, 2010, ISBN 978-0-387-95863-7 ▪ https://www.makersempire.com/7-benefits-of-using-3d-printing-technology-in-education/ ▪ 3D Printers in Education http://3dprintingsystems.com/education/ ▪ The future of 3D printing in education ▪ https://www.stratasysdirect.com/resources/case-studies ▪ How to 3D print PFM dental crowns // Glidewell Laboratories (video) ▪ 10 ways 3D printing can impact architecture industry ▪ https://www.raconteur.net/technology/3d-printers-producing-factory-goods ▪ http://www.javelin-tech.com/3d-printer/industry/

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UNIT 7. 3D printing to boost creativity and innovation

3D printing to boost creativity and innovation	
Learning outcomes	• Understanding of 3DP creative and innovative possibilities • Learning to think out of the box
Sub-topics to be covered	• Creative and innovative techniques • Examples
Number of hours	2
Teaching material	Case studies
Teaching tools	internet, computers
Teaching organization	<u>Introduction:</u> Trainer defines content theme and learning outcomes. Questions for the introduction and interpretation of the content: 1. Do you know any 3D printing business in your area /country? 2. What do you think are the sectors where 3D printing can boost creativity and innovation? 3. What are the advantages of 3D printing that can help us be more creative?
	<u>Content presentation:</u> Using the PowerPoint presentation and a selected video content, the teacher explains in detail about the following topics. 1. Creative and innovative techniques 2. Examples of creative applications of 3D printing – fashion, art, film making, etc. 3. Examples of innovative applications of 3D printing – space, automotive, education, etc. In this part it is important to motivate the participants. Show them interesting videos and pictures, and encourage them to imagine new creative and innovative uses of 3D printing.

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Teaching organization	Brief summary: Allow the students discuss about the topic in a collaborative environment. If necessary, encourage debate on type issues: 1. How can 3D printing be applied creatively in your sector of activity? 2. What do you think are the biggest problems in implementing 3D printing in your sector of activity? 3. What benefits 3D Printing can bring? In this part of the lesson, it is necessary to clarify and explain any possible concerns of the participants about the exhibited contents.
	Individual work Create worksheets that will be solved by participants or direct them to the website where the online quiz is linked to the processed content.
	Evaluation of success of the participants Review the individual work of your students. Based on their responses, you are planning further activities. Regardless of the results, commend their efforts.
Other	
Methods and forms of work	**Methods:** lecture method, method of dialogue, quiz **Forms:** frontal form of teaching
Elements and forms of monitoring and evaluation of the participants	**Elements:** Acquisition of program contents (verbal, written) **Forms:** verbal exam, written exam
Literature	What is 3D printing? The definitive guide https://www.3dhubs.com/guides/3d-printing/ Designing 3D Printing Innovations in Education, https://www.matterhackers.com/articles/designing-3d-printing-innovations-in-education

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UNIT 8. 3DP and entrepreneurship

3DP and entrepreneurship	
Learning outcomes	• Knowledge of different types of business opportunities related to 3DP • Understand the particularities of a 3DP business
Sub-topics to be covered	• Examples of successful 3DP start-ups • Platforms for 3DP entrepreneurs • 3DP skills required on the market • 3DP business opportunities
Number of hours	3
Teaching material	Case studies
Teaching tools	internet, computers
Teaching organization	<u>Introduction:</u> Trainer defines content theme and learning outcomes. Questions for the introduction and interpretation of the content: 1. Do you know any 3D printing business in your area /country? 2. What do you think are the sectors where a 3D printing has the biggest chances to succeed? 3. What are the advantages of 3D printing that can help a business to have success?
	<u>Content presentation:</u> Using the PowerPoint presentation and a selected video content, the teacher explains in detail about the following topics. 1. Examples of successful 3DP start-ups 2. Platforms for 3DP entrepreneurs 3. 3DP skills required on the market 4. 3DP business opportunities In this part it is important to motivate the participants. Show them interesting videos and pictures, and encourage them to write short business planes based of 3D printing or to develop business ideas based on 3DP.

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Teaching organization	Brief summary: Allow the students discuss about the topic in a collaborative environment. If necessary, encourage debate on type issues: 1. How can 3D printing be used to gain competitiveness? 2. What do you think are the biggest problems in implementing 3D printing in a business? 3. What benefits 3D Printing can bring to a business? In this part of the lesson, it is necessary to clarify and explain any possible concerns of the participants about the exhibited contents.
	Individual work Create worksheets that will be solved by participants or direct them to the website where the online quiz is linked to the processed content.
	Evaluation of success of the participants Review the individual work of your students. Based on their responses, you are planning further activities. Regardless of the results, commend their efforts.
Other	
Methods and forms of work	**Methods:** lecture method, method of dialogue, quiz **Forms:** frontal form of teaching
Elements and forms of monitoring and evaluation of the participants	**Elements:** Acquisition of program contents (verbal, written) **Forms:** verbal exam, written exam
Literature	11 great 3D printing business ideas https://www.sculpteo.com/blog/2018/07/06/11-great-3d-printing-business-ideas/ The 3-D Printing Playbook https://hbr.org/2018/07/the-3-d-printing-playbook

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5. CONCLUSION

The manual was written in order to help educators in organizing and conducting classes according to the content of the curriculum developed in the 3D - HELP project

The manual includes:

• Professional and pedagogical competencies of educators
• Characteristic stages of the teaching process
• Detailed instructions for the organization and implementation each of the eight teaching units for which, within the project, are made teaching materials.

Finally, it should be noted that each educator needs to adapt suggested guidelines to their group of learners, to make the most of the teaching materials created through this project.

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