



### **BOOKLET OF 3D PRINTING DESIGN AND OPERATION ONLINE COURSE**







Co-funded by the Erasmus+ Programme of the European Union



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## **DoD Project Partners**





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# DoD Project Aims







### **DoD Project Aims**

The **DEMO OR DIE** project aims at developing an Open Access to Online Training in the 3D Printing field by introducing "non-manufacturing" professionals (e.g., Health Professionals) and other potential professionals such as students from both **Vocational Education and Training (VET)** and **Higher Education (HE)** to embrace digital technologies such as 3D Printing.

#### The goals of the project:

- Promote inclusive and open access to 3D online training through an online curriculum;
- Increase the level of knowledge and skills for becoming proficient and confident in 3D printing, design and operations of desktop 3D printers;
  - Facilitate the understanding on 3D printing benefits, limitations and growing challenges;
- Promote the understanding 3D printing benefits and potentialities in different sectors i.e., health sector;
- Introduce youngsters to adopt to multi-skilled technological careers in industry;
- Facilitate the continuity of education through remote learning.

#### What is 3D printing technology?

**Additive manufacturing (AM**), also known as 3D printing, as opposed to traditional technologies, subtractive and formative, consists of the process of **joining materials** in order to produce parts from 3D models. Objects are usually created by adding material layer-by-layer in AM process (ISO/ASTM 52900:2015).

#### Advantages of 3D Printing Technology:

- Rapid prototyping and fast production
- > Eco-friendly due to less wasted material
- > Create more complex and flexible geometric designs
- Print on demand
- Ease of access
- Strong and lightweight parts



## MEX Training Course







**DEMO** or **DIE** 



> The course is composed by five independent **Competence Units (CU)** with a recommended learning path starting with "3D Printer Operational Settings" from **CU\_D**, followed by **CU\_A**, **CU\_B** (which is optional for students with existing knowledge and skills on CAD) and **CU\_C**. The course is completed after the delivery and approval of the final project **CU\_E** "Do it Yourself".







### **Material Extrusion Training Course**



#### **Learning Outcomes:**

 Distinguish 3D Printing parts produced by MEX from other polymers 3D printing processes;

List the advantages and limitations of MEX over other 3D
Printing Polymers processes, including their applicability
according to the characteristics of the process;

Identify Polymer Materials for MEX AM according to the specific medical use and real-life applications;

Recognize MEX applications, including examples in the biomedical and other sectors.



#### **Learning Outcomes:**

 > Navigate the interface of a standard CAD software to view in the 3D space the models/or existing ones;
> Manipulate objects in a 3D space by zooming in and out, and rotating the view;
> Design simple solid shapes and combine them to form an

assembly;

Create assemblies of 3D objects to make a final 3D model;
Save and export files ready for 3D Printing.



#### **Learning Outcomes:**

- Recognize MEX 3D Printing potentials and limitations when designing AM Polymers parts;
- Relate the capabilities and limitations of MEX to design considerations;
- Associate design considerations to design thinking in the development of AM Polymer parts;
- > Apply design for Additive Manufacturing principles when developing and CAD modeling a part.





### **Material Extrusion Training Course**



Learning Outcomes:

> Set up a 3D printer by following all the operational steps required;

 Recognize the need for post processing operations on as-built parts according to the required part properties;

 Recognize the requirements that 3D parts need to comply with for each post process;

 Recognize the required Health, Safety and Environmental measures linked to MEX 3D printing process;

> Choose post-processing methods for a variety of part geometries, materials MEX, in order to improve surface properties such as roughness, chemical and/or physical resistance, haptics & colour;

 Solve basic problems identified when printing a part for MEX.

Material Extr

CU\_E - 3D Printing project "Do it Yourself"

#### **Learning Outcomes:**

- Design the part and create a 3D model file using CAD software;
- Export STL file format to open in slicing program for 3D Printing;
- Select the appropriate build parameters, printer settings, material and temperature settings in a slicing software;
- Set up a 3D printer by following all the operational steps required;
- Recognize the post-processing operations to be applied on as-built parts according to the required part properties;
  Solve basic problems when printing a part for MEX, if needed.

## DoD Online Learning Platform







## **DoD Online Learning Platform**

The Online learning "Moodle" platform enables an **innovative approach** to learning, with the access to **interactive tools**.

The student can follow the **learning path** that better suits to his/her needs and interests, accessible at any place and time. The user-friendly learning platform is compatible with **smart-phone**, **tablet** and **computers**.

- The learning platform is developed based on a game-based learning approach;
- Students perform in videos, presentations, quizzes and "win" a star or medal at the end;
- The platform offers a flexible learning path, students can start their journey with any CU (except CU E);
- The platform also allows students to pick up where they left off;
- Students an also have a fun playing with "Space Game".

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	O CU E				T	Here you are! You already realize that you have	
				T		several paths to go, right? Do you want some tips before you stant?	ð
	CU C				Ţ	Ohh, yes! Don't bother, l'il find out!	
		P		<b>S</b>	TIONAL.	SPACE 5	
	O CU A					OPTIONAL	



## Additional Sources













EMO or DIE

**Database of 3D Design Software Functionalities:** This source can be used by staff from partner organisations, students, VET providers, HE institutions, EWF members and other external stakeholders, supporting them in understanding the terms related to Material Extrusion applications.

**DoD Game about 3D Printing:** The "Space Game" is an optional feature in the platform, showing the potential use of 3D printing in an interactive and funny way.

**DoD Videos about each CU:** Short teasers providing brief information about each competence unit.



**DoD TikTok Videos:** Short-form videos spotting key words on 3D Printing.

**Inclusive teaching guideline:** The guideline is a framework to integrate inclusive strategies and useful alternatives that can support all students.

**DoD Publications:** ARTICLE #1: Online Training for 3D Printing in Response to Covid-19 & ARTICLE #2: Benefits of 3D Printing in Sustainable Manufacturing.





Develop Engaging Massive Open Online Resources for Designers Innovative Education

For more information regarding the **DEMOorDIE** project, please visit the website:

#### >> www.demoordieproject.eu

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