

## Syllabus

### 1. Information about the **Module 5**

1.1 University	Universitat Politècnica de València
1.2 Team	UPV_Team
1.3 Trainer_Name	Associate Professor Santiago Ferrándiz
1.3 Degree level	Ph.D. degree

### 2. Information about the course

Module title	<b>3D Printing Workflow for Trainers</b>
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### 3. Time budget

3.1 Number of hours	<b>45 h</b>	divided in:	Lecture	<b>420 mins</b>	Laboratory/ Project	<b>2280 mins</b>
3.2 Time budget distribution (hours) for individual activity:						
(a) Individual study (course, obligatory bibliography, etc.)						5
(b) Additional documentation (recommended bibliography, etc.)						3
(c) Preparation for seminary/laboratory/project activities						2
(d) Peer learning						0
(e) Exam preparation						0
(f) Other activities						0
3.3 Total individual study (sum (3.7(a)...3.7(f)))				<b>10 h</b>		
3.4 ECTS credits				<b>1.0</b>		

### 4. Preconditions

4.1 curriculum	Librarian
4.2 competences	Space vision, technical skills, computer using knowledge

### 5. Course requirement

5.1. for lecture	Lecture room with video projector, laptop
5.2. for seminary/ laboratory/ project	Laboratory room with video projector, laptop, 3D printers

### 6. Gained competences

Professional competences	<ul style="list-style-type: none"> <li>1. Explaining concepts specific processes and solving engineering problems phased expert on mathematical algorithms and basic knowledge of mechanics</li> <li>2. Develop technical project execution for partial assemblies basic</li> <li>3. Competences in organizing new services in libraries</li> <li>4. Competences in managing a Makerspaces in libraries</li> </ul>
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Transversal competenc	1. Familiarity with specific roles and teamwork activities and distributing tasks to subordinate levels 2. Familiarity with new business models in libraries
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## 7. Course objective

7.1 General objective	Manufacturing 3D printed parts with client specifications
7.2 Specific objectives	Learners should be able to: <ul style="list-style-type: none"> <li>- Ability to recognize technologies estimation built time.</li> <li>- Skill to use slicing software, like PrusaSlicer.</li> <li>- Ability to recognize 3D printing glossary and terminology.</li> <li>- Ability to use platform built simulators.</li> <li>- Skill to manage Boolean operations, symmetry, scaled, duplicated parts with dedicated software.</li> <li>- Ability to programming printing parameters.</li> </ul>

## 8. Contents

8.1 Lecture	Hours	Teaching methods	Observation
<b>3D Printing Workflow for Trainers</b>		Video projector exposure methods, whiteboard explanations and discussions	
1.1 Prerequisites	90 mins		
<ul style="list-style-type: none"> <li>• Design guide rules</li> </ul>			
1.2 Platform management	60 mins		
<ul style="list-style-type: none"> <li>• Move, scale, rotate, copy, cut parts</li> </ul>			
1.3 Print configuration	90 mins		
<ul style="list-style-type: none"> <li>• Brim, raft, infill patterns and density, supports</li> </ul>			
1.4 Filament settings	80 mins		
<ul style="list-style-type: none"> <li>• Temperatures, diameters, material tipe</li> </ul>			
1.5 Print settings	90 mins		
<ul style="list-style-type: none"> <li>• Bed dimensions, extruders numbers</li> </ul>			
1.6 Print costs	10 mins		

8.2 Seminary / Laboratory / Project	Hours	Teaching methods	Observation
<b>3D Printing Workflow for Trainers</b>			
1.1 Prerequisites	450 mins	PBL, Video projector exposure methods, whiteboard explanations and discussions	
<ul style="list-style-type: none"> <li>Design guide rules</li> </ul>			
1.2 Platform management	450 mins		
<ul style="list-style-type: none"> <li>Move, scale, rotate, copy, cut parts</li> </ul>			
1.3 Print configuration	465 mins		
<ul style="list-style-type: none"> <li>Brim, raft, infill patterns and density, supports</li> </ul>			
1.4 Filament settings	450 mins		
<ul style="list-style-type: none"> <li>Temperatures, diameters, material tipe</li> </ul>			
1.5 Print settings	465 mins		
<ul style="list-style-type: none"> <li>Bed dimensions, extruders numbers</li> <li>Cost calculation</li> </ul>			
<p>8. 3 Bibliography:</p> <p>(1) Source: <a href="https://www.hubs.com/get/3d-printing-design-rules/">https://www.hubs.com/get/3d-printing-design-rules/</a></p> <p>(2) <a href="https://www.prusa3d.com/downloads/manual/prusa3d_manual_mk3s_en.pdf#_ga=2.158791602.903288970.1626718951-1383044114.1626718951">https://www.prusa3d.com/downloads/manual/prusa3d_manual_mk3s_en.pdf#_ga=2.158791602.903288970.1626718951-1383044114.1626718951</a></p> <p>(3) <a href="https://all3dp.com/2/what-is-a-delta-3d-printer-simply-explained/">https://all3dp.com/2/what-is-a-delta-3d-printer-simply-explained/</a></p> <p>(4) <a href="https://help.prusa3d.com/en/article/ui-overview_1766">https://help.prusa3d.com/en/article/ui-overview_1766</a></p> <p>(5) Basis of 3D printing by Josef Průša 2019</p> <p>(6) <a href="https://help.prusa3d.com/en/article/infill-patterns_177130">https://help.prusa3d.com/en/article/infill-patterns_177130</a></p> <p>(7) <a href="https://ca.m.wikipedia.org/wiki/Fitxer:Skirts,_Brim,_Rafts.jpg">https://ca.m.wikipedia.org/wiki/Fitxer:Skirts,_Brim,_Rafts.jpg</a></p> <p>(8) <a href="https://help.prusa3d.com/en/article/skirt-and-brim_133969">https://help.prusa3d.com/en/article/skirt-and-brim_133969</a></p> <p>(9) <a href="https://www.simplify3d.com/support/articles/rafts-skirts-and-brims/">https://www.simplify3d.com/support/articles/rafts-skirts-and-brims/</a></p> <p>(10) <a href="https://help.prusa3d.com/en/article/support-material_1698">https://help.prusa3d.com/en/article/support-material_1698</a></p> <p>(11) <a href="https://www.sd3d.com/3d-printing/quality/">https://www.sd3d.com/3d-printing/quality/</a></p> <p>(12) <a href="https://www.sd3d.com/3d-printing/quality/">https://www.sd3d.com/3d-printing/quality/</a></p> <p>(13) <a href="https://help.prusa3d.com/en/glossary/print-speed_1717">https://help.prusa3d.com/en/glossary/print-speed_1717</a></p> <p>(14) <a href="https://my3dmatter.com/what-is-the-influence-of-color-printing-speed-extrusion-temperature-and-ageing-on-my-3d-prints/">https://my3dmatter.com/what-is-the-influence-of-color-printing-speed-extrusion-temperature-and-ageing-on-my-3d-prints/</a>, 2019</p> <p>(15) <a href="https://my3dmatter.com/what-is-the-influence-of-color-printing-speed-extrusion-temperature-and-ageing-on-my-3d-prints/">https://my3dmatter.com/what-is-the-influence-of-color-printing-speed-extrusion-temperature-and-ageing-on-my-3d-prints/</a>, 2019</p> <p>(16) 3D printing handbook. J. Prusa. 2019</p> <p>(17) <a href="https://help.prusa3d.com/en/article/layers-and-perimeters_1748">https://help.prusa3d.com/en/article/layers-and-perimeters_1748</a></p> <p>(18) <a href="https://shop.prusa3d.com/en/prusament/715-prusament-pla-lipstick-red-1kg.html">https://shop.prusa3d.com/en/prusament/715-prusament-pla-lipstick-red-1kg.html</a></p>			

- (19) <https://www.simplify3d.com/support/materials-guide/>
- (20) <http://www.3dprintmaterials.guru/talk/how-to-find-optimal-3d-printer-settings>
- (21) [https://help.prusa3d.com/en/article/different-nozzle-types\\_2193](https://help.prusa3d.com/en/article/different-nozzle-types_2193)
- (22) <https://filament2print.com/gb/extrusores/803-extrusor-titan-aero-original.html>
- (23) [https://help.prusa3d.com/en/article/different-nozzle-types\\_2193](https://help.prusa3d.com/en/article/different-nozzle-types_2193)
- (24) ASTM International, ISO/ASTM 52900-15, Standard Terminology for Additive Manufacturing – General Principles. Terminology, West Conshohocken, 2015.

## 9. Evaluation at the end of the course

Prepare and print a 3D part.