

EUROPASS SUPPLEMENT TO THE MASTER'S DEGREE IN VOCATIONAL EDUCATION AND TRAINING

TITLE OF THE TITLE

Master's degree in additive manufacturing

TITLE DESCRIPTION

The holder has acquired the general competence relating to:

Develop and manage additive manufacturing projects through the use of 3D printing, supervise or execute the assembly, maintenance and commissioning of such projects, as well as make implementation decisions in the development of company products (auxiliary or final products) respecting quality, design, safety and environmental criteria.

Within this framework, each PROFESSIONAL MODULE includes the following LEARNING OUTCOMES acquired by the holder.

"Additive manufacturing technologies."

The titleholder:

- Recognizes the basic principles of additive manufacturing analyzing its advantages and disadvantages.
- Recognizes the different existing 3D printing techniques, describing the specific characteristics of each one of them.
- Determines the appropriate printing materials, associating them with the most suitable 3D printing technique.
- Identifies the characteristic demands of the different economic sectors relating them to 3D printing techniques.
- Generates predesigned objects applying FDM and SLA technologies.

"Design of lightweight structures and topological optimization in fabrication".

The titleholder:

- Relates objects manufactured by 3D printing analyzing their structure and functions.
- Calculates the strength of objects manufactured by 3D printing by performing physical tests.
- Generates different types of lightweight structures by 3D printing using specific software.
- Define the structural topologization process in relation to additive manufacturing.

"Modeling, laminating and 3D printing".

The titleholder:

- Designs or redefines objects using parametric design software to perform 3D printing.
- Sets up additive manufacturing machinery by performing dimensional quality checks.
- Performs volumetric reconstruction of 3D objects from photographic images.
- It generates Gcodes through laminating programs allowing the additive manufacturing of the object.
- Determines the structure and edition of G-code files favoring the improvement of the manufacturing process.

"3D mesh scanning and repair".

The titleholder:

- Identify according to specific needs the types of scanners relating them to the applications for which they are intended.
- Controls scanning and its applications by assimilating the concepts of the process.
- Scan objects for 3D printing using a standard scanner.
- Scans objects for 3D printing using cell phone applications and specific photogrammetry software.
- Repair STL files using specific free software to allow the use of damaged or incomplete files.

"Post processed."

The titleholder:

- Design and build large parts with small format printers using specific software.
- Identifies and generates post printing mechanical surface treatments, comparing them with the primary finishes of the process.
- Identifies and performs thermal and chemical post printing surface treatments comparing them with the primary finishes of the process.
- Identifies the different types of postprocessing, achieving optimum resistances in the printing materials used.
- Recognizes the procedures for gluing and finishing of printed pieces according to the material and the printing technique used.
- Complies with the rules of occupational risk prevention and environmental protection, and identifies the associated occupational hazards, measures and equipment to prevent them.

"Management, repair and costs of additive manufacturing".

The titleholder:

- Recognizes the basic operating principles of additive manufacturing and its processes, identifying critical parts and planning the maintenance of machinery.
- Disassembles, repairs and replaces the elements of a standard printer by identifying its parts.
- Edits and modifies the main working firmwares according to the specific needs of each print, optimizing the results.
- Identifies calibration problems in printing processes optimizing part quality obtained.
- Generates 3D objects according to the appropriate print quality and speed while optimizing resource consumption.
- Plan and determine the costs of additive manufacturing by comparing the different technological options for its optimized implementation in the company.
- Complies with occupational risk prevention and environmental protection standards, identifying the most relevant associated occupational hazards, measures and equipment to prevent them.

JOBS THAT CAN BE PERFORMED WITH THIS

The most relevant occupations and jobs are as follows:

- Expert in additive manufacturing systems.
- Expert in 3D printing.
- Expert in product design for 3D printing.
- 3D designer by scanning.
- Rapid prototyping expert.

ISSUANCE, ACCREDITATION AND DEGREE LEVEL

Body that issues the diploma on behalf of the King: Ministry of Education and Vocational Training or the autonomous communities within the scope of their own competences. The title has academic and professional effects with validity throughout the State.

Official duration of the degree: 330 hours.

Degree level (national or international).

- NATIONAL: Non-university higher education.
- INTERNATIONAL:
 - Level P-5.5.4 of the International Standard Classification of Education (ISCED P-5.5.4).
 - Level 5C of the European Qualifications Framework (EQF 5C).

Access requirements:

To access the Specialization Course in Additive Manufacturing it is necessary to be in possession of one of the following degrees:

- a) Higher Technician in Prosthetic Audiology, established by Royal Decree 1685/2007, of December 14, 2007, which establishes the title of Higher Technician in Prosthetic Audiology and sets its minimum teaching requirements.
- b) Higher Technician in Production Programming in Mechanical Manufacturing, established by the Royal Decree of the Ministry of Industry, Tourism and Trade. Decree 1687/2007, of December 14, 2007, which establishes the degree of Higher Technician in Production Programming in Mechanical Manufacturing and its minimum teaching requirements are established.
- c) Higher Technician in Metallic Constructions, established by Royal Decree 174/2008, of February 8, 2008, which establishes the title of Higher Technician in Metallic Constructions and sets its minimum teaching requirements.
- d) Higher Technician in Pattern Making and Fashion, established by Royal Decree 954/2008, of June 6, 2008, whereby the decree of Higher Technician in Pattern Making and Fashion is established and its minimum teaching requirements are set.
- e) Higher Automotive Technician, established by Royal Decree 1796/2008, of November 3, 2008, which establishes the title of Advanced Automotive Technician and sets its minimum education requirements.
- f) Higher Technician in Mechanical Manufacturing Design, established by Royal Decree 1630/2009, of 30 June 2009. of October, by which the title of Higher Technician in Mechanical Manufacturing Design and its minimum teaching requirements are established.
- g) Higher Technician in Kitchen Management, established by Royal Decree 687/2010, of May 20 2010, which establishes the title of Higher Technician in Kitchen Management and sets its minimum teaching requirements.
- h) Higher Technician in Design and Production of Footwear and Accessories, established by the Royal Decree 689/2010, of May 20, by which the title of Higher Technician in Design and Production of Footwear and Accessories is established and its minimum teaching requirements are set.
- i) Higher Technician in Building Projects, established by Royal Decree 690/2010, of May 20 2010, which establishes the title of Higher Technician in Building Projects and sets its minimum teaching requirements.
- j) Higher Technician in Renewable Energies, established by Royal Decree 385/2011, of March 18, which establishes the title of Higher Technician in Renewable Energies and sets its teachings minimums.
- k) Higher Technician in Civil Works Projects, established by Royal Decree 386/2011, of March 18, which establishes the title of Senior Technician in Civil Works Projects and sets its minimum teaching requirements.
- l) Higher Technician in Production Programming in Metal and Polymer Molding, established by Royal Decree 882/2011, of June 24, 2011, which establishes the title of Higher Technician in Production Programming in Metal and Polymer Molding and its minimum teaching requirements are established.
- m) Higher Technician in Design and Furnishing, established by Royal Decree 1579/2011, of November 4, which establishes the Title of Higher Technician in Design and Furnishing and establishes its minimum teaching standards.
- n) Higher Technician in Technical Design in Textile and Leather, established by Royal Decree 1580/2011, of November 4, which establishes the Title of Higher Technician in Technical Design in Textile and Leather and sets its minimum teachings.
- o) Higher Technician in Automation and Industrial Robotics, established by Royal Decree 1581/2011, of November 4, which establishes the Degree of Higher Technician in Automation and Robotics.

- p) Industrial Automation and Robotics, and Correction of errors of Royal Decree 1581/2011, of November 4, which establishes the title of Higher Technician in Industrial Automation and Robotics and sets its minimum teachings.
- q) Higher Technician in 3D Animations, Games and Interactive Environments, established by Royal Decree 1583/2011, of November 4, which establishes the Degree of Higher Technician in Animations, Games and Interactive Environments, and the minimum teaching requirements are established, and Correction of Errors of the Royal Decree 1583/2011, of November 4, which establishes the title of Higher Technician in 3D Animations, Games and Interactive Environments and its minimum teaching requirements are established.
- r) Higher Technician in Made-to-Measure and Show Costumes, established by Royal Decree 1679/2011, of November 18, which establishes the title of Higher Technician in Made-to-Measure and Show Costumes and sets its minimum teachings, and Correction of error and erratum of the Royal Decree 1679/2011, of November 18, 2011, which establishes the title of Higher Technician in Costume and its minimum teaching requirements.
- s) Higher Technician in Characterization and Professional Makeup, established by Royal Decree 553/2012, of March 23, which establishes the title of Higher Technician in Characterization and Professional Makeup and sets its minimum teachings.
- t) Superior Technician in Orthoprosthetics and Support Products, established by Royal Decree 905/2013, of 22 November, which establishes the title of Higher Technician in Orthoprosthetics and its minimum teaching requirements are established.

Access to the next level of education or training: Access to any university study is possible.

Legal Basis. The regulatory regulation is Royal Decree 280/2021, of April 20, which establishes the Specialization Course in Additive Manufacturing and sets the basic aspects of the curriculum.

Explanatory note: This document is intended as additional information to the title in question, but has no legal validity whatsoever.

FORMATION OF THE OFFICIALLY RECOGNIZED MASTER'S DEGREE

PROFESSIONAL MODULES OF THE MASTER'S DEGREE ROYAL DECREE	ECTS CREDITS
Additive manufacturing technologies	5
Design of lightweight structures and topological optimization in fabrication	5
Modeling, laminating and 3D printing	11
3D mesh scanning and repair	4
Post processed	5
Management, repair and costs of additive manufacturing	6
	TOTAL CREDITS
	36
OFFICIAL DURATION OF THE MASTER'S DEGREE (HOURS)	330

* The minimum Master's degree courses shown in the table above, 55%, are official and valid in the entire national territory. The remaining 45% belongs to each Autonomous Region and may be reflected in the **Annex I** of this supplement.

INFORMATION ABOUT THE EDUCATION SYSTEM

