

Call FoF-05-2016

AM-motion

**A STRATEGIC APPROACH TO INCREASING EUROPE'S
VALUE PROPOSITION FOR ADDITIVE MANUFACTURING
TECHNOLOGIES AND CAPABILITIES**

Grant Agreement N° 723560

D3.6 Mapping of AM educational initiatives

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1. Background and objectives of the document

The present document constitutes Deliverable D3.6 in the framework of the AM-Motion project “A strategic approach to increasing Europe’s value proposition for Additive Manufacturing technologies and capabilities” (Project Acronym: AM-motion; Contract No.: 723560). This document is the result of the activities performed within the framework of work package 3 (WP3): “Analysis of non-technological aspects”, and more specifically of Task 3.4 entitled “Training & Education: Learning resources approaches”.

This deliverable contributes to meet the overall objective of WP3, which is to identify existing non-technological barriers that hamper the industrialization of additive technologies in Europe. Together with D3.5 “Report on employer needs” and D3.7 “Educational implementation model”, it addresses the skills dimension of the topic. The document specifically investigates on the existing educational and training courses focusing on AM. It also offers an overview of the EU-funded initiatives, which have looked closely at the issue of additive technologies in the educational context.

2. Educational & training courses on AM

The existing educational and training courses on AM was mapped out. The table below (table 1) lists all courses found, including details about the European Qualification Framework (EQF) level concerned. EQF is a common European reference framework¹ whose purpose is to make qualifications more readable and understandable across different countries and systems. It has eight reference levels² defined in terms of learning outcomes, which are knowledge, skills and autonomy-responsibility. The table also includes the entry requirements for the course at issue. As it can be seen, at higher education level today there exist only postgraduate courses that are specifically focused on the technology.

Table 1: Existing programmes at Postgraduate level

Title	Institution	EQF	Entry requirements
Master of Science in Additive Manufacturing ³	Anglia Ruskin University (United Kingdom)	7	Bachelor’s degree in: <ul style="list-style-type: none"> • Engineering or • Maths • Science • Product design • Graduates from any related numerate disciplines

¹ <http://www.cedefop.europa.eu/en/events-and-projects/projects/european-qualifications-framework-eqf>

² <https://ec.europa.eu/ploteus/content/descriptors-page>

³ <https://www.anglia.ac.uk/study/postgraduate/additive-manufacturing>

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Master of Science in Additive Manufacturing and 3D Printing ⁴	University of Nottingham (United Kingdom)	7	Bachelor's degree in: <ul style="list-style-type: none"> • Engineering or • Science
Master of Research in Additive Manufacturing and Advanced Manufacturing Technologies ⁵	University of Sheffield (United Kingdom)	7	Bachelor's degree in: <ul style="list-style-type: none"> • Mechanical Engineering • or related subject • Or relevant professional experience
Master of Science in Advanced Materials and Additive Manufacturing ⁶	University of Derby (United Kingdom)	7	Bachelor's degree in: <ul style="list-style-type: none"> • Chemistry • or Biology • or Geology • or Engineering • or related analytical discipline
2 nd level Specializing Master Additive Manufacturing ⁷	Polytechnic University of Turin (Italy)	7	Master's degree in: <ul style="list-style-type: none"> • Aerospace or Automotive or computer Engineering • or Electrical or Electronic Engineering • or Industrial Production and Technological Innovation Engineering • or Management Engineering • or Materials Engineering • or Mechanical Engineering • or Mechatronic Engineering • or Nanotechnologies for ICT
Master of Science in Biofabrication ⁸	Utrecht University (Netherlands) in cooperation with: University of Würzburg in Germany, and University of Wollongong and Queensland University in Australia	7	Bachelor's degree in: <ul style="list-style-type: none"> • Biomedical or other Life Sciences • or Medicine • or Biology • or Pharmaceutical Sciences • or Chemistry, if including a biomedical component

⁴<https://www.nottingham.ac.uk/pgstudy/courses/mechanical-materials-and-manufacturing-engineering/additive-manufacturing-and-3d-printing-msc.aspx>

⁵<https://www.sheffield.ac.uk/postgraduate/taught/courses/engineering/mechanical/additive-manufacturing-advanced-manufacturing-technologies-msc-res>

⁶<https://www.derby.ac.uk/courses/postgraduate/advanced-materials-and-additive-manufacturing-msc/>

⁷https://didattica.polito.it/master/additive_manufacturing/2017/introduction

⁸<https://www.uu.nl/masters/en/biofabrication>

The table below (table 2) instead illustrates all existing short courses, summer schools and vocational training courses across Europe, which were identified by the consortium:

Table 2: *Mapped courses, summer schools, seminars on AM per country*

Title	Institution	Entry requirements
BELGIUM		
Masterclass 'Design for additive manufacturing' ⁹	Sirris (Belgium)	<ul style="list-style-type: none"> For practitioners involved in the design process: designers, engineers, production managers and R&D managers
ESTONIA		
Summer School on Practical Robotics with 3D printing ¹⁰	Tallinn University of Technology (Estonia)	Bachelor's or Master's degree in: <ul style="list-style-type: none"> mechanical engineering or mechatronics or information technology, etc. or students interested in robotics and programming
FINLAND		
Summer school course on Additive Manufacturing – 3D Printing ¹¹	Lappeenranta University of Technology (Finland)	<ul style="list-style-type: none"> Students in their final year of Bachelor's studies or Master's students in the fields of technology and business
FRANCE		
3D Printing ¹²	University of Southern Brittany (France)	<ul style="list-style-type: none"> Project manager Senior manager Production manager Workshop manager Office manager Technician
Additive manufacturing production with Laser Metal Fusion ¹³	Centre technique des industries de la fonderie & Spartacus3D (france)	<ul style="list-style-type: none"> Bachelor's degree or equivalent General basic knowledge on AM required

⁹ <http://www.sirris.be/agenda/masterclass-design-additive-manufacturing-day-1-2-1>

¹⁰ <https://www.ttu.ee/robo>

¹¹ <https://www.lut.fi/documents/27578/148066/Additive+Manufacturing/8b06e122-788a-4cab-9a21-ca63af4089e8>

¹² <http://www.univ-ubs.fr/fr/formation-initiale-continue/formations-2017-2018/diplome-d-universite-du-DU/sciences-technologies-sante-STS/diplome-d-universite-impression-3d-program-us3d00-215-us3d01.html?search-keywords=impression>

¹³ http://www.farinia.com/sites/default/files/A3f_2016_fabrication_additive.pdf

		<ul style="list-style-type: none"> For technicians, engineers, R&D and commercials
Metal Additive Manufacturing ¹⁴	Centre de formation de la plasturgie (France)	<ul style="list-style-type: none">
Metal-based additive manufacturing processes ¹⁵	IREPA Laser (France)	<ul style="list-style-type: none"> Engineers Researchers Students
Design approaches for metal additive manufacturing ¹⁶	CETIM (France)	<ul style="list-style-type: none"> Knowledge of additive manufacturing materials and applications
Additive manufacturing, 3D printing - New technological issues and industrial perspectives ¹⁷	École Polytechnique (France)	<ul style="list-style-type: none"> Engineers Researchers Project managers Technical decision-makers
Introduction to Additive Manufacturing ¹⁸	Pôle Formation des Industries Technologiques de Champagne-Ardenne (France)	<ul style="list-style-type: none">
GERMANY		
Certified Industrial Technician (IHK) - specialization in Additive Manufacturing ¹⁹	SKZ (Germany) (in cooperation with the Würzburg- Schweinfurt Chamber of Industry and Commerce, (Germany))	Qualified technician in the field of <ul style="list-style-type: none"> Metal or mechatronics or electrical engineering or plastics and then at least one year's professional experience or the acquisition of at least 90 ECTS points in a university degree program with a technical focus and at least one year's professional experience or at least five years' professional experience.
Summer school course	Aachen University of Applied Sciences	Basic knowledge of manufacturing techniques and at least one CAD modelling language such as

¹⁴ [Catalogue of courses offered](#)

¹⁵ [Catalogue of courses offered](#)

¹⁶ <http://www.cetim.fr/fr/Formation/Procedes/Production/Fabrication-additive/Demarche-de-conception-pour-la-fabrication-additive-metal-FA03>

¹⁷ <https://exed.polytechnique.edu/fr/formations/32569/fabrication-additive%2C-impression-3d-nouveaux-enjeux-technologiques-et-perspectives-industrielles>

¹⁸ <http://www.platinium3d.com/fr/formation-ingenieur-procedes-fabrication>

¹⁹ <https://www.wuerzburg.iwk.de/weiterbildungsprogramm/weiterbildungsdetails/veranstaltung/gepruefter-industrietechnikerin-ihk-fachrichtung-additive-fertigung-215466.html>

on 3D Printing ²⁰	(Germany)	Autodesk Inventor or NX
Basics of Additive Manufacturing ²¹	VDI (Germany)	
European Summer University Additive Manufacturing ²²	Technical University of Dresden (Germany), with the Fraunhofer Institute for Manufacturing Technology and Advanced Materials	<ul style="list-style-type: none"> • Industry practitioners and academia with no or limited knowledge of Additive Manufacturing wishing to gain quick and thorough insights into the topic. • or outstanding bachelor or master students
Introduction to 3D-Scanning and Printing ²³	Technical University of Berlin (Germany)	<ul style="list-style-type: none"> • Students with an interest in 3D printing, 3D scanning to gain insight into work with professional 3D printing technologies • at least one year of university experience + English level B2 or equivalent
IRELAND		
Technical Training-Additive Manufacturing for Medtech ²⁴	Irish Medtech Association Skillnet (Ireland)	<ul style="list-style-type: none"> • Designed to provide decision makers in the medical device sector with theoretical and practical information about AM
ITALY		
PhD summer school ²⁵ course on Design of Mechanical components using AM	University Institute for Higher Studies, IUSS – Ferrara (Italy)	<ul style="list-style-type: none"> • Ph.D. students and young researchers active in the field of mechanical design and with particular interest in experimental mechanics and stress analysis
Master Additive Manufacturing: The Strategic Role of Metal Materials in Additive Manufacturing ²⁶	Rina Consulting in cooperation with Politecnico of Milan and University Roma Tre (Italy)	<ul style="list-style-type: none"> • Managers • Practitioners • Researchers • Graduates • Students

²⁰ <https://www.daad.de/deutschland/studienangebote/international-programmes/en/?p=d&s=sk&id=1229>

²¹ <https://www.vdi-wissensforum.de/weiterbildung-maschinenbau/additive-fertigungsverfahren/>

²² https://www.ifam.fraunhofer.de/en/Profile/Locations/Dresden/trade_fairs_and_events/SummerUniversityAM.html

²³ http://www.tu-berlin.de/menue/summer_university/winter_university/introduction_to_3d_scanning_and_printing/

²⁴ http://www.irishmedtechskillnet.ie/Sectors/IMDA/SKILLNET.nsf/vPages/Training_courses~Technical_Training-additive-manufacturing-for-medtech-in-ireland~3938?OpenDocument

²⁵ <http://www.aiasnet.it/phdschool.html>

²⁶ <https://www.techmec.it/additive-manufacturing-a-roma-il-master-mam/>

Course: Technician for Additive Manufacturing ²⁷	General Federation of Italian Artisans and Craftsmen and Technology Centre of Castelfidardo (Italy)	<ul style="list-style-type: none"> Requirements not described
Course: Technician for Additive Manufacturing ²⁸	CAM-Technology Centre in cooperation with CGIA and University of Modena (Italy)	<ul style="list-style-type: none"> Requirements not described
Course: Additive Manufacturing Project Managers ²⁹	TUCEP in cooperation with University of Perugia (Italy)	<ul style="list-style-type: none"> Managers, executives in the biomedical industry interested in applying AM technologies in their businesses Recently graduates in engineering or architecture
NETHERLANDS		
Summer school course on 3D Printing and Biofabrication ³⁰	Utrecht University (the Netherlands)	<ul style="list-style-type: none"> Requirements not described
Course on Additive Manufacturing State of the Art ³¹	Mikrocentrum (Netherlands)	<ul style="list-style-type: none"> Practitioners involved in the design process: Designers, manufacturers, product engineers and project leaders
Additive Manufacturing Lab Experience ³²	Mikrocentrum (Netherlands)	<ul style="list-style-type: none"> Practitioners involved in the design process: Designers, manufacturers, product engineers and project leaders
SPAIN		
Creative 3D printing expert ³³	University of Oviedo (Spain)	<ul style="list-style-type: none"> post-graduates students mechanics and electronics control of the printer, new ways of designing (generative design) and entrepreneurial skills
E-learning course on Technician for 3D printing ³⁴	CCC in cooperation with King Juan Carlos University and TUmaker (Spain)	<ul style="list-style-type: none"> Requirements not described
Fundamentals of 3D Digital Design & Additive	Universidad Católica San Antonio de Murcia	

²⁷ <http://www.centropagina.it/attualita/la-manifattura-si-modernizza/>

²⁸ <http://www.ptpi.it/corso-formazione-tecnico-manageriale-manifattura-additiva/>

²⁹ http://www.tucep.org/wp-content/uploads/2017/11/Bando-selezione-CARIPG_AM_2017_proroga.pdf

³⁰ <https://www.utrechtsummerschool.nl/courses/life-sciences/3d-printing-and-biofabrication>

³¹ <https://mikrocentrum.nl/opleidingen/additive-manufacturing-en-prototyping/additive-manufacturing-state-of-the-art/>

³² <https://mikrocentrum.nl/opleidingen/additive-manufacturing-en-prototyping/additive-manufacturing-lab-experience/>

³³ https://cei.uniovi.es/postgrado/titulosyfc/visor/-/asset_publisher/g16U/content/experto-en-impresion-3d-creativa?redirect=%2Fpostgrado%2Ftitulosyfc%2Foferta

³⁴ <https://www.cursosccc.com/a-distancia/curso-tecnico-impresion-3d>

Manufacturing (3D Printing) ³⁵	(Spain)	
Master in Engineering and Additive Manufacturing ³⁶	EDDM (Spain)	<ul style="list-style-type: none"> Recently graduated engineers Engineers with working experience interested in better understanding 3D printing Entrepreneurs in technology
Summer school course on 3D Printing ³⁷	Marbella Design Academy (Spain)	<ul style="list-style-type: none"> At least one year of university experience Basic knowledge of CAD software
SWEDEN		
(Summer school) Course on Design for Additive Manufacturing ³⁸	Lund University (Sweden)	<ul style="list-style-type: none"> Engineers and designers with basic experience in CAD
SWITZERLAND		
Continuing education course on Additive Manufacturing (3D-Printing) ³⁹	Zurich University of Applied Sciences (Switzerland)	<ul style="list-style-type: none"> Engineers and architects Scientists Technicians Interested professionals
UNITED KINGDOM		
Course on Fundamentals of Selective Laser Melting (SLM) ⁴⁰	The Welding Institute (UK)	<ul style="list-style-type: none"> Basic understanding of 3D printing at a novice to intermediate level, for technicians, engineers, managers, scientists etc.
Short course on 3D Printing/Rapid Prototyping ⁴¹	London Metropolitan University (UK)	<ul style="list-style-type: none"> aimed at anyone with prior knowledge of 3D modelling
Advanced Introduction to AM-Practical training course ⁴²	The Manufacturing Technology Centre (National Centre for AM) (UK)	<ul style="list-style-type: none"> Target audience: Decision makers, Heads of engineering and business owners
A Guide for Decision-Makers: Part 1-eLearning course ⁴³	The Manufacturing Technology Centre (National Centre for	<ul style="list-style-type: none"> Target audience: Decision makers, Heads of engineering and business owners

³⁵ <http://international.ucam.edu/short-course/fundamentals-of-3d>

³⁶ <https://eddm.es/master-impression-3d-ingenieria-fabricacion-aditiva/>

³⁷ <https://www.designschool.com/summer-courses/3d-printing/>

³⁸ https://luvit.education.lu.se/LUCE/activities/activitydetails_ext.aspx?id=354

³⁹ <https://weiterbildung.zhaw.ch/de/school-of-engineering/programm/wbk-additive-fertigung-3d-druck.html>

⁴⁰ <http://www.twitraining.com/home/news/twi-announces-new-selective-laser-melting-training-course>

⁴¹ <http://www.londonmet.ac.uk/courses/short/3d-printing-rapid-prototyping/>

⁴² <http://the-amtc.co.uk/training/courses/advanced-introduction-to-additive-manufacturing/>

⁴³ <http://the-amtc.co.uk/training/courses/guide-decision-makers-part-1/>

	AM) UK	
A Guide for Decision-Makers: Part 2-eLearning course ⁴⁴	The Manufacturing Technology Centre (National Centre for AM) UK	<ul style="list-style-type: none"> Target audience: Decision makers, Heads of engineering and business owners
Technical Insight into AM-Ask the expert – virtual classroom ⁴⁵	The Manufacturing Technology Centre (National Centre for AM) UK	<ul style="list-style-type: none"> Target audience: Decision makers, Heads of engineering and business owners
Design for Additive Manufacturing-Practical training course ⁴⁶	The Manufacturing Technology Centre (National Centre for AM) UK	Bachelor's degree in: <ul style="list-style-type: none"> Mechanical Engineering Product design or related subject Target audience: Existing Design engineers wanting to adopt AM
Design for Additive Manufacturing-eLearning course ⁴⁷	The Manufacturing Technology Centre (National Centre for AM) UK	Bachelor's degree in: <ul style="list-style-type: none"> Mechanical Engineering Product design or related subject Target audience: Existing Design engineers wanting to adopt AM
Technical Insight into Design for AM-Ask the expert – virtual classroom ⁴⁸	The Manufacturing Technology Centre (National Centre for AM) UK	Bachelor's degree in: <ul style="list-style-type: none"> Mechanical Engineering Product design or related subject Target audience: Existing Design engineers wanting to adopt AM
Practical Intro to the Full AM Process-Practical training course ⁴⁹	The Manufacturing Technology Centre (National Centre for AM) UK	Bachelor's degree in: <ul style="list-style-type: none"> Mechanical Engineering Product design or related subject Target audience: Existing Application, Manufacturing or Design engineers wanting to adopt AM
EUROPE		
EPMA Powder Metallurgy Summer School ⁵⁰	Location changing every year (Europe)	<ul style="list-style-type: none"> Young scientists and engineers under 35 years old
EPMA Metal AM Seminar ⁵¹	Location changing every year (Europe)	<ul style="list-style-type: none"> Scientists, engineers
EWf European Qualification System in Metal AM	can be used and deployed by Training Centres and Universities across	<ul style="list-style-type: none"> It will cover from Operator level to Engineer level for Metal AM – To be launched in November 2018

⁴⁴ <http://the-amtc.co.uk/training/courses/additive-manufacture-guide-decision-makers-part-2/>

⁴⁵ <http://the-amtc.co.uk/training/courses/a-technical-insight-into-design-for-am-ask-the-expert-virtual-classroom/>

⁴⁶ <http://the-amtc.co.uk/training/courses/design-additive-manufacturing-face-face-course/>

⁴⁷ <http://the-amtc.co.uk/training/courses/design-for-additive-manufacturing/>

⁴⁸ <http://the-amtc.co.uk/training/courses/technical-insight-into-additive-manufacturing/>

⁴⁹ <http://the-amtc.co.uk/training/courses/practical-introduction-full-process/>

⁵⁰ <https://summerschool.epma.com/>

⁵¹ <https://seminars.epma.com/>

	Europe	
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3. EU-funded initiatives about additive manufacturing skills, education or training

Information about existing and past EU-funded initiatives dealing with education and training in the field of additive manufacturing was also mapped . As it can be seen, the initiatives identified below cut across different streams in the EU funding landscape. Arguably, this points to the interest that this particular matter has gained from policy-makers involved in the allocation of EU structural funds, Erasmus+ funds or Horizon2020 funds.

1. ADMIRE - Knowledge alliance for Additive Manufacturing between industry and universities

The project aims to address the death-valley among academic and industrial world, establishing a solid relationship among enterprises working in the AM supply chain, research centres and universities. At the same time, it is intended to respond to an urgent industrial need: the qualification of Additive Manufacturing workforce. Together universities, companies and students will design a Metal AM Master degree according to level 7 of the European Qualification Framework .

Coordinator: Cranfield University (UK)

Partners:

- University of Birmingham (United Kingdom)
- University of Bremen (Germany)
- Instituto Superior Técnico (Portugal)
- Global Robots Ltd (United Kingdom)
- IREPA LASER (France)
- MTC (United Kingdom)
- EWF (Portugal)

Website: <http://admireproject.eu>

EU Funding Stream: Erasmus +

Duration: 01-01-2017 to 31-12-2019

Budget: 998. 035€

2. 3D PRInting Skills for Manufacturing – 3D PRISM

The 3DPrism initiative aims to improve the quality of VET by linking training provision with the needs of industry. The initiative aims at tackling this challenge by enhancing VET provision so as to equip technicians & operators with sought-after skills, with outputs that emphasise on the applied aspects of 3D printing. The project has generated two occupational profiles for technicians working with 3d printing technologies as well as a MOOC.

Coordinator: Advanced Manufacturing Research Centre of the University of Sheffield (United Kingdom)

Partners:

- Florida University (Spain)
- CECIMO (Belgium)
- EXELIA (Greece)
- CIMEA (Italy)

Website: <https://3dprism.eu>

EU Funding Stream: Erasmus +

Duration: 01-11-2015 to 01-02-2018

Budget: 337.350€

Available Results:

- [3D PRISM MOOC](#)
- [Occupational profiles for Entry-level and Experienced technicians in 3D printing](#)
- [Development of hands-on training methodology and definition of required equipment](#)
- [Course description for Entry-level technician in 3D printing](#)
- [Course description for Experienced technician in 3D printing](#)

3. METALS - Machine Tool Alliance for Skills

The project aims to narrow the skills gap in the additive manufacturing industry by providing market intelligence about the outstanding skills requirements for the technology, creating a curriculum for an additive manufacturing operator at EQF level 5, and by generating an open online course about basics for the use of the technology.

Coordinator: CECIMO (Belgium)

Partners:

- Institute Technology and Education of the University of Bremen (Germany)
- VDW Youth Foundation (Germany)
- Detmold Government Department (Germany)
- Machine Tool Institute (Spain)
- AFM (Spain)
- TKNIKA (Spain)

- Afol Metropolitana (Italy)
- UCIMU-Sistemi per Produrre (Italy)
- ECOLE (Italy)

Website: <http://www.metalsalliance.eu/>

EU Funding Stream: Erasmus +

Duration: 01-11-2015 to 31-10-2018

Budget: 858.080€

Available Results:

- [METALS European machine tool skills panorama](#)

4. SAMT SUDOE

The project aims at developing links and synergies between enterprises, R&D centres, clusters, higher education and R&D+i governmental & regional institutions. Its goal is to promote new industrial technologies in in Southwest Europe, especially additive manufacturing and Advanced Materials with a particular focus on plastic processors and mould industries. The project plans to create training materials in the form of Open Educational Resources (OER) to foster retention of Knowledge, technological update and development of skilled workforce.

Coordinator: Institute of Children's Products and Leisure (AIJU) (Spain)

Partners:

- Cluster of Toy Valley Region (Spain)
- Regional Development Agency of the Valencian Region (Spain)
- Institut de Chimie de la Matière Condensée de Bordeaux (France)
- Technological Centre for the Mould Making, Special Tooling and Plastic Industries (Portugal)

Website: <https://www.samtsudoe.com/>

EU Funding Stream: INTERREG SUDOE

Duration: 27-09-2016 to 30-06-2019

Budget: 994.827 € (746.120 € funding)

Available Results:

- Specialized roadmaps on existing technologies (plastic and mould industries' techniques) and future KET (AM and advanced materials)
- Transnational collaborative SAMT web Platform

5. VETRIANGLE - Promotion of Web-based Learning via Vocational Education Training Triangle

The project is dedicated to tackle the lack of workplace experience and the related skills and competences contributing to the “skills gap” in the EU today. A major focus appears to be placed in the project on advanced manufacturing. Additive manufacturing technologies are addressed in the project as part of the curricula developed as well as learning materials proposed.

Coordinator: *Kielce Technology Park (Poland)*

Partners:

- *VESBE e.V. (Germany)*
- *Global Ideas (Lithuania)*
- *Miguel Altuna LHII (Spain)*
- *Kocaeli Provincial Directorate Of National Education (Turkey)*

Website: <http://vetriangle.eu/>

EU Funding Stream: *Erasmus +*

Duration: *From 01-09-2016 to 01-09-2018*

Available Results:

- [Mapping of VET intermediaries in countries addressed](#)
- [Advanced manufacturing Curriculum](#)

6. 3DP - Training in 3D Printing To Foster EU Innovation & Creativity

The project aims to give people the opportunity to develop their skills in 3D printing and to acquire the knowledge that allows them to activate in this field, like employee, entrepreneur, trainer, intermediary, etc. It is addressed to organizations, companies and persons interested to use or to support others to use the 3D printing revolution, in various domains: education, industry, art, entrepreneurship, intermediation, law, politics, finance, etc. The partners will develop 3D printing curricula with courseware, a trainer guideline and an e-learning platform.

Coordinator: *Ludor Engineering is a Romania (Romania)*

Partners:

- *University Politehnica of Bucharest (Romania)*
- *Centro de Formación Somorrostro (Spain)*
- *Danmar Computers (Poland)*
- *MECB Ltd (Malta)*
- *Public institution Information Technologies Institute (Lithuania)*
- *"Grigore Moisil" Iasi Computer Highschool (Romania)*

- GoDesk (Italy)
- Northern Lithuania College (Lithuania)

Website: <https://3d-p.eu>

EU Funding Stream: Erasmus +

Duration: 01-09-2016 to 31-08-2018

Budget: 224.052 €

Available Results:

- [Guidelines and casestudies on the use of 3D printing in VET education](#)
- [Curricula of 3DP course](#)
- [3DP courseware](#)
- [3DP trainer guidelines](#)
- [E-learning platform](#)

7. OVOMAX - Online Vocational training course on design, manufacture and validation of custom-made orthopaedic, oral and cranio-maxillofacial devices.

Development of contents and implementation of an online free access course to assure Medical Device designers a worthy education and training along their professional career regarding design, manufacture and validation of custom-made medical devices is the main objective of OVOMAX project. Nowadays, surgeons look for medical devices highly adapted to patient's needs. In some cases, standard implants are not sufficient because of abnormal anatomy or postoperative complications. Fully customization of medical devices enables greater structural, functional and biological compatibility with the patient, enabling longer implant life-time; improved aesthetics, performance and patient comfort leading to improved quality of life; and often enable quicker and less invasive surgical operations; thus demonstrating higher-added value. OVOMAX project will also be addressed to product engineers and designers aiming to complete their academic and professional education, thus becoming in potential new employees of Medical Device industries.

The e-learning tool resulting from the project will be available online in 4 European languages (English, Spanish, Polish and Hungarian) in order to increase acceptance of the e-learning course. Among others, the e-course will contain production process of custom-made medical devices.

Coordinator: KOMAG Institute of Mining Technology (Poland)

Partners:

- Instituto de Biomecanica de Valencia (Spain)
- Spanish Federation of Healthcare Technology Companies (Spain)
- Ateknea Solutions Hungary KFT (Hungary)
- AIDIMME (Spain)

Website: www.ovomax.eu

Funding stream: Erasmus+

Duration: 01-09-2015 to 31-08-2018

Budget: 310.214 €

8. CLAIMM - Creating Knowledge and skills in AM

The main aim of CLAIMM, set to address the Manufacturing & Engineering sector, is to develop a brand-new European sector-oriented qualification system and body in Additive Manufacturing (AM) through the exchange among EU partners of an innovative training curriculum.

Coordinator: CESOL (Spain)

Partners:

- The Welding Institute (United Kingdom)
- EWF (Portugal)
- PRODINTEC (Spain)
- Lloyd's Register (UK)
- DVS
- LZH Laser Akademie GmbH
- Fraunhofer Institute (Germany)

Website: www.claimprojectam.eu

Funding stream: Erasmus+- Sector skills alliances

Duration: From 01-01-2018 to 31-12-2020

Budget: 998.868 €

9. PAM2 - Precision Additive Metal Manufacturing

This Innovative Training Network project aims to drastically improve the precision of metal AM processes by tackling the three principles of robustness, predictability and metrology, and by developing CAE methods that empower rather than limit AM design. Both the technological and personnel challenges of precision metal AM, are addressed in this project by providing in-depth training to young EU researchers through innovative and

interconnected research projects, combined with network-wide training events covering the whole knowledge and production chain of AM.

Coordinator: KU Leuven, Mechanical Engineering Department (*Belgium*)

Academic partners:

- Technical University of Denmark (Denmark)
- University of Padua (Italy)
- Karlsruhe Institute of Technology (Germany)
- Delft University of Technology (the Netherlands)
- University of Nottingham (United Kingdom)

Industrial partners

- 3D Systems Leuven (Belgium)
- GE (Pignone Tecnologie srl) (Italy)
- Alicona (Austria)
- LEGO Systems AS (Denmark)

Associated Partners

- ASML (the Netherlands)
- MAGMA GmbH (Germany)

Website: <https://www.pam2.eu/>

https://cordis.europa.eu/project/rcn/205471_en.html

EU Funding Stream: Horizon 2020- MSCA-ITN-ETN - European Training Networks (Grant Agreement No 721383)

Duration: From 01-12-2016 to 30-11-2020

Budget: 3.944.925,36 €

Available Results:

- Publication: [Controlling local overheating in topology optimization for Additive Manufacturing](#)

10.PRINT-AID- Multidisciplinary European training network for development of personalized anti-infective medical devices combining printing technologies and antimicrobial functionality

Current opportunities for young researchers to receive an structured, inter-sectoral and up-to-date education on personalized medicine and medical devices are marginal, and to our knowledge PRINT-AID is the first European Training Network set up for this purpose. The mission of PRINT-AID is to provide multi-disciplinary training in microbial biofilms, 3D-printing technologies and in vivo infection models. The consortium will offer a training

programme for early-stage researchers to exploit the power of emerging technologies in order to explore innovative routes to counteract biofilm caused infections in medical devices.

Coordinator: University of Helsinki (Finland)

Partners:

- University of Ghent (Belgium)
- Warsaw University of Technology (Poland)
- Voxdale (Belgium)
- University of Antwerpen (Belgium)
- Academic Medical Center (the Netherlands)
- Aptuit Verona (Italy)
- University of Porto (Portugal)

Website: <http://printaid-etn.eu/>

https://cordis.europa.eu/project/rcn/205457_en.html

EU Funding Stream: Horizon 2020- MSCA-ITN-ETN - European Training Networks (Grant Agreement No 722467)

Duration: From 01-01-2017 to 31-12-2020

Budget: 2.265.900,12 €

11. AMABLE-AdditiveManufacturABLE

The principal objective of this project is to overcome barriers in the uptake of Additive Manufacturing (AM) related to lack of skilled human resources, and lack of access to know-how, equipment, infrastructure and markets. To achieve this objective, partners with expertise right across the AM value chain have been brought together from the four corners of the EU to:

- Create an open-sourced-based, living and adapting AM eco-system, which can offer required assistance to European SMEs/mid-caps and become self-sustainable after project execution.
- Provide all necessary assistance to SMEs/mid-caps allowing successful exploitation of AM, including 3 'competitive calls' for experiments.
- Offer a comprehensive range of (at least 10) AM support services through an open source- and API-based digital marketplace structured as three Platforms (Technology, Business, and Skills and Education).
- Support and develop 'best in class' AM data handling tools and approaches, on an open-source basis.

- Coordinate the development of synergies with the already existing I4MS framework, Competence Centres, Digital Innovation Hubs and other related research and innovation activities at the European level.

Coordinator: Fraunhofer Institute (Germany)

Partners:

- CISCO Systems International (Netherlands)
- Industrial Data Space (Germany)
- Keen Bull (Switzerland)
- Roland Berger (Germany)
- AIMEN (Spain)
- Teknologisk Institute (Denmark)
- EWF (Belgium)
- Frederick Research Center (Cyprus)
- Inspire (Switzerland)
- University of Patras (Greece)
- Lortek (Spain)
- MTC (United Kingdom)
- Politecnico of Turin (Italy)
- Sirris (Belgium)
- University of Applied Sciences and Arts of Southern Switzerland (Switzerland)
- TNO (Netherlands)
- The Welding Institute (United Kingdom)
- VTT (Finland)
- Wrocław University of Science and Technology (Poland)
- Zabala Innovation Consulting (Spain)

Website: www.amable.eu

https://cordis.europa.eu/project/rcn/211557_en.html

Funding stream: H2020-FoF-2017

Duration: From 01-09-2017 to 31-08-2021

Budget: 8.217.958,75 € (8.001.358,75 EC contribution)

12. REVOLVE- Radio Technologies for Broadband Connectivity in a Rapidly Evolving Space Ecosystem: Innovating Agility, Throughput, Power, Size and Cost

Radio signals are core to space systems and services; they are the backbone of satellite broadcasting & communications and further represent the primary underpinning technology of the nearly ubiquitous space-based radio navigation services. Radio technologies are therefore central in defining the investment return for a wide range of

missions. As the frightening rates of concurrent advances in space-related services, business models and technologies are driving the space ecosystem to a new age, the need to re-invent radio technologies for space is becoming increasingly urgent;

This paradigm shift dictates an acute need of highly trained researchers and engineers with a broad set of skills and abilities that extend across and beyond conventional boundaries, enabling them to re-think current approaches and pioneer fresh concepts and radio technologies for space. Recognising this urgent need, REVOLVE brings together a world-leading consortium of industrial and academic beneficiaries aiming to challenge conventional practice in a training network formed around the following five pillars; excellent science & engineering; cross-fertilisation within and between sectors and technologies; application-focused R&D; innovation-centred training, and; P5: promote career acceleration and fulfil personal potential

Coordinator: HERIOT-WATT UNIVERSITY (UK)

Partners:

- THALES ALENIA SPACE (France)
- LARGE SPACE STRUCTURES GMBH (Germany)
- FUNDACION PRODINTEC (Spain)
- CNRS (France)

Website: <http://revolve.eps.hw.ac.uk/>

https://cordis.europa.eu/project/rcn/205538_en.html

Funding stream: H2020-MSCA-ITN-EID - European Industrial Doctorates

Duration: From 01-01-2017 to 31-12-2020

Budget: 1.834.895,07 €

13. BAMOS- Biomaterials and Additive Manufacturing: Osteochondral Scaffold innovation applied to osteoarthritis

Osteoarthritis is a degenerative joint disease, typified by a loss of quality of cartilage and changes in bone at the interface of a joint, resulting in pain, stiffness and reduced mobility. BAMOS particularly addresses the challenges in OA treatment by providing novel cost effective osteochondral scaffold technology for early intervention of OA to delay or avoid the joint replacement operations. This project has the potential to relieve pain in patients with OA improving their quality of life by keeping people active. It fits with the scope of EU Societal Challenges to encourage the provision of improved clinical care for patients in the field of healthcare, especially for elderly patients.

Coordinator: Universidad de Las Palmas de Gran Canaria (Spain)

Partners:

- University College London (UK)
- Universidade do Minho (Portugal)
- THE ROYAL NATIONAL ORTHOPAEDIC HOSPITAL NATIONAL HEALTH SERVICE TRUST (UK)
- XI'AN JIAOTONG UNIVERSITY (China)
- SHAANXI HENGTONG INTELLIGENT MACHINE CO LTD (China)
- Zhejiang University (China)

Website: risebamos.eu

https://cordis.europa.eu/project/rcn/207034_en.html

Funding stream: *H2020-MSCA-RISE-2016*

Duration: *From 01-01-2017 to 31-12-2020*

Budget: *828.000 € (639.000 € EC contribution)*

14. PM Life- lifelong training programme to help develop the Powder Metallurgy Future

The course will offer students the chance to either attend the full programme to learn about the whole industry or pick topics to help further their knowledge in certain areas.

The course offers weeks training and an optional internship covering five strands:

- Powder and Hard Metals
- Press & Sinter
- Additive Manufacturing
- Metal Injection Moulding
- Hot Isostatic Pressing

Coordinator: European Powder Metallurgy Association (EPMA) (Belgium)

Partners:

- CEA (France)
- Chalmers (Sweden)
- Eramet Research (France)
- Fraunhofer IFAM (Germany)
- Grenoble INPB (France)
- Höganäs (Sweden)
- KTH Stockholm (Sweden)
- Linde (Germany)
- Montan University (Austria)

- Manufacturing Technology Centre (UK)
- Politecnico di Torino (Italy)
- Rio Tinto (Canada)
- Sandvik (Sweden)
- Sintex (Denmark)
- University Carlos III Madrid uc3m (Spain)
- University of Trento (Italy)

Website: <https://www.pmlifetraining.com/>

EU Funding Stream: EIT RawMaterials

4. Summary and conclusions

The analysis revealed a high number of AM teaching programmes identified. In the university context, however, traditional study programmes fully dedicated to AM are few, and all confined to the post-graduate level. From the investigation carried out, it emerges that a total of 6 master degrees where AM subjects play a major role are part of the study offerings of universities across Europe. The majority of them is offered by UK universities, while one of them is designed and run by European universities conjunction non-European universities. In all these 6 courses, having a bachelor's degree is a pre-requisite for application, with 1 course requiring also the possession of a master's degree in engineering subjects.

A total of 41 courses, MOOCs, summer schools, seminars on additive manufacturing destined to managers, operators, learners and other AM stakeholders more in general has been identified. They are offered offline or digitally by universities, industrial actors or research institutes across Europe, or jointly by some of these entities.

With regards to EU-funded projects looking at the issues of AM skills, training or education, 14 initiatives drawing from different EU funding streams were presented. In line with the overall focus of the programme on jobs and competences, the majority of them belongs to Erasmus+. The reminder is distributed between Horizon 2020 (within the Marie-Curie Programm), the KIC-Raw Materials programme managed by the European Institute of Innovation & Technology (EIT) and a sub-programme within the European Regional Development Fund (ERDF), which forms part of the EU structural and cohesion funds. This heterogeneity suggests that AM remains a topic cutting across a diversified set of interests and, accordingly, capturing the attention of a variety of European Commission departments and related bodies in charge of EU funds' implementation.