universidade de aveiro
theoria poiesis praxis
dem
department of mechanical engineering
tema
centre for mechanical technology and automation

From Industry Needs to Educational Outputs: Co-designing the DIGI3D Curriculum for Sustainable Additive Manufacturing in Aerospace

Fábio A.O. Fernandes[(a)*], Victor F. Neto[(a)*], Gabriel F. Serra[(a)], Virginija Leonavičiūtė[(b)], Emre Özeren[(c)], Selim Gürgen[(d)]

(a) Centre for Mechanical Technology and Automation (TEMA), Department of Mechanical Engineering, University of Aveiro; (b) Department of Aeronautical Engineering, Antanas Gustaitis' Aviation Institute, Vilnius Gediminas Technical University; (c) TEI; TUSAS Engine Industries; (d) Department of Aeronautical Engineering, Eskişehir Osmangazi University;
(a) Aveiro, Portugal; (b) Vilnius, Lithuania; (c) Eskişehir, Turkey; (d) Eskişehir, Turkey;
* fabiofernandes@ua.pt; vneto@ua.pt

Abstract — The rapid adoption of additive manufacturing in the aerospace sector is creating demand for engineers who can connect digital design, materials, process control, certification and sustainability. DIGI3D – Digital Manufacturing in 3D Printing for Eco-Friendly and Sustainable Aerospace Applications – addresses this need through an Erasmus+ partnership involving universities in Türkiye, Portugal and Lithuania, together with the aerospace engine manufacturer TEI. The project is developing an industry-informed educational ecosystem intended for engineering students, educators and technical professionals. The curriculum is structured into four complementary modules covering digital manufacturing and 3D printing, materials for aerospace applications, 3D printing processes for aerospace components and maintenance, and industrial case studies. These modules provide the foundation for four intellectual outputs: a curriculum based on learning module outlines, a comprehensive textbook, supporting educational resources, including presentations, lesson reviews, and quizzes, and an open-access e-learning platform. A key stage in the curriculum development process was an industry engagement event organised on 27 November 2025 at CENTIMFE, Marinha Grande, within Moulds Week 2025 [1]. The event combined a presentation of the proposed curriculum with an industrial keynote, a moderated panel and an open discussion involving representatives from additive manufacturing, mouldmaking and aerospace companies, particularly Hypermetal, 3D Ever, Durit and Tekever [2]. The discussion identified priority areas for engineering education, including aerospace certification and process qualification, material behaviour, post-processing and surface finishing, digital design-to-production workflows, small series manufacturing and the transition from prototyping to serial production. The feedback gathered is being used to refine the curriculum and guide the preparation of the textbook, supporting materials and e-learning platform. DIGI3D therefore provides a practical model for developing engineering education through continuous dialogue between academia and industry, while embedding digitalisation, applied learning and environmental responsibility into aerospace additive manufacturing training.

Keywords — additive manufacturing; aerospace education; curriculum development; academia–industry collaboration; digital manufacturing; sustainability.

TOPIC

1) a.: Sustainable Manufacturing Solutions – Manufacturing Processes & Simulation".

ACKNOWLEDGMENTS

This work is supported by the project 2024-1-TR01-KA220-HED-000245462 funded by the European Union.

This work is supported by the project UID/00481 – Centro de Tecnologia Mecânica e Automação (TEMA) – Fundação para a Ciência e a Tecnologia.

REFERENCES

[1] Gabriel Serra, Fábio Fernandes, Victor Neto, "O Fabrico Aditivo na Interseção com a Indústria Aeroespacial e de Moldes", *Molde*, 149, pp. 45-46, April 2026.

[2] Helena Silva, "Tecnologias emergentes ganham relevância na estratégia industrial", *Molde*, 148, pp. 48, January 2026.