

Master degree in Digital Manufacturing

Subject: ADDITIVE MANUFACTURING

Description of the Content:

Advanced Manufacturing has been identified as one of the key factors for sustainable economic growth, job creation and long-term competitiveness. And within this, additive manufacturing is one of its most important fields and one that is expected to have greater growth and development in the future. Additive manufacturing, frequently associated with the term 3D-Printing, is a technology with great innovative potential that is transforming the way of conceiving, designing and manufacturing products.

This course deals with the different technologies related to Additive Manufacturing and is made up of both theoretical and practical aspects. The fundamental objective is to publicize the basic principles of the process (characteristics, advantages and limitations, fields of application, manufacturing strategies and the initial aspects of the design of this type of parts). Another important part of the course will consist of the design, planning and execution of tests and practical cases.

Character: OPTIONAL

Credits: 5 ECTS

TEACHING

Teaching period: 2nd Year

Face-to-face modality

Language: English

Academic year: 2024-2025

Lecturers: Xabier Cearsolo, Maitane Gabilondo

Master degree in Digital Manufacturing

CONTENT

- Introduction to Additive Manufacturing and Additive Manufacturing Technologies
- Scanning and reverse engineering for Additive Manufacturing
- Topology Optimization
- FDM technology
- Stereolithography SLA technology
- HP-4200 Multi Jet Fusion technology
- Metallic materials for Additive Manufacturing
- Laser Metal Deposition (LMD) technology
- Laser Powder Bed Fusion (LPBF) technology

BIBLIOGRAPHY

- Bandyopadhyay, A., & Bose, S. (n.d.). *Additive manufacturing*.
- Gebhardt, A., & Hötter, J.-S. (n.d.). *Additive manufacturing : 3D printing for prototyping and manufacturing*.
- Shimamura, K., Singh, M. (Mrityunjay), Ohji, T. (Tatsuki), & Michaelis, A. (n.d.). *Additive manufacturing and strategic technologies in advanced ceramics : a collection of papers presented at CMCEE-11, June 14-19, 2015, Vancouver, BC, Canada*.
- Badiru, A. (n.d.). *Additive Manufacturing Handbook*.
- Additive MANufacturing Innovations, Advances, and Applications. (n.d.).
- Dutta, B., & Froes, F. H. *Additive manufacturing of titanium alloys : state of the art, challenges and opportunities*.
- Gibson, I., Rosen, D., & Stucker, B. (2015). Additive manufacturing technologies: 3D printing, rapid prototyping, and direct digital manufacturing, second edition. In *Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing, Second Edition*. Springer New York. <https://doi.org/10.1007/978-1-4939-2113-3>

Master degree in Digital Manufacturing

- Wimpenny, D. I., Pandey, P. M., & Jyothish Kumar, L. (2016). Advances in 3D Printing & additive manufacturing technologies. In *Advances in 3D Printing and Additive Manufacturing Technologies*. Springer Singapore. <https://doi.org/10.1007/978-981-10-0812-2>
- Niaounakis, M. (n.d.). *Biopolymers : processing and products*.
- Senthilkannan, S., Monica, M., & Savalani, M. (n.d.). *Environmental Footprints and Eco-design of Products and Processes Handbook of Sustainability in Additive Manufacturing*. <http://www.springer.com/series/13340>
- Lipson, Hod., & Kurman, Melba. (n.d.). *Fabricated : the new world of 3D printing*.
- Industrializing Additive Manufacturing - Proceedings of Additive Manufacturing in Products and Applications - AMPA2017. (2018). In *Industrializing Additive Manufacturing - Proceedings of Additive Manufacturing in Products and Applications - AMPA2017*. Springer International Publishing. <https://doi.org/10.1007/978-3-319-66866-6>
- Brandt, M. (2017). *Laser additive manufacturing : materials, design, technologies, and applications*. Elsevier Science.
- Toyserkani, Ehsan., Corbin, Stephen., & Khajepour, Amir. (2005). *Laser cladding*. CRC Press.
- Bian, L. (n.d.). *Laser-Based Additive Manufacturing of Metal Parts*.
- Zohdi, T. I. (n.d.). *Lecture Notes in Applied and Computational Mechanics 60 Continuum and Discrete Element Methods Modeling and Simulation of Functionalized Materials for Additive Manufacturing and 3D Printing: Continuous and Discrete Media*. <http://www.springer.com/series/4623>
- Wang, J., Antoun, B., Brown, E., Chen, W., Chasiotis, I., Huskins-Retzlaff, E., Kramer, S., & Thakre, P. R. (Eds.). (2018). *Mechanics of Additive and Advanced Manufacturing, Volume 9*. Springer International Publishing. <https://doi.org/10.1007/978-3-319-62834-9>
- Gebhardt, A. (2012). *Understanding additive manufacturing : rapid prototyping, rapid tooling, rapid manufacturing*. Hanser Publishers.
- Gu, D. (2015). Laser additive manufacturing of high-performance materials. In *Laser Additive Manufacturing of High-Performance Materials*. Springer Berlin Heidelberg. <https://doi.org/10.1007/978-3-662-46089-4>
- Milewski, J. O. (n.d.). *Springer Series in Materials Science 258 Additive Manufacturing of Metals From Fundamental Technology to Rocket Nozzles, Medical Implants, and Custom Jewelry*. <http://www.springer.com/series/856>
- Niaounakis, M. (n.d.). *Biopolymers : processing and products*.
- Yang, L., Hsu, K., Baughman, B., Godfrey, D., Medina, F., Menon, M., & Wiener, S. (n.d.). *Additive Manufacturing of Metals: The Technology, Materials, Design and Production Springer Series in Advanced Manufacturing*. <http://www.springer.com/series/7113>

COMPETENCES

- Know the different Additive Manufacturing technologies, the characteristics of each of them and their fields of application.

EVALUATION SYSTEM

- Final test 100 %