



2023 Master internship at University of Cádiz

TITLE

Product desing and material development for Additive Manufacturing

LAB & PEOPLE

- Name of the hosting lab: INNANOMAT
- General activities of the lab: Materials development and design for additive manufactuirng
- Website: <https://tep946.uca.es/>
- Number of staff / PhD: 25
- Supervisor name and contact:
Supervisor: Daniel Moreno Sánchez danielmoreno.sanchez@uca.es
Head of the research group : Sergio Molina Rubio sergio.molina@uca.es

TOPIC OF THE INTERNSHIP

- **Scientific context of the internship (max 20 lines)**
The incoming student will assist in different duties regarding to the activity of INNANOMAT research group. Two main research lines will be aviable according the the candidate profile :
 1. The select student he will assist in the development and charactersiation of novel polymeric materials specially deveolped for large scale additive manufacturing. Material selection, material blend using a twin screw extruder, material processing with a pellet based equipment, specimens preparation and characterisation will be some of the selected tasks.
 2. Another possible line is to assist in novel products development with Additive Manufacturing technologies. The scope is broad for products application as the research group is working in different projects in different industrial sectors :

medicine, aeronautics, naval or consumer goods. The approach for product design comes from novel engineering tools that are embraced in what is called simulation driven design. Topology optimisation, lattice design.

Keywords

Additive manufacturing, material development, polymers, design for additive manufacturing, product design

Bibliography

Moreno-Nieto, D., Burgos-Pintos, P. and Moreno-Sánchez, D. (2023). Modeling Strategies and Computer-Aided Designs for Producing Optimized Performance of Additively Manufactured Nanomaterials. In Nanotechnology-Based Additive Manufacturing (eds K. Deshmukh, S.K.K. Pasha and K.K. Sadasivuni). <https://doi.org/10.1002/9783527835478.ch22>

Moreno Nieto D, Moreno Sánchez D. Design for Additive Manufacturing: Tool Review and a Case Study. *Applied Sciences*. 2021; 11(4):1571. <https://doi.org/10.3390/app11041571>

Moreno-Sanchez D, Sanz de León A, Moreno Nieto D, Delgado FJ, Molina SI. Basalt Fiber Composites with Reduced Thermal Expansion for Additive Manufacturing. *Polymers*. 2022; 14(15):3216. <https://doi.org/10.3390/polym14153216>

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Gibson, I.; Rosen, D.; Stucker, B. *Additive Manufacturing Technologies*; Springer: New York, NY, USA, 2015.

Duty, C.; Ajinjeru, C.; Kishore, V.; Compton, B.; Hmeidat, N.; Chen, X.; Liu, P.; Hassen, A.A.; Lindahl, J.; Kunc, V. What makes a material printable? A viscoelastic model for extrusion-based 3D printing of polymers. *J. Manuf. Process*. **2018**, *35*, 526–537.

Duty, C.E.; Drye, T.; Franc, A. *Material Development for Tooling Applications Using Big Area Additive Manufacturing (BAAM)*; ORNL Technical Report ORNL/TM-2015/78; Oak Ridge National Laboratory (ORNL): Oak Ridge, TN, USA, 2015; pp. 1–8.

Nieto, D.M.; López, V.C.; Molina, S.I. Large-format polymeric pellet-based additive manufacturing for the naval industry. *Addit. Manuf.* **2018**, *23*, 79–85.

- **Tasks and duties entrusted to the student:**

Material selection, material blend using a twin screw extruder, material processing with a pellet based equipment, specimens preparation and characterisation will be some of the selected tasks.

Advanced 3D modelling, design for Additive manufacturing

- **Skills to be acquired or developed:**

Acquisition of the knowledge of how new polymeric materials are developed, the blending process and specific material characterisation for Additive manufacturing.

Learning how the design process for Additive Manufacturing works, specific design and simulation tools for Additive Manufacturing, processing the design with different AM technologies.

PROFILE OF THE DESIRED STUDENT

- Minimum level of study required: BCs / Current MSc Student
- Field(s) of study: Engineering / Industrial design / Materials
- Scientific skills : Not needed
- Language skills required : English fluent

THE INTERNSHIP ASSIGNMENT:

Desired duration of the internship (in months): from 3 to 9 months

Desired Starting date of the mission: *(please indicate the level of flexibility) 1st October 2023. Highly flexible.*

Indicative weekly schedule: *25h / week*

Remuneration : *Not from the research group.*

Erasmus grant : If applicable.

Internship agreement: *an internship agreement will be signed.*

To SEA-EU students:

If you're interested please send your CV and letter of motivation to the scientist in charge, danielmoreno.sanchez@uca.es and daniel.moreno@uca.es before the 15 /09 / 2023.