FACULDADE DE CIÊNCIAS E TECNOLOGIA UNIVERSIDADE D COIMBRA

CEMMPRE
CENTRO DE ENGENHARIA MECÂNICA, MATERIAIS E PROCESSOS

# Centre for Mechanical Engineering, Materials and Processes

# CEMMPRE

**PROPOSTA DE PLANO DE DOUTORAMENTO/DOCTORAL PLAN PROPOSAL**

**(a ser redigido em Inglês / to be filled in English)**

**ORIENTADOR(A)/SUPERVISOR:** Maria Teresa Vieira and André Cavaleiro

**GRUPO/GROUP:** Materials and Processes

**ORIENTADOR(A)/SUPERVISOR:** Ricardo Branco

**GRUPO/GROUP:** Mechanical and Intelligent Manufacturing

**LOCAL DE REALIZAÇÃO DO TRABALHO/PLACE OF WORK:** CEMMPRE

**TÍTULO DO PLANO DE DOUTORAMENTO/TITLE OF THE DOCTORAL PLAN:** Space environment effect in the properties of additive manufactured parts


**RESUMO/SUMMARY (max. 300 words total)**

Objetivo/Objectives:

A clear void of knowledge regarding the effects of space conditions namely microgravity, is patent in the state of art. Additive manufacturing (AM) is the elective technology to produce 3D objects for space. On the technologies associated to additive manufactured 3D materials porosity, anisotropy and residual stresses are different from the conventional manufacturing. Additive manufacturing plays an increasingly important role on space exploration, with the possibility of creating geometrically complex parts in small series at a sustainable cost, the integration of generative design tools to boost the weight reduction and design freedom capabilities. Additive manufacturing normally contributes to a sustainable approach to manufacturing 3D objects.

The main focus of the research lies on analyzing and comparing mechanical behavior of terrestrial typical metallic alloys additively manufactured under gravity and microgravity conditions. The materials to be tested, according to applicability and innovation within the space industry, will be mainly Copper, Aluminium and Inconel alloys.

The proposed work aims to assist in the development of Additive Manufacturing for Space and In Space Additive Manufacturing knowledge, recognizing the importance of a joint effort of research that will be able to create a sustainable path towards space exploration.

Resultados Esperados/Expected Results:

Optimized set of parameters for different AM technologies, as well as a full comparison between them in what concerns the applicability and the cost.

Attain a fully functional part as a case study, integrable within a low/medium sized satellite.

Case study focused on development of thermal bridges/straps, relying on the development of new/multi material to improve heat transfer on specific directions

A minimum of 4 scientific publications.

| **Programa Doutoral/Doctoral Program** | **Ordenação por ordem de preferência/Sorting in order of preference** |
|---|---|
| **Engenharia Mecânica/Mechanical Engineering** | **1** |
| **Engenharia Química/Chemical Engineering** | |
| **Engenharia Biomédica/Biomedical Engineering** | |
| **Biociências/Biosciences** | |