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)

ORIENTADORA/SUPERVISOR: Ana Paula Amaro

GRUPO/GROUP: A

ORIENTADORA/SUPERVISOR: Ana Paula Piedade

GRUPO/GROUP: B

ORIENTADOR EXTERNO/EXTERNAL SUPERVISOR: Lino Gonçalves

GRUPO/GROUP: Director of the Cardiology of CHUC, Full professor of Faculty of Medicine-University of Coimbra

LOCAL DE REALIZAÇÃO DO TRABALHO/PLACE OF WORK: Departament of Mechanical Engineering da Faculdade de Ciências e Tecnologia da Universidade de Coimbra

TÍTULO DO PLANO DE DOUTORAMENTO/TITLE OF THE DOCTORAL PLAN: Numerical and experimental evaluation of additive manufacturing as a tool for mimicking the biomechanical behavior of artereosclerothic vessels

RESUMO/SUMMARY (max. 300 words total)

Objetivo/Objectives:

Atherosclerosis is one of the leading causes of death worldwide. It is a chronic inflammatory disease that affects blood vessels wall, and its progression leads to plaque formation, reducing the lumen size of the affected vessels. Although this subject arises lots of interest, there are limitations associated with the biomechanical investigation done in atherosclerotic tissues, namely the unstandardized tests to perform mechanical characterization of this type of biological tissues, and the inherent non-consensual values obtained from those tests. The variability of tests, as well as typologies of samples, histological origin, and method of preparation, hampers direct comparisons between results and hinders the full understanding about the pathologic process involved in atherosclerosis development and progression. The main objective is to use additive manufacturing (AM) to mimic blood vessels with several degrees of

obstruction due to plaque formation. To achieve this goal several secondary objectives must be taken in consideration, namely the complementary provided by numerical and experimental approaches.

Resultados Esperados/Expected Results:

To achieve the objectives, and as technologies continue to develop, AM holds the potential to revolutionize the future of many scientific fields, namely Medicine. AM will probably stand as an essential part of treatment plans, for example to print objects to be used in training and surgeon's education situations.
Therefore, continued research in 3D-printed vascular networks, as well as in biomechanical properties of blood vessels (healthy and atherosclerotic vessels), will certainly help and guide the treatment of vascular diseases, such as atherosclerosis.
The researcher to develop this work must have a multi and interdisciplinary formation that comprises a Biomedical background, with experience in the interpretation of imaging biomedical techniques, such as Optical Coherence Tomography, the development and characterization of polymeric biomaterials, and formation in Non-Linear Analysis Methods.

Programa Doutoral/Doctoral Program	**Ordenação por ordem de preferência/Sorting in order of preference**
Engenharia Mecânica/Mechanical Engineering	**3**
Engenharia Química/Chemical Engineering	**4**
Engenharia Biomédica/Biomedical Engineering	**1**
Biociências/Biosciences	**2**