Lecturer

Name: Ana Paula Piedade
Background: BSc Biochemistry, MSc Cellular Biology and Ph.D. Mechanical Engineering
Specialization: Biotic/abiotic interface, biopolymers, additive manufacturing, Professor at UC
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Name: Ricardo Branco
Background: PhD in Mechanical Engineering
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Name: Carlos Leitão
Background: Ph.D. in Mechanical Engineering
Specialization: CAD and technical drawing at UC
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Name: Paula Vasconcelos Morais
Background: PhD in Microbiology
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Name: Ana Paula Chung
Academic Background: Ph.D. Biochemistry, specialization Microbiology
Field of Specialization: Production of biopolymers from bacteria
Employer: University of Coimbra
Previous Positions: Pos Doc Researcher at University of Coimbra
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Name: Marisa Azevedo De Almeida Fernandes
Background: PhD in Environmental Sciences and Engineering
Specialization: ?
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Name: Hélio Rui Caldeira da Silva Jorge
Background: PhD in Polymer Science and Engineering
Specialization: Specialist technician in new materials and applications; in preparation and characterization of granular materials for precision forming.
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Course Description

Title: 003D: No Time To Waste
Fields of activity: Lectures, Project work, Workshop, Tutorial, Seminar, Company Visits
Examination type: Quiz test
Number of ECTS credits issued: 1,0
Learning Goals and Objective: At the end of the course, the student should understand the basics of thinking in different ways in order to take the best advantage of additive manufacturing (AM) and its contribution to a renewable economy. AM is only limited by your imagination.

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Syllabus

Name of activity	High-value bacterial products for new materials production
Number of working hours	4 hours
Type of activity	Lecture
Lecturer	Paula V Morais & Ana Paula Chung
Short summary of content	Bacterial production of biopolymers and purification Expression of heterologous protein
Bibliography	Branco et al., 2013 DOI: 10.1371/journal.pone.0054005 Santos et al.,2016, DOI: 10.3390/ma9070599
Expected effect	The participants will experiment with bench work on microbiology for the production of biomaterials. Concepts such as working under sterile conditions will be emphasized.

Name of activity	3D modeling of components for general manufacturing
Number of working hours	2 hours
Type of activity	Lecture
Lecturer	Carlos Leitão
Short summary of content	Technical Drawing 2D and 3D 3D modeling
Bibliography	The used materials (presentation) will be shared.
Expected effect	Participants will be able to concept a CAD project and establish approach strategies to produce a part, either by subtractive or additive production processes.

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Name of activity	Individual Project
Number of working hours	2 hours
Type of activity	Project work
Lecturer	Carlos Leitão
Short summary of content	Individual Project
Bibliography	The used materials (presentation) will be shared.
Expected effect	Each participant will have made a 3D model of a component, capable of being produced on any equipment using either of these types of processes.

Name of activity	Additive Manufacturing Technologies with Inorganic Materials and Circular Economy in Industry
Number of working hours	3 hours
Type of activity	Workshop
Lecturer	Hélio Jorge/Marisa Almeida
Short summary of content	Presentation of methods of Additive Manufacturing Technologies applied to the industry and visit to the laboratory of development of prototypes in 3D (ceramics and stone powder) and presentation of Circular Economy and Industrial Symbiosis practices between complementary sectors.
Bibliography	The workshops will be developed based on the work that is developed in the CTCV and in the partner industries.
Expected effect	Participants will have a greater knowledge about the application of these technologies in the industry of the materials for Habitat.

Name of activity	Additive Manufacturing: Introduction
Number of working hours	2 hours
Type of activity	Lecture
Lecturer	Ana Paula Piedade
Short summary of content	Additive Manufacturing: standards, definitions, processes and technologies Slicing software for defining the 3D printing parameters
Bibliography	The used materials (presentation) will be shared.
Expected effect	Participants will be in contact with the fist approach to additive manufacturing, namely the process and main technologies. Main emphasis will be given on those used for polymeric materials.

Name of activity	Additive Manufacturing: Practice
Number of working hours	2 hours
Type of activity	Tutorial
Lecturer	Ana Paula Piedade
Short summary of content	Producing a component by a technology of additive manufacturing of polymers
Bibliography	The used materials (presentation) will be shared.
Expected effect	The 3D model produced in a previous activity will be used for defining the .gcode file that will be used for the practical activity: producing a component by additive manufacturing

Name of activity	Metal additive manufacturing
Number of working hours	2 hours
Type of activity	Lecture
Lecturer	Ricardo Branco
Short summary of content	Metal additive manufacturing: overview of main processes; main areas of application, mechanical behavior; modeling and design approaches; and case studies.
Bibliography	The used materials (presentation) will be shared.
Expected effect	The participants will understand the main advantages and disadvantages of different metal additive manufacturing processes, their main areas of application and current engineering limitations and challenges.

Name of activity	Case Study: Metal additive manufacturing
Number of working hours	2 hours
Type of activity	Seminar
Lecturer	Ricardo Branco
Short summary of content	Case studies
Bibliography	The used materials (presentation) will be shared.
Expected effect	Current engineering limitations and challenges: metal additive manufacturing of medium size pieces, Digital twins

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Name of activity	Company visit to Porcelanas da Costa Verde
Number of working hours	3,5 hours
Type of activity	Company visit
Lecturer	Hélio Jorge/Marisa Almeida
Short summary of content	Presentation of methods of Additive Manufacturing Technologies applied to the industry and visit to the laboratory of development of prototypes in 3D (ceramics and stone powder)
Bibliography	-
Expected effect	Participants will see in real context the technologies presented in the workshop.

Name of activity	Company visit to Ecogres
Number of working hours	4,5 hours
Type of activity	Company visit
Lecturer	Hélio Jorge/Marisa Almeida
Short summary of content	Presentation of Circular Economy and Industrial Symbiosis practices between complementary sectors.
Bibliography	-
Expected effect	Participants will see in real context the technologies presented in the workshop.

Name of activity	Final Discussion and Examination
Number of working hours	2 hours
Type of activity	Examination
Lecturer	Ana Paula Piedade
Short summary of content	Final discussion and quiz examination
Bibliography	The used materials (for discussion) will be shared in advance
Expected effect	Through the discussion and quiz examination, the participants will prove their gathered knowledge throughout the whole Course.

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Pre-materials

Name	https://www.mdpi.com/1996-1944/9/7/599
Topic/field	Recent Developments in Antimicrobial Polymers
Professor/Author	Madson R. E. Santos, Ana C. Fonseca, Patrícia V. Mendonça, Rita Branco, Arménio C. Serra, Paula V. Morais, Jorge F. J. Coelho

Name	https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0054005
Topic/field	Highly Sensitive, Highly Specific Whole-Cell Bioreporters for the Detection of Chromate in Environmental Samples
Professor/Author	Rita Branco, Armando Cristóvão, Paula V. Morais

Name	https://link.springer.com/10.1007/s40544-022-0691-9
Topic/field	Additive manufacturing of flexible 3D surface electrodes for electrostatic adhesion control and smart robotic gripping
Professor/Author	Dong Geun Kim, Hyeongmin Je, A. John Hart & Sanha Kim

Name	https://link.springer.com/article/10.1007/s12540-023-01467-x
Topic/field	Science and Technology of Additive Manufacturing Progress: Processes, Materials, and Applications
Professor/Author	Vahid Monfared, Seeram Ramakrishna, Navid Nasajpour-Esfahani, Davood Toghraie, Maboud Hekmatifar, Sadegh Rahmati

Name	https://engrxiv.org/preprint/view/2200
Topic/field	A physics-based modeling framework to assess the cost scaling of additive manufacturing, with application to laser powder bed fusion
Professor/Author	Kaitlyn Gee, Suh In Kim, Haden Quinlan, A. John Hart