

Editorial Note

This is the third issue of the Mechanical Engineering Department (DEM) Newsletter, being the first in 2025. It marks not only the beginning of a new year but also a new chapter for DEM. The Department has a new Executive Committee led by myself, as President, together with Professor Fátima Vaz and Professor Carlos Bettencourt da Silva, as Vice-Presidents, Professor Luis Eça, as Coordinator of International Relations, in addition to Professor Elsa Henriques, Professor Filipa Moleiro and Professor João Folgado, as members in charge of Industry Relations, Public Relations and Finance affairs, respectively.

In the coming times we will need the contribution of all, together, in the Department to overcome the multiple challenges ahead, all along providing a solid training for our students, as well as promoting a sustainable renewal and valorisation of our Academic Faculty towards scientific and educational excellence.



Inauguration Ceremony of the President-elect of DEM

In this Newsletter, focused on the second semester of 2024, we celebrate the Awards of our Academic Faculty, who we congratulate for their achievements. We extend our thanks to Professor José Maria André, who just retired, for his long-time dedication to DEM, and we welcome Professor Lúcia Moreira, Professor Haitong Xu and Professor Ricardo Pereira, as new Assistant Professors of DEM.

This issue also highlights other four outstanding projects developed by our Professors within the research centres CENTEC, IDMEC, IN+ and MARETEC, respectively.

We hope you enjoy reading this Newsletter and we wish you all a very successful year of 2025.

DEM President: Paulo Fernandes

Editorial Board: Paulo Fernandes (DEM President), Pedro Coelho (Former DEM President), Filipa Moleiro (DEM Dissemination), Tiago Santos (CENTEC), Duarte Valério (IDMEC), Patrícia Baptista (IN+), Marcos Mateus (MARETEC).

Student Admissions

The number of students who enrolled in the bachelor's programmes under the responsibility or co-responsibility of DEM in the academic year 2024/2025, along with the minimum admission grade, are as follows:

- Aerospace Engineering – 135 students, minimum admission grade 187.3
- Environmental Engineering – 31 students, minimum admission grade 142.3
- Materials Engineering – 25 students, minimum admission grade 153.5
- Mechanical Engineering – 160 students, minimum admission grade 179.3
- Naval Architecture and Ocean Engineering – 30 students, minimum admission grade 172.3



1st Day of Welcome Week (Photo by Maria Carolina)



3rd Day of Welcome Week (Photo by Maria Carolina)

New Academic Faculty

Recent international recruitment competitions for tenure-track Assistant Professor positions in DEM/IST led to the appointment of the following new Assistant Professors, to whom DEM wishes bright academic and research careers:

- Lúcia Moreira – Scientific Area of Naval Architecture and Marine Engineering
- Haitong Xu – Scientific Area of Naval Architecture and Marine Engineering
- Ricardo Teixeira – Scientific Area of Environment and Energy

Retired Academic Faculty

Professor José Maria André, from the Scientific Area of Thermofluids and Energy Conversion Technologies, retired in the course of the second semester of 2024. DEM expresses its gratitude for his dedication and contributions, and wishes him all the best as he embarks on this new chapter of his life.

Ranking of Scientists

Fifteen researchers from IDMEC and six from CENTEC have been recognized as among the most-cited scientists worldwide in 2023, according to the latest edition of the Top 2% Most Influential Scientists ranking published by Stanford University and Elsevier. This prestigious list gathers 200,000 researchers worldwide from various fields.

Furthermore, the career-long impact list highlights seventeen researchers from IDMEC, four from CENTEC and one from IN+. Other than that, Emeritus Professor Carlos Guedes Soares, from CENTEC, is ranked among the national top 10 for both the number of citations in 2023 and throughout his entire career.

Ranking of Universities

Several academic subjects taught by DEM are featured in the most recent 2024 releases of various World University Rankings. While some of these subjects are exclusive to DEM, others are also covered by other departments or faculties within the University of Lisbon. Notably, the University of Lisbon maintained an impressive 4th place globally in the area of marine/ocean engineering.

The world rankings by subjects are as follows:

- Energy Science and Engineering
Shanghai Ranking – 301-400
- Environmental Science and Engineering
NTU Ranking – 165
Shanghai Ranking – 301-400
- Materials Science
NTU ranking – 233
QS World University Rankings – 251-300
- Marine/Ocean Engineering
Shanghai Ranking – 4
- Mechanical Engineering
NTU Ranking – 115
QS World University Rankings – 151-200
Shanghai Ranking – 50

Academic Faculty Awards

Lifetime Scientific Award

The Emeritus Professor Luís Braga Campos received the “SARES Lifetime Achievement Award” granted by the International Sustainable Aviation and Energy Research Society (SARES). This is a career Award that honours leading scientists and researchers in the field of aviation. The Award was presented in the closing session of the International Symposium on Sustainable Aviation (ISSA'24: <https://2024.issasci.org/>), on 1st November 2024.

Academic Faculty Awards

Best Paper Awards

The paper entitled "Hybrid manufacturing of collector coins with free-moving features", by Pedro M.S. Rosado, Rui F.V. Sampaio, João P.M. Pragana, Ivo M.F. Bragança, Carlos M.A. Silva, and Paulo A.F. Martins received the Best Paper Award at the 21st International Conference on Manufacturing Research (ICMR 2024), which was held in Glasgow, UK, on 28th to 30th August 2024.

The paper entitled "Analysis of the foot-ground contact using a MSD-FEM co-simulation approach", by Francisco Melo, Sérgio Gonçalves, Miguel Silva and Pedro Areias received the International Federation for the Theory of Machines and Mechanisms (IFTOMM) Best Paper Award at the European Conference on Mechanism Science (EuCoMeS), which was held in Padova, Italy, on 18th to 20th September 2024.

Honourable Mention

Luís Filipe Pratas Quinto received an honourable mention in the framework of the Award "Vem experimentar nos 40 anos da APAET", which seeks to recognize the best Master's and Doctoral works developed in the field of Experimental Mechanics. The Ph.D. thesis, entitled "*Design, Implementation, and Analysis of a Quasi-Passive Ankle Exoskeleton to Support Military Locomotion*", was developed at IST under the supervision of Professor Miguel Tavares da Silva. It resulted from a close collaboration between IST and Academia Militar, focusing on the development of exoskeletons to support human movement.

The Award was presented in the commemorative session celebrating the 40th anniversary of APAET, the Portuguese Association for Experimental Stress Analysis (Portuguese: *Associação Portuguesa de Análise Experimental de Tensões*). Founded in 1982, APAET promotes scientific and technical cooperation in the field of Structural Mechanics and acts as the national representative in the European Society for Experimental Mechanics (EuraSEM) and the Society for Experimental Mechanics (SEM).



TLMoto electric motorcycle (Photo by Henrique Pereira)

Students' Organisations Rollouts

DEM is proud to highlight the rollout of the fourth electric prototype built by TLMoto, which was held on 18th October 2024. It can reach 200 km/h and promises to revolutionise electric motorcycle competition.

WAPOSAL – Wave power and satellite altimetry project



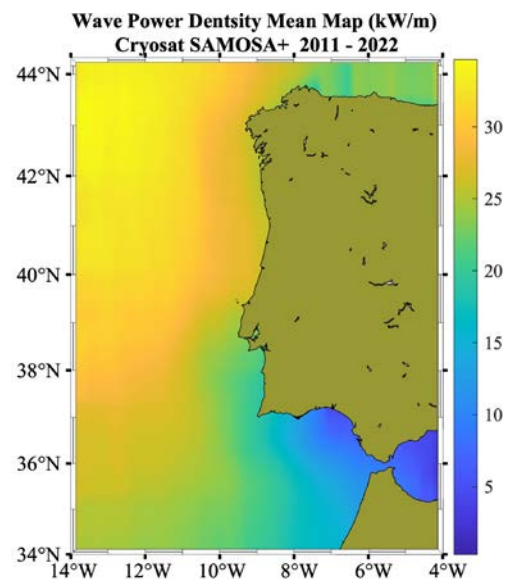
The WAPOSAL project, *Assessment of wave energy resource in the European and Mediterranean coastal zones using high-resolution altimetry products*, has recently kicked-off. The main goal is to develop an innovative application of Earth Observation (EO) data to deliver a state-of-the-art database of wave renewable energy in European coastal zones, thus supporting the European Union (EU) Green Transition and making the EU climate neutral by 2050.

The global coverage of the altimetry constellation and the provision of significant wave height measurements, together with the capability of estimating wave periods, reveal that satellite altimeters are useful systems for estimating the site-specific wave energy potential. WAPOSAL is introducing a novel methodology to compute wave power density based on a newly produced EO dataset that enables high-resolution multi-mission altimetry data in the coastal zone. The main objective is the generation of a database of the wave power density along coastal zones using the high-resolution altimetry data from the OCRE-EO database (OCRE – European Commission HORIZON2020 Open Clouds for Research Environment) available in the Altimetry Virtual Lab facility of the European Space Agency (ESA).

PI: Sonia Ponce de León

Partners: IST-ID-CENTEC (Leader) and ESA
Duration: 15 months
Kicked-off: 2nd July 2024

Website: <https://eo4society.esa.int/projects/waposal/>



Project funded by the European Space Agency (ESA)



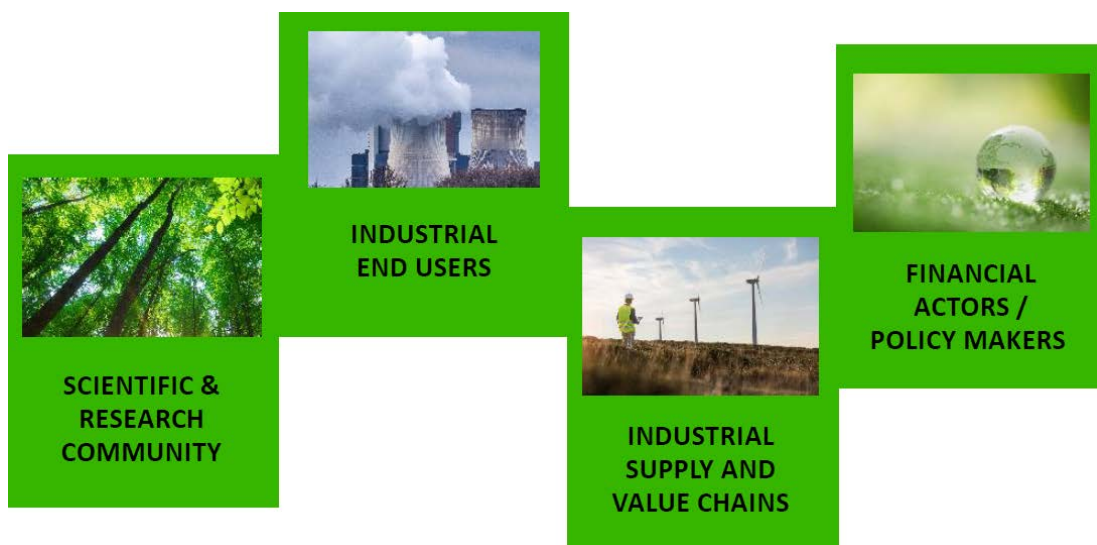
DRIVE – Deep Removal of CO2 and Innovative Electrification Concepts



DRIVE is a pioneering project at the forefront of combating climate change by focusing on CO2 capture in industrial settings. Aligned with the ambitious goals set by the Clean Energy Transition Partnership (CETP) Strategic Research and Innovation Agenda (SRIA) and in harmony with the European Union’s commitment to achieve climate neutrality by 2050, DRIVE aims to revolutionise the way to approach carbon emissions.

DRIVE develops technologies and methods that will allow a wide range of industries to become carbon neutral or even carbon negative, leading to a significant reduction in costs to achieve EU carbon neutrality goals, and directly contributing to keeping global warming below 1.5°C. The direct long-term impacts of DRIVE are associated with the implementation of the technology in different sectors: the project throughout will showcase for power, cement and waste-to-energy use cases, though any industry planning on implementing point-source CO2 could potentially benefit from deep removal and/or electrification. At IDMEC, the project will extend the know-how on life cycle and sustainability assessment of CO2 capture technologies including the inventory database for life cycle analysis, through the exploitation between consulting and service provider with the end-user being the industry. Website: <https://drive-co2.eu/>

PI: Ana Filipa Ferreira



Cities for Climate



The Cities for Climate Network is a collaborative initiative, without legal personality, with the mission to support Portuguese cities and regions in their effort to accelerate the transition to climate neutrality, in alignment with the European Mission “The 100 Climate-Neutral and Smart Cities by 2030, by and for the citizens”. The Cities for Climate Network was founded in 2024 by Portuguese cities and regions that expressed their interest in integrating the Mission and, thus, the ambition to develop a “Climate City-Contract”, incorporating a strategy and an action plan for climate neutrality by 2030. Any Portuguese city and region committed to the objective of climate neutrality can join the Cities for Climate Network.

The activities of the Cities for Climate Network are promoted and managed by the Technical Secretariat, assigned to IN+ Center for Innovation, Technology and Policy Research. The work of the Cities for Climate Network develops along four main lines of action, on the topics of Energy, Buildings, Mobility and Carbon Removal. The Cities for Climate Network collaboratively develops urban intervention projects, being their environmental, economic, and social impacts scientifically measured using urban-scale modelling tools, in order to deliver sectoral implementation and investment plans whose integration will be promoted by cross-cutting actions and projects.

PI: Paulo Ferrão



Monitoring the state of soils with smartphones and remote sensing



Monitoring soil health, and important environmental and agronomic parameters such as soil carbon, nitrogen and phosphorus, is costly. VirtuaCrop emerged with the goal of developing a low-cost and effective soil assessment technology that could be used by any farmer regardless of technical expertise. It started with the development of a machine learning algorithm that takes only free sources of data as input to estimate critical soil parameters. Concretely, the inputs are remotely sensed data from satellites, plus colour and texture of the soil characterized using a simple digital photograph. A smartphone app was then developed. The app requires only the indication of the farms of interest by the user, and then automatically collects remotely sensed data to characterize the plots. The farmer can then take a photo of the soil and, in 15-30 seconds, receives a soil analysis bulletin.

This app won the myEUspace competition in 2022 for best idea in the “Farming by Satellite” category. A spin-off company, VirtuaCrop, was created in 2023, and since then the company has already received a grant from the European Space Agency Business Incubation Centre (ESA-BIC) to further develop the product.

PI: Ricardo F.M. Teixeira

