



UC3M R&D IN THE area of energy, environment, and climate

IDENTIFICATION OF THE RESEARCH ACTIVITY,
TECHNOLOGIES, PATENTS, INFRASTRUCTURES,
AND OTHER UC3M CAPABILITIES IN THE AREA
OF ENERGY, ENVIRONMENT, AND CLIMATE

uc3m

Universidad **Carlos III** de Madrid

Vicerrectorado de Política Científica

Servicio de Apoyo al Emprendimiento y la Innovación



The Entrepreneurship and Innovation Support Service of Universidad Carlos III of Madrid (UC3M) presents UC3M potential in this "technology map" through the lines of research conducted within the framework of the National and international R&D projects, patents, and other results attained by UC3M researchers in the area of health and health technologies.

The overall knowledge achieved, experience in collaborating with the industry, the existence of internally owned infrastructures and laboratories, and above all else, the multidisciplinary nature of UC3M are unique characteristics which provide an added value for the provision of a comprehensive support to innovation in institutions, large companies, and small- and medium-sized enterprises.

We would like you to learn more about the know-how at UC3M and to collaborate in new R&D&I projects.

**Entrepreneurship and Innovation Support Service,
Universidad Carlos III de Madrid**

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R&D GROUP

LINES OF RESEARCH

RESEARCH PROJECTS

TECHNOLOGICAL OFFER / OTHERS

ENGINEERING

AEROSPACE ENGINEERING

Space Propulsion and Plasmas Team (EP2)

PI: Eduardo Ahedo

- Fusion by magnetic confinement
- RF plasma and microwave sources
- Ion and electron sources
- Plasma diagnostic systems
- Wave-plasma interaction
- Instabilities and turbulence
- Plasma-surface interaction
- Simulation techniques
- Data analysis

European Projects

- ZARATHUSTRA: Revolutionizing advanced electrodeless plasma thrusters for space transportation
- HIPATIA: Helicon Plasma Thruster for In-space Applications

Regional R&D Plan Projects

- PROMETEO: Plasma propulsion and nuclear fusion: innovating space transport
- SIMTURB: Numerical Simulation of Turbulence in Electric Space Propulsion: Synergy with Fusion Plasmas
- EXOPLAWIN: Stellar wind-exoplanetary magnetosphere interaction study by means of artificial plasma sources and computational models

Private funding

- Electric propulsion diagnostics for plasma thrusters (funded by ESA)

Experience and Capabilities

20 years of experience in various national and international projects. Capabilities in plasma device modelling, simulation, design, and testing.

Equipment

Laboratory with three vacuum chambers that are well equipped for the development and testing of plasma devices.

Numerical simulation tools

Several numerical simulation codes have been developed internally based on both fluid and kinetic formulations and including detailed models of all individual plasma phenomena.

[Numerical tools](#)

[Group's video](#)

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
AEROSPACE ENGINEERING			
<p><u>Aerospace Engineering Research Group</u></p> <p>PI: Stefano Discetti</p>	<ul style="list-style-type: none"> • Aerodynamics <ul style="list-style-type: none"> · Bioinspired aerodynamics · Turbulent flow control · Artificial intelligence applications in aerodynamics · Fluid-structure interaction · Turbulence · Heat transfer · Computational fluid mechanics · Supercomputing · Experimental aerodynamics · Advanced dynamic thermofluid measuring techniques • Air navigation <ul style="list-style-type: none"> · Aircraft trajectory optimisation · Meteorological uncertainty management · Aviation induced environmental impact · Artificial intelligence applications in air traffic management • Aeronautical technology <ul style="list-style-type: none"> · Aerostructures · Multidisciplinary design and optimisation · Unconventional aircraft · Unmanned air vehicles (UAVs) · Structural health monitoring · Structural dynamics and vibro-acoustics · Composite materials and advanced materials · Airborne energy generation systems 	<p>European Projects</p> <ul style="list-style-type: none"> • FlyATM4E: Flying Air Traffic Management for the benefit of environment and climate; • NEXTFLOW: Next-Generation flow diagnostic for control; • ALARM: multi-hazard monitoring and early warning system <p>National R&D Plan Project</p> <ul style="list-style-type: none"> • ARTURO: Active control of turbulence for sustainable aircraft propulsion • Flight modelling and testing of airborne wind energy and power generation systems • Flight simulation and testing of power kite applications in wind energy generation <p>Regional R&D Plan Project</p> <ul style="list-style-type: none"> • HYDROGENATING-CM-UC3M - Aviation and climate change: HYDROGEN-powered aircraft model design and climate-optimal aircraft operations using Artificial Intelligence • PREDATOR-CM-UC3M: Prediction and control of turbulent flows with advanced statistical techniques • PITUFLOW-CM-UC3M: Pattern Identification in Turbulence for Flow control 	<p>Experience and Capabilities</p> <p>The research activities of the Aerospace Engineering group are categorised into five areas:</p> <ul style="list-style-type: none"> • Aeroelastic and Structural Design Lab (ASDLab) • Computational Fluid Dynamics Lab • Dynamics and Control in Aerospace Systems • Experimental Aerodynamics and Propulsion Lab • Tethers Applied to Aerospace Engineering <p>Technological offer (Patents)</p> <ul style="list-style-type: none"> • System for generating electric power in orbit by means of floating conductor cables • System for in-orbit propulsion by means of floating conductor cables <p>Equipment</p> <ul style="list-style-type: none"> • Aerospace Technology Laboratories <ul style="list-style-type: none"> · Subsonic wind tunnel · Hydrodynamic tunnel · Equipment for measuring fluids: velocimetry for particle images, IR thermography, hot-wire anemometry, aerodynamic force and pressure measurements · Chemical propulsion laboratory · Flight mechanics and navigation laboratory · Hangar · Additive manufacturing laboratory for aeronautics · Computer cluster

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
AEROSPACE ENGINEERING			
<p><u>Aerospace Engineering Research Group</u></p> <p>PI: Stefano Discetti</p>	<ul style="list-style-type: none"> • Space technology <ul style="list-style-type: none"> · Space tethers · Mission analysis and trajectory optimisation · Orbit determination and space surveillance and tracking · Satellite design and systems engineering · Space debris removal 	<p>Private funding</p> <ul style="list-style-type: none"> • Development of energy generation systems with airborne systems • Generating clean energy with power kites • AEROMATIC: Active control of aerodynamic flows with machine learning (BBVA Beca Leonardo) • Development of energy generation systems with airborne systems 	

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
MATERIALS SCIENCE AND ENGINEERING AND CHEMICAL ENGINEERING			
<p><u>In-service Material Behaviour</u></p> <p>PI: Francisco J. Velasco, Miguel Ángel Martínez</p>	<ul style="list-style-type: none"> • Alternative materials to Portland cement: geopolymers • Corrosion • Organic coatings: powder paints • Durability of cementing materials • Cementing materials for thermal storage applications • Surface treatments and adhesion: adhesives, paints, and coatings 	<p>European Projects</p> <ul style="list-style-type: none"> • Electrical Steel Structuring, Insulating and Assembling by means of the Laser technologies (ESSIAL) • The inhibition synergism of some plant extracts and common inorganic inhibitors to enhance the corrosion control of the embedding steel bars in concrete (NATCON) <p>National R&D Projects</p> <ul style="list-style-type: none"> • Influence of corrosion and its morphology on the fatigue behaviour of stainless steel or carbon steel ribbed bars (FACOR) <p>Regional R&D Plan Projects</p> <ul style="list-style-type: none"> • New concepts of sustainable concretes for solar thermal energy storage (HORATSO) 	<p>Experience and Capabilities</p> <p>Group specialising in the field of materials, their processing, properties, and in-service behaviour.</p> <p>Scientific-technical services</p> <ul style="list-style-type: none"> • Evaluation of the in-service behaviour of metal materials • Evaluation of corrosion processes in aggressive media and provision of solutions • Design of organic and inorganic coatings to ensure component durability • Tribology studies: friction and wear • Development of new cementing materials and alternative activators from industrial waste or by-products • Development of surface treatments to improve the adhesion of environmentally sound paints, varnishes, and adhesives <p>Technological equipment</p> <ul style="list-style-type: none"> • Microstructural analysis • Chemical analysis • Thermal analysis • Corrosion and wear testing • Paint and adhesive testing

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
MATERIALS SCIENCE AND ENGINEERING AND CHEMICAL ENGINEERING			
<p>Material Synthesis and Processing (SYPMAT)</p> <p>PI: Alejandro Varez, Belén Levenfeld</p>	<ul style="list-style-type: none"> • Injection moulding/extrusion of ceramics and metals (CIM, MIM) • Fuel cells • Li batteries • Polymer mixture. Rheological, thermal, and mechanical behaviour • Synthesis and structural characterisation of ceramic materials • Magnetic ceramics: Ferrites • Additive manufacturing of metals and ceramics. 3D printing (Fused Filament Manufacture) 	<p>European Projects</p> <ul style="list-style-type: none"> • VIDICAT: Versatile Ionomers for Divalent Calcium baTteries <p>National R&D Plan Projects</p> <ul style="list-style-type: none"> • High-performance materials for safer batteries, and more cost-effective, symmetrical solid oxide fuel cells: development of materials and prototypes • Materials for lithium batteries, post-lithium batteries, and fuel cells: from the prototype laboratory • Electrodes and electrolytes for efficient energy storage and production: batteries and fuel cells <p>Regional R&D Plan Projects</p> <ul style="list-style-type: none"> • Towards post-lithium systems: circular economy strategies for sodium and calcium batteries (CIRENAICA-CM-UC3M) • Synthesis, characterisation, testing, and modelling of proton exchange polymer membranes for electrochemical energy devices • Materials for energy: electric, magnetic, and superconductors (MATERNEYER-CM) <p>Private funding</p> <ul style="list-style-type: none"> • New solid electrolytes for safe, efficient, and sustainable sodium batteries 	<p>Experience and Capabilities</p> <p>A multidisciplinary group with almost 30 years of experience in the field of material science and technology. In particular, the group has vast experience in (polymer and ceramic) electrolyte synthesis and characterisation for energy applications.</p> <p>Technological offer (Patents)</p> <ul style="list-style-type: none"> • <i>Electrodos para baterías recargables de Litio</i> (Electrodes for rechargeable lithium batteries) Patent P201630313. Extended to Europe (EP3432390A4) and the United States (US20190173083A1) <p>Equipment</p> <ul style="list-style-type: none"> • Synthesis laboratory • Additive manufacturing (3D printing) laboratory • Characterisation and microstructure laboratory • Thermal characterisation laboratory • Mechanical characterisation laboratory • Electrical characterisation laboratory • Electrochemical characterisation laboratory

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
MATERIALS SCIENCE AND ENGINEERING AND CHEMICAL ENGINEERING			
<p><u>Powder Technology (GTP)</u></p> <p>PI: Elena Gordo, José Manuel Torralba</p>	<ul style="list-style-type: none"> • Material synthesis and processing through pulvimetallurgical techniques • Coatings and surface treatments • Thermodynamic and kinetic simulation • Additive manufacturing • Material processing by means of powder technology (PIM) • Material characterisation • Sintered materials 	<p>European Projects</p> <ul style="list-style-type: none"> • Powder Metallurgy Approaches for Next-Generation Bipolar Plate Materials – PERMEABLE • EIT Raw Materials <p>Regional R&D Plan Projects</p> <ul style="list-style-type: none"> • Additive Manufacturing: from material to application (ADITIMAT-CM) • Intelligent manufacturing of advanced materials for transportation, energy, and health <p>Private funding</p> <ul style="list-style-type: none"> • Study for the addition of graphene and ceramic nanoparticles for the preparation of alternative hard metals 	<p>Experience and Capabilities</p> <p>Group specialising in the development of solutions in the field of powder technology/pulvimetallurgy</p> <ul style="list-style-type: none"> • Optimisation of material manufacturing processes by means of powder technology/pulvimetallurgy • Study of the in-service behaviour of materials • Characterisation and design of new materials with improved performance and a high added value <p>Technological offer (Patents)</p> <ul style="list-style-type: none"> • <i>Proceso para la fabricación de piezas metálicas y/o cerámicas utilizando un sistema ligante termoplástico basado en polisacáridos</i> (Process for manufacturing metal and/or ceramic parts using a polysaccharide-based thermoplastic binding system) (Patent ES2356952) • <i>Aleaciones de titanio de bajo coste y métodos para la preparación de las mismas</i> (Low-cost titanium alloys and methods for preparation thereof) (Patent ES2341162) <p>Infrastructure</p> <p>LACTE – Company scientific-technological support laboratory</p> <ul style="list-style-type: none"> • New material design, processing, and characterisation; Analysis of failures in service or in severe conditions of wear and corrosion; Corrosion and environmental protection behaviour studies; Manufacturing and processing of nanostructured materials with specific and functional properties; Synthesis and processing through pulvimetallurgical techniques

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
MATERIALS SCIENCE AND ENGINEERING AND CHEMICAL ENGINEERING			
<p><u>Powder Technology (GTP)</u></p> <hr/> <p>PI: Elena Gordo, José Manuel Torralba</p>			<p>Related news</p> <ul style="list-style-type: none"> • Nuevos materiales magnéticos para extraer energía de las mareas (New magnetic materials for extracting energy from the sea) • Nueva técnica para fabricar componentes de titanio (New technique for manufacturing titanium components)

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
IT			
<p><u>Computers, Communications, and Systems Architecture (ARCOS)</u></p> <hr/> <p>PI: Jesús Carretero</p>	<ul style="list-style-type: none"> • Real-time systems • High-throughput computing • Distributed and parallel systems 	<p>Private funding</p> <ul style="list-style-type: none"> • Maintenance of the programme: Power supply analysis and computing system • Improving performance in solar concentration system simulation • Performance evaluation for the optical computing of thermal solar power plants 	<p>Experience and Capabilities</p> <p>Research and development of hardware and software systems in the fields of built-in, real-time systems, high-throughput computing, high-productivity computing (Cloud and Grid), storage systems, and reliable systems and systems.</p> <p>Technological offer</p> <p>TIC for smart cities</p> <ul style="list-style-type: none"> • Smart cities Research and development of wireless sensor networks, energy management in combination with the use of solar cells, (self)-adaptation of the behaviour of devices to environmental conditions to render said devices autonomous, and context knowledge. • Smart lighting The ARCOS group has developed a simulation tool to evaluate the energy efficiency of a public lighting configuration. The street light control devices run the applications taking into account the context and are capable of adapting their behaviour in a continuous and dynamic manner in response to environmental changes (for example, the presence of pedestrians, ambient light).

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
IT			
<p><u>Evolutionary Computation and Neural Networks (EVANNAI)</u></p> <p>PI: Pedro Isasi</p>	<ul style="list-style-type: none"> • Bioinspired computation: genetic algorithms, evolution Strategies, genetic programming, particle swarms • Multi-objective optimisation • Machine learning/data mining • Artificial neural networks 	<p>National R&D Plan Projects</p> <ul style="list-style-type: none"> • Probabilistic forecasting and metaheuristic optimisation of solar/wind resource in the Iberian peninsular for a low-carbon power system • Monitoring the energy market based on artificial intelligence techniques (MoMEBIA) • Evolutionary learning and optimisation for solar radiation prediction and integration • MOVES: Efficient and Sustainable Mobility Management 	<p>Technological offer</p> <ul style="list-style-type: none"> • System for efficiently controlling power and chemical plants • Artificial intelligence software for data optimisation, forecasting, and analysis

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
IT			
<p>Knowledge Reuse</p> <hr/> <p>PI: Juan B. Llorens</p>	<ul style="list-style-type: none"> • Knowledge representation, retrieval, and reuse • Development of targeted software by models • Process and project management • New technological innovation methods • Process organisation for reuse • Software process measurement • Predictive maintenance of power systems • Monitoring energy markets 	<p>European Projects</p> <ul style="list-style-type: none"> • Cross Nature: Cross Harmonization & Exploitation of NATURE Data Sets <p>National R&D Plan Projects</p> <ul style="list-style-type: none"> • Monitoring the energy market based on artificial intelligence techniques (MoMEBIA) • Power service platform based on data from multiple integrated sources-enersis <p>Private funding</p> <ul style="list-style-type: none"> • Tecnalía-UC3M Intelligence for Energy Chair • Service for analysing the dissemination of sustainable development goals • Enerloud: a smart grid interoperability system for the energy consumption optimisation • iSPEC project: iGreen Smart Prediction of Energy Consumption • PRICE-GENE: Intelligent Project Networks in the Corredor del Henares (Energy Management) • ENERFICIENCY- User Led Energy Efficiency Management 	<p>Experience and Capabilities</p> <ul style="list-style-type: none"> • Optimisation of software development process efficiency and quality. • Development of knowledge management tools based on information management, retrieval, and intelligent reuse • Integration of multimedia developments with advanced content management techniques • Design and development of customised complex computer applications (predictive maintenance, monitoring of behaviours in energy markets, etc.) <p>Technological offer</p> <p>Powerful and innovative in-house computer tools for knowledge management, as well as computer development components intended for knowledge reuse.</p> <p>Artificial intelligence-based tools for the monitoring of energy markets and the predictive maintenance of power-generating systems.</p>

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
ELECTRICAL ENGINEERING			
<p>Power Control (GCP)</p> <hr/> <p>PI: Santiago Arnaltes, José Luis Rodríguez Amenedo</p>	<ul style="list-style-type: none"> • Wind energy • Photovoltaic solar energy • Energy storage systems • Renewable energy grid integration • Microgrids • Hybrid power systems 	<p>National R&D Plan Projects</p> <ul style="list-style-type: none"> • Contribution of renewable energies to power system replenishing service. Application to the case in Spain • Integration of offshore wind energy in the power system in Spain by means of multiterminal DC links <p>Regional R&D Plan Projects</p> <ul style="list-style-type: none"> • PROMINT-CM. Smart microgrid programme, Community of Madrid <p>Private funding</p> <ul style="list-style-type: none"> • Framework collaboration agreement with Red Eléctrica de España • Development and validation of energy management applications for energy storage systems in batteries • Control of electronic power converters in grid forming mode • Development and validation of power control applications for energy storage systems in batteries • Energy management system for a grid-connected storage system in batteries 	<p>Experience and Capabilities</p> <p>Development of novel solutions to solve industrial problems relating to power systems control in the field of renewable energies, fundamentally, wind energy, photovoltaic energy, and energy storage systems.</p> <ul style="list-style-type: none"> • Electric storage Control of energy storage systems in applications for integrating renewable energy in isolated power grids and systems. • Wind and photovoltaic systems Power control in wind and photovoltaic generation systems. Control of wind turbines and photovoltaic inverters. Control of HVDC systems for power transport in offshore wind farms. • Microgrids and hybrid systems Energy management systems (EMS) for isolated microgrids with hybrid power systems and for grid-connected renewable energy generation systems. <p>Technological offer (Patents)</p> <ul style="list-style-type: none"> • <i>Método para el control distribuido de la frecuencia en un parque eólico offshore</i> (Method for the distributed control of the frequency in an offshore wind farm) (P201731257) • <i>Método y sistema para controlar un conjunto de parques eólicos conectados en serie a un enlace de corriente continua a alta tensión</i> (Method and system for controlling a group of wind farms connected in series to a high-voltage DC link) (ES2620972)

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R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
ELECTRICAL ENGINEERING			
<p><u>Power Control (GCP)</u></p> <hr/> <p>PI: Santiago Arnaltes, José Luis Rodríguez Amenedo</p>			<ul style="list-style-type: none"> • <i>Método y sistema para el control de tensión y frecuencia en una red aislada</i> (Method and system for controlling voltage and frequency in an isolated network) (ES2584535. EP3276771) <p>Equipment</p> <ul style="list-style-type: none"> • Electric power control system research laboratory This laboratory is equipped with the means necessary for achieving a TRL 4 level in different developments performed in the GI.

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
ELECTRICAL ENGINEERING			
<p><u>Diagnosis of Electrical Machines and Insulating Materials (DIAMAT)</u></p> <hr/> <p>PI: Juan Carlos Burgos</p>	<ul style="list-style-type: none"> • Analysis of aging and characteristics of insulating materials in electrical machines and devices • Diagnosis by partial surges with high-frequency sensors • Monitoring and diagnosis of electrical machines and transformers for "Smart Grids" • Review of transformer design • Analysis and characterisation of electrochemical systems of energy storage • Application of fuel cells, batteries, and supercapacitors in electric vehicles and electric traction systems 	<p>National R&D Plan Projects</p> <ul style="list-style-type: none"> • Improvement of transformer insulation systems by means of dielectric nanofluids • Experimentation and modelling of the mechanical and electrical behaviour of smart electroactive polymers structures • Smart sensor for the localisation and identification of partial surges in power asset maintenance <p>Private funding</p> <ul style="list-style-type: none"> • Review of the electromechanical design of power transformers • Analysis of the loss of service life of a distribution transformer under different scenarios • Tests for determining the effectiveness of the reduction of EMI emissions in cooling components for drones • Tests for crown measurement in cooling components for drones 	<p>Experience and Capabilities</p> <p>The group specialises in:</p> <ul style="list-style-type: none"> • Development of novel techniques for the monitoring and diagnosis of electrical machine, particularly power transformer, insulation • Analysis of the behaviour of insulating materials in electrical machines and devices • Performance of high-voltage tests and measurements and analysis of dielectric response (in the frequency domain). These tests can be completed and compared with the simulation results by means of finite elements. <p>Technological offer</p> <ul style="list-style-type: none"> • <i>Sensor inductivo con aislamiento galvánico para la detección y medida de pulsos de corriente de alta frecuencia</i> (Inductive sensor with galvanic insulation for the detection and measurement of high-frequency current pulses) (Patent ES2340750) • <i>Método y dispositivo para la diferenciación de descargas parciales y ruido eléctrico</i> (Method and device for the differentiation of partial surges and electrical noise) (Patent ES2014/0701199) • Computing the loss of service life of transformers • Computing short-circuit forces in transformers • Algorithms for the localisation, separation, and identification of pulse signals in environments with a low signal-noise ratio

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R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
ELECTRICAL ENGINEERING			
<p><u>Diagnosis of Electrical Machines and Insulating Materials (DIAMAT)</u></p> <hr/> <p>PI: Juan Carlos Burgos</p>			<p>Infrastructure</p> <ul style="list-style-type: none"> • High-voltage research and testing laboratory (LINEALT) belonging to the Laboratories Network of the Community of Madrid <p>DIAMAT group's video</p>

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
ELECTRICAL ENGINEERING			
<p><u>Electrical Energy Networks and Systems (REDES)</u></p> <p>PI: Julio Usaola, Hortensia Amarís</p>	<ul style="list-style-type: none"> • Quality of power supply • Integration of wind energy into the power system • Energy markets • Smart grids 	<p>European Projects</p> <ul style="list-style-type: none"> • Energy Poverty Intelligence Unit • IDE4L: Ideal Grid for All <p>National R&D Plan Projects</p> <ul style="list-style-type: none"> • Optimal and safe operation of the power system with high renewable energy generation participation • Distribution network intelligent supervision optimisation [OSIRIS] • Integration of autonomous electric vehicles in urban environments • Smart sensor for the localisation and identification of partial surges in power asset maintenance <p>Regional R&D Plan Projects</p> <ul style="list-style-type: none"> • New paradigm for the management of emergency transport services: ambulances <p>Private funding</p> <ul style="list-style-type: none"> • Method for associating the power supply of counters in low-voltage smart grids • CYBER attacks in smart grid IED (CIBER-IED) 	<p>Experience and Capabilities</p> <p>Group with a long history of working on studies, diagnoses, and predictions related to the energy market, to the integration of wind power systems in the power network of Spain from a technical and economic perspective, and to the quality of the electric supply, as well as to smart grids.</p> <p>Technological offer</p> <ul style="list-style-type: none"> • Smart grid dynamic reconfiguration algorithm (registered software) • Active filter for improving energy efficiency in electric installations • Evaluation of the technical and economic impact of the integration of wind power systems in the power network of Spain • Energy market study • Strategies for participation in renewable and aggregating energy markets • Monitoring and estimating the demand in smart grids with a high deployment of smart counters • Strategies for reducing losses and detecting electricity theft in smart grids • Status estimation and demand management in smart grids. • Models for the dynamic analysis of wind generators suitable for studying the interaction with the electrical network

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R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
ELECTRICAL ENGINEERING			
<p><u>Electrical Energy Networks and Systems (REDES)</u></p> <hr/> <p>PI: Julio Usaola, Hortensia Amarís</p>			<ul style="list-style-type: none"> • Algorithms for the optimal integration of electric vehicles in smart grids <p>Equipment</p> <ul style="list-style-type: none"> • THALES measuring equipment especially developed for evaluating the quality of the energy produced by the wind generators according to international standard IEC 61400-21 • Network analysing instruments • Electrical network analysis and simulation tools and programmes: PSCAD/EMTDC, ATP, MATLAB, PSS/E (educational license), GAMS • Power-In-The-Loop OPAL-RT real time simulation equipment

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
MECHANICAL ENGINEERING			
<p><u>Organisation Engineering</u></p> <hr/> <p>PI: Alfonso Durán, Isabel García</p>	<ul style="list-style-type: none"> • Sourcing and supply chain management • Product and process innovation • Industrial logistics • Integral evaluation (social-technical-economic) of alternative designs for complex systems. • Production planning, programming and control systems 	<p>Private funding</p> <ul style="list-style-type: none"> • Consultation and technical assistance in environmental management and energy efficiency • AIRBUS-UC3M Chair on healthy company, well-being, and performance 	<p>Experience and Capabilities</p> <ul style="list-style-type: none"> • Circular economy • Sustainable supply chains • Sustainability indicators in the value chain

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
MECHANICAL ENGINEERING			
<p><u>Mechanical Simulation and Optimisation (SiOMec)</u></p> <p>PI: Belén Muñoz Abella, Lourdes Rubio</p>	<ul style="list-style-type: none"> • Identification of defects in mechanical components • Health monitoring • Fracture and fatigue of mechanical components • In-service behaviour of mechanical components in fatigue and fracture • Direct and invert approach of mechanical problems • Simulation of mechanical systems • Computer-aided modelling and engineering • Biomechanics • Optimisation techniques applied to mechanical engineering • Small mechanical and biomechanical devices design and prototyping 	<p>National R&D Plan Projects</p> <ul style="list-style-type: none"> • ROTACRACK: Development of simple theoretical models and commissioning of a virtual laboratory for defining a methodology for identifying fissures in rotary beams • VIBROCRACK: Identification of fissures in one-dimensional mechanical components by means of methods for detecting non-linearity • PROFISEJE: Propagation of fatigue fissures in rotary shafts • SHAFTCRACK: Detection and identification of fatigue fissures in rotary shafts by means of genetic algorithms <p>Regional R&D Plan Projects</p> <ul style="list-style-type: none"> • Analysis of the influence of damage in the dynamic response of wind turbine blades made of a composite material. • Development of a non-destructive method for the detection and identification of fissures in non-rotary shafts 	<p>Experience and Capabilities</p> <ul style="list-style-type: none"> • Group specialising in the finite element modelling of normalised and non-normalised mechanical components, as well as in the study of their behaviour under service conditions. • Experienced in the use of conventional optimisation methods and of methods such as neural networks and genetic algorithms for solving inverse problems in mechanical engineering. • Development of research projects in the field of fracture by developing numerical and experimental models of fissured elements. These models are used for the detection and identification of fissures. <p>Equipment</p> <ul style="list-style-type: none"> • Rotary beam test bench • High-throughput computer equipment • Rotor dynamic test bench • Machine for creating fissures by means of resonance • Static shaft and beam test bench • Dynamic shaft and beam test bench • Vibration data acquisition equipment • Contactless, dual axis measuring microscope

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
MECHANICAL ENGINEERING			
<p><u>Mechanical and Biomechanical Component Manufacture and Design Technologies (FABDIS)</u></p> <hr/> <p>PI: Henar Miguélez, José Luis Cantero</p>	<ul style="list-style-type: none"> • Manufacturing systems and processes • Machining <ul style="list-style-type: none"> · Study on the machining of special materials · Ecological machining 	<p>Private funding</p> <ul style="list-style-type: none"> • Cryogenic treatment for sustainable integral machining production of hardened metal parts • TARGET: Smart technologies and sustainable environments for the generation of structures in composite materials 	<p>Experience and Capabilities</p> <p>Group focusing on manufacturing systems and processes, as well as on the design of mechanical components and the detection of defects (health monitoring), and biomechanics.</p> <p>Technological offer</p> <ul style="list-style-type: none"> • Technologies for manufacturing components for the aeronautical industry • Techniques for detecting defects in mechanical systems • Experimental techniques for studying the behaviour of mechanical systems <p>Equipment</p> <ul style="list-style-type: none"> • Work stations and PCs with finite element numerical simulation software (ABAQUS) • Machining centre • Numerical control lathe • Extensometer equipment • Data acquisition systems with different sampling ranges • Surface analysis equipment • Systems for measuring forces, displacements, and deformations • Testing device for rotating mechanical elements

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
TELEMATIC ENGINEERING			
<p><u>Telematic Applications and Services (GAST)</u></p> <hr/> <p>PI: Carlos Delgado Kloos, Carlos García, Andrés Marín, Luis Sánchez</p>	<ul style="list-style-type: none"> • Efficient energy saving strategies in sensor networks • Efficient energy management in Big Data systems • Energy efficiency in vehicles • Energy consumption in ubiquitous computing environments 	<p>National R&D Plan Projects</p> <ul style="list-style-type: none"> • Healthy and Efficient Routes in Massive Open-Data Based Smart Cities: Smart Driving and Semantic Data Handling (HERMES-SMARTDRIVER) • Open-source intelligence for safe smart grids • Architecture for energy efficiency and sustainability in vehicles <p>Private funding</p> <ul style="list-style-type: none"> • Development and validation of techniques for conditioning and predicting energy signals in smart buildings 	<p>Equipment</p> <ul style="list-style-type: none"> • Ubiquitous Laboratory Computation: <ul style="list-style-type: none"> · Measurement and optimisation of energy consumption in mobile telephone applications. · Measures and recommendations on energy consumption and execution of cryptographic algorithms, security protocols (e.g., SSL), and digital certificate management.

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
TELEMATIC ENGINEERING			
<p><u>Network Technologies</u></p> <p>PI: Francisco Valera, Arturo Azcorra, David Larrabeiti</p>	<ul style="list-style-type: none"> • Energy efficiency in telecommunication systems and networks • High-performance switching • Network Science • Cognitive networks • 5G Networks 	<p>European Projects</p> <ul style="list-style-type: none"> • 5G-Crosshaul: The 5G Integrated fronthaul/backhaul • CROWD: Connectivity management for energy Optimized Wireless Dense networks. <p>National R&D Plan Projects</p> <ul style="list-style-type: none"> • Evolution towards self-managed networks and services for 5G of the future • Data-driven, next generation networks (B5G and 6G) for the sustainable manufacturing and response to emergencies • New technologies for the sustainable development of 6G in extreme environments <p>Private funding</p> <ul style="list-style-type: none"> • Definition and design of a shade-less lighting system 	<p>Experience and Capabilities</p> <p>Group specialising in network architectures, communications protocols, and distributed services.</p> <p>Technological offer</p> <ul style="list-style-type: none"> • <i>Método de ahorro de energía basado en microapagados para un dispositivo inalámbrico en una red de telecomunicación</i> (Method for saving energy based on the micro-shutoff of a wireless device in a telecommunication network) (ES2598169). Joint ownership with UNIBS • Method for optimizing energy consumption of a network. Joint ownership with NEC.

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
THERMAL AND FLUID ENGINEERING			
<p><u>Technologies Suitable for Sustainable Development Group (GTADS)</u></p> <p>PI: Ulpiano Ruiz-Rivas</p>	<ul style="list-style-type: none"> • Energy poverty and vulnerability • Energy sustainability • Technologies suitable for energy supply • Thermal solar systems • Photovoltaic-wind electrification • Systems for harnessing human energy • Water pumping and purification • Biodigestion 	<p>European Projects</p> <ul style="list-style-type: none"> • Energy Poverty Intelligence Unit <p>R&D Projects</p> <ul style="list-style-type: none"> • Service for the recruitment, configuration, and monitoring of a panel of vulnerable households in order to comply with core idea I of "improving knowledge on energy poverty" <p>International development projects</p> <ul style="list-style-type: none"> • DESFERS Développement Economique et Social des Femmes à travers les Energies Renouvelables au Sahel (Sénégal, Mali et Niger). • Professional training for the introduction of renewable energies in the communities of Grand'Anse, Haïti. • Household monitoring for an energy vulnerability study in Cañada Real, Madrid <p>Private funding</p> <ul style="list-style-type: none"> • Review of power transformer electromechanical design <p>Collaboration agreements</p> <ul style="list-style-type: none"> • Collaboration agreement between Community of Madrid and Universidad Carlos III of Madrid to carry out the Project "Diagnosis of the uses and energy requirements of the population of Cañada Real Galiana". 	<p>Experience and Capabilities</p> <p>Group specialising in suitable technologies, specifically in systems for supplying water and providing access to energy. Home sensorisation for energy vulnerability study.</p> <p>Equipment</p> <ul style="list-style-type: none"> • Home energy sensorisation <ul style="list-style-type: none"> · Thermal comfort sensors (temperature, moisture, CO₂, presence sensors, etc.) · Consumption sensors (for electricity, gas, etc.) · Non-intrusive network measurement and discharge. • Thermal solar systems <ul style="list-style-type: none"> · Solar cookers (solar oven, parabolic cooker, and semiparabolic cooker) · Solar driers (pilot installation and laboratory drier with alternative power source). • Electricity production <ul style="list-style-type: none"> · Microhydraulic installation. · Manual production. Bicycle dynamo system. · Charging batteries with photovoltaic solar panels. • Water pumping and distribution <ul style="list-style-type: none"> · Manual pumps (Afridev, Malda, Mecate, etc.) · Ram pumping (rampump) · Photovoltaic pumping

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R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
THERMAL AND FLUID ENGINEERING			
<p><u>Technologies Suitable for Sustainable Development Group (GTADS)</u></p> <hr/> <p>PI: Ulpiano Ruiz-Rivas</p>			<p>Infrastructure</p> <ul style="list-style-type: none"> • Suitable technologies laboratory Development, from a multidisciplinary perspective, of suitable technologies for countries undergoing development in technological areas such as, among others, supply of potable water (pumping, distribution, and purification) and access to energy (heating, cooking and drying, illumination, power generation), prioritising technologies for isolated rural environments.

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
THERMAL AND FLUID ENGINEERING			
<p><u>Thermal Engineering, Energy, and Atmosphere (ITEA)</u></p> <hr/> <p>PI: Antonio Lecuona</p>	<ul style="list-style-type: none"> • Low-environmental impact and efficient energy and thermal systems • Reduction of thermal machinery and engine emission into the atmosphere • Technology for energy assessment, for sustainable energy, and the use of renewable energy • Heat and mass transport • Clean combustion of green hydrogen • Thermal fluid dynamic laser instrumentation • Computer simulation of flows of industrial and environmental interest • Solar cookers and driers for sustainable development • Thermal applications of solar energy 	<p>European Projects</p> <ul style="list-style-type: none"> • COUNTERFOG: Device for Large Scale Fog Decontamination <p>National R&D Plan Projects</p> <ul style="list-style-type: none"> • Solar thermal energy technologies and technologies for harnessing residual heat at low and medium temperature integrated in the electric network • Integrated solar cold advance absorption with electricity • Laser-based OptrOnic Key instrumentation for duAl-fuel HydrogEn-AssisteD combustion concepts for efficient aeroengine operation <p>Regional R&D Plan Projects</p> <ul style="list-style-type: none"> • Direct production of air at a high temperature and turbocharged pressure in concentrating solar collectors <p>Private funding</p> <ul style="list-style-type: none"> • Chair on the research of heat dissipation with discharging devices. Crown 	<p>Experience and Capabilities</p> <ul style="list-style-type: none"> • Human and technical resources with the capabilities to provide real and practical solutions to the problems of interests in different sectors of the industry • Capacity to act as a group, like an environmental and technological advisory, consultation and R&D office, in the atmospheric field • Prototype development • Design engineering projects <p>Innovative technological solutions</p> <ul style="list-style-type: none"> • Particle image velocimetry system with a high spatial resolution and temporal information reconstruction resolution LFC PIV and DYNAMIC PIV • Refrigerating absorption machines for harnessing residual heat at a low temperature and solar thermal energy integrated with electricity • VARIOSSOL: System for the production of heat, cold, and optionally electricity, based on mid-temperature thermal collectors and an innovative absorption machine located in the solar field <p>Technological offer (Patents)</p> <ul style="list-style-type: none"> • <i>Secadero solar</i> (Solar drier) (Patent ES2626253) • <i>Dispositivo de expansión, absorción y compresión para máquinas de absorción</i> (Expansion, absorption, and compression device for absorption machines) (Patent ES2556225)

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R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
THERMAL AND FLUID ENGINEERING			
<p><u>Thermal Engineering, Energy, and Atmosphere (ITEA)</u></p> <hr/> <p>PI: Antonio Lecuona</p>			<ul style="list-style-type: none"> • <i>Procedimiento y sistema de almacenamiento de energía</i> (Energy storage method and system) (Patent ES2554133. Joint ownership UPM) • <i>Generador-separador de vapor mediante energía solar</i> (Solar energy steam generator-separator) (Patent ES2543975) • <i>Horno solar</i> (Solar oven) (Patent ES2540160) <p>Technological equipment</p> <ul style="list-style-type: none"> • Split heat pumps and 4 m3 cryogenic chamber • Stereoscopic particle image velocimetry system with a high spatial resolution (LFCPIV) and temporal (Dynamic PIV) resolution • Laser Doppler interferometer with phase information (PDA) • High-speed image analysis in digital video • Shadowgraphy and PDA for injector and spray characterisation <p>ITEA group's video</p>

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
THERMAL AND FLUID ENGINEERING			
<p>Power Systems Engineering (ISE)</p> <p>PI: Domingo Santana</p>	<ul style="list-style-type: none"> • Thermochemical processes of solid fuels (biomass gasification and combustion, fuel characterisation) • Fluidised bed study and development • Thermal solar energy • Multiphase flow simulation (CFD) • Renewable energies • Filtration • Absorption machine technologies • Non-intrusive measuring techniques in thermal engineering and fluid mechanics • Two-phase flow characterisation • Studies on jet development 	<p>European Projects</p> <ul style="list-style-type: none"> • Collaboration on engineering studies in the framework of the HL-LHC Project • WP22-BOP: Heat transfer, balance-of-plant and site <p>National R&D Plan Projects</p> <ul style="list-style-type: none"> • Towards competitive, reliable, safe, and sustainable concentration solar plants <p>Regional R&D Plan Projects</p> <ul style="list-style-type: none"> • Concentrating thermal solar energy in the sectors of transport and heat and electricity production • Safe operation of tubular receptors by means of inverse thermo-elastic methods of analysis • High-entropy alloys for applications at a high temperature and extreme conditions • Development of computer VISion techniques for the alignment of HELIOstats • Contingency plan for removing natural gas from the power system in Spain: Will solar thermal plants replace combined cycle plants in the coming years? <p>Private funding</p> <ul style="list-style-type: none"> • Thermal-mechanical design of a liquid hydrogen evaporator • Development of a renewable biogas-based, novel small-power cogeneration system 	<p>Experience and Capabilities</p> <ul style="list-style-type: none"> • Tests for solar receiver tubes consisting of salts and other components • Heliostat field dimensioning • Thermomechanical design of solar receivers and heat exchangers • Evaluation of the production of tower-type solar power plants • Evaluation of energy potentials of biomass and waste • Absorption machine tests and dimensioning • Evaluation of energy processes (multi-criteria optimisation and energy-based analysis) • Simulation by means of FEM and CFD <p>Technological offer (Patents)</p> <ul style="list-style-type: none"> • <i>Receptor solar de torre exterior</i> (Outdoor solar tower receiver) (Patent ES2735303B2) • <i>Receptor de torre de energía solar</i> (Solar energy tower receiver) (Patent ES2648737B1) • <i>Sistema óptico de haz descendente lineal solar</i> (Solar linear beam-down optical system) (Patent ES2648148B2) <p>Equipment</p> <ul style="list-style-type: none"> • Solar receiver loop • Molten Salt Solar Loop • Compound Parabolic Concentrator

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
THERMAL AND FLUID ENGINEERING			
<p><u>Power Systems Engineering (ISE)</u></p> <p>PI: Domingo Santana</p>		<ul style="list-style-type: none"> • Shouhang Research Chair (Concentrating Solar Power-transient behaviour of the receiver and plant optimisation for Molten Salt Power Tower) • Increasing wind energy penetration through the management of combined cycle plants with pressurised water storage • Design and evaluation of a new external solar receiver with oval-shaped tubes • Stress and deformation analysis in central solar receivers 	<p>Infrastructures</p> <ul style="list-style-type: none"> • Biomass fuel testing laboratory (BIOLAB) Service for fuel energy analysis and characterisation. This laboratory is part of the Laboratory Network of the Community of Madrid.

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
THERMAL AND FLUID ENGINEERING			
<p>Fluid Mechanics (GMF)</p> <hr/> <p>PI: Francisco Javier Rodríguez</p>	<ul style="list-style-type: none"> • Combustion • Multiphase flows • Biofluid dynamics • Electrochemical system fluid dynamics • Computational fluid mechanics • Compressible flow and explosion dynamics • Heat transfer in industrial systems 	<p>European Projects</p> <ul style="list-style-type: none"> • Compound Coatings Nurturing applications in Tissue Engineering <p>State R&D Plan Projects</p> <ul style="list-style-type: none"> • Experimental and theoretical study of the evaporation of coronavirus-containing expiratory droplets • Numerical-experimental study on the safety and combustion of hydrogen and hydrogen-derived fuels • Formation in hydrogen technologies and hydrogen-derived fuels • Efficient biofuel combustion applied in portable power generation. • Modelling and optimisation of new electrochemical system architectures and components for energy storage and conversion. • Geothermal energy and flow battery hybridisation for temperature control in zero-energy commercial buildings <p>Regional R&D Plan Projects</p> <ul style="list-style-type: none"> • Technical and economic optimisation of design and manufacturing variables for additively manufactured heat pipes • Strategic positioning in green hydrogen and fuel cell R&D&I (GREENH2CM) 	<p>Experience and Capabilities</p> <p>Group specialising in the use of analytical, numerical, and experimental techniques to solve thermal fluid dynamic problems of industrial interest.</p> <p>Technological offer</p> <ul style="list-style-type: none"> • Modelling and numerical simulation of fluid mechanic processes of industrial interest • Experimental characterisation of fluid mechanic processes of industrial interest • Theoretical analysis of fluid mechanic processes of industrial interest <p>Technological equipment</p> <ul style="list-style-type: none"> • High Speed Cameras • Compact Continuous Wave Solid State Laser <p>Infrastructure</p> <ul style="list-style-type: none"> • Low Speed Wind Tunnel • Recirculating Water Channel • Ultrasound Laboratory • Computer Cluster • Combustion Cell • Electrochemical Characterization Laboratory <p>Biomass fuel testing laboratory (BIOLAB)</p> <p>Service for fuel energy analysis and characterisation. This laboratory is part of the Laboratory Network of the Community of Madrid.</p>

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
THERMAL AND FLUID ENGINEERING			
<p><u>Fluid Mechanics (GMF)</u></p> <hr/> <p>PI: Francisco Javier Rodríguez</p>		<ul style="list-style-type: none"> • Study and design of cutting tools for turning obtained by 3D printing with internal cooling (ROTORNEA-CM-UC3M) • Study of detonation and explosion hazards in hydrogen-air mixtures (H2SAFE-CM-UC3M) • Design and optimisation of membrane-free flow microbatteries <p>Private funding</p> <ul style="list-style-type: none"> • Thermomechanical design of a liquid hydrogen evaporator (AIRBUS OPERATIONS, S.L.) • Alternative fuels in high-speed conditions (FUNDACIÓN IBERDROLA ESPAÑA) • Study on Fibre Optic Temperature Sensor (Airbus S.L.) 	<p>Related news</p> <ul style="list-style-type: none"> • Un experimento científico logra crear una ola congelada en el tiempo (A scientific experiment successfully creates a wave that is frozen in time) • Un estudio analiza el inesperado comportamiento de las llamas de hidrógeno (A study analyses the unexpected behaviour of hydrogen flames)

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
SYSTEMS AND AUTOMATIC ENGINEERING			
<p><u>Intelligent Systems Laboratory (LSI)</u></p> <p>PI: Arturo de la Escalera, José María Armingol, Francisco José Rodríguez</p>	<ul style="list-style-type: none"> • 3D perception systems • Computer vision systems • Intelligent transport systems • Connected electrical self-driving systems 	<p>National R&D Plan Projects</p> <ul style="list-style-type: none"> • Integration of autonomous electric vehicles in urban environments (i-Urbe) • System for the automation of public and shared transport vehicles for semi-structured environments (Aventura) <p>Regional R&D Plan Projects</p> <ul style="list-style-type: none"> • New paradigm for emergency transport services management (AMBULATE-CM) • Vehicle safety for intelligent, sustainable, safe, and inclusive mobility ((SEGVAUTO-4.0-CM) • Cooperation of drones with high capabilities for extinguishing urban and forest fires <p>Private funding</p> <ul style="list-style-type: none"> • Cities Timanfaya (Lanzarote Art, Culture, and Tourism Centres) • Interpretatic (Tragsa) • Mobility 2030 (Sacyr Concesiones) • JANO (ITP Aero) • Firefighting UAVs (Drone Hopper) 	<p>Experience and Capabilities</p> <p>Group with a long and established experience in issues relating to autonomous ground and aerial vehicles, developing various systems in the field of perception technologies and intelligent control systems.</p> <p>The laboratory has different research platforms, including autonomous electric vehicles, an ADAS smart car, and several drones.</p> <p>Technological offer</p> <ul style="list-style-type: none"> • iCab The LSI has developed a system consisting of several connected electrical autonomous taxis operating within the EPS campus in a safe and efficient manner • Firefighting UAVs The LSI, in collaboration with the company, Drone Hopper, develops a heavy payload multirotor platform UAV to be used as a firefighting quick-response UAV. <p>Group's marketing datasheet</p>

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
MECHANICS OF CONTINUOUS MEDIA AND THEORY OF STRUCTURES			
<p><u>Lightweight Structures Dynamics</u></p> <p>PI: David Varas, Jorge López</p>	<ul style="list-style-type: none"> • Behaviour of fuel tanks subjected to impact (HRAM) • Behaviour of metallic structures against impact • Development of material behavioural models at high strain rates • Analysis of the behaviour of ice under impact conditions • Analysis of impacts of composite fragments 	<p>European Projects</p> <ul style="list-style-type: none"> • Graphene Core 3: Graphene Flagship Core Project • BEDYN: Development of a methodology (test, measurement, analysis) to characterise the Behaviour of composite structures under DYNamic loading <p>National R&D Plan Projects</p> <ul style="list-style-type: none"> • Analysis and development of auxetic protections for carbon/epoxy structures • Safe operation of tubular receptors by means of inverse thermo-elastic methods of analysis II <p>Regional R&D Plan Projects</p> <ul style="list-style-type: none"> • Tower receiver for a 100% renewable future • CP07: analysis of energy absorbing elements manufactured with composite materials subjected to impact 	<p>Experience and Capabilities</p> <p>Group specialising in the field relating to the behaviour of structures in a dynamic regime. The group has developed different experimental methodologies for conducting complex impact tests at high and medium speed. It also has extensive experience in developing behavioural models for materials under high strain rates, and simple analytical models for modelling impact phenomena.</p>

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
MECHANICS OF CONTINUOUS MEDIA AND THEROY OF STRUCTURES			
<p><u>Advanced Materials Mechanics</u></p> <p>PI: Enrique Barbero, Sonia Sánchez</p>	<p>The lines of research focus on the analysis and modelling of composite and sandwich structures, specifically:</p> <ul style="list-style-type: none"> • Impact and damage tolerance of structural elements • Structures for energy absorption • Structures manufactured with sustainable materials • Composite structure repairs • Attachments in composite structures 	<p>National R&D Plan Projects</p> <ul style="list-style-type: none"> • Study of the impact and post-impact behaviour of wind turbine blades manufactured from sandwich structures • Experimentation and modelling of the mechanical and electrical behaviour of smart electroactive polymer structures <p>Regional R&D Plan Projects</p> <ul style="list-style-type: none"> • CP07: analysis of energy absorbing elements manufactured with composite materials subjected to impact • Analysis of the influence of damage in the dynamic response of wind turbines blades made of a composite material 	<p>Experience and Capabilities</p> <p>Analysis (modelling and experimentation) of structural elements manufactured with sandwich and composite materials subjected to impulsive load, as well as study of the damage tolerance of said elements. The group has extensive experience in the development of non-standard test methodologies.</p> <p>Equipment</p> <ul style="list-style-type: none"> • Computing laboratory • Experimental laboratory <p>Group's video</p> <p>Group's marketing datasheet</p>

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
ELECTRONIC TECHNOLOGY			
<p><u>Photonic Displays and Applications (GDAF)</u></p> <hr/> <p>PI: José Manuel Sánchez Pena, Carmen Vázquez</p>	<ul style="list-style-type: none"> • Electro-optic devices and applications • Advanced instrumentation and sensors • Photonic devices for Optical networks 	<p>National R&D Plan Projects</p> <ul style="list-style-type: none"> • Advanced, optical fibre-based intelligent technologies • New photonic techniques for transmission, monitoring and sensing in low consumption broadband networks • Nano-assembled materials for sensing and manipulating light in a wide spectral range (I): Adaptive phase and metasurface devices <p>Regional R&D Plan Projects</p> <ul style="list-style-type: none"> • SINFOTON2-CM. Sensors and instrumentation in photonic technologies 2. • Photovoltaic tele-powering by optical fibre for measurement and control in extreme environments • Integration of new solar technologies in industrial processes <p>Other projects</p> <ul style="list-style-type: none"> • Using fibre optics to measure temperature during rock mechanics experiments • 6G-Extreme. New technologies for the sustainable development of 6G in extreme environments with optical fibre and the "Power over Fibre" technology 	<p>Experience and Capabilities</p> <ul style="list-style-type: none"> • Development of an optical fibre pyrometer for contactless measurement of high temperatures whose possible applications include, among others, measurement of the temperature in the cores of solar thermal power plants and in machining processes • Optical network data consumption analysis and monitoring techniques to reduce consumption • Transmission of energy to remote equipment with optical fibre. Electric power of up to 2W at 100 m, or 300W at 14 km with an integrated communication channel • Development of prototypes for level measurement flammable liquid tanks • Development of optical fibre-based sensors for detecting and measuring bubbles in fluidized beds. One of the applications is to help in the characterisation of combustion processes in biomass plants • Designing of integrated optical fibre components to reduce the consumption of computers with optical connections and of plastic fibre data networks • Development of intelligent light control systems for domotic buildings based on liquid crystal and electrochromic materials

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R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
ELECTRONIC TECHNOLOGY			
<p><u>Photonic Displays and Applications (GDAF)</u></p> <hr/> <p>PI: José Manuel Sánchez Pena, Carmen Vázquez</p>			<p>Technical and scientific services</p> <ul style="list-style-type: none"> • Characterisation of I-V curves, cyclability, chronoamperometry and cyclic voltammetry • Electrochemical impedance spectroscopy of electro-optic devices from 0.1 Hz to 1 MHz • Characterisations under controlled lighting conditions in 14 spectral ranges of 380 to 1000 nm and up to 1 sol AM 1.5G • Frequency characterisation of up to 20 GHz for electric, optical, and electro-optical devices • Measuring temperature from 300° to 1000° with optical fibre pyrometry in extreme environments • Support for the design, characterisation, and monitoring of systems for remote light supply • Transmission test in 5G networks with optical carrier up to 20 GHz-Analog Radio over Fibre • Special optical fibre connections • Simulation of different photonic systems, optoelectronic systems, and associated devices • Photovoltaic cell efficiency characterisation <p>Technological offer (Patents)</p> <ul style="list-style-type: none"> • <i>Sistema y método de monitorización de potencia y temperatura en redes de fibra óptica</i> (System and method for monitoring power and temperature in optical fibre networks) (Patent ES2760798 B2)

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R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
ELECTRONIC TECHNOLOGY			
<p><u>Photonic Displays and Applications (GDAF)</u></p> <p>PI: José Manuel Sánchez Pena, Carmen Vázquez</p>			<ul style="list-style-type: none"> • <i>Pirómetro de fibra óptica a dos colores</i> (Two-colour fibre optic pyrometer) (Patent ES2587435) • <i>Método y sistema para la monitorización de redes de fibras ópticas</i> (Method and system for monitoring optical fibre networks) (Patent ES2576748) • <i>Sistema de Medición de Nivel de Combustible en Ultraligeros</i> (System for measuring fuel level in ultralight aircrafts) (Patent ES2333931) • <i>Sensor de fibra óptica autorreferenciado para la detección de líquido y/o medida de líquido</i> (Self-referenced fibre optic sensor for detecting liquid and/or for measuring liquid) (Patent ES2343607) <p>Group's video</p> <p>Group's marketing datasheet</p>

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
ELECTRONIC TECHNOLOGY			
<p>Electronic Power Systems (GSEP) Group</p> <hr/> <p>PI: Andrés Barrado, Emilio Olías</p>	<ul style="list-style-type: none"> • Energy conversion systems • Photovoltaic and hybrid energy systems • Magnetic component design • Electromagnetic compatibility in equipment 	<p>National R&D Plan Projects</p> <ul style="list-style-type: none"> • Energy distribution system for hydrogen-driven drones • Integrated intelligent power electronics for power control and management in IoT • Modelling and control strategies for stabilising the interconnection of power electronic converters • ELECTRA: Electric Aircraft Platform • Power supply systems for on-board and portable applications based on emergent energy storage devices and sources • Modular converters applying advanced control strategies implemented in digital platforms • Energy storage and management system for hybrid electric car based on fuel cell, battery, and ultracapacitors <p>Regional R&D Plan Projects</p> <ul style="list-style-type: none"> • Development of new solid-state lithium batteries and electronic system for power charging and management applicable to biomedical devices and unmanned aircrafts • Advanced control unit for Zynq technology-based electronic power converters. UltraSCALE, applicable to multiconverter systems • New bidirectional DCDC converters with galvanic insulation for high-power applications 	<p>Experience and Capabilities</p> <p>Comprehensive services in the consultation, analysis, custom design, and optimisation of electronic power systems and magnetic components, as well as photovoltaic and hybrid energy systems, and electromagnetic compatibility.</p> <p>Energy conversion systems</p> <ul style="list-style-type: none"> • Converter design, modelling, and optimisation • Modeling of DC supply systems, including a behavioural model of converters and stability analysis. • Design of analogue and digital control. • Regulator calculation • Converter-based system stability • Total harmonic distortion reduction by means of modulation techniques. • Hardware in the loop • CAD tools for electronic power system and equipment design • Design of laboratory and pre-production prototypes • For applications such as: <ul style="list-style-type: none"> · Energy storage · Modular converters · Medical equipment · Telecommunications equipment · Electric vehicles · Photovoltaic systems · Wind power systems · Electric railway systems

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
ELECTRONIC TECHNOLOGY			
<p><u>Electronic Power Systems (GSEP) Group</u></p> <p>PI: Andrés Barrado, Emilio Olías</p>		<p>Private funding</p> <ul style="list-style-type: none"> • MAGICBOX portable multi-source energy processing centre (EPC) • Hydrogen fuel cell drone propulsion system • Verification of FCC converter behaviour with respect to new voltage specifications • BCM control for DC-DC converters for energy storage • Providing advice in a fuel cell-based hybrid electric vehicle power supply system design and reliability testing • Development of new technologies for the manufacture of solid electrolyte fuel cells (DEIMOS). • ECOTRANS: Ecological technologies for urban transport • Characterisation of commercial electricity meters in the presence of harmonics • Auxiliary electric propulsion system for general lightweight and sport aviation • Auxiliary electric propulsion system for general lightweight and sport aviation • Application of identification techniques for the characterisation of commutated DC-DC converters • Development and innovation in polymeric membrane and solid oxide fuel cells • Resonant heat DC-DC converter for portable X-ray equipment <p style="text-align: right;">+</p>	<p>Magnetic component design</p> <ul style="list-style-type: none"> • Magnetic component design (coils and transformers). • Optimisation of magnetic component volume, losses, and temperature • Finite element-based analytical models of high-frequency magnetic components • Contactless power supply systems <p>Photovoltaic and hybrid energy systems</p> <ul style="list-style-type: none"> • Optimisation of power electronics in photovoltaic systems • Design of energy control, regulation, and conditioning systems for autonomous and networking systems • Hybrid systems <p>Electric mobility</p> <ul style="list-style-type: none"> • Electric aviation • Railway power systems • Pure and hybrid electric vehicles • Hydrogen-driven electric vehicles <p>IIoT – Industrial Internet of Things</p> <ul style="list-style-type: none"> • Energy management and control for terminals, servers, and actuators. • Very high-frequency power converters. • Magnetic component design and characterisation. <p>Equipment electromagnetic compatibility</p> <ul style="list-style-type: none"> • Pre-certification testing of equipment electromagnetic compatibility • Development of EMI filters • Environmental measurement <p style="text-align: right;">+</p>

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
ELECTRONIC TECHNOLOGY			
<p><u>Electronic Power Systems (GSEP) Group</u></p> <p>PI: Andrés Barrado, Emilio Olías</p>		<ul style="list-style-type: none"> • 30kW and 40kV-130kV resonant DC-DC converter for portable X-ray equipment • ISC-based high-performance AC-DC converter for TV and RADIO transmitters 	<p>Technological offer (Patents)</p> <ul style="list-style-type: none"> • <i>Convertidor y método de conversión bidireccional de corriente continua a corriente continua sin aislamiento galvánico</i> (Converter and method for the bidirectional conversion of DC to AC without galvanic insulation) (Patent ES2706391 B2). • <i>Convertidor CC-CC reductor y elevador, método de conversión CC-CC, y planta fotovoltaica que incorpora dicho convertidor</i> (Step-up/step-down DC-DC converter, method for DC-DC conversion, and photovoltaic plant incorporating said converter) (Patent ES2681127 B2). • <i>Método y dispositivo de transformación de corriente continua en corriente alterna</i> (Method and device for transforming direct current into alternating current) (Patent ES2395460) • <i>Método y sistema de alimentación de una carga constituida por una pluralidad de cargas elementales, en particular de LED</i> (Method and system for supplying a load consisting of a plurality of LED fundamental loads) (Patent ES2391218) • <i>Procedimientos de control activo para la conexión de cargas altamente capacitivas mediante SSPCs</i> (Active control procedures for the connection of very capacitive loads using SSPCs) (Patent ES2398884) • <i>Convertidor de corriente alterna-continua de una etapa con corrección de factor de potencia</i> (Single-phase alternating-direct current converter with voltage factor correction) (Patent ES2192992) <p>Group's video</p>

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
ELECTRONIC TECHNOLOGY			
<p><u>Sensors and Instrumentation Techniques (SIT)</u></p> <p>PI: Pablo Acedo</p>	<ul style="list-style-type: none"> • Optical sensors and instrumentation • Spectroscopy (UV/VIS/NIR/MIR/THz) and Applications (biomedical, environmental, and industrial) • Novel optical sources and photonic architectures 	<p>European Projects</p> <ul style="list-style-type: none"> • AEROMIC: Development of New digital Microphone-MEMS-Sensors for wind tunnels with open/closed test sections and flight tests • CODE: RE-FARM: Consumer-driven demands to reframe farming systems • HYPERTERA: Taking Hyperspectral Terahertz Imaging to the Industry <p>National R&D Plan Projects</p> <ul style="list-style-type: none"> • Dual optical frequency comb linear and non-linear spectroscopy for biomedical, environmental, and industrial applications • Real-time evaluation of water quality parameters using new photonic architectures and components • Development of an on-board winter viability system, with continuous measurement of innovative variables on roads <p>Private funding</p> <ul style="list-style-type: none"> • ESCAPHIB: Structures and systems in tail for a hybrid propulsion passenger aircraft ALAVA INGENIEROS • Optical Backbone for Future Airborne Systems. AIRBUS D&S • Development of a photonic hyperspectral system for the assessment of foreign objects in airport environments. ARQUIMEA 	<p>Experience and Capabilities</p> <ul style="list-style-type: none"> • Optical spectroscopy and interferometry techniques. • Use of new optical sources and architectures for signal generation and processing • Development of instrumentation and measurement systems for different applications <p>Technological offer (Patents)</p> <ul style="list-style-type: none"> • Road condition sensor and method for detecting the state condition of the roadway (EP19382399.4). • <i>Sistema y método para la monitorización del estado de perfusión de colgajos de piel</i> (System and method for monitoring the perfusion state of skin flaps) (P202130486) • <i>Imágenes dual-comb hiperespectrales</i> (Hyperspectral dual-comb images) (ES2020/070400).

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
SIGNAL AND COMMUNICATIONS THEORY			
<p><u>Communications</u></p> <p>PI: Ana García Armada</p>	<ul style="list-style-type: none"> • Multi-antenna systems (MIMO) for broadband communication • Multi-carrier modulation OFDM • Turbo-coding • Channel estimation, synchronism and power peak reduction • Cooperative transmission and Relays • Signal processing in digital communications • Coordinated transmission and cancelling interference in cellular systems • Communication system simulation and modelling 	<p>National R&D Plan Projects</p> <ul style="list-style-type: none"> • Energy- and cost-efficient communications with universal coverage • General radio concepts for energy-efficient mobile communications: system-level aspects 	<p>Experience and Capabilities</p> <p>Group with an extensive experience in the analysis, design, and evaluation of fixed and mobile communication system prototypes, thereby allowing it to offer alternatives for optimising the applications and services supported thereon.</p> <p>Group's video</p>

R&D GROUP

LINES OF RESEARCH

RESEARCH PROJECTS

TECHNOLOGICAL OFFER / OTHERS

HUMANITIES, DOCUMENTATION, AND COMMUNICATION

COMMUNICATION

Analytics, Media and Public Engagement: Communication, Journalism and Technology Laboratory (UC3M Media Lab)

PI: Daniel Catalán

- Climate change and media communication
- Environment and communication
- Science, technology, and society
- Communication of technology
- Public understanding of science

National R&D Plan Projects

- Big data, social networks, and data journalism: application of monitoring tools in source and journalistic content analysis

European Projects

- Multi-source and multi-method prediction to support COVID-19 policy decision making
- Jean Monnet Chair "EU, Disinformation & Fake News"
- Jean Monnet Module "European Communication: challenge or miracle"

Experience and Capabilities

Analysis of the behaviour of traditional and digital media, journalistic coverage of relevant and sensitive issues for the society, as well as the influence of communication technologies on public perception and citizen participation in public debate.

Among the methodologies developed by the group, the following stands out:

- Conducting population-based surveys
- Social network and communication media content analysis
- Focus groups and in-depth interviews

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
GEOGRAPHY			
<p><u>Territory, Environmental Resources, and Patrimony</u></p> <p>PI: Guillermo Morales</p>	<ul style="list-style-type: none"> • Territorial and environmental impact of economic activities • Governance and territorial and environmental implications • Genesis, evolution, and environmental problems of urban areas 	<p>Private funding</p> <ul style="list-style-type: none"> • Diagnosis of national park network, social analysis of current situation • Analysis of the structure and operation of strategic sectors, particularly auction systems in gas and electric sectors 	<p>Experience and Capabilities</p> <ul style="list-style-type: none"> • Territorial and environmental impacts.

R&D GROUP

LINES OF RESEARCH

RESEARCH PROJECTS

TECHNOLOGICAL OFFER / OTHERS

LAW

CRIMINAL LAW

Fundamental Issues in Criminal Law

PI: Francisco Javier Álvarez

- Criminal law of the environment

National R&D Plan Projects

- Criminal liability of transnational corporations for human rights and environmental violations.

Experience and Capabilities

- Criminal law of the environment

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
PRIVATE LAW			
<p><u>FAR (FREEDOM AND REGULATION - LAW AND PRIVATE WILL IN THE SHAPING OF THE MARKETS)</u></p> <hr/> <p>PI: Antonio Robles, David Ramos</p>	<ul style="list-style-type: none"> • Competition and regulation law • Economic law and regulated markets • Financial markets law • Incidence of regulatory agencies in commercial law • Contract Law and Dispute Resolution 	<p>National Projects</p> <ul style="list-style-type: none"> • Business and Markets: digital (r)evolution, integrity and sustainability, and its assimilation by private, regulatory and Competition Law 	<p>Experience and Capabilities</p> <ul style="list-style-type: none"> • Climate Strategic Initiative (https://climate.uc3m.es/?lang=es) that brings together professors from the Departments of Economics, Statistics, Mathematics, Engineering, and Law, as a platform to share research on issues related to climate change. Founders: among others, David Ramos and Pilar Perales (FAR Group) • Working group on "Finance, Climate Change and Sustainability" at the European Banking Institute (EBI) (https://ebi-europa.eu/projects/workstreams/finance-climate-change-and-sustainability/) Responsible: David Ramos At an institutional level, UC3M is also a member of the Academic Board at the EBI.

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
PUBLIC STATE LAW			
<p><u>Urban Planning and Zoning.</u> <u>Environmental Issues – Public Health and Risk Management</u></p> <hr/> <p>PI: Antonio Descalzo (Pascual Madoz Institute)</p>	<ul style="list-style-type: none"> • Sustainability and the environment • Law and the energy market • Planning, environmental management, and climate • Community environment • Security, sustainability, and precaution 	<p>National R&D Plan Projects</p> <ul style="list-style-type: none"> • Law in the face of innovation and climate change risks • Public administration for social innovations derived from sustainable urban mobility policies <p>Regional R&D Plan Projects</p> <ul style="list-style-type: none"> • Administrative sustainability actions in cities: challenge analysis <p>Private funding</p> <ul style="list-style-type: none"> • Analysis of the structure and operation of strategic sectors, particularly auction systems in gas and electric sectors • Energy market consumer protection 	<p>Experience and Capabilities</p> <p>Analysis of the different legislations, policies, and systems which regulate public administration and hiring systems, territory and urban planning, the telecommunications sector, etc.</p> <p>Group's video</p>

R&D GROUP

LINES OF RESEARCH

RESEARCH PROJECTS

TECHNOLOGICAL OFFER / OTHERS

ECONOMICS

ECONOMICS

Climate
Econometrics

PI: Jesús Gonzalo

- Econometrics
- Climate change
- Big Data
- Prediction

National R&D Plan Projects

- Climate change, Big Data, and Prediction
- New quantitative models for studying climate change
- Heterogeneous climate change
- Long-term weather predictions
- A New generation of factorial models

Experience and Capabilities

- Econometric models for the analysis of economic and climate variables showing three common key characteristics: persistence (trend), non-linearity (asymmetries), and volatility (extreme events).
- Development of a new generation of factorial models for finding common elements per quantiles (not only in the media) in Big Data environments.
- Predictive regression analysis in no-linear and/or Big Data environments.

(For more information, see <https://www.eco.uc3m.es/~jgonzalo/>)

The Econometrics group of the Economics Department of Universidad Carlos III of Madrid is considered one of the 20 best groups in the field worldwide.

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
ECONOMICS			
<p><u>Energy economics</u></p> <p>PI: Natalia Fabra</p>	<ul style="list-style-type: none"> • Energy economics • Regulation and competition in the Energy sector: market organisation, investment in capacity, vertical integration, future market. • Electric auction and investment incentive design • Competition and contracts in oligopolistic markets • Markets, investments, and supply security 	<p>European Projects</p> <ul style="list-style-type: none"> • Electric Challenges - Current Tools and Policy Challenges in Electricity Markets • ClimateFinReg: Can we Mitigate Climate Change through Financial Regulation? <p>National R&D Plan Projects</p> <ul style="list-style-type: none"> • Simulating future energy markets. Public sector and regulation in a market economy IV. • Cutting-edge methodology to address regulatory challenges in energy market. <p>Private funding</p> <ul style="list-style-type: none"> • Energy transition: an analysis of the design and impact of economic policies. • The socio-economic impacts of low emission zones • Storage in the electric sector: Investment incentives and regulation • Technology for efficient consumption: digital meters, hourly prices, and electricity consumption in Spain (SMART). 	<p>Experience and Capabilities</p> <p>Group specialising in the study of different energy sectors, in the development of models in the area of industrial organisation which are relevant for the analysis of these sectors, and in the use of experimental economics tools for improving the understanding of regulatory policies and market design.</p> <p>Scientific-technical services</p> <p>Environmental policy analysis: greenhouse gas emission control mechanisms (emission rights markets, pollution taxes, etc.) and policies to support renewable energies.</p> <ul style="list-style-type: none"> • Analysis of the strategic behaviour of electric utilities in energy markets, emphasising on their implications for competition policy. • Analysis of regulation and the incentives it generates in the different stages of power supply. • Experimental economics as a methodology for analysing the design and operation of auctions, futures markets, the impact of structural changes such as mergers or divestitures, etc. <p>Innovative solutions</p> <ul style="list-style-type: none"> • ENERGEIA SIMULA. Strategic behaviour simulator for electric companies in energy markets. <p>Group's marketing datasheet</p>

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R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
ECONOMICS			
<p><u>Energy economics</u></p> <hr/> <p>PI: Natalia Fabra</p>			<p><u>ENERGY ECOLAB</u></p> <p>Energy Ecolab brings together a group of researchers committed to carrying out rigorous policy-relevant research in the area of energy and environmental economics. Using sound theoretical, empirical, and simulation tools, researchers at Energy EcoLab explore market design and policy issues that arise in the transition to a low carbon economy.</p> <ul style="list-style-type: none"> • EnergyEcoLab, among its projects, REVALORISE+ Energy EcoLab has been selected as a success story to inspire researchers in the area of social sciences and humanities to become more actively involved in dissemination efforts. • ENERGYECOLAB Newsletter

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
ECONOMICS			
<p><u>European Economy (EconEU)</u></p> <hr/> <p>PI: Carlos San Juan</p>	<ul style="list-style-type: none"> • Evaluation of European policies: PAC, structural funds, and policy • Environmental economics: Taxation • Energy market competition policy: market power estimate 	<p>National R&D Plan Projects</p> <ul style="list-style-type: none"> • The role of taxation in achieving sustainable development goal 11: sustainable cities and communities. <p>Private funding</p> <ul style="list-style-type: none"> • Budgetary architecture in the EU and Cohesion: Fiscal consequences faced by Spain as a result of changes in the PAC and European funds. • Econ Pol: Structural Funds, regional convergence, and policy mix. 	<p>Experience and Capabilities</p> <ul style="list-style-type: none"> • Public policy assessment. • Common agricultural policy (desalination devices and PV irrigation) • International productivity comparisons • Environmental economics (Water and photovoltaic energy) • Electric mobility • Economy of hydrogen • Methodology (econometrics and computational methods) of applied microeconometrics

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
BUSINESS ECONOMICS			
<p><u>Financial Economics</u></p> <hr/> <p>PI: Beatriz García Osma, María Gutiérrez Urtiaga</p>	<ul style="list-style-type: none"> • Valuation of companies • Financial information quality • Company governance and social corporate responsibility • Microstructure of financial markets 	<p>National R&D Plan Projects</p> <ul style="list-style-type: none"> • Derivative and contact energy markets: pricing, efficiency, and investment portfolios. • Financial energy markets: products, microstructure, and regulation • New financial instruments for energy transition <p>Private funding</p> <ul style="list-style-type: none"> • Financial products for energy transition: current situation, future perspectives, and regulatory implications 	<p>Experience and Capabilities</p> <p>Group specialising in various finance- and accounting-related areas. Researchers of the group work at the forefront of scientific knowledge. Besides publishing their works in leading academic journals, they also conduct very prestigious finance training programmes. Furthermore, experts from this group participate in projects along with private companies to put the latest financial techniques into practice.</p> <p>Group's webpage</p>

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
STATISTICS			
<p><u>Operation Research</u></p> <hr/> <p>PI: Francisco Javier Nogales</p>	<ul style="list-style-type: none"> • Tools for the time series prediction of renewable energies, consumptions, energy prices, etc. • Machine learning models (prediction, classification, clustering) for extracting consumption profiles, customer classification, etc. • Robust stochastic optimisation tools to carry out bidding strategies in spot and future markets, renewable energy operations, etc. • Optimisation of systems, such a trading strategies, risk management, electric vehicle operation. 	<p>Private funding</p> <ul style="list-style-type: none"> • The Flexener Project • Statistical modelling for energy storage dimensioning. Grid To Data (G2D) • Gas and electricity market-related risk prediction and management techniques. • Development of a novel intelligent energy efficiency management system. • Efficient demand management in Smart Grids based on analytical models and Big Data. • Forecasting disaggregated power demand and distributed renewable generation in "Smart Grids". 	<p>Experience and Capabilities</p> <p>Group's marketing datasheet</p>

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
STATISTICS			
<p><u>Statistics</u> <u>Modelling and Data Analysis</u></p> <p>PI: Rosa E. Lillo, Daniel Peña Sánchez de Rivera, Ismael Sánchez Rodríguez-Morcillo</p>	<ul style="list-style-type: none"> • Heterogeneity in statistical models and model selection. • Models applicable to wind energy • Size reduction methods • Resampling methods • Bayesian estimation 	<p>National R&D Plan Projects</p> <ul style="list-style-type: none"> • Advanced statistical methods for complex data <p>Regional R&D Plan Projects</p> <ul style="list-style-type: none"> • Contingency plan for removing natural gas from the power system in Spain: Will solar thermal plants replace combined cycle plants in the coming years? <p>Private funding</p> <ul style="list-style-type: none"> • Forecasting disaggregated power demand and distributed renewable generation in "Smart Grids". • Development of a novel intelligent energy efficiency management system. 	<p>Scientific-technical services</p> <ul style="list-style-type: none"> • Analytical and computational decision making-assistance tools for agents in energy markets • Time series methodology-based electric power price and demand forecasting tools. <p>Means and equipment</p> <ul style="list-style-type: none"> • Computer programmes for data processing and simulations • Analytical and computational decision making-assistance tools • Computer equipment for intensive numerical calculation <p>Group's marketing datasheet</p>

R&D GROUP

LINES OF RESEARCH

RESEARCH PROJECTS

TECHNOLOGICAL OFFER / OTHERS

SOCIAL SCIENCES

SOCIAL ANALYSIS

Sociology of Climate Change and Sustainable Development

PI: Mercedes Pardo

- Climate Change: social trends and emerging policies. Social adaptation.
- Sustainable development: social trends and emerging policies. Agenda for 2030
- Communication and Transfer of knowledge in Climate Change: Science / Companies / Policies / Society
- Societal Values and Behaviours in relation to Climate Change and Sustainable Development
- Efficiency, Energy Saving, and Society.
- Processes of social participation and Environmental Education
- Human mobility in the context of disasters and the adverse effects of climate change

European Projects

- Energy Poverty Intelligence Unit

National R&D Plan Projects

- Law in the face of innovation and climate change risks

Private funding

- Study of mobilisers of change in the recycling habits and civic collaboration of adolescents and young people aged 10 to 22 living in urban areas in Spain.
- System for the evaluation and socio-economic monitoring of climate change and global change in the Sierra de Guadarrama National Park
- New forms of Governance of protected natural areas as a criterion for promoting sustainable rural development and contributing to the mitigation of the effects of global change

Experience and Capabilities

Study of the relationship between the activities of contemporary societies and climate change, taking into account social causes, socio-political and economic trends, social consequences, as well as prospective analyses aimed at proposing mitigation and adaptation strategies, within the general framework of Sustainable Development.

Its main area of activity is Social Trend Analysis and Prospective Analysis.

- Collection, systematisation and categorisation of data and documents
- Data analysis
- Devising situation assessments
- Proposal for the development of strategic lines, programmes, projects, and actions, management of their application, evaluation, and monitoring
- Design and application of evaluation indicator systems

R&D GROUP

LINES OF RESEARCH

RESEARCH PROJECTS

TECHNOLOGICAL OFFER / OTHERS

MATHEMATICS AND PHYSICS

PHYSICS

Plasmas Physics

PI: Luis García Gonzalo

- Turbulence and transport in fusion plasmas
- Study of runaway electrons
- MHD stability
- Design of fusion devices by magnetic confinement

European Projects

- EUROFUSION-WPPMI-2018: WP-PMI-5.3.2-T008-TS activities on Runaway electrons

National R&D Plan Projects

- Development of codes and models for the study of problems in two critical areas for the ITER tokamak: plasma edge modelling and disruption mitigation.
- Study of the impact of three-dimensional magnetic perturbations on stability properties and transport of tokamaks and stellarators.

Regional R&D Plan Projects

- Numerical Simulation of Turbulence in Electric Space Propulsion: Synergy with Fusion Plasmas

Experience and Capabilities

Group specialising in thermonuclear fusion controlled by magnetic confinement. The group has extensive experience in solving fusion device design problems, in the study of turbulent plasma transport, and in the design of runaway electron control mechanisms to avoid possible damage from these high-speed particles in the reactor. To do so, they employ sophisticated mathematical and computational tools.

[Group's video](#)

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
PHYSICS			
<p><u>Remote Sensing and Infrared Image Sensors Laboratory (LIR)</u></p> <p>PI: Fernando López</p>	<ul style="list-style-type: none"> • Spectral Analysis <ul style="list-style-type: none"> · Detection of invisible hydrogen flames and leaks · Remote sensing and analysis of gaseous species, both from combustion and non-combustion processes. · Early pinpointing of forest fire risk · Threat detection in complex environments · Visualisation of gases in the infrared · Atmospheric measurements • Thermography and Radiometry <ul style="list-style-type: none"> · Energy efficiency · Precise remote temperature measurement · Simulation of radiometric scenarios · IR remote sensing · Process monitoring · New composites for optimised energy consumption in aviation · Resistance of thermoplastic materials to fire and high temperatures 	<p>European Projects</p> <ul style="list-style-type: none"> • IMPRESS: JRP-v11: Metrology for Air Pollutant Emissions • EMPRESS: Enhancing process efficiency through improved temperature measurement. • EMPRESS 2: Enhancing process efficiency through improved temperature measurement 2. • HITCOMP: High Temperature Characterization and Modelling of Thermoplastic Composites. <p>National R&D Plan Projects</p> <ul style="list-style-type: none"> • INNPACTO: Remote Traffic Pollution Detection • Extending the dust sensor into a multi-parameter integrated atmospheric mini-instrument for the surface of Mars based on an infrared spectral array, MarsDS-PLUS • Science and Technology for in-situ characterisation of the atmosphere of Mars. Development of the Dust Sensor instrument for the ESA/IKI EXOMARS18 mission. PHASES A/B AND C/D. <p>Private funding</p> <ul style="list-style-type: none"> • SENSIA Chair. Research in applications of IR to energy process optimisation and greenhouse gas detection • Assembly, integration, and commissioning of electro-optical devices with environmental and controlled atmosphere quality requirements in Clean Mounting and Monitoring 	<p>Experience and Capabilities</p> <ul style="list-style-type: none"> • Remote detection of traffic pollution • RIO: Optical Infrared Radar • Environmental IR Remote Sensing. Application to forest fires • Microleak detection in EFA wings • Pollutant gases: Infrared technology for the remote detection of pollutant gases • Energy Efficiency: inspection and maintenance of buildings, construction, public works, etc. • Renewable energy • Contactless temperature measurement using infrared technology • Contactless testing system for photovoltaic solar panels • Detection of hidden defects in wind turbine blades <p>Technological offer (Patents)</p> <ul style="list-style-type: none"> • <i>Método y dispositivo para la detección y medida de la concentración de gases</i> (Method and device for the detection and measurement of gas concentration) (P2012322013) • <i>Método para caracterizar el tráfico rodado</i> (Method for characterising road traffic)

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R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
PHYSICS			
<p><u>Remote Sensing and Infrared Image Sensors Laboratory (LIR)</u></p> <hr/> <p>PI: Fernando López</p>			<p>Equipment</p> <ul style="list-style-type: none"> • MIR, TIR, VIS/NIR cameras • Spectroradiometry • Imaging spectroradiometry • Blackbodies <p>Infrastructure</p> <p>LATIR</p> <p>Shutter-less and TEC-less calibration services for infrared cameras, handheld devices, and small optical devices.</p> <p>Related News</p> <p>Crean un sistema de detección a distancia de la contaminación del tráfico (A remote traffic pollution detection system is created)</p> <p>Desarrollan la primera cámara infrarroja que detecta uno de los principales causantes de la lluvia ácida (The first infrared camera detecting one of the main causes of acid rain is developed)</p>

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
PHYSICS			
<p><u>Nanostructured and Multifunctional Materials</u></p> <p>PI: Miguel Ángel Monge</p>	<ul style="list-style-type: none"> • Development of structural materials for high temperatures. • Steels with a structural application. • Metal alloys. • Ceramic materials. • Nanostructured materials. • Biomaterials. • Nanostructured materials. • Alloy production. • Powder metallurgy route for material production. • Alloy processing and severe plastic deformation. • Study of irradiation damage in materials. <p>Materials</p> <ul style="list-style-type: none"> • Low activation steels. • ODS steels. • Metal matrix composites. • Hydroxyapatite-based ceramic materials and biomaterials. • High-entropy alloys. • W-based refractory materials. • Structural materials for applications in thermonuclear fusion reactors. • Cu-based alloys. • Powder metallurgy alloys. 	<p>Proyectos Plan Nacional I+D</p> <ul style="list-style-type: none"> • Desarrollo e irradiación de aleaciones de alta entropía, materiales de base cobre y aceros ODS nanoestructurados para reactores de fusión • Procesado, caracterización e irradiación de aleaciones nanoestructuradas de Cu, W-Cu y de aceros ODS para reactores de fusión • Análisis y desarrollo de materiales para su integración en células solares basadas en nanohilos III-V. <p>Proyectos Plan Regional I+D</p> <ul style="list-style-type: none"> • Desarrollo del Programa de actividades de I+D multidisciplinares del Centro de Tecnologías para la Fusión (TechnoFusión (III)CM). 	<p>Experiencia y capacidades</p> <ul style="list-style-type: none"> • Production and processing of new materials: <ul style="list-style-type: none"> · Low activation steels, ODS steels, and nanostructured steels · W-based refractory materials · Cu and Cu-ODS based alloys · Ceramic materials · Metal matrix biomaterials · Production by powder metallurgy and induction furnace and arc furnace casting · Furnaces for treatments up to high temperature and special atmospheres or vacuum · ECAP and extruder processing system. · Irradiation damage study. Radiation resistance. · Resistance of materials to thermal cycling • Characterisation: <ul style="list-style-type: none"> · Microscopy techniques: optical, TEM, SEM, EBSD, and AFM · Spectroscopy techniques: IR-VIS and UV absorption and emission spectroscopy and positron annihilation spectroscopy. · X-ray diffraction techniques. This includes the use of large facilities for synchrotron and neutron diffraction experiments. · Techniques for characterising mechanical properties with temperature and tribological properties: Tensile machines, instrumented Charpy, nanoindentation, microindentation, compression machines, and tribological wear testing machines. · Experience in the use and analysis of APT (Atom probe tomography)

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R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
PHYSICS			
<p><u>Nanostructured and Multifunctional Materials</u></p> <hr/> <p>PI: Miguel Ángel Monge</p>			<p>Equipment</p> <ul style="list-style-type: none"> • IR-VIS-UV absorption and emission spectroscopy laboratory. • Positron spectroscopy laboratory. • Material production and processing laboratory. • Material preparation laboratory. • Mechanical and tribological property characterisation laboratory. • SEM/EBSD and TEM equipment.

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
PHYSICS			
<p>Ceramic Oxides</p> <hr/> <p>PI: Beatriz Galiana</p>	<ul style="list-style-type: none"> • Solid-state physics • Integration of fluorescent materials in solar cells • Quantum efficiency measurements of photovoltaic devices • Modelling of optical and electrical properties of nanostructures and thin films. • Sputtering growth of fluorescent and photoactive materials • Synthesis of fluorescent and photoactive nanoparticles. • Transmission and scanning electron microscopy. • Atomic force microscopy in tapping and conductive mode. • Electrical properties of thin films. • Design and modelling of solar cells 	<p>National R&D Plan Projects</p> <ul style="list-style-type: none"> • Analysis and development of materials for integration into III-V nanowire-based solar cells • Development and irradiation of high entropy alloys, nanostructured copper and ODS steels based materials for fusion reactors <p>Regional R&D Plan Projects</p> <ul style="list-style-type: none"> • Development of the multidisciplinary R&D activities programme for the Fusion Technology Centre (TechnoFusion). <p>Private funding</p> <ul style="list-style-type: none"> • Simulation modernisation: visualisation of slow targets (MS-VOL) 	<p>Experience and Capabilities</p> <p>Group specialising in the field of applied physics including experts in solar cells, thin film (MBE, MOVPE; sputtering), advanced materials characterisation (TEM, AFM, PL, etc.), modelling of semiconductor materials and study of rare earth-based luminescent materials.</p> <p>Equipment</p> <p>TEM, sputtering equipment with two magnetrons (co-sputtering), C-AFM, optical measurement laboratory, quantum efficiency equipment, spectrophotometer.</p>

R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
MATHEMATICS			
<p><u>Modelling, Numerical Simulation, and Industrial Mathematics (GMSMI)</u></p> <hr/> <p>PI: Luis López Bonilla</p>	<ul style="list-style-type: none"> • Combustion of hydrogen and synthesis gas in advanced gas turbines • Combustion and detonation problems • Non-linear phenomena in microelectronic semiconductor devices • Non-linear charge transport in nanostructures: <ul style="list-style-type: none"> · Non-linear transport in carbon nanotubes and graphene 	<p>National R&D Plan Projects</p> <ul style="list-style-type: none"> • Non-linear transport phenomena in nanostructures <p>Regional R&D Plan Projects</p> <ul style="list-style-type: none"> • Clean combustion: analysis, modelling and simulation • Development of predictive tools for hydrogen combustion in gas turbines <p>Other competitive projects</p> <ul style="list-style-type: none"> • Quantum Transport in Terahertz Detectors 	<p>Experience and Capabilities</p> <p>GMSMI offers comprehensive solutions comprising the formulation of a mathematical model, its mathematical and numerical study, and the development of specific software.</p> <p>GMSMI is the first Spanish node of the European Consortium for Mathematics in Industry (ECMI).</p> <p>Innovative technological solutions</p> <ul style="list-style-type: none"> • Modelling of defect-inclusive graphite-based nanotubes, fullerenes, etc. • Programme for characterising (oil) fields to retrieve permeability distribution from production data • Modelling and numerical simulation of partial derivative or difference balance equations for charge transport in nanodevices subjected to high electric and magnetic fields • Modelling of high critical temperature superconducting materials and obtaining their phase diagram • Atomistic models of dislocation dynamics, cracks, and other defects in cubic system crystalline materials, for both single metals and semiconductors

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R&D GROUP	LINES OF RESEARCH	RESEARCH PROJECTS	TECHNOLOGICAL OFFER / OTHERS
MATHEMATICS			
<p><u>Modelling, Numerical Simulation, and Industrial Mathematics (GMSMI)</u></p> <hr/> <p>PI: Luis López Bonilla</p>			<p>Equipment</p> <p>The GMSMI has considerable hardware and software capacity to undertake numerical simulation projects. It also has the capacity to carry out supercomputing projects through its collaboration with CIEMAT (they form a Joint Unit), which gives it access to the SGI Origin 3800 parallel computing computer.</p> <p>Group's video</p> <p>Group's Commercial Datasheet</p>

R&D GROUP

OBJECTIVES

LINES OF RESEARCH

TECHNOLOGICAL OFFER / OTHERS

RESEARCH INSTITUTES

RESEARCH INSTITUTES

"Pascual Madoz"
Institute of Land, Urbanism, and Environment

Director:
Antonio Descalzo

Objectives

The study of issues related to spatial and urban planning within the framework of the use of natural resources and the environment.

Lines of research

- Spatial planning, city planning, and housing
- Environment and climate planning and management
- Mobility, accessibility, communication, and information society management
- Territorial and local government
- Security, sustainability and precautionary measures

Experience and Capabilities

CLIMATE CHANGE OBSERVATORY

A centre for reflection and creation of ideas (through research) to provide legal solutions to the problems of climate change in the public and private sectors, from a complex perspective (the problem itself) and which, due to its relationship with the Pascual Madoz Institute, focuses on those related to the territory (and the coast), the city, the environment and energy.

In addition to the research activity, there is also a legal consultancy activity, with a two-fold aspect:

- Practical solutions to real problems posed by public and private organisations
- Training for professionals

R&D GROUP	DESCRIPTION	LINES OF RESEARCH	TECHNOLOGICAL OFFER / OTHERS
RESEARCH INSTITUTES			
<p><u>"Gregorio Millán Barbany" University Institute for Modelling and Simulation in Fluidynamics, Nanoscience, and Industrial Mathematics</u></p> <hr/> <p>Director: Luis López Bonilla</p>	<p>Description</p> <p>The Gregorio Millán Barbany Institute carries out its research work in the areas of Combustion and Fluid Dynamics.</p>	<p>Lines of research</p> <ul style="list-style-type: none"> • Sustainable combustion • Jets and wakes • Multiphase flows • Computational fluid dynamics • Charge and spin transport in nanostructures • Nano electro mechanical systems • Multiscale modeling of materials • Mathematical physics • Meshless numerical methods • Reduced order models and acceleration of numerical codes 	<p>Experience and Capabilities</p> <p>The group's activity in the field of energy, climate, and environment is organised around four research groups:</p> <ul style="list-style-type: none"> • Aerospace Engineering Group <p>Computational fluid mechanics lab</p> <ul style="list-style-type: none"> • Fluid Mechanics Group <p>Low-speed wind tunnel – recirculating water channel – ultrasound laboratory</p> <ul style="list-style-type: none"> • Solid State Physics Group <p>Structural characterisation and physics of materials</p> <ul style="list-style-type: none"> • Modelling, Numerical Simulation, and Industrial Mathematics Group

R&D GROUP

OTHERS

**Infrastructures,
Works, and
Environmental
Sustainability
Service
Carlos III
University of
Madrid**

**Director:
Tomás Gómez**

Carlos III University of Madrid has installed the EcoStruxure™ Power Monitoring Expert platform.

This energy management platform or software allows the distribution and consumption of energy to be monitored and analysed in order to optimise its use and carry out energy management. For this purpose, different sensors have been installed and warning alarms have been generated for the University's Works and Energy team, as well as for the company that carries out the University's electrical maintenance. This information is also analysed by the company that provides energy advice to the University.

There is also a BMS to control and plan both air-conditioning and lighting.

Co-funding:

Activity of the Project "UC3M Plan for Promoting Innovation and R&D Result Transfer in the Production Sector of the Community of Madrid with Priority in the Southern Metropolitan Area" with Ref.: OI2018/PC-UC3M-5152 and the acronym PC-UC3M. This project was awarded in the 2018 Call for Grants for fostering technological innovation and promoting technology transfer to the production sector comprised within the priorities of the Regional Research and Innovation Strategy for Smart Specialization (RIS3) of the Community of Madrid through technological innovation coordinating entities. It is co-funded by the European Regional Development Fund which provides 25% of the funding and by the Community of Madrid which provides another 25% within the framework of the FEDER 2014-2020 operational program.



uc3m

Universidad **Carlos III** de Madrid

Vicerrectorado de Política Científica

Servicio de Apoyo al Emprendimiento y la Innovación