

University of Aveiro

Founded in 1973, the Universidade de Aveiro is now an exponent of quality and progress, occupying an outstanding place in research and higher education. The University offers a broad range of innovative courses in fields that promote regional and national productivity.

At present the University has some 12.385 students, 400 of which some come from abroad, and a teaching staff of 885.

Located in Aveiro, a city of tradition, progress, and high quality of life, with a population of some 80.000 people, the Universidade de Aveiro also plays a key role in the growth and development of one of the most beautiful and promising regions of Portugal.

The Associate Laboratory CICECO (<http://www.ciceco.ua.pt/>) was created on March 2002, with the mission of developing the scientific and technological knowledge necessary for the innovative production and transformation of ceramics and composite materials.

The main areas of expertise in Aveiro are:

- Advanced Micro- and Nano-Structured Materials for Communications Technologies (research lines Advanced molecular and supramolecular materials, Inorganic multifunctional materials and Organic-inorganic hybrids, Electroceramics, Magnetostructural modulation of strongly correlated electric materials)
- Advanced Materials for Industrial Applications (Reactive ceramic components for process control, Ceramic composites and ultra-hard coatings for mechanical applications)
- Chemistry and Technology of Polymeric and Lignocellulosic Materials and Biomaterials (Macromolecular materials and lignocellulosics, Biomedical and biomimetic materials, Process development and optimization)

Disciplines

- Nanochemistry
- Advanced characterization methods
- Colloids, surfaces and interfaces
- Physical properties of materials

FAME Master format

Each year, 40 students will be recruited for Year 1 of the program and will start at INP Grenoble (France) or Augsburg (Germany). Half of the students will come from non-European countries and half from within Europe. Year 1 will provide a multidisciplinary teaching in the field of Functional Materials.

In Year 2 each student will specialize in scientific area offered by one of the 7 consortium universities. Students will have to study in at least two different universities and European countries.

Curriculum offered in Aveiro

As member of the FAME Erasmus Mundus Consortium, Aveiro University will admit students for Year 2 of the FAME Master.

These will be students who will choose the **Nanomaterials and Hybrids specialization** for the final part of their Master's program and will graduate with a **double-diploma**.

The specialization on "Nanomaterials and Hybrids" will allow students to deepen their knowledge on these types of materials at the molecular level, enabling the use of synthesis strategies and the use of characterization methods to design materials for specific applications.

Students who do not apply for the official Erasmus Mundus Master of Science curriculum and wish to attend Year 1 must have earned a Bachelor's degree in Science (Physics, Chemistry, Metallurgy, Materials Science, Electrochemistry).

Those who wish to attend Year 2 (Semester 3) must have passed Year 1 of a Master degree in the Materials Science area of a high-standing university.

At the end of their studies, such students will only be awarded a national diploma and not the official Erasmus Mundus FAME Master of Science label.



Course description (Semester 3) 30 ECTS*

*ECTS: European Credit Transfer System

Compulsory Courses

24 ECTS

- Project/thesis 12 ECTS
- Nanochemistry 6 ECTS
- Advanced characterization methods 6 ECTS

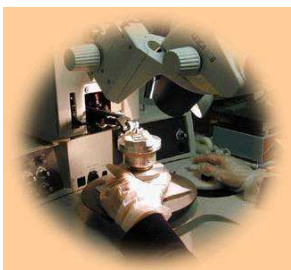
Elective courses

(1 module to choose out of 2)

6 ECTS

- Colloids, Surfaces and Interfaces 6 ECTS
- Physical Properties of Materials 6 ECTS

Parallel to the classes, students will carry out project work. Each student will have a specific project supervisor depending on his/her research interests. The project work corresponds to 12 ECTS credits, i.e. approximately two days/week. For students registered at the University of Aveiro the project work will be part of the Master thesis.



Staff involved in the FAME Master

- Paula Vilarinho
- Augusto Lopes
- João Rocha
- Luís Carlos
- Alessandro Gandini
- Tito Trindade
- Ana Barros-Timmons
- Vítor Amaral
- Andrei Kholkine
- Nicola Pinna

Research partners



- FAME European partners (Germany, UK, Belgium, Spain, Portugal)
- Materials Networked Atlantic Area – MNAA, INTERREG IIIB.
- POLECER-European Thematic Network on Polar Electro-ceramics
- Electroceramics from nanopowders produced by innovative methods – ELENA
- Materials for Improved Wear Resistance of Total Artificial Joints,
- E-ECORISK – A regional enterprise network decision support system for environmental risk and disaster management of large scale industrial spills
- SUSTAINPACK – Innovation and sustainable development in the fiber based packaging value chain
- ULCOS - Ultra Low CO₂ Steelmaking
- WACHEUP – New concepts for upgrading pulp and cork mill waste streams to values-added chemicals
- Multifunctional ceramic layers with high electromagnetoelastic coupling in complex geometries
- MIND: Multifunctional Integrated Piezoelectric Devices
- MatSILC-Materials for Silicate-Based Fuel Cells
- Mixed conducting membranes for partial oxidation of natural gas to synthesis gas, Project NATO Science for Peace
- Rede de Competência em Polímeros (RCP), Agência de Inovação
- Parceiros: FEUP, UA, CIN, Amorim e Irmãos, Resiquímica, Euroresinas, Sysadvance, CUF
- Plataforma de Desenvolvimento e Investigação em Polímeros de Fontes Renováveis (IDPoR) (financiamento de parceiros industriais, FCT, UA)
- Parceiros: RAIZ, Caima, CIN, Resiquímica, Euroresinas/Sonae

Selected industry partners

International partners:

- Bayer (Germany)
- Infolchem (U K)
- Asphaltteam (Denmark)
- Petrobrás (Brazil)
- Institut Français du Pétrole (France)
- Oilphase-DBR, Schlumberger (Can.)
- Repsol (Spain)
- Imperial Oil (Canada)

Local partners:

- Celulose do Caima, S.G.P.S., a holding in the sector of pulp
- CIN, S.A., the largest Iberian group in the area of paints and varnishes
- RAIZ - Instituto de Investigação da Floresta e Papel, Portugal, a private non-profit research institute committed to support the competitiveness of the Portuguese Pulp and Paper Industry
- Resiquímica – Resinas Químicas, S.A., Portugal's major resins producer, providing raw materials for the national and international paint, varnish, adhesive, textile and composite material industries
- Euroresinas, formaldehyde producer, used to prepare resins to agglomerates and MDF
- UNICER - Bebidas de Portugal SGPS, SA
- CERISOL - Isoladores Cerâmicos SA e MOTA - Pastas Cerâmicas SA
- Biomart (Marifer group) which deals with the production of Biodiesel
- Indasa – the company produces abrasives
- Gesqua

Typical Master Thesis projects/subjects

- Processing and characterization of tungsten carbide powders coated with stainless steel
- Diamond coating of silicon nitride by hot filament chemical vapor deposition
- SiO₂ and CdS/ Polymer based nanocomposites
- In vitro formation and transformation of apatites and other biologically related calcium phosphates
- Structure and magnetic properties of di-ureasils nanohybrids doped with iron and neodymium
- Novel bismuth based pigments
- Recycling of fly-ashes by vitrification/ceramization
- Chemical preparation and properties of calcium phosphate based materials for biomedical applications
- Composition, structure and properties of ceramic manganites. The effect of lanthanum substitution for calcium and vacancies
- Flexibilization of a phenolic resin for the production of flexible abrasives
- Study of manganites with rare-earth ion substitution
- Turning of silicon-aluminium alloys with CVD diamond brazed and coated ceramic cutting tools
- Synthesis and characterization of functionalized double-walled carbon nanotube/poly(methyl methacrylate) nanocomposites

Facilities used for research

CICECO is probably the best equipped institute in the country to perform research in materials science. In particular, it is the focal point of the Portuguese Electron Microscopy Network (facilities: TEM, SEM and AFM, including a Piezoelectric Force Microscope) and house the top liquid- (300 and 500 MHz) and solid-state (400 and 500 MHz) nuclear magnetic resonance facilities (including LC-NMR).

CICECO is one of the best equipped national centers for X-ray diffraction (single crystal, powders and films). Other relevant equipment includes FTIR, Raman, FTRaman, UV-vis, TGA, DSC, DTA, dilatometry, GC, GC-MS, photoluminescence spectrometers (10-300 K), particle size analyser, glove box, vacuum line, dedicated gas lines for Ar, N₂, CO₂, H₂+N₂ mixtures, methane, etc.

Equipment for magnetism studies: 1.9-700 K, magnetic fields up to 10 T; magnetization (VSM) and magnetic susceptibility (AC technique, up to 10 kHz). Impedance bridges (1 Hz-2 GHz, 11-800 K); ferroelectric hysteresis analyser; photonic sensor for evaluating electromechanical properties; Berlincourt apparatus for measuring piezoelectric coefficients; equipment for films preparation (dip coater, spin coater, dc and rf sputtering).

Wide range of: furnaces for high-temperature calcination and sintering in air and under controlled atmosphere and other facilities for the preparation of ceramic materials; pressure vessel for hydrothermal synthesis. Set ups for catalytic testing. There is good access in the University of Aveiro to EPR and mass spectrometers (MALDI-TOF/TOF, Q-TOF, Linear trap, nano-hplc, triple quadrupole).