Universidad de Castilla-La Mancha

Erasmus+

DISCOVERING THE FASCINATING WORLD OF NANOMATERIALS

Erasmus Blended Intensive Programme (BIP)

Jan Dlugosz University in Czestochowa

UNIVERSITÄT PADERBORN

Le Mans Université

In summer 2022, UCLM is to organize a Blended Intensive Programme (BIP) whose title is "Discovering the Fascinating World of Nanomaterials". This 3ECTS Programme has been conceived for students from Jan Dlugosz University (Poland), Universität Paderborn (Germany) and Le Mans Université (France), three of our COLOURS university partners.

A BIP combines short-term physical mobility (one week at UCLM) with a virtual component (two weeks online).

The International Relations offices from the sending institutions will provide information and support to students for physical mobility.

Students must apply before 31 May 2022.

The BIP maximum number of participants (students) is 30.

Contact person:

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Jan Dlugosz University: m.makowska@ujd.edu.pl

Calendar:

- Virtual event: June 2022 (from 20th to 30th).
- Physical event: July 2022 (from 4th to 8th) at Ciudad Real, Almadén, and Toledo Campuses.

Admission requirements:

- Undergraduate (BA) (min 150 ECTS) or Master's Student at one of the participating universities in the field of Chemistry, Physics, Engineering or related.
- English: B1 according to CEFR (Common European Framework of Reference for Languages), CertAcles. Recommended B2.

Contents:

Nanotechnology is an interdisciplinary science that is based on the design, synthesis and application of materials at the atomic and molecular scale. This establishes some links among different disciplines such as Physics, Chemistry and Biology- and has a strong impact on society and the environment. In recent years, researchers are investing a lot of effort in the synthesis and characterisation of nanomaterials due to their potential applications in fields as Nanomedicine, Nanoelectronics, Biomaterials, Sensors, Catalyst, Energy Production, etc. In addition, the Nanomaterials characterization is gaining great importance, on the one hand, for their technological development and, on the other, to understand the structure-property relationship. While many characterisation techniques have been performed over the last few years, new methodologies are steadily emerging.

On this basis, we would like to go further with our structured proposal on a Blended Intensive Programme (BIP) in this field.

Virtual event. Microsoft Teams Sessions. English language.

In the online sessions, first, a review about concepts and background of Nanoscience and Nanotechnology will be introduced. Second, special attention will be paid to the preparation of

carbon-based Nanomaterials and metallic Nanoparticles. Third, the main characterisation techniques will be reviewed, to conclude with some applications of these Nanomaterials in fields such as Biomedicine or Optoelectronics.

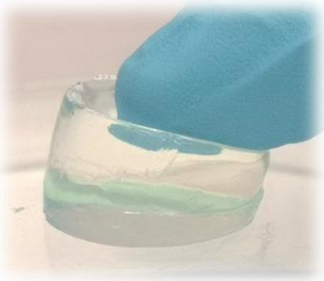
Example of possible lectures titles:

- Introduction to Nanoscience and Nanotechnology
- Magnetic Nanoparticles: Fundamentals and Applications
- Synthesis and Modification of Carbon Nanomaterials using Green Protocols
- Modifying the Properties of Graphene & Carbon Nanotubes through Chemical Functionalisation
- Using Raman Spectroscopy to Answer Nanotechnology Questions
- Fundamentals of Atomic Force Microscopy (AFM). An overview of AFM Measurement Modes.
- Advanced Scanning Probe Microscopy
- Characterization of Nanomaterials through Electron Microscopy
- Applications of Theoretical Methods for Nanomaterials
- Tuning the Structure of Nanomaterials for efficient BHJ Solar Cells
- Interaction of Graphene Related Materials with Biological Systems

Physical Event. Nano-Week

Within this Nano-Week, the participants will go through the different sections that had been studied in the on-line sessions, i.e. equipment for Nanomaterials synthesis (Planetary Mill), Magnetic Nanoparticles synthesis (vacuum deposition chamber, spark ablation source), as well as the characterisation equipment's (AFM, RAMAN, SEM, SQUID, etc.).

They will be able to be in contact with Nanomaterials and explore the passage from nano to macro with the use of three-dimensional materials, these being HIDROGELS. The Nanoparticles integration in these three-dimensional polymeric structures will allow us to obtain smart materials with interesting applications in the fields of Biomedicine and Soft-Robotics. In addition, they will discover the different possibilities of printing hydrogels with the use of a 3D printer. These sessions will be held at the Faculty of Chemical Sciences and Technologies and at the IRICA (Regional Institute for Applied Scientific Research) in **Ciudad Real** Campus.



In addition, during this week, participants will spend a day in the city of **Toledo**, where there will be a visit to the Technological Campus (Fábrica de Armas) and in particular the INAMOL Institute (Institute for Nanoscience, Nanotechnology and Molecular Materials).

Furthermore, as Toledo (UNESCO World Heritage City since 1987) is one of the richest cities in Spain in terms of cultural history, a touristic visit has been organised through its historical downtown.

The following day **Almadén Campus** will be visited. Almadén is a town that is placed 100 km away from Ciudad Real where Mining and Industrial Engineering studies are taught. During this flying visit, the laboratories of the Nanotechnology and Materials group will be seen. Finally, we will also visit its Mining Park, where to discover the secrets of its mercury mines, the oldest in the world and recently awarded with the EuChemS Historical Landmarks Award 2019.

Considering that the field of Nanomaterials Science is incorporating elements from **Physics**, **Chemistry**, and **Engineering**, the proposed BIP is of great interest regarding related BA's and MA's degrees that are offered in all our COLOURS university partners.