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The Institute  
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Sciences



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Aix-Marseille



## Master in Photonics – “PHOTONICS BCN” ERASMUS+ “EUROPHOTONICS”

### MASTER THESIS PROPOSAL

**Dates: April - September 2020**

**Laboratory :** Nanopto

**Institution:** Institute of Materials Science of Barcelona – **ICMAB - CSIC**

**City, Country :** Barcelona, Spain

**Title of the master thesis:** Design, Fabrication and Characterization of all-dielectric photonic architectures

**Name of the master thesis supervisor:** Agustín Mihi

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**Keywords :** Dielectric metasurfaces, light management, nanoimprinting lithography, optical properties

#### **Summary of the subject (maximum 1 page):**

The unique optical properties of metals brought new opportunities for managing light at the nanoscale. Metallic nanostructures are investigated for their capacity to enhance light-matter interactions, a property exploited in photodetection, photocatalysis, enhanced photovoltaics, surface enhanced Raman scattering (SERS), photothermal therapy and optical tweezers. Alternatively, the photonic community has turned towards high-index dielectric nanostructures with great interest. These architectures sustain strong optical resonances in the visible and near infrared region with low or inexistent optical losses but with the capacity to exhibit the same properties as their metallic counterparts such as negative refractive index, energy conversion, enhanced light-matter interaction, SERS and more. Another fundamental difference from the field enhancement seen in plasmonic structures is the possibility to excite magnetic resonances in simple geometries, a unique opportunity to generate and interact with magnetic hot spots in the visible and NIR region. In this project, we will use scalable techniques to fabricate the photonic architectures, we will engineer and characterize their optical properties and implement them in emerging devices.

**Additional information :** \* Required skills: Photonics / Plasmonics experience (theoretical and/or optical characterization)