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## **Master in Photonics – “PHOTONICS BCN” Master ERASMUS+ “EuroPhotonics”**

### **MASTER THESIS PROPOSAL**

**Dates: April 2020 - September 2021**

**Laboratory: Polarimetry Lab, Feman Group**  
**Institution: Universitat de Barcelona**  
**City, Country: Barcelona, Spain**

**Title of the master thesis: Imaging polarimetry in real time for bio applications**

**Name of the master thesis supervisor and co-supervisor: Oriol Arteaga**

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**Keywords: polarimetry, imaging, polarization, microscopy**

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

Mueller polarimetric imaging measures Mueller matrices over a field of view and thus allows for visualizing the polarization characteristics of the objects. It has emerged as a promising technique in recent years for tissue imaging, improving image contrast and providing a unique perspective to reveal additional information that cannot be resolved by other optical imaging modalities. The Mueller matrix represents the transfer function of an optical system in its interactions with polarized light, and it contains all of the necessary information about the linear optical properties of the medium.

This work proposes the modification a polarimetric microscope [O. Arteaga, M. Baldrís, J. Antó, A. Canillas, E. Pascual, and E. Bertran, “Mueller matrix microscope with a dual continuous rotating compensator setup and digital demodulation,” *Appl. Opt.* 53, 2236-2245 (2014)] with a new camera that uses a polarization sensor. The goal is to reduce significantly the measurement time in order to make possible polarimetry measurements based on the Mueller matrix in real time (around 1 frame every second or better). This instrument will be used to study moving biological systems such as active liquid crystals and for enabling in vivo measurement in medical diagnostic applications.

#### **Additional information:**



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\* Required skills: Interest in polarization optics and experimental work is recommended.  
Some Labview programming fluency is necessary.