Last update: 13-05-2015

230561 - IMPROCES - Image Processing in Biophotonics

Coordinating unit: 230 - ETSETB - Barcelona School of Telecommunications Engineering

Teaching unit: 731 - OO - Department of Optics and Optometry

Academic year: 2015

Degree: ERASMUS MUNDUS MASTER'S DEGREE IN PHOTONICS ENGINEERING, NANOPHOTONICS AND BIOPHOTONICS (Syllabus 2010). (Teaching unit Optional)
MASTER'S DEGREE IN PHOTONICS (Syllabus 2013). (Teaching unit Optional)

ECTS credits: 3 Teaching languages: English

Teaching staff

Coordinator: Artur Carnicer, UB.

Opening hours

Timetable: artur.carnicer@ub.edu

Degree competences to which the subject contributes

Transversal:

1. EFFECTIVE USE OF INFORMATION RESOURCES: Managing the acquisition, structuring, analysis and display of data and information in the chosen area of specialisation and critically assessing the results obtained.
2. ENTREPRENEURSHIP AND INNOVATION: Being aware of and understanding how companies are organised and the principles that govern their activity, and being able to understand employment regulations and the relationships between planning, industrial and commercial strategies, quality and profit.
3. FOREIGN LANGUAGE: Achieving a level of spoken and written proficiency in a foreign language, preferably English, that meets the needs of the profession and the labour market.
4. SUSTAINABILITY AND SOCIAL COMMITMENT: Being aware of and understanding the complexity of the economic and social phenomena typical of a welfare society, and being able to relate social welfare to globalisation and sustainability and to use technique, technology, economics and sustainability in a balanced and compatible manner.
5. TEAMWORK: Being able to work in an interdisciplinary team, whether as a member or as a leader, with the aim of contributing to projects pragmatically and responsibly and making commitments in view of the resources that are available.

Teaching methodology

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Learning objectives of the subject

This subject overviews several advanced topics on digital image processing; especial emphasis is made on biophotonics applications. The course provides an in-depth treatment of advanced image processing techniques, emphasizing software principles and practical implementation. This is a hands-on course and a basic knowledge of the MATLAB/Octave computing environment is required.

BIBLIOGRAPHY
· Digital Image Processing Using Matlab, R. C. González, S. L. Eddins, R. E. Woods (2004) Pearson-Prentice Hall

Further reading

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· The Matlab Particle Tracking Code Repository. http://physics.georgetown.edu/matlab/index.html
· 3D deconvolution package for microscopic images, http://bigwww.epfl.ch/algorithms/deconvolutionlab/
· Detecting cells using imatge segmemtation
http://www.mathworks.es/products/image/examples.html?file=/products/demos/shipping/images/ipexcell.html

Study load

Total learning time: 75h	Theory classes:	22h 30m	30.00%
	Practical classes:	0h	0.00%
	Laboratory classes:	0h	0.00%
	Guided study:	2h 15m	3.00%
	Self study:	50h 15m	67.00%

Content

1.- Fundamentals

Degree competences to which the content contributes:

Description:
1.1.- Review of matrix- and array-based operations in MATLAB / SciPy.
1.2.- Intensity transformations and Spatial Filtering.
1.3.- Colour image processing.
1.4.- Frequency (Fourier) domain processing.
1.5.- Image restoration algorithms.
1.6.- Image/video capture.

2.- Applications

Degree competences to which the content contributes:

Description:
2.1.- Point spread function analysis and restoration in optical microscopy.
2.2.- Single particle tracking.
2.3.- Cell segmentation.

Qualification system

- Students have to implement one of the algorithms analyzed in the course, providing examples of how it is used in practice. A written a report of his/her work is required (100%)

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Bibliography