Biomedical Image Processing

Academic Year: (2023 / 2024)   **Review date: 25-04-2023**

Department assigned to the subject: Signal and Communications Theory Department

Coordinating teacher: DIAZ DE MARIA, FERNANDO

Type: Electives ECTS Credits : 6.0

Year : 1 Semester : 1

OBJECTIVES

Ability to use techniques for processing massive amounts of medical data and images.
Ability to implement medical imaging and data processing methods. In particular, students will not only study the techniques, but they will also implement them in the laboratory, solving practical problems.

DESCRIPTION OF CONTENTS: PROGRAMME

1.- Digital images
2.- Fundamentals of bioimages
3.- Basic image processing techniques
  3.1. Pixel-wise transformations
  3.2. Filtering
  3.3. Fourier transform
  3.4. Interpolation
  3.5. Edge detection
  3.6. Restoration
4.- Segmentation
5.- Morphological processing
6.- Feature extraction for image classification
7.- Visualization
8.- Wavelets and multiresolution
9.- Keypoint detectors and descriptors
10.- Registration
11.- Advanced segmentation

LEARNING ACTIVITIES AND METHODOLOGY

AF3   Theoretical practical classes
AF4   Laboratory practices
AF5   Tutorials
AF6   Team work
AF7   Student individual work
AF8   Partial and final exams

Activity code	total hours number	presencial hours number	% Student Presence
AF3	134	134	100%
AF4	42	42	100%
AF5	24	0	0%
AF6	120	0	0%
AF7	248	0	0%
AF8	16	16	100%
SUBJECT TOTAL	600	184	30,66%

ASSESSMENT SYSTEM

% end-of-term-examination: 0

% of continuous assessment (assigments, laboratory, practicals…):   100

SE1   Participation in class
SE2   Individual or team works made during the course
SE3   Final exam

Evaluation systems	Minimum weighting (%)	Maximum Weighting (%)
SE1	0	20
SE2	0	100
SE3	0	60

SE1: 0%
SE2: quizzes: 40%; final project: 60%
SE3: 0%

The evaluation of the extraordinary call will be made on the basis of the final project (which the student must do in any case). The continuous evaluation questionnaires will be taken into account only if they contribute positively to the final grade.

BASIC BIBLIOGRAPHY

- G. Dougherty Digital Image Processing for Medical Applications, Cambridge University Press, 2009

- Mark A. Haidekker Advanced Biomedical Image Analysis, John Willey and Sons, 2011

- Rafael C. González and Richard E. Woods Digital Image Processing, Fourth Edition, Pearson, 2018

ADDITIONAL BIBLIOGRAPHY

- P. Suetens Fundamentals of Medical Imaging, Cambridge University Press, 2009

- Wilhelm Burger and Mark J. Burge Principles of Digital Image Processing: Fundamental Techniques, Springer-Verlag, 2009

- Wilhelm Burger and Mark J. Burge Principles of Digital Image Processing: Core Techniques, Springer-Verlag, 2009