



SUBJECT: Biomedical Image Processing		
MASTER DEGREE: Information & Health Engineering	ECTS: 6	QUARTER: 1st

TIMETABLE FOR THE SUBJECT								
WEEK	SESSION	DESCRIPTION OF EACH SESSION	GROUP (X mark)		Indicate if a different lecture room is needed (computer, audiovisual, etc.)	HOMEWORK PER WEEK		
			1	2		DESCRIPTION	ATTENDING HOURS	HOMEWORK Max. 7H/WEEK
1	1	0. Overview of the subject 1. Introduction to digital images	X			Digital Images (study)	1,5	2,25
1	2	2. Basic Image Processing Techniques 2.1. Pixelwise operations 2.2. Filtering	X			Basic Intensity transformations. Histograms. Histogram Equalization. Low-pass filters. High-pass filters. Gaussian Filters. Statistical ordered filters (Study & practical exercises)	1,5	3,25
2	3	2. Basic Image Processing Techniques 2.3. Frequency Domain 3. Image Restoration	X			FT and properties. Filtering in the Frequency Domain. Image restoration: noise and linear distortion. (Study & practical exercises)	1,5	3,25
2	4	Lab 1 Managing images	X		Lab	Reading and showing images. Color spaces. (practical computer implementations)	1,5	3,25
3	5	4. Edge Detection	X			Gradient and Laplacian. Discrete approximations. Canny Edge Detector. Edge sharpening. (Study & practical exercises)	1,5	3,25



3	6	Lab 2 Filtering	X		Lab	Basic Filters and template matching. (practical computer implementations)	1,5	3,25
4	7	5. Segmentation (1)	X			Thresholding. Clustering. (Study & practical exercises)	1,5	3,25
4	8	5. Segmentation (2)	X			Graphs. (Study & practical exercises)	1,5	3,25
5	9	6. Morphological image processing	X			Basic morphological operators. (Study & practical exercises)	1,5	3,25
5	10	Lab 3 Segmentation	X		Lab	Threshold-based image segmentation. Clustering-based image segmentation. (practical computer implementations)	1,5	3,25
6	11	7. Image descriptors (1)	X			Simple descriptors: shape, texture and color. PCA. (Study & practical exercises)	1,5	3,25
6	12	7. Image descriptors (2)	X			Hough transform. Local descriptors. (Study & practical exercises)	1,5	3,25
7	13	8. Image classification	X			Learning by example paradigm. K-NN. Linear classifiers. Linear SVMs. (Study & practical exercises)	1,5	3,25
7	14	Lab 4 Image descriptors for classification	X		Lab	Image descriptors for classification. (Practical computer implementations)	1,5	3,25



8	15	9. 3D visualization	X			Multiplanar reconstructions 3D visualization: General concepts; surface rendering and volume rendering (Study & practical exercises)	1,5	3,25
8	16	Lab 5 Visualization	X		Lab	Syn3D (Practical session)	1,5	3,25
9	17	10. Wavelets and Multiresolution (1)	X			Wavelet transform. Pyramids. (Study & practical exercises)	1,5	3,25
9	18	11. Wavelets and Multiresolution (2)				Applications in medical imaging. (Study & practical exercises)	1,5	3,25
10	19	Lab 6 Wavelets and Multiresolution	X		Lab	Spectrogram; Continuous Wavelet transform; Image denoising; Image compression (Practical session)	1,5	3,25
10	20	11. Registration (1)	X			Interpolation and geometrical transformations. Feature- based registration (Study & practical exercises)	1,5	3,25
11	21	11. Registration (2)	X			Intensity-based registration (Study & practical exercises)	1,5	3,25
11	22	Lab 7 Registration	X		Lab	Image registration (Practical computer implementation)	1,5	3,25
12	23	12. Advanced segmentation (1)	X			Active contours. Level sets. (Study & practical exercises)	1,5	3,25



12	24	13. Advanced segmentation (2)	X			Atlas-based segmentation (Study & practical exercises)	1,5	3,25
13	25	Lab 9 Advanced segmentation	X		Lab	Atlas-based segmentation of brain structures (Practical computer implementation)	1,5	3,25
13	26	14. Spectral image analysis	X			Spectral unmixing and abundance estimation (Study & practical exercises)	1,5	3,25
14	27	Lab 10 Spectral image analysis	X		Lab	Spectral Unmixing (Practical computer implementation)	1,5	3,25
14	28	Siemens Syngo Academy	X				1,5	3,25
TOTAL HOURS							42	90