[MMD103] ADVANCED PROCESSING OF BIOMEDICAL IMAGES

GENERAL INFORMATION

Studies	MASTER'S DEGREE IN BIOMEDICAL TECHNOLOGIES			**Subject**	?
Semester	1	**Course**	1	**Mention / Field of specialisation**	???
Character	OPTIONAL				
Plan	2023	**Modality**	Face-to-face	**Language**	ENGLISH
Credits	3	**Hours/week**	2.66	**Total hours**	47.8 class hours + 27.2 non-class hours = **75 total hours**

PROFESSORS

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REQUIRED PREVIOUS KNOWLEDGE

Subjects	Knowledge
SIGNAL AND BIOMEDICAL IMAGES PROCESSING	[!] *Bases de captura y procesamiento de imágenes biomédicas*
[!] *Procesamiento de imagen biomédica*	
[!] *Procesamiento de señales biomédicas*	

LEARNING RESULTS

LEARNING RESULTS	KC	SK	AB	ECTS
MMRA16 - To propose advanced image processing algorithms for healthcare applications		*x*		2,1
MMRA26 - To apply the knowledge acquired and your problem-solving skills in new, little-known or changing environments within broader (or multidisciplinary) contexts related to your area of study		*x*		0,72
MMRA28 - To communicate your conclusions and the knowledge and ultimate reasons that support them to specialized and non-specialized audiences in a clear and unambiguous way		*x*		0,18
			Total:	3

KC: Knowledge or Content / SK: Skills / AB: Abilities

SECONDARY LEARNING RESULTS

RMM134 **[!]** ***Diseñar e implementar correctamente algoritmos de procesamiento de texturas y formas para la extracción de características que permitan su clasificación.***

LEARNING ACTIVITIES	CH	NCH	TH
Carrying out/resolving projects/challenges/cases, etc. to provide solutions to problems in interdisciplinary contexts, real and/or simulated, individually and/or in teams	6 h.	3,5 h.	9,5 h.
Computer simulation exercises, individually and/or in teams	5 h.	4 h.	9 h.
Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	7 h.	2 h.	9 h.

EVALUATION SYSTEM	W
Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems	60%
Presentation and defence of exercises, case studies, computer practical work, simulation practical work, laboratory practical work, term projects, end of degree project, master's thesis, challenges and problems	40%

MAKE-UP MECHANISMS

Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems

CH - Class hours: 18 h.
NCH - Non-class hours: 9,5 h.
TH - Total hours: 27,5 h.

RMM135 **[!]** ***Buscar, analizar, seleccionar y aplicar técnicas avanzadas de procesamiento de imagen adaptadas a problemas complejos del ámbito biomédico.***

LEARNING ACTIVITIES	CH	NCH	TH
Development and writing of records, reports, presentations, audiovisual material, etc. on	10 h.	9 h.	19 h.

projects/work experience/challenges/case studies/experimental investigations carried out individually and/or in teams		
Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	6 h.	6 h.

EVALUATION SYSTEM	W	MAKE-UP MECHANISMS
Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems	100%	Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems

CH - Class hours: 16 h.
NCH - Non-class hours: 9 h.
TH - Total hours: 25 h.

RMM144 **[!]** ***Analiza las variables intervinientes en la solución de los problemas y plantea acciones para lograr una situación estable asumiendo responsabilidades en el equipo de trabajo, afrontando contingencias y organizando y planificando tareas.***

LEARNING ACTIVITIES	CH	NCH	TH
Carrying out/resolving projects/challenges/cases, etc. to provide solutions to problems in interdisciplinary contexts, real and/or simulated, individually and/or in teams	5,5 h.	3,5 h.	9 h.

EVALUATION SYSTEM	W	MAKE-UP MECHANISMS
Individual written and/or oral tests or individual coding/programming tests	40%	Observation (technical capacity, attitude and participation)
Co-assessment	5%	
Prototype / Product	55%	

Comments: If the score of the defense is lower than 5, this evaluation item will be evaluated in its entirety (%100) with the score of the defense. A co-evaluation system will be implemented to adjust the score of the student based on his or her participation in the Project.

CH - Class hours: 5,5 h.
NCH - Non-class hours: 3,5 h.
TH - Total hours: 9 h.

RMM145 **[!]** ***Conoce y es capaz de aplicar las herramientas de resolución de problemas en el campo de la Ingeniería Biomédica con iniciativa, toma de decisiones, creatividad y razonamiento crítico.***

LEARNING ACTIVITIES	CH	NCH	TH
Conducting tests, giving presentations, presenting defences, taking examinations and/or doing checkpoints	5,5 h.	3,5 h.	9 h.

EVALUATION SYSTEM	W	MAKE-UP MECHANISMS
Individual written and/or oral tests or individual coding/programming tests	40%	Observation (technical capacity, attitude and participation)
Co-assessment	5%	
Prototype / Product	55%	

Comments: If the score of the defense is lower than 5, this evaluation item will be evaluated in its entirety (%100) with the score of the defense. A co-evaluation system will be implemented to adjust the score of the student based on his or her participation in the Project.

CH - Class hours: 5,5 h.
NCH - Non-class hours: 3,5 h.
TH - Total hours: 9 h.

RMM146 **[!]** ***Define el problema, el desarrollo de la solución, así como las conclusiones de manera eficaz, argumentando y justificando cada una de ellas, y haciendo un uso correcto del lenguaje, por escrito y de manera oral.***

LEARNING ACTIVITIES	CH	NCH	TH
Development and writing of records, reports, presentations, audiovisual material, etc. on projects/work experience/challenges/case studies/experimental investigations carried out individually and/or in teams	1,5 h.	1 h.	2,5 h.

EVALUATION SYSTEM	W	MAKE-UP MECHANISMS
Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems	50%	Observation (technical capacity, attitude and participation)
Presentation and defence of exercises, case studies, computer practical work, simulation practical work, laboratory practical work, term projects, end of degree project, master's thesis, challenges and problems	50%	

CH - Class hours: 1,5 h.
NCH - Non-class hours: 1 h.
TH - Total hours: 2,5 h.

RMM147 **[!]** ***Define los objetivos, realiza la planificación para su consecución y su seguimiento sistemático coordinando su trabajo con los demás miembros del equipo.***

LEARNING ACTIVITIES	CH	NCH	TH
Development and writing of records, reports, presentations, audiovisual material, etc. on projects/work experience/challenges/case studies/experimental investigations carried out individually and/or in teams	1,3 h.	,7 h.	2 h.

EVALUATION SYSTEM	W	MAKE-UP MECHANISMS
Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems	50%	Observation (technical capacity, attitude and participation)
Presentation and defence of exercises, case studies, computer practical work, simulation practical work, laboratory practical work, term projects, end of degree project, master's thesis, challenges and problems	50%	

CH - Class hours: 1,3 h.
NCH - Non-class hours: ,7 h.
TH - Total hours: 2 h.

CONTENTS

1.- Thresholding

2.- Shape Analysis and feature extration

3.- Texture analysis

4.- OCT analysis pipeline

4.1.- Visualization

4.2.- Preprocessing

4.3.- Feature extraction

5.- MRI analysis pipeline

5.1. Image visualization and preprocessing

5.2. Image registration

5.3. Brain & tissue segmentation

LEARNING RESOURCES AND BIBLIOGRAPHY

Learning resources	Bibliography
Class presentations Technical articles Moodle Platform	Rangayyan, R. M. (2004). Biomedical image analysis. CRC press. Gonzalez, R.C., & Woods, R.E. (2008). Digital Image Processing. Pearson Prentice Hall Gonzalez, R.C., Woods, R.E., Eddins, S.L. (2009). Digital Image Processing Using MATLAB. Gatesmark Publishing Jenkinson, M. & Chappell, M. (2018). Introduction to Neuroimaging Analysis (Oxford Neuroimaging Primers). OUP Oxford. ISBN:978-0198816300