Goi Eskola

Course: 2024 / 2025 - Course planning

Escuela Politécnica Superior [MMD103] ADVANCED PROCESSING OF BIOMEDICAL IMAGES **GENERAL INFORMATION** Studies MASTER'S DEGREE IN BIOMEDICAL Subject ? **TECHNOLOGIES** Semester 1 Mention / Field of ??? Course 1 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 MENDICUTE ERRASTI, MIKEL CILLA UGARTE, RODRIGO UIRED PREVIOUS KNOWLEDGE Subjects Knowledge SIGNAL AND BIOMEDICAL IMAGES PROCESSING (No previous knowledge required) [!] Procesamiento de imagen biomédica [!] Procesamiento de señales biomédicas LEARNING RESULTS кс SK ECTS LEARNING RESULTS AB MMRA16 - To propose advanced image processing algorithms for healthcare applications 2.1 x MMRA26 - To apply the knowledge acquired and your problem-solving skills in new, little-known or 0,72 x changing environments within broader (or multidisciplinary) contexts related to your area of study 0,18 MMRA28 - To communicate your conclusions and the knowledge and ultimate reasons that support them x to specialized and non-specialized audiences in a clear and unambiguous way 3 Total: KC: Knowledge or Content / SK: Skills / AB: Abilities SECONDARY LEARNING RESULTS 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 NCH СН TH 1.3 h. Development and writing of records, reports, presentations, audiovisual material, etc. on .7 h. 2 h. projects/work experience/challenges/case studies/experimental investigations carried out individually and/or in teams **EVALUATION SYSTEM** w MAKE-UP MECHANISMS Reports on the completion of exercises, case studies, 50% Observation (technical capacity, attitude and participation) computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems 50% 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 CH - Class hours: 1,3 h. NCH - Non-class hours: ,7 h. TH - Total hours: 2 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	СН	NCH	тн
Conducting tests, giving presentations, presenting defences, taking examinations and/or doing	5,5 h.	3,5 h.	9 h.
checkpoints			



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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, the evaluation item will be evaluated in its entirety (%100) with of the defense. A co-evaluation system will be implemente adjust the score of the student based on his or her particip the Project.	nts a the score ed to pation in	
CH - Class hours: 5,5 h. NCH - Non-class hours: 3,5 h. TH - Total hours: 9 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			СН	NCH	тн
Carrying out/resolving projects/challenges/cases, etc. interdisciplinary contexts, real and/or simulated, indiv	. to provide so idually and/or	lutions to problems in in teams	5,5 h.	3,5 h.	9 h.
EVALUATION SYSTEM	W	MAKE-UP MECHANI	SMS		
Individual written and/or oral tests or individual coding/programming tests	40%	Observation (technica	l capacity, at	titude and par	ticipation)
Co-assessment	5%				
Prototype / Product	55%				
Comments: If the score of the defense is lower than avaluation item will be evaluated in its entirety (%100) of the defense. A co-evaluation system will be implementation the score of the student based on his or her part the Project.	5, this with the score ented to icipation in				
CH - Class hours: 5,5 h. NCH - Non-class hours: 3,5 h. TH - Total hours: 9 h.					

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

			СП	NCH	н
Development and writing of records, reports, presentation projects/work experience/challenges/case studies/experin individually and/or in teams	ns, audiovis mental inve	sual material, etc. on estigations carried out	10 h.	9 h.	19 h.
Presentation by the teacher in the classroom, in participa procedures associated with the subjects	tory classe	s, of concepts and	6 h.		6 h.
EVALUATION SYSTEM	W	MAKE-UP MECHAN	IISMS		
Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems	100%	Reports on the comp exercises, simulatior projects, challenges	pletion of exerc n exercises, la and problems	cises, case stu boratory exerc	idies, compute iises, term
:H - Class hours: 16 h. ICH - Non-class hours: 9 h. 'H - Total hours: 25 h.					

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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			СН	NCH	тн
Development and writing of records, reports, presentations, audiovisual material, etc. on 1,5 h. 1 h. 2,5 h. projects/work experience/challenges/case studies/experimental investigations carried out individually and/or in teams					2,5 h.
EVALUATION SYSTEM	W	MAKE-UP MECHANI	SMS		
Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems	50%	Observation (technica	al capacity, at	titude and par	ticipation)
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.					

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

LEARNING ACTIVITIES	СН	NCH	ТН
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	MAKE-UP MECHANISMS
Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems	60%	Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems
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%	
CH - Class hours: 18 h. NCH - Non-class hours: 9,5 h. TH - Total hours: 27,5 h.		

CONTENTS

- 1.- Advanced segmentation
- 2.- Shape Analysis and feature extration
- 3.- Texture analysis
- 4. MRI analysis pipeline
- 4.1. Image visualization and preprocessing
- 4.2. Image registration
- 4.3. Brain & tissue segmentation
- 5. Other biomedical image analysis



5.1 Image visualization and preprocessing5.2. Image Registration5.3. Segmentation and characterization

LEARNING RESOURCES AND BIBLIOGRAPHY

Learning resources	Bibliography
Class presentations	Rangayyan, R. M. (2004). Biomedical image analysis. CRC press.
Technical articles Moodle Platform	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