

[MMA100] FLUID MECHANICS AND HEAT TRANSFER

GENERAL INFORMATION

Studies	MASTER'S DEGREE IN BIOMEDICAL TECHNOLOGIES		Subject	?
Semester	1	Course	1	Mention / Field of specialisation
Character	COMPULSORY		Language	ENGLISH
Plan	2023	Modality	Face-to-face	Total hours [!] 72.6 class hours + 39.9 non-class hours = 112.5 total hours
Credits	4,5	Hours/week	4.03	

PROFESSORS

MARTIN MAYOR, ALAIN
ERRARTE YARZA, ANE

REQUIRED PREVIOUS KNOWLEDGE

Subjects	Knowledge
(No specific previous subjects required)	(No previous knowledge required)

LEARNING RESULTS

LEARNING RESULTS	KC	SK	AB	ECTS
MMRA01 - To apply knowledge of fluid mechanics, as well as transfer mechanisms			x	3,16
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		1,08
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		0,26
Total:				4,5

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

SECONDARY LEARNING RESULTS

RMM100 [!] *Conocer y comprender las propiedades termofísicas y de transporte de los fluidos.*

LEARNING ACTIVITIES

	CH	NCH	TH
Conducting tests, giving presentations, presenting defences, taking examinations and/or doing checkpoints	2 h.		2 h.
Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	8 h.		8 h.
Carrying out exercises and solving problems individually and/or in teams	7,2 h.	11 h.	18,2 h.

EVALUATION SYSTEM

	W
Individual written and/or oral tests or individual coding/programming tests	100%

MAKE-UP MECHANISMS

Individual written and/or oral tests or individual coding/programming tests
Comments: If the score of the exam is lower than 5, it Will be mandatory to repeat the exam

CH - Class hours: 17,2 h.

NCH - Non-class hours: 11 h.

TH - Total hours: 28,2 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	2 h.	1 h.	3 h.

EVALUATION SYSTEM

	W
Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems	50%

MAKE-UP MECHANISMS

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: 2 h.
NCH - Non-class hours: 1 h.
TH - Total hours: 3 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

Carrying out/resolving projects/challenges/cases, etc. to provide solutions to problems in interdisciplinary contexts, real and/or simulated, individually and/or in teams

CH

8,5 h.

NCH

5 h.

TH

13,5 h.

EVALUATION SYSTEM

W

Individual written and/or oral tests or individual coding/programming tests

40%

Co-assessment

5%

Prototype / Product

55%

MAKE-UP MECHANISMS

Observation (technical capacity, attitude and participation)

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: 8,5 h.
NCH - Non-class hours: 5 h.
TH - Total hours: 13,5 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

Carrying out/resolving projects/challenges/cases, etc. to provide solutions to problems in interdisciplinary contexts, real and/or simulated, individually and/or in teams

CH

8,5 h.

NCH

5 h.

TH

13,5 h.

EVALUATION SYSTEM

W

Individual written and/or oral tests or individual coding/programming tests

40%

Co-assessment

5%

Prototype / Product

55%

MAKE-UP MECHANISMS

Observation (technical capacity, attitude and participation)

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: 8,5 h.
NCH - Non-class hours: 5 h.
TH - Total hours: 13,5 h.

RMM102 [!] *Analizar de manera numérica diversos aspectos de distintos fluidos mediante herramientas de cálculo en base a CFD-CHT (Computational fluid dynamic - Computational Heat Transfer)*

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	2 h.	2,6 h.	4,6 h.
Computer simulation exercises, individually and/or in teams	5 h.	3 h.	8 h.
Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	10 h.		10 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: 17 h.			
NCH - Non-class hours: 5,6 h.			
TH - Total hours: 22,6 h.			

RMM101 [!] *Calcular e interpretar las ecuaciones de conservación de la mecánica de fluidos y de transferencia térmica.*

LEARNING ACTIVITIES	CH	NCH	TH
Conducting tests, giving presentations, presenting defences, taking examinations and/or doing checkpoints	2 h.		2 h.
Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	8 h.		8 h.
Carrying out exercises and solving problems individually and/or in teams	7,2 h.	11 h.	18,2 h.
EVALUATION SYSTEM	W	MAKE-UP MECHANISMS	
Individual written and/or oral tests or individual coding/programming tests	100%	Individual written and/or oral tests or individual coding/programming tests	
Comments: If the score of the exam is lower than 5, it Will be mandatory to repeat the exam			

CH - Class hours: 17,2 h.
NCH - Non-class hours: 11 h.
TH - Total hours: 28,2 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	2,2 h.	1,3 h.	3,5 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: 2,2 h.
NCH - Non-class hours: 1,3 h.
TH - Total hours: 3,5 h.

CONTENTS

1.-FLUID MECHANICS 1.1.- Introduction to fluid mechanics 1.2- Thermophysical properties 1.3 - Hydrostatic
1.4 - Hydrodynamic analysis 1.5 - Hemodynamics 1.6 - Viscous flows 1.7.- Biomedical applications2.- HEAT
TRANSFER 2.1.- Basic concepts of thermodynamics 2.2 - Heat transfer mechanisms 2.3 - Heat transfer in bi
ological systems 2.4.- Biomedical applications4.-CFD-CHT (Computational fluid dynamic - Computational Hea
t Transfer)4.1.-. Basic concepts4.2.- Biomedical applications4.3.- Practical case

LEARNING RESOURCES AND BIBLIOGRAPHY

Learning resources	Bibliography
Subject notes	Incropera Fundamentals Heat Mass Transfer 7th, Frank P Incropera.
Class presentations	David P. Dewitt, 2011
Moodle Platform	2500 Solved Problems in Fluid Mechanics and Hydraulics, J. B.
Specific Master Software	Evet, Cheng Liu., Mc Graw- Hill.
	Heat Transfer a Practical Approach 2nd edition, Yunus A. Cengel, 2002