![Mondragon Unibertsitatea logo] **Goi Eskola Politeknikoa | Mondragon Unibertsitatea**
Goi Eskola Politeknikoa
Escuela Politécnica Superior

Course: 2024 / 2025 - Course planning

[MMC100] BIOMECHANICAL DESIGN AND ANALYSIS

GENERAL INFORMATION

Studies	MASTER'S DEGREE IN BIOMEDICAL TECHNOLOGIES			**Subject**	?
Semester	2	**Course**	1	**Mention / Field of specialisation**	
Character	COMPULSORY				
Plan	2023	**Modality**	Face-to-face	**Language**	CASTELLANO
Credits	4,5	**Hours/week**	2.68	**Total hours**	48.2 class hours + 64.3 non-class hours = **112.5 total hours**

PROFESSORS

TORCA DE LA CONCEPCIÓN, IRENEO

REQUIRED PREVIOUS KNOWLEDGE

Subjects	**Knowledge**
BIOMECHANICS	*(No previous knowledge required)*
BEHAVIOR AND DESIGN OF BIOMECHANICAL SYSTEMS	

LEARNING RESULTS

LEARNING RESULTS	KC	SK	AB	ECTS
MMRA14 - To apply mechanics concepts to the process of analysis, calculation and design of biomechanical and healthcare elements and assemblies using specific simulation tools		x		3,16
MMR-26 - 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
MMR-28 - 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

RMM114 [!] *Calcular de manera analítica elementos y conjuntos biomecánicos y sanitarios aplicando los criterios mecánicos de resistencia y rigidez*

LEARNING ACTIVITIES	CH	NCH	TH
Personal study and flexible development of concepts and subjects using active dynamics, to foster more meaningful learning		10 h.	10 h.
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		10 h.	10 h.

EVALUATION SYSTEM	W
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	10%
Individual written and/or oral tests or individual coding/programming tests	90%

Comments: If the score of the exam is lower than 4, this evaluation item will be evaluated in its entirety (%100) with the score of the exam.

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: 10 h.
NCH - Non-class hours: 20 h.
TH - Total hours: 30 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	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 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	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	8,5 h.	5 h.	13,5 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: 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	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	8,5 h.	5 h.	13,5 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: 8,5 h.

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

RMM116 [!] *Aplicar los conceptos de cálculo dinámico y/o estructural en un entorno práctico*

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		5 h.	5 h.
Computer simulation exercises, individually and/or in teams	7 h.	7 h.	14 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: 7 h.
NCH - Non-class hours: 12 h.
TH - Total hours: 19 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.

RMM115 [!] *Calcular de manera numérica elementos y conjuntos biomecánicos y sanitarios desde el punto de vista dinámico y/o estructural*

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		10 h.	10 h.
Personal study and flexible development of concepts and subjects using active dynamics, to foster more meaningful learning		10 h.	10 h.
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.

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	10%	Individual written and/or oral tests or individual coding/programming tests
Individual written and/or oral tests or individual coding/programming tests	90%	**Comments:** If the score of the exam is lower than 5, it Will be mandatory to repeat the exam
Comments: If the score of the exam is lower than 4, this evaluation item will be evaluated in its entirety (%100) with the score of the exam.		

CH - Class hours: 10 h.
NCH - Non-class hours: 20 h.
TH - Total hours: 30 h.

CONTENTS

1. ANALYTICAL ANALYSISa. Bendingb. Stress transformationsc. Combined stressesd. Fundamentals of structural design2. NUMERICAL ANALYSISa. Modelizationb. Structural simulation fundamentalsc. Dynamic simulation fundamentalsd. Fatigue

LEARNING RESOURCES AND BIBLIOGRAPHY

Learning resources	Bibliography
Subject notes	Fundamentals of Biomechanics: Equilibrium, Motion and Deformation, Nihat Özkaya, David Goldsheyder, Margareta Nordin. 4th edition, 2017, ISBN 978-3-319-44737-7, Springer
Technical articles	
Moodle Platform	Finite Element Analysis: From Biomedical Applications to Industrial Developments. Edited by David Moratal, 2016. ISBN-10: 953-51-0474-8; ISBN-13: 978-953-51-0474-2. Open Access distributed under the Creative Commons Attribution 3.0 license
Specific Master Software	
	Mechanics of Materials, Roy R. Craig Jr., 3rd edition, 2011, ISBN 978-0-470-48181-3, John Wiley and Sons
	A Primer of Biomechanics, George L. Lucas, 1999. Springer Science+Business Media. Springer