



1. General information

Course: ANATOMY AND BIOMECHANICS OF HUMAN MOVEMENT

Type: BASIC

Degree: 314 - DEGREE IN SCIENCES OF THE PHYSICAL ACTIVITY AND OF THE SPORT

Center: 8 - FACULTY OF SPORT SCIENCES

Year: 1

Main language: Spanish

Use of additional languages:

Web site:

Code: 39303

ECTS credits: 9

Academic year: 2022-23

Group(s): 40

Duration: AN

Second language: English

English Friendly: Y

Bilingual: N

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2. Pre-Requisites

Not established

3. Justification in the curriculum, relation to other subjects and to the profession

Not established

4. Degree competences achieved in this course

Course competences

Code	Description
A03	Understand the scientific literature in the field of physical activity and sport in the English language and in other languages of significant presence in the scientific field.
A04	Knowing how to apply information and communication technologies (ICT) to the field of Physical Activity and Sports Sciences.
A08	Understand and use common handbooks, as well as manuscripts and, in general, leading bibliography on subjects related to physical activity and sport, in order to prepare reports or solve specific problems that may arise.
B01	Know and understand the object of study of the Physical Activity and Sport Sciences.
B02	Know and understand the object of study of the Physical Activity and Sport Sciences.
B03	Know and understand the physiological and biomechanical factors that condition the practice of physical activity and sport.
B05	Know and understand the effects of the practice of physical exercise on the structure and function of the human body.
B13	Apply the physiological, biomechanical, behavioral and social principles to the different fields of physical activity and sport.
M111	To acquire the basic knowledge of anatomy required to analyse the functions of the locomotive system during movement.
M113	To analyze exercise programs following anatomical criteria
M114	To apply basic mechanical principles in the analysis of physical activity and sports performance.
M115	To describe the movement and related forces.
M116	To explain the causes of movement and balance.
M117	To be aware of different methodologies (both, basic and complex) designed to analyse the human movement.
M118	To apply theoretical and practical knowledge and skills in the analysis of a sport chosen by the student.

5. Objectives or Learning Outcomes

Course learning outcomes

Description

Differentiate the characteristics and structures of bones, muscles and joints.

Identify the functions of the different systems of the human body.

Use motion analysis methodologies to analyze the practice of physical activity and sport.

Use basic anatomical vocabulary to describe any function and movement of the human body.

Select exercises and tasks according to the characteristics and problems of the subject being treated.

Recognize the muscles and joints involved in different movements identifying their functions.

Apply biomechanical analysis of a technical gesture to the teaching of sports skills.

Apply the basic biomechanical principles associated to the movement and states of balance to improve efficiency and reduce injuries in sports practice.

6. Units / Contents**Unit 1: Context of Biomechanics**

- Unit 1.1** Definitions
- Unit 1.2** Objectives of Biomechanics of Human Movement
- Unit 1.3** Areas of Biomechanics
- Unit 1.4** Subdivisions of Biomechanics
- Unit 1.5** History of Biomechanics
- Unit 1.6** Sports Biomechanics in Spain
- Unit 1.7** Biomechanics in the study plans
- Unit 1.8** Basic literature
- Unit 1.9** Biomechanics resources in the Internet

Unit 2: Measuring in Biomechanics. Magnitudes

- Unit 2.1** Quantitative and qualitative methodologies
- Unit 2.2** Definition of magnitude
- Unit 2.3** Fundamental and derived magnitudes
- Unit 2.4** Scalar and vectorial magnitudes
- Unit 2.5** Units
- Unit 2.6** Relativity of measurements
- Unit 2.7** Reference systems
- Unit 2.8** Space reference terms in Biomechanics
- Unit 2.9** Validity, objectivity and reliability

Unit 3: Types of motion

- Unit 3.1** Types of motion
- Unit 3.2** Linear motion
- Unit 3.3** Angular motion
- Unit 3.4** Special types of motion

Unit 4: Newton's laws

- Unit 4.1** First law
- Unit 4.2** Second law
- Unit 4.3** Third law

Unit 5: Torque**Unit 6: Balance**

- Unit 6.1** Center of gravity
- Unit 6.2** Mechanical variables of balance
- Unit 6.3** Types of balance
- Unit 6.4** Strategies to recover balance

Unit 7: Muscle mechanics

- Unit 7.1** Mechanical determinants of muscle strength
- Unit 7.2** Hill's equation. Force-velocity relationship
- Unit 7.3** Torque
- Unit 7.4** Muscle architecture

Unit 8: Tissue and material properties

- Unit 8.1** Types of stress
- Unit 8.2** Stress-strain relationship. Hooke's law. Young's modulus
- Unit 8.3** Mechanical responses of living tissues to stress

Unit 9: Introduction to anatomy of the locomotor system**Unit 10: Types of movement and joint axes****Unit 11: Basics of osteology****Unit 12: Basics of arthrology****Unit 13: Basics of myology and soft tissues****Unit 14: Neuromuscular skeletal structure and reflex arcs****Unit 15: Osteology of the upper limb****Unit 16: Arthrology of the upper limb****Unit 17: Myology of the upper limb****Unit 18: Osteology of the trunk and thorax****Unit 19: Arthrology and myology of the trunk and thorax****Unit 20: Osteology of the lower limb****Unit 21: Arthrology and myology of the lower limb****Unit 22: Anatomy of the nervous system****ADDITIONAL COMMENTS, REMARKS**

There will be practical classes (laboratories) both in Anatomy and Biomechanics, where the contents of the theoretical classes will be applied.

7. Activities, Units/Modules and Methodology

Training Activity	Methodology	Related Competences (only degrees before RD 822/2021)	ECTS	Hours	As	Com	Description
Class Attendance (theory) [ON-	Lectures	A03 A08 B01 B02 B03 B13	1.2	30	Y	Y	

Laboratory practice or sessions [ON-SITE]	Combination of methods	A04 A08 B03 B13 M114 M117 M118	0.6	15	Y	Y	
Study and Exam Preparation [OFF-SITE]	Self-study	A03 A08 B01 B02 B03 B13 M114 M115 M116	1	25	Y	Y	
Practicum and practical activities report writing or preparation [OFF-SITE]	Self-study	A04 A08 B03 B13 M114 M117 M118	1.7	42.5	Y	Y	
Class Attendance (theory) [ON-SITE]	Lectures	B01 B03 M114 M115	1.2	30	Y	Y	
Class Attendance (practical) [ON-SITE]	Combination of methods	B01 B02 B03 M111 M118	0.6	15	Y	Y	
Study and Exam Preparation [OFF-SITE]	Self-study	B03 B05 B13 M118	2.7	67.5	Y	Y	
Total:			9	225			
Total credits of in-class work: 3.6				Total class time hours: 90			
Total credits of out of class work: 5.4				Total hours of out of class work: 135			

As: Assessable training activity

Com: Training activity of compulsory overcoming (It will be essential to overcome both continuous and non-continuous assessment).

8. Evaluation criteria and Grading System			
Evaluation System	Continuous assessment	Non-continuous evaluation*	Description
Final test	40.00%	50.00%	ANATOMY
Progress Tests	20.00%	0.00%	BIOMECHANICS
Final test	30.00%	50.00%	BIOMECHANICS
Progress Tests	10.00%	0.00%	ANATOMY
Total:	100.00%	100.00%	

According to art. 4 of the UCLM Student Evaluation Regulations, it must be provided to students who cannot regularly attend face-to-face training activities the passing of the subject, having the right (art. 12.2) to be globally graded, in 2 annual calls per subject, an ordinary and an extraordinary one (evaluating 100% of the competences).

Evaluation criteria for the final exam:

Continuous assessment:

The evaluation activities will be adapted for the foreign student, according to his/her Spanish and English level.

Non-continuous evaluation:

The evaluation activities will be adapted for the foreign student, according to his/her Spanish and English level.

Specifications for the resit/retake exam:

No further specifications.

9. Assignments, course calendar and important dates	
Not related to the syllabus/contents	
Hours	hours
Unit 1 (de 22): Context of Biomechanics	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	4
Laboratory practice or sessions [PRESENCIAL][Combination of methods]	2
Study and Exam Preparation [AUTÓNOMA][Self-study]	3.2
Practicum and practical activities report writing or preparation [AUTÓNOMA][Self-study]	6
Unit 2 (de 22): Measuring in Biomechanics. Magnitudes	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	4
Laboratory practice or sessions [PRESENCIAL][Combination of methods]	2
Study and Exam Preparation [AUTÓNOMA][Self-study]	3.2
Practicum and practical activities report writing or preparation [AUTÓNOMA][Self-study]	6.5
Unit 3 (de 22): Types of motion	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	4
Laboratory practice or sessions [PRESENCIAL][Combination of methods]	2
Study and Exam Preparation [AUTÓNOMA][Self-study]	3.2
Practicum and practical activities report writing or preparation [AUTÓNOMA][Self-study]	6.5
Unit 4 (de 22): Newton's laws	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	4
Laboratory practice or sessions [PRESENCIAL][Combination of methods]	1
Study and Exam Preparation [AUTÓNOMA][Self-study]	3.2
Practicum and practical activities report writing or preparation [AUTÓNOMA][Self-study]	6.5
Unit 5 (de 22): Torque	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	3

Laboratory practice or sessions [PRESENCIAL][Combination of methods]	2
Study and Exam Preparation [AUTÓNOMA][Self-study]	3
Practicum and practical activities report writing or preparation [AUTÓNOMA][Self-study]	3
Unit 6 (de 22): Balance	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	5
Laboratory practice or sessions [PRESENCIAL][Combination of methods]	2
Study and Exam Preparation [AUTÓNOMA][Self-study]	4.2
Practicum and practical activities report writing or preparation [AUTÓNOMA][Self-study]	5.5
Unit 7 (de 22): Muscle mechanics	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Laboratory practice or sessions [PRESENCIAL][Combination of methods]	2
Study and Exam Preparation [AUTÓNOMA][Self-study]	2.5
Practicum and practical activities report writing or preparation [AUTÓNOMA][Self-study]	4.25
Unit 8 (de 22): Tissue and material properties	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Laboratory practice or sessions [PRESENCIAL][Combination of methods]	2
Study and Exam Preparation [AUTÓNOMA][Self-study]	2.5
Practicum and practical activities report writing or preparation [AUTÓNOMA][Self-study]	4.25
Unit 9 (de 22): Introduction to anatomy of the locomotor system	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	2
Class Attendance (practical) [PRESENCIAL][Combination of methods]	2
Study and Exam Preparation [AUTÓNOMA][Self-study]	5
Unit 10 (de 22): Types of movement and joint axes	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	2
Class Attendance (practical) [PRESENCIAL][Combination of methods]	1
Study and Exam Preparation [AUTÓNOMA][Self-study]	4
Unit 11 (de 22): Basics of osteology	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	2
Class Attendance (practical) [PRESENCIAL][Combination of methods]	1
Study and Exam Preparation [AUTÓNOMA][Self-study]	5
Unit 12 (de 22): Basics of arthrology	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	2
Class Attendance (practical) [PRESENCIAL][Combination of methods]	1
Study and Exam Preparation [AUTÓNOMA][Self-study]	4
Unit 13 (de 22): Basics of myology and soft tissues	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Class Attendance (practical) [PRESENCIAL][Combination of methods]	1
Study and Exam Preparation [AUTÓNOMA][Self-study]	5
Unit 14 (de 22): Neuromuscular skeletal structure and reflex arcs	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	2
Class Attendance (practical) [PRESENCIAL][Combination of methods]	1
Study and Exam Preparation [AUTÓNOMA][Self-study]	5.5
Unit 15 (de 22): Osteology of the upper limb	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Class Attendance (practical) [PRESENCIAL][Combination of methods]	1
Study and Exam Preparation [AUTÓNOMA][Self-study]	5
Unit 16 (de 22): Arthrology of the upper limb	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	2
Class Attendance (practical) [PRESENCIAL][Combination of methods]	1
Study and Exam Preparation [AUTÓNOMA][Self-study]	5
Unit 17 (de 22): Myology of the upper limb	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Class Attendance (practical) [PRESENCIAL][Combination of methods]	1
Study and Exam Preparation [AUTÓNOMA][Self-study]	5
Unit 18 (de 22): Osteology of the trunk and thorax	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	2
Class Attendance (practical) [PRESENCIAL][Combination of methods]	1

Study and Exam Preparation [AUTÓNOMA][Self-study]	5
Unit 19 (de 22): Arthrology and myology of the trunk and thorax	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	2
Class Attendance (practical) [PRESENCIAL][Combination of methods]	1
Study and Exam Preparation [AUTÓNOMA][Self-study]	5
Unit 20 (de 22): Osteology of the lower limb	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	2
Class Attendance (practical) [PRESENCIAL][Combination of methods]	1
Study and Exam Preparation [AUTÓNOMA][Self-study]	5
Unit 21 (de 22): Arthrology and myology of the lower limb	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	2
Class Attendance (practical) [PRESENCIAL][Combination of methods]	1
Study and Exam Preparation [AUTÓNOMA][Self-study]	4
Unit 22 (de 22): Anatomy of the nervous system	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	1
Class Attendance (practical) [PRESENCIAL][Combination of methods]	1
Study and Exam Preparation [AUTÓNOMA][Self-study]	5
Global activity	
Activities	hours
Study and Exam Preparation [AUTÓNOMA][Self-study]	25
Laboratory practice or sessions [PRESENCIAL][Combination of methods]	15
Practicum and practical activities report writing or preparation [AUTÓNOMA][Self-study]	42.5
Class Attendance (theory) [PRESENCIAL][Lectures]	30
Class Attendance (practical) [PRESENCIAL][Combination of methods]	15
Study and Exam Preparation [AUTÓNOMA][Self-study]	67.5
Class Attendance (theory) [PRESENCIAL][Lectures]	30
Total horas: 225	

10. Bibliography and Sources						
Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
Blazevich, Anthony	Sports biomechanics: the basics : optimising human performan	Bloomsbury		978-1-4081-2749-0	2012	Libro de biomecánica aplicada al deporte con numerosos ejemplos aplicados.
Fucci, Sergio	Biomecánica del aparato locomotor aplicada al acondicionamiento muscular	Elsevier		84-8174-645-2	2003	Libro con un enfoque anatómico que incluye excelentes ilustraciones de la musculatura implicada en diferentes ejercicios de musculación.
Gilroy AM	Prometheus. Atlas de Anatomía	Editorial Médica Panamericana		978-84-7903-600-3	2008	
Izquierdo, Mikel	Biomecánica y bases neuromusculares de la actividad física y	Editorial Médica Panamericana		978-84-0935-023-4	2008	Compendio de capítulos sobre diferentes aspectos de la Biomecánica. Es el libro reciente más completo en español sobre el tema.
Kapandji, A I	Fisiología articular. Volúmenes I, II y III.	Médica Panamericana.	Madrid	978-84-9835-461-4	2010	Libros con excelentes esquemas anatómicos y biomecánicos
Latarjet M, Ruiz Liard A.	Anatomía humana. Tomos I y II	Médica Panamericana.	Madrid		2004	Atlas clásico de anatomía humana
Netter F.H.	Atlas de Anatomía Humana.	Masson	Barcelona		1999	Atlas clásico de anatomía humana
Neumann, D.	Fundamentos de rehabilitación física	Paidotribo	Madrid		2007	Libro que relaciona estructura anatómica y función de manera clara con excelentes ilustraciones
Sobotta, J; VV.AA	Anatomía humana. Tomos I y II	Médica Panamericana.	Madrid	84-7903191-3	1993	Atlas clásico de anatomía humana
Williams P, Warwick R.	Gray. Anatomía. Volúmenes I y II	Alhambra-Longman	Madrid	84-205-2298-8	1992	Libro clásico de anatomía descriptiva
Delavier F	Guía de los movimientos de musculación	Paidotribo	Badalona	84-8019-388-3	2006	Libro de tapa blanda con buenas ilustraciones de gestos empleados en musculación y sus

Aguado Jódar, Xavier	Biomecánica fuera y dentro del laboratorio	Universidad, Secretariado de Publicaciones	84-7719-626-5	1997	relaciones anatómicas Libro sobre prácticas de laboratorio con metodologías sencillas y sofisticadas.
Aguado Jódar, Xavier	Eficacia y técnica deportiva : análisis del movimiento humano	Inde	84-87330-20-7	1993	Libro básico sobre Biomecánica aplicada al deporte. Tiene un enfoque cualitativo, con numerosos ejemplos aplicados a la educación física y el deporte.
Alegre, Luis María	Causas de la traslación lineal de los cuerpos	Editorial Médica Panamericana	978-84-0935-023-4	2008	Capítulo con orientación docente sobre las leyes de Newton, explicadas de forma cualitativa
Bartlett, Roger	Sports biomechanics : reducing injury and improving performance	E & FN Spon Routledge	0-419-18440-6	1999	Libro de Biomecánica aplicada al deporte que incluye capítulos sobre las propiedades de los materiales y tejidos. Presenta un enfoque cuantitativo.
Blazevich, Anthony	Biomecánica deportiva :manual para la mejora del rendimiento	Paidotribo	978-84-9910-071-5	2011	
McGinnis, Peter Merton	Biomechanics of sport and exercise	Human Kinetics	0-87322-955-X	1999	Libro con muy buenos ejemplos aplicados al deporte. Explicaciones claras de conceptos básicos.
Viladot Voegeli, Antonio	Lecciones básicas de biomecánica del aparato locomotor / Ant	Springer Verlag Iberica	84-07-00198-8	2001	
Morin, Jean-Benoit; Samozino, Pierre	Biomechanics of Training and Testing: Innovative Concepts and Simple Field Methods	Springer	978-3319056326	2018	