



1. General information

Course: BIOPHYSICS AND BIOMECHANICS

Type: CORE COURSE

Degree: 399 - PODIATRY DEGREE

Center: 16 - FACULTY OF SCIENCES OF THE HEALTH OF TALAVERA

Year: 1

Main language: Spanish

Use of additional
languages:

Web site:

Code: 32508

ECTS credits: 6

Academic year: 2023-24

Group(s): 60 61

Duration: C2

Second language: English

English Friendly: Y

Bilingual: N

Lecturer: ALBERTO ALDANA CABALLERO - Group(s): 60 61

Building/Office	Department	Phone number	Email	Office hours
Facultad de Ciencias de la Salud Despacho 2.7	ENFERMERÍA, FISIOTERAPIA Y TERAPIA OCUP.	926051361	Alberto.Aldana@uclm.es	Mondays and Tuesdays from 13-16h. Please book an appointment through email beforehand.

2. Pre-Requisites

Not established

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

This course establishes a link between knowledge of human anatomy and physiology and the biophysical bases of the human body. The importance of this subject is also given because it aims to assess both the human gait and the static biped position of the person, which implies that they must know the characteristics of the mobility of the joints involved in such processes, such as the spinal column as a whole, the pelvis as a central element of body gravitation, and finally the involvement of the lower limb joints, which are responsible for the person's movement, such as the hip, knee and ankle, as well as the other joints that make up the foot. The importance of this set of knowledge is also related to the subsequent approach of biomechanical problems by students as future professionals of Podiatry.

4. Degree competences achieved in this course

Course competences

Code	Description
CB02	Apply their knowledge to their job or vocation in a professional manner and show that they have the competences to construct and justify arguments and solve problems within their subject area.
CB03	Be able to gather and process relevant information (usually within their subject area) to give opinions, including reflections on relevant social, scientific or ethical issues.
CE03	Know the subjects of biophysics, physiology and biochemistry related to the human body. Immediate principles. Biochemistry and biophysics of the membranes, muscles and nerves. Acquire knowledge of the functions and regulation of the different organs and systems of the human body
CE14	Know the fundamentals of biomechanics and kinesiology. Support theories. The human gait. Structural alterations of the foot. Postural alterations of the locomotor system with repercussion in the foot and vice versa. Instruments for biomechanical analysis.
CE15	Perform the podiatric clinical history and record the information obtained. Phylogeny of the locomotor system. The foot through history. Develop physical examination techniques. Normal clinical parameters in decubitus, static and dynamic standing. Clinical exploration techniques. Study of the techniques and how to conduct podiatric intervention in the health field.
CE22	To know and identify the foot and systemic pathological processes with podiatric repercussion, foot risk and the pathological clinical parameters of the structural and functional affections of the locomotor apparatus in decubitus, static and dynamic standing. Identify dermatological lesions and their treatment. Know and apply the specific pharmacology of podiatric use.
CE48	Develop the skill and dexterity in the use of the tools, material and devices used for the preparation and application of podiatric treatments.
GC02	Know the structure and function of the human body, especially the lower extremity, semiology, mechanisms, causes and general manifestations of the disease and diagnostic methods of medical and pathological processes, interrelating general pathology with foot pathology.
GC05	Collaborate with health professionals specifically trained in the subject, in the adaptation and use of prostheses and necessary technical aids, according to the physical, psychological and social conditions of the patients.

5. Objectives or Learning Outcomes

Course learning outcomes

Description

To analyse and describe the normal and pathological biomechanical functions of different structures of the human body and its most important activities, especially the lower limb standing and walking.

To search and interpret information collected from different sources (textbooks, scientific journals, webpages) related to different biomechanical issues.

To understand and reason different principles of clinical biomechanics, applying these concepts to organic tissues and different regions of the human body, especially to the ankle and foot.

Getting to know and reason different ideas on which biophysics principles are based on from a podiatric point of view, being able to apply those principles to the human body, podiatric practice and the range of devices that will be used throughout professional life.

To relate symptoms to biomechanical alterations.

6. Units / Contents

Unit 1: INTRODUCTION

Unit 1.1 Presentation of the teaching plan for the subject.

Unit 2: BIOPHYSICS APPLIED TO BIOMECHANICS AND FOUNDATIONS OF BIOMECHANICS

Unit 2.1 Basic concepts of trigonometry and goniometry.

Unit 2.2 Generalities in biophysics and biomechanics: basic concepts. Forces. Pulleys, levers, friction and resistance

Unit 2.3 Kinematic and kinetic parameters.

Unit 2.4 Tissue biomechanics.

Unit 3: BIOMECHANICS OF THE LOWER LIMB.

Unit 3.1 Biomechanics of the pelvic girdle.

Unit 3.2 Biomechanics of the hip.

Unit 3.3 Biomechanics of the knee joint.

Unit 3.4 Biomechanics of the ankle.

Unit 4: BIOMECHANICS OF THE FOOT.

Unit 4.1 Biomechanics of the subtalar joint.

Unit 4.2 Biomechanics of the mediotarsal joint.

Unit 4.3 Biomechanics of the Linfranc joint.

Unit 4.4 Biomechanics of the metatarsophalangeal and interphalangeal joints.

Unit 5: POSTURAL BIOMECHANICS AND HUMAN GAIT.

Unit 5.1 Biomechanics of posture and balance.

Unit 5.2 Biomechanics of human gait.

Unit 6: PARADIGMS OF BIOMECHANICS.

Unit 6.1 Root model.

Unit 6.2 Rotational equilibrium model of the subtalar joint. Dr. Kirby.

Unit 6.3 Pressure Center Model. Dr. Fuller.

Unit 6.4 Facilitation Model in the Sagittal Plan. Dr. Dananberg.

Unit 6.5 Tissue stress model. Dr. McPoil and Dr. Hunt.

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-SITE]	Lectures	CB02 CB03 CE03 CE14 CE15 CE22 CE48 GC02 GC05	1.6	40	Y	N	Assessable in final test.
Problem solving and/or case studies [ON-SITE]	Combination of methods	CB02 CB03 CE03 CE14 CE15 CE22 CE48 GC02 GC05	0.48	12	Y	Y	Clinical cases and/or practical workshops, seminars or works in groups. Can be re-evaluated.
Group tutoring sessions [ON-SITE]	Problem solving and exercises	CB02 CB03 CE03 CE14 CE15 CE22 CE48 GC02 GC05	0.2	5	Y	Y	Clinical cases and/ or practical. Can be re-evaluated.
Final test [ON-SITE]	Assessment tests	CB02 CB03 CE03 CE14 CE15 CE22 CE48 GC02 GC05	0.12	3	Y	Y	Multi answer test type. Correction formula: Final test score= (Right answers - (Errors/2)) x10. Can be re-evaluated.
Study and Exam Preparation [OFF-SITE]	Self-study	CB02 CB03 CE03 CE14 CE15 CE22 CE48 GC02 GC05	3.2	80	Y	N	Assessable in final test or progress tests/problem solving case studies.
Writing of reports or projects [OFF-SITE]	Combination of methods	CB02 CB03 CE03 CE14 CE15 CE22 CE48 GC02 GC05	0.4	10	Y	N	Audiovisual or written project, deadline: second to last week of the semester. Can be re-evaluated.
Total:			6	150			
Total credits of in-class work: 2.4			Total class time hours: 60				
Total credits of out of class work: 3.6			Total hours of out of class work: 90				

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
Practical exam	20.00%	20.00%	Clinical and / or practical cases, workshops and seminars, group work. Attendance is mandatory. Evaluation will be according to the student's performance or exercises for continuous assessment. Students will only be able to justify the absence to up to 30% of these activities.
Final test	70.00%	70.00%	Final test. Formula established for the score: Final grade = ((Correct answers) - (Errors / 2)) / (Total questions) x 10
Theoretical papers assessment	10.00%	10.00%	Reading of scientific articles and preparation of reviews. Group work and/or presentation.
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 current grading system will be applied at all times: currently, UCLM student assessment regulations approved on May 23, 2022. The global assessment will be based on the weighted average of the assessment systems (Final test and preparation of theoretical works). Students must achieve 40% of the final test grade.

Non-continuous evaluation:

The current grading system will be applied at all times: currently, UCLM student assessment regulations approved on May 23, 2022. The global assessment will be based on the weighted average of the assessment systems (Final test and preparation of theoretical works). The practical exam will be done in simulation rooms or laboratory. Students must achieve 40% in each system.

Specifications for the resit/retake exam:

The assessment of the elaboration of theoretical works that have been passed by the student up to a maximum of two academic years from the current year will be kept, provided that the training activities are not modified.

9. Assignments, course calendar and important dates	
Not related to the syllabus/contents	
Hours	hours
General comments about the planning: The temporal distribution of the different training activities during the course is adapted to the needs of the students and may vary depending on the degree of their performance and the criteria of the professors involved in teaching the subject. The official academic calendar will be followed at all times.	

10. Bibliography and Sources						
Author(s)	Title/Link	Publishing house	City	ISBN	Year	Description
PEDRO V. MUNUERA-MARTÍNEZ	EL PRIMER RADIO: BIOMECÁNICA Y ORTOPODOLOGÍA	EXA EDITORES	SANTANDER	978-84-612-8758-1	2009	El primer radio y primer dedo del pie constituyen el primer segmento metatarso-digital de vital importancia para la función normal del pie y la extremidad inferior. Su cinética y cinemática han sido estudiadas a lo largo de los años por multitud de autores, así como las patologías que alteran su función, algunas de las cuales pueden tener repercusiones a niveles más superiores del aparato locomotor. Aunque el tratamiento correcto de estas alteraciones implica en la mayoría de los casos una intervención quirúrgica, sobre todo a la hora de compensar dichas disfunciones, paliar sus síntomas y en determinados casos, restablecer la biomecánica normal del primer segmento metatarso-digital. Introducción.- Cómo lograr el éxito.- Conceptos básicos de Trigonometría.- Generalidades de Biomecánica.- Composición y resolución de fuerzas.- Estabilidad.- Equilibrio estático.- Cálculo del centro de gravedad.- Poleas.- Palancas.- Rozamiento.- Resistencia de materiales.- Apéndices: Funciones trigonométricas; Prefijos de las unidades fundamentales;
ANTONIO LÓPEZ ROMAN	BIOFÍSICA APLICADA A LA BIOMECÁNICA DEL CUERPO HUMANO (2ª ED.)	BELLISCO	MADRID	9788496486546	2007	

						magnitudes más empleadas; parámetros de segmentos corporales. En 1977 se publica la mejor obra de todos los tiempos sobre la biomecánica podológica, Función normal y anormal del pie. Considerada un clásico, supuso un cambio radical en el conocimiento que hasta ese momento se tenía del comportamiento del pie. Tanto es así que sus autores marcaron un camino en la exploración, el diagnóstico y el tratamiento de las alteraciones del pie y la extremidad inferior que acabó siendo el paradigma dominante respecto a la biomecánica funcional podiátrica durante más de treinta años. En la actualidad no hay ningún otro libro sobre el funcionamiento del pie que haya tenido una repercusión tan importante en la comunidad podológica internacional. No es de extrañar, a pesar de la fecha de publicación original, que este libro continúe siendo de lectura obligada para todas aquellas personas, estudiantes, profesionales y formadores, que estén interesadas en conocer aspectos de la biomecánica del pie. La estructura, la información que contiene, sus imágenes y su facilidad de lectura hacen que esta importante obra clásica sobre el pie y la extremidad inferior sea una referencia obligada en nuestras bibliotecas. El estudio de la marcha humana es un ámbito que ha generado un gran interés como medio para poder entender los mecanismos que nos permiten desplazarnos. Muchas disciplinas han realizado aportaciones sobre la fisiología del movimiento, produciendo obras que han ido evolucionando desde la descripción de la cinemática a partir de la observación hasta la utilización de sofisticados sistemas de análisis que permiten añadir la descripción y el análisis cinético, con instrumentos que
MERTON L. ROOT, WILLIAM P. ORIEN, JOHN H. WEED	FUNCIÓN NORMAL Y ANORMAL DEL PIE	BASE	BARCELONA	9788493916169	2012	
JACQUELIN PERRY, JUDITH M. BURNFIELD	ANÁLISIS DE LA MARCHA	BASE	ESPAÑA	9788415706489	2015	

						intentan acercarnos a la comprensión de todos los factores que hacen que podamos movernos. La obra de la Dra. Perry y la Dra. Burnfield, por primera vez en castellano, es de lectura obligada para quien esté interesado en conocer todo lo relacionado con la marcha humana. A medida que pasan los años el conocimiento de la biomecánica va adquiriendo cada vez más una mayor relevancia para todos aquellos profesionales que tratan, de una forma u otra, el aparato locomotor. Hay que destacar principalmente entre éstos a médicos, ingenieros, licenciados en educación física, fisioterapeutas, podólogos y técnicos ortopédicos. El hecho de proceder todos ellos de formaciones básicas a veces muy diferentes, constituye una dificultad para encontrar un lenguaje común inteligible para todos. Por ello, hemos querido dar al libro el formato de 'lecciones básicas' para facilitar el entendimiento de la materia evitando el uso de cálculos matemáticos, difíciles de entender para los profesionales de la salud, e introduciendo unos 'Recuerdos Anatómicos' para los lectores no sanitarios. Al final de cada capítulo existe una bibliografía recomendada para quienes deseen profundizar en cada uno de los temas. Este libro tiene sus orígenes en los 'Cursos de Biomecánica del Aparato Locomotor' que desde hace años se vienen impartiendo en el Hospital San Rafael bajo la dirección del Prof. A. Viladot Pericé y que forman parte de las asignaturas de doctorado de la Universidad Autónoma de Barcelona. Asimismo en el Departamento de Ciencias Morfológicas de la Facultad de Medicina de la Universidad de Barcelona, bajo la dirección del Prof. Domingo Ruano Gil, la asignatura se imparte tanto como optativa de pregrado en Medicina y Podología, como curso de posgrado de Medicina. Colaborando
VILADOT VOGELI	LECCIONES BASICAS DE BIOMECANICA DEL APARATO LOCOMOTOR (2ª)	MASSON	MADRID	9788445814710	2004	

						como profesor en ambos centros, hemos visto la necesidad de facilitar a los alumnos un texto guía. La escasez de libros en lengua castellana sobre esta materia, ha sido uno de los móviles que nos impulsaron para su publicación.
ROOT M; ORIEN W	NORMAL AND ABNORMAL FUNCTION OF THE FOOT, CLINICAL BIOMECHANICS.VOL II.	CLINICAL BIOMECHANICS CORPORATION	LOS ANGELES		1991	
						The fourth Precision Intricast Newsletter Book consists of ten chapters with the newsletters within each chapter being arranged in chronological order. As in the other three books, a chronological list of newsletters has also been included to show how newsletter topics have progressed over the past five years. At the end of the book is a comprehensive index that should allow the reader to more readily research subjects that are of specific interest. Over the past five years of writing these newsletters, I have focused on a wide range of subjects. The chapter on prescribing better foot orthoses for foot and lower extremity pathologies includes thirteen newsletters which describe the most common foot and lower extremity pathologies that I see in my practice and which discuss the biomechanics and specific orthosis modifications I use for patients with these pathologies. Also included within the book are discussions on the biomechanics of the midtarsal joint, medial and lateral longitudinal arches, first ray and first metatarsophalangeal joint. The biomechanics and function of foot orthoses are also included along with a chapter specific to the function, modification and troubleshooting of the medial longitudinal arch of foot orthoses. In addition, chapters have been included on fundamental biomechanics concepts, the biomechanics of barefoot versus shod running and how shoe construction may affect the biomechanics of
KIRBY, K.	Foot and Lower Extremity Biomechanics, Vol. IV: Precision Intricast Newsletters, 2009-2013	INTRICAST	ARIZONA	9780965730921	2014	

