



Information about the subject

Degree: Bachelor of Science Degree in Podiatry

Faculty: Faculty of Medicine and Health Sciences

Code: 472002 **Name:** Ergonomics and footwear

Credits: 3,00 **ECTS Year:** 4 **Semester:** 1

Module: GENERAL PODOLOGY AND BIOMECHANICS

Subject Matter: Biomechanics **Type:** Elective

Field of knowledge: Health Sciences

Department: Pathology

Type of learning: Classroom-based learning

Languages in which it is taught: Spanish

Lecturer/-s:

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Module organization

GENERAL PODOLOGY AND BIOMECHANICS

Subject Matter	ECTS	Subject	ECTS	Year/semester
General Podiatry	21,00	Evolutionary Podiatry	3,00	This elective is not offered in the academic year 24/25
		Expertise in podiatry	3,00	This elective is not offered in the academic year 24/25
		General Podiatry	6,00	1/2
		Preventive Podiatry	3,00	4/1
		Social Morality. Deontology	6,00	3/1
Biomechanics	27,00	Biomechanics	6,00	2/2
		Ergonomics and footwear	3,00	4/1
		General Intervention Procedures	6,00	This elective is not offered in the academic year 24/25
		Physiotherapy Assessment	6,00	This elective is not offered in the academic year 24/25
		Sports Podiatry	6,00	3/2
Radiology	6,00	Radiology and Radiation Protection	6,00	3/1



Research and management	12,00	Introduction to research and sanitary documentation	6,00	4/1
		Planning and management of the podiatric clinic	6,00	4/2

Learning outcomes

At the end of the course, the student must be able to prove that he/she has acquired the following learning outcomes:

- R1 The student is acquainted with ergonomics and its application in the prevention of physical and psychological problems and diseases caused by daily practice in the podiatry clinic.
- R2 Identifies the different footwear manufacturing techniques.
- R3 Knows the different types of footwear in relation to their activity and age.



Competencies

Depending on the learning outcomes, the competencies to which the subject contributes are (please score from 1 to 4, being 4 the highest score):

BASIC		Weighting			
		1	2	3	4
CB1	Students demonstrate knowledge and understanding in an area of study that is at the core of general secondary education, and is often at a level that, while supported by advanced textbooks, also includes some aspects that involve knowledge from the cutting edge of their field of study.		X		
CB3	Students have the ability to gather and interpret relevant data (usually within their area of study) to make judgments that include reflection on relevant social, scientific or ethical issues.				X

GENERAL		Weighting			
		1	2	3	4
CG3	Students develop the capacity, ability and skill necessary to diagnose, prescribe, indicate, perform and/or elaborate and evaluate any type of podiatric, orthopedic, chiropractic, podiatric surgery, physical, pharmacological, preventive and/or educational treatment, based on the clinical history.			X	
CG8	Acquire work skills in the educational and research environments, health care, as well as in uniprofessional and multiprofessional teams. Advise on the development and implementation of care and education policies on issues related to prevention and podiatry care		X		
CG10	Identify that the practice of the profession is based on respect for patient autonomy, beliefs, culture, genetic, demographic and socio-economic determinants, applying the principles of social justice and understanding the ethical implications in a changing global context.	X			



SPECIFIC	Weighting			
	1	2	3	4
CE39 Students know the basics of podiatry. Ergonomics. History of the profession and conceptual framework. Concept of the profession. Technical nomenclature used in health sciences. Students acquire skills in the clinical management of podiatry services.	X			
CE48 Students design, obtain and apply by means of different techniques and materials the plantar supports and digital orthoses, prostheses, splints. Plantar and digital orthoses. Study of footwear and shoe therapy. Prescription of orthopaedic treatments of the lower limb				X

TRANSVERSAL	Weighting			
	1	2	3	4
CT3 Oral and written communication in native language			X	
CT7 Problem solving			X	
CT8 Decision making			X	
CT10 Interdisciplinary teamwork	X			
CT14 Critical Reasoning			X	
CT15 Ethical commitment		X		
CT16 Autonomous learning		X		
CT17 Adaptation to new situations			X	
CT18 Creativity		X		
CT22 Motivation for quality			X	



Assessment system for the acquisition of competencies and grading system

Assessed learning outcomes	Granted percentage	Assessment method
R1, R2, R3	65,00%	Tests
R3	20,00%	Practice (exercises, case studies, problems)
R1, R2, R3	15,00%	Class participation

Observations

Minimum criteria to pass the Ergonomics and footwear subject:

- Have exceeded 50% of each assessment instrument, to average.

Evaluation criteria:

To pass the subject it will be mandatory:

- Perform all evaluable activities on the platform.
- The pass is considered a minimum grade of 5 out of 10.
- Have passed the final.

Theoretical evaluation (65%)

It will be carried out at the end of the course, through a final exam consisting of 50 objective multiple-answer questions (type test).

The wrong answers penalize according to the formula: $\text{Successes} - (\text{Errors} / \text{Answer No.} - 1) = X / (\text{No. of questions} / 10)$

The duration of the exam will be 60 minutes.

It is essential to have passed the exam in order to average with all the evaluation instruments.

The minimum grade to pass the written test will be 5 out of 10. If the written test is not passed, the note about 10 will appear on the intranet.



Individual work in teleformation platform and Laboratory practices (20%)

- Throughout the course, activities aimed at the student's autonomous work will be carried out through the teleformation platform that will be practical and different in each subject.
- The presentation of all the works may account for 15% of the final grade.

Participation (15%)

- Attendance and completion of the activities and practical workshops carried out throughout the course will be mandatory.
- The participation in class and practices, as well as the collaborative attitude, will be positively valued.

Maintaining the respective percentages, the evaluation systems set out above may be developed in a continuous evaluation mode throughout the semester, informing the students in advance and collecting this information on the subject's UCVnet platform.

The grade of the exceeded parts will be saved for the second call of the same registration, whatever the grade obtained in the first call. In successive enrollments no partial notes of any evaluation element are kept.

MENTION OF DISTINCTION:

In accordance with the regulations governing the assessment and grading of subjects in force at UCV, the distinction of "Matrícula de Honor" (Honours with Distinction) may be awarded to students who have achieved a grade of 9.0 or higher. The number of "Matrículas de Honor" (Honours with Distinction) may not exceed five percent of the students enrolled in the group for the corresponding academic year, unless the number of enrolled students is fewer than 20, in which case a single "Matrícula de Honor" (Honours with Distinction) may be awarded. Exceptionally, these distinctions may be assigned globally across different groups of the same subject. Nevertheless, the total number of distinctions awarded will be the same as if they were assigned by group, but they may be distributed among all students based on a common criterion, regardless of the group to which they belong. The criteria for awarding "Matrícula de Honor" (Honours with Distinction) will be determined according to the guidelines stipulated by the professor responsible for the course, as detailed in the "Observations" section of the evaluation system in the course guide.

Learning activities

The following methodologies will be used so that the students can achieve the learning outcomes of the subject:



- M1 Theoretical classes (TC). Training activity preferably oriented to the acquisition of knowledge skills. It is characterised by the fact that students are spoken to. Also called master class or expository class, it refers to the oral exposition made by the teacher, (with the support of a blackboard, computer and cannon for the exposition of texts, graphics, etc.).
- M2 Seminars (S). Training activity preferably oriented to obtain knowledge application and research competences. Knowledge is built through interaction and activity. Consisting of supervised monographic sessions with shared participation (Teachers, students, experts). The size of the group is variable, from a large group to small groups, no less than 6 students for interaction. The evaluation will be made by means of follow-up records by the teacher. Participation and development of problem-solving skills should be taken into account.
- M3 Problems practice (CPP). Training activity oriented to group work for problem solving under the supervision of a teacher. The size of the group is variable, in a range of 10-20 students, to avoid confusion with a master class.
- M4 Classroom practice (CPA). Training activity of work in groups that is developed in the classroom. It includes work with documents (e.g.: work with articles or documents, clinical case studies, diagnostic analyses, etc). The size of the group is variable, in a range of 10-20 students.
- M5 Computer Practice (CPI). Training activity of work in groups that is developed in the Computer Classroom where the learning is developed using the computer as a support. It includes the work with computer models, specific software, web queries, etc. The size of the group is variable, in a range of 10-20 students.
- M6 Laboratory Practice (CPL). Training activity of work in groups that is developed in the Laboratory. It includes the sessions where students actively and autonomously develop, supervised by the teacher, laboratory experiments. The size of the group is variable, in a range of 10-20 students.
- M7 Tutorials (T). Set of activities carried out by the teacher with personalised attention to the student or in small groups with the aim of reviewing and discussing the materials and topics presented in the classes, seminars, readings, completion of assignments, etc. The aim is to ensure that education is truly a comprehensive training of the student and is not reduced to a transfer of information. It is, therefore, a personalized relationship of help in which the teacher-tutor attends, facilitates and guides one or more students in the formative process.



- M8 Evaluation (Ev). It is the set of processes that try to evaluate the learning results obtained by the students and expressed in terms of acquired knowledge, capacities, developed skills or abilities and manifested attitudes. It covers a wide range of activities that can be developed for students to demonstrate their training (e.g. written, oral and practical tests, projects or assignments,). It also includes Official Calls.
- M10 Estudio del alumno: Preparación individual de lecturas, ensayos, resolución de problemas, seminarios

IN-CLASS LEARNING ACTIVITIES

	LEARNING OUTCOMES	HOURS	ECTS
Theoretical lessons M1	R1, R2, R3	27,50	1,10
Practice lessons M4	R2	1,00	0,04
Evaluation M8	R1, R2, R3	1,50	0,06
TOTAL		30,00	1,20

LEARNING ACTIVITIES OF AUTONOMOUS WORK

	LEARNING OUTCOMES	HOURS	ECTS
Autonomous work M10	R1, R2, R3	25,00	1,00
Group work M10	R1, R2, R3	20,00	0,80
TOTAL		45,00	1,80



Description of the contents

Description of the necessary contents to acquire the learning outcomes.

Theoretical contents:

Content block	Contents
DIDACTIC UNIT I: Descriptive footwear	<ol style="list-style-type: none">1.Introductory Session2.Footwear history3.The social role of footwear4.The last. Footwear components and construction methods
DIDACTIC UNIT II: Therapeutic footwear	<ol style="list-style-type: none">1.Footwear and comfort2.Standard footwear and adapted footwear3.Custom footwear. Take action4.Treatment of patients with complex pathologies
DIDACTIC UNIT III: Analysis of different types of shoes	<ol style="list-style-type: none">1.Work footwear2.Unstable footwear3.Children's footwear4.Heeled footwear5.Sport-specific sports shoes: Running, Football, Golf, Cycling, Basketball, Dance6.Critical study of running shoes
DIDACTIC UNIT IV: Overview of ergonomics and application podiatric	<ol style="list-style-type: none">1.Ergonomics in Podiatry



Temporary organization of learning:

Block of content	Number of sessions	Hours
DIDACTIC UNIT I: Descriptive footwear	2,00	4,00
DIDACTIC UNIT II: Therapeutic footwear	4,00	8,00
DIDACTIC UNIT III: Analysis of different types of shoes	8,00	16,00
DIDACTIC UNIT IV: Overview of ergonomics and application podiatric	1,00	2,00



References

1. Bai DY, Yuan ZG, Shao JJ, Zhu T, Zhang HJ. Unstable shoes for the treatment of lower back pain: a meta-analysis of randomized controlled trials. *Clin Rehabil.* 2019 Nov;33(11):1713-1721.
2. Beschoner KE, Siegel JL, Hemler SL, Sundaram VH, Chanda A, Iraqi A, Haight JM, Redfern MS. An observational ergonomic tool for assessing the worn condition of slip-resistant shoes. *Appl Ergon.* 2020 Oct;88:103140.
3. Boër CR, Dulio S. *Mass Customization and Footwear: Myth, Salvation or Reality?* Springer; 2007.
4. Ceballos Atienza R. *Prevención de riesgos laborales para personal de oficios varios.* Alcala Grupo Editorial; 2010.
5. Cigoja S, Firminger CR, Asmussen MJ, Fletcher JR, Edwards WB, Nigg BM. Does increased midsole bending stiffness of sport shoes redistribute lower limb joint work during running? *J Sci Med Sport.* 2019 Nov;22(11):1272-1277.
6. Daniellou F, Duraffourg J, Guérin F, Kerguelen A, Laville A. *Comprender el trabajo para transformarlo. La práctica de la ergonomía. Modus laborandi;* 2009.
7. Dobson JA, Riddiford-Harland DL, Bell AF, Steele JR. Effect of work boot type on work footwear habits, lower limb pain and perceptions of work boot fit and comfort in underground coal miners. *Appl Ergon.* 2017 Apr;60:146-153.
8. Dobson JA, Riddiford-Harland DL, Bell AF, Steele JR. Work boot design affects the way workers walk: A systematic review of the literature. *Appl Ergon.* 2017 May;61:53-68.
9. Evans AM. *Paediatrics (pocket podiatry).* Mathieson I, editor. Churchill Livingstone; 2010
10. Farzadi M, Nemati Z, Jalali M, Doulagh RS, Kamali M. Effects of unstable footwear on gait characteristic: A systematic review. *Foot (Edinb).* 2017 Jun;31:72-76.
11. Goonetilleke RS. *The Science of Footwear.* New York: Taylor & Francis Group; 2013.
12. Hoitz F, Vienneau J, Nigg BM. Influence of running shoes on muscle activity. *PLoS One.* 2020 Oct 7;15(10):e0239852.
13. Hunter S, Dolan G, Davis JM. *Foot orthotics in therapy and sport.* Champaign: Human Kinetics cop.; 1995.
14. Jouvencel MR. *Ergonomía básica aplicada a la medicina del trabajo.* España: Díaz de Santos; 1994.
15. Kirby KA. *Biomecánica del pie y la Extremidad Inferior II: Artículos de Precision Intricast,* 1997-2002. Payson: Precision Intricast; 2002.
16. Kirby KA. *Biomecánica del pie y la Extremidad Inferior III: Artículos de Precision Intricast,* 2002-2008. Payson: Precision Intricast; 2009.
17. Kirby KA. *Biomecánica del pie y la Extremidad Inferior: Colección de una década de artículos de Precision Intricast.* Payson: Precision Intricast; 1997.
18. Kirby KA. *Foot and lower extremity biomechanics IV: Precision Intricast Newsletters,* 2009-2013. Payson: Precision intricast; 2014.
19. Kirby KA. *Foot and lower extremity biomechanics V: Precision Intricast Newsletters,* 2014-2018. Payson: Precision intricast; 2019.



20. Kirby KA. Foot and lower extremity biomechanics V: Precision Intricast Newsletters, 2014-2018. Payson: Precision intricast; 2019.
21. Langley B, Cramp M, Morrison SC. The Influence of Motion Control, Neutral, and Cushioned Running Shoes on Lower Limb Kinematics. *J Appl Biomech.* 2019 Jun 1;35(3):216-222.
22. Larson P, Katovsky B. Tread lightly: Form, footwear, and the quest for injury-free running. New York: Skyhorse Publishing; 2012.
23. Levy AE, Cortés JM. Ortopodología y aparato locomotor. Ortopedia de pie y tobillo. Barcelona: Masson; 2003.
24. Llana FJ. Ergonomía y Psicología aplicada. Manual para la formación del especialista. 15ª ed. Valladolid: Lex Nova; 2010.
25. Luximon A. Handbook of footwear design and manufacture. Philadelphia: Woodhead Publishing Limited; 2013.
26. Mei Q, Gu Y, Fernandez J. A biomechanical assessment of running with hallux unstable shoes of different material stiffness. *Acta Bioeng Biomech.* 2019;21(1):121-128.
27. Mikkelsen P, Jarvis DN, Kulig K. Heeled Shoes Increase Knee Work Demand During Repeated Hopping in Dancers. *Med Probl Perform Art.* 2018 Dec;33(4):243-250.
28. Nigg BM. Biomechanics of Sport Shoes. University of Calgary; 2010.
29. Okholm Kryger K, Jarratt V, Mitchell S, Forrester S. Can subjective comfort be used as a measure of plantar pressure in football boots? *J Sports Sci.* 2017 May;35(10):953-959.
30. Okholm Kryger K, Mutamba K, Mitchell S, Miller SC, Forrester S. Physical performance and perception of foot discomfort during a soccer-specific match simulation. A comparison of football boots. *J Sports Sci.* 2021 May;39(9):1046-1054.
31. Olaso Melis JC, Priego Quesada JI, Lucas-Cuevas AG, González García JC, Puigcerver Palau S. Soccer players' fitting perception of different upper boot materials. *Appl Ergon.* 2016 Jul;55:27-32.
32. Puszczalowska-Lizis E, Dabrowiecki D, Jandzis S, Zak M. Foot Deformities in Women Are Associated with Wearing High-Heeled Shoes. *Med Sci Monit.* 2019 Oct 16;25:7746-7754.
33. Sanno M, Epro G, Brüggemann GP, Willwacher S. Running into Fatigue: The Effects of Footwear on Kinematics, Kinetics, and Energetics. *Med Sci Sports Exerc.* 2021 Jun 1;53(6):1217-1227.
34. Tan JM, Auhl M, Menz HB, Levinger P, Munteanu SE. The effect of Masai Barefoot Technology (MBT) footwear on lower limb biomechanics: A systematic review. *Gait Posture.* 2016 Jan;43:76-86.
35. Wang IL, Graham RB, Bourdon EJP, Chen YM, Gu CY, Wang LI. Biomechanical Analysis of Running Foot Strike in Shoes of Different Mass. *J Sports Sci Med.* 2020 Feb 24;19(1):130-137.
36. Webster J; Murphy D. Atlas of Orthoses and Assistive Devices. 5ª ed. Philadelphia: Elsevier; 2019.
37. Werd MB, Knight EL, editores. Athletic Footwear and Orthoses in Sports Medicine. 2ª edicion. USA: Springer Science; 2017.
38. Williams AE, Nester CF. Footwear and Foot Orthoses. Churchill Livingstone/Elsevier; 2010.
39. Yang Y, Zhang X, Luo Z, Wang X, Ye D, Fu W. Alterations in Running Biomechanics after 12 Week Gait Retraining with Minimalist Shoes. *Int J Environ Res Public Health.* 2020 Jan 28;17(3):818.