

1. OVERVIEW

Subject area	Exercise and Sport Biomechanics
Degree	Bachelor's Degree in Exercise and Sport Sciences
School/Faculty	Exercise and Sport Sciences and Physiotherapy
Year	2º
ECTS	6
Type	Compulsory
Language/s	Spanish / English
Delivery mode	On campus
Semester	S3 and S4
Academic year	2023 / 2024
Coordinating professor	Ignacio López Moranchel
Teacher	Jesus Aceituno Duque

2. INTRODUCTION

Biomechanics is a discipline that studies the structure of the musculoskeletal system and its movements, considering the connection between the properties and mechanical implications of movement and the biological conditions of the organism. Specifically, Sport Biomechanics focuses on studying human movement from the perspective of physical activity, analysing the structure of basic movements and sports techniques.

On 08 March 2016, Spain's General Council of Professional Colleges of Physical and Sport Education (CONSEJO COLEF) announced the following in relation to biomechanical studies and the professions that can conduct them: Spain's Ministry of Health, Social Services and Equality (MSSI) reports that it is feasible for Exercise and Sport Science graduates to perform "for purposes other than medical diagnosis, in the field of sports performance, physical education and research, sports biomechanics studies that include gait analysis in health people, providing that the purpose of such work is not to diagnose, treat or monitor patients, regardless of whether they are athletes or not". The same CONSEJO COLEF announcement also states that: "biomechanical assessment in all professional fields (sport, education, health, research, etc.) is a professional skill and an important part of the work performed regularly by professionals with a university degree in exercise and sport sciences".

The final conclusions of the announcement highlight the most important message: "the improvement of sports performance and prevention of injuries in professional athletes or amateurs should always involve a multi-disciplinary team. As such, any sport or health professional (doctors, physiotherapists, podiatrists,

coaches, trainers, etc.) may ask professionals with a university degree in exercise and sport science to perform a biomechanical assessment on one of their patients or athletes".

This subject area explores the fundamentals of biomechanics to analyse human movement in any type of sport, focusing on the specific actions of throwing and hitting and the core actions of walking, running and jumping.

The ECTS for this subject area include lectures, case studies, problem-based learning, guided projects, tutorials, independent working and collaborative learning.

3. SKILLS AND LEARNING OUTCOMES

Basic skills (CB, by the acronym in Spanish):

- CB1: Students have demonstrated knowledge and understanding of a study area originating from general secondary school education, and are usually at the level where, with the support of more advanced textbooks, they may also demonstrate awareness of the latest developments in their field of study.
- CB3: Students have the ability to gather and interpret relevant data (usually within their study area) to form opinions which include reflecting on relevant social, scientific or ethical matters.
- CB5: Students have developed the necessary learning skills to undertake further study with a high degree of autonomy.

Cross-curricular skills (CT, by the acronym in Spanish):

- CT11: Planning and time management: Ability to set objectives and choose the right means to fulfil them through efficient use of time and resources.
- CT13: Problem solving: Ability to resolve an unclear or complex issue or situation which has no established solution and requires skill to reach a conclusion.
- CT18: Use of information and communication technology (ICT): Ability to effectively use information and communication technology as a tool for finding, processing and storing information, and for developing communication skills.

Specific skills (CE, by the acronym in Spanish):

- CE03: Ability to plan, programme, apply, control and assess the process of training and competition at different levels and in different age groups.
- CE04: Ability to analyse and apply physiological, biomechanical, psychological and social principles in different areas of physical activity, sport and recreation.
- CE05: Ability to identify inappropriate practices that pose a risk to health in order to prevent and correct them in different groups of people.
- CE06: Ability to assess levels of physical fitness and motor skills, prescribing and planning health-orientated physical exercises in different age groups.
- CE09: Ability to select and know how to use the right material and sports equipment for each type of activity, identifying the technical characteristics of different sports spaces.

Learning outcomes (RA, by the acronym in Spanish):

- RA1: To understand fundamental concepts related to the application of biomechanical principles in different fields of sport and exercise.
- RA2: To act professionally when using equipment and following safety protocols for laboratory work.
- RA3: To conduct tests to study human movement, applying the relevant biomechanical principles and understanding the methods and techniques that contribute to measuring different characteristics related to efficiency.
- RA4: To conduct in-depth projects related to the analysis of movement in sport.

The following table shows how the skills developed in the subject area match up with the intended learning outcomes:

Skills	Learning outcomes
CB1, CB3, CT11, CT13, CE4	RA1: To understand fundamental concepts related to the application of biomechanical principles in different fields of sport and exercise.
CB3, CT13, CT18, CE4, CE5, CE9	RA2: To act professionally when using equipment and following safety protocols for laboratory work.
CB1, CB3, CB5, CT11, CT13, CT18, CE3, CE4, CE6, CE9	RA3: To conduct tests to study human movement, applying the relevant biomechanical principles and understanding the methods and techniques that contribute to measuring different characteristics related to efficiency.
CB3, CB5, CT11, CT13, CT18, CE4, CE6, CE9	RA4: To conduct in-depth projects related to the analysis of movement in sport.

4. CONTENTS

1. Principles and laws of physics to understand how to correctly perform exercises and sports techniques.
2. Description and analysis of exercises and sports techniques using biomechanical criteria.
3. Measuring human movement using instrumental techniques and methods.

The subject is organised into 3 learning units and 11 topics:

Learning unit 1: The fundamentals of biomechanics.

Topic 1. Introduction to biomechanics and its units of measurement.

Topic 2. Kinematics.

Topic 3. Kinetics. Dynamic and static (balanced systems).

Topic 4. Mechanical work and energy.

Topic 5. Forces exerted by fluids

Learning unit 2: Application of biomechanics to biological tissue

Topic 6. Fundamental biomechanics of bone structure. Elasticity, resistance and mechanical stress.

Topic 7. Fundamental biomechanics of the muscle and connective tissue system. Lengthening/shortening cycle. Types of contraction. Analysis of how force is recorded (force-time and force-velocity curves).

Learning unit 3: Biomechanical analysis of sport movement

Topic 9. Biomechanics of jumping and catching

Topic 10. Sports surfaces and footwear

Topic 11. Biomechanics of walking and running.

5. TEACHING/LEARNING METHODS

The types of teaching-learning methods are as follows:

- Lectures.
- Problem-based learning (ABP by its acronym in Spanish).
- Simulation environments.

6. LEARNING ACTIVITIES

The types of learning activities, plus the amount of time spent on each activity, are as follows:

On campus:

Learning activity	Number of hours
Lectures	28
Asynchronous lectures	12
Case studies	30
Problem-solving	22
Searching resources and choosing information sources	10

Formative assessment (feedback on assessment)	30
Case studies/workshop activities	10
Tutorials	8
TOTAL	150

7. ASSESSMENT

The assessment methods, plus their weighting in the final grade for the course, are as follows:

On campus:

Assessment system	Weighting
On-campus knowledge tests	60%
Learning portfolio (learning activities)	10%
Oral presentations	20%
Participation in debates and forums	10%

On the Virtual Campus, when you open the subject area, you'll find details of your assessment activities, including the submission dates and assessment procedures for each activity.

7.1. Ordinary exam period

To pass the subject area in the ordinary exam period, students must achieve a final grade of a minimum of 5/10. This grade is based on the weighted average of all assessable tasks (objective tests, learning activities and practical exercises).

A minimum of 5/10 is required in the objective knowledge test(s) to pass the subject area. A minimum grade of 4 (PASS) is required in each of the activities in order to calculate the final weighted average grade.

Work that is submitted after the corresponding deadline and work that is incomplete will be graded 0 (FAIL).

Attendance of laboratory sessions is strictly compulsory.

7.2. Extraordinary exam period

To be assessed in the extraordinary exam period, students must submit all activities that were not passed or not submitted in the ordinary exam period, after receiving the corresponding corrections from the teacher. The maximum grade awarded for these activities in the extraordinary exam period is 5.

To pass the subject area in the extraordinary exam period, students will need a final grade of at least 5 out of 10 for the subject area.

8. TIMELINE

This section presents the timeline and submission dates for the assessable tasks in this subject area.

Assessable tasks	Date
Activity 1. Application of kinetic and kinematic parameters in sport movements or activities	Weeks 3-5
Activity 2. Finding reliable scientific sources and search processes in the field of biomechanics	Weeks 6-7
Activity 3. Test 1	Weeks 6-7
Activity 4. Kinetic analysis of movement in sport using Kinovea	Weeks 8-10
Activity 5. Laboratory work. Analysing and recording measurements of force	Weeks 11-12
Activity 6. Test 2	Week 12

The timeline may be subject to modifications for logistical reasons. Students will be informed of any changes in due time and course.

9. BIBLIOGRAPHY

The recommended bibliography is indicated below:

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10. EDUCATIONAL GUIDANCE AND DIVERSITY UNIT

From the Educational Guidance and Diversity Unit we offer support to our students throughout their university life to help them reach their academic achievements. Other main actions are the students inclusions with specific educational needs, universal accessibility on the different campuses of the university and equal opportunities.

From this unit we offer to our students:

1. Accompaniment and follow-up by means of counselling and personalized plans for students who need to improve their academic performance.
2. In terms of attention to diversity, non-significant curricular adjustments are made in terms of methodology and assessment for those students with specific educational needs, pursuing an equal opportunities for all students.
3. We offer students different extracurricular resources to develop different competences that will encourage their personal and professional development.
4. Vocational guidance through the provision of tools and counselling to students with vocational doubts or who believe they have made a mistake in their choice of degree.

Students in need of educational support can write to us at:
orientacioneducativa@universidadeuropea.es

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Many thanks for taking part.