



COURSE DATA

Data Subject

Code	33217
Name	Biomechanics of physical activity
Cycle	Grade
ECTS Credits	6.0
Academic year	2023 - 2024

Study (s)

Degree	Center	Acad. year	Period
1312 - Degree in Physical Activity and Sport Sciences	Faculty of Physical Education and Sport Sciences	3	Other cases
1331 - Degree in Physical Activity and Sport Sciences (Ont)	Faculty of Physical Education and Sport Sciences	3	Other cases

Subject-matter

Degree	Subject-matter	Character
1312 - Degree in Physical Activity and Sport Sciences	13 - Biomechanics of physical activity	Obligatory
1331 - Degree in Physical Activity and Sport Sciences (Ont)	13 - Biomecánica de la Actividad Física	Obligatory

Coordination

Name	Department
BRIZUELA COSTA, GABRIEL ALBERTO	122 - Physical and Sports Education
PEREZ SORIANO, PEDRO	122 - Physical and Sports Education

SUMMARY

Biomechanics of physical activity is a matter of basic and mandatory training, which consists of 6 ECTS credits spread over a semester. Biomechanics of Physical Activity (and / or Sports Biomechanics), could be defined as an eminently interdisciplinary branch of applied biomechanics, with foundation or starting point in the Science of Physical Activity and Sport, whose object of study through different tools and instrumental techniques, focuses on humans for physical practice / sports (especially the kinetics and kinematics of movement), and the result of their interaction with others, fluids, surface and /or inanimate objects .



Through theoretical matter, be submitted to the biomechanics, its method, its application areas and their different perspectives, will explore the mechanical basis governing the movement, describing the instrumental techniques employed, different movements will be analyzed human as well as the main biomechanical design criteria and selection of material and sports equipment. To complement this theoretical content, practical content developed through workshops and seminars will enable students / as familiar with the method of Biomechanics, taking direct contact measurement instrumentation, and propose solutions to various problems proposed.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

Other requirements

COMPETENCES (RD 1393/2007) // LEARNING OUTCOMES (RD 822/2021)

1312 - Degree in Physical Activity and Sport Sciences

- Apply the principles of fundamental rights, gender equality, equal opportunities, universal accessibility for people with disabilities, solidarity, environmental protection, the culture of peace and democratic values.
- Design, implement and evaluate the teaching-learning processes related to physical activity and sport, paying attention to the individual, collective and contextual characteristics of people.
- Promote and evaluate the acquisition of enduring and autonomous habits of practising physical activity and sport.
- Plan, implement and evaluate physical activity and sports programmes targeted at special populations.
- Select and know how to use sports material and equipment, suitable for each type of activity and population.
- Apply information and communication technologies (ICTs) in the field of physical activity and sport sciences.
- Develop habits of professional excellence and quality.
- Gain basic scientific training applied to physical activity and sport in their mechanical forms.
- Know and understand the biomechanical factors that determine the practice of physical activity.
- Know and understand the effects of the practice of physical exercise on the structure and mechanical function of the human body.



- Apply biomechanical principles to the different fields of physical activity.
- Identify mechanical risks derived from inappropriate physical and sporting activities and propose alternatives.
- Select and know how to use sports material and equipment in the most appropriate way for different types of activities and populations under biomechanical criteria.

LEARNING OUTCOMES (RD 1393/2007) // NO CONTENT (RD 822/2021)

The **general objectives** of the student expected to matter Biomechanics of Physical Activity scope, are closely linked with the competencies listed above. In brief, one could say that the fundamental objective of the course is that "*the student knows and is able to analyze the physical and sporting activity, from a biomechanical perspective, applying its methodology.*" In this sense, the general objectives proposed will enable the student:

1. *Understanding the origins, perspectives and current status of sports biomechanics, and their main sources of scientific information.*
2. *Apply basic biomechanical principles of the causes of motion and equilibrium states for improving efficiency and reducing injuries in practice physical / sports.*
3. *Describe the physical techniques / sports from the standpoint of mechanics to improve the teaching-learning process.*
4. *Know and correctly select the tools, techniques and methodology suited to the study and analysis of different techniques and physical activities / sports.*
5. *Identify and distinguish the characteristics, properties and functions most important materials and equipment for physical practice / sports.*

Skills or abilities that the student of the subject Biomechanics of Physical Activity must meet, will be able to:

1. *Understanding Physical Activity and Sport from a biomechanical perspective, and apply subject knowledge to specific problems that occur during exercise training.*
2. *Relate the principles and laws of mechanics with the content of other subjects of the degree, especially with the structure and function of the human body.*
3. *Using concepts and mechanical parameters for describing and analyzing human body movement.*
4. *Select and recommend, from a biomechanical perspective, the material and sports equipment suited to the characteristics of individuals and Physical Activity to develop.*



5. 5. *Drawing on documentary sources that specialize in finding specific information to solve problems.*
6. 6. *Select and use simple biomechanical instrumentation for basic analysis of human movement, and to interpret data derived from the use of basic playing techniques.*

Enhanced social skills in the subject of Biomechanics of Physical Activity, from the academic point of view, social and professional are:

1. 1. *Observe and follow established educational standards in the classroom and the laboratory of the Faculty of Physical Education and Sport.*
2. 2. *Be rigorous, methodical, and systematic during the application of methods and techniques used in biomechanics, as well as the shape and organization of the results.*
3. 3. *Rate Biomechanics as a useful tool for improving the work of graduates in Science of Physical Activity and Sport.*
4. 4. *Appreciate the usefulness of technology for the analysis and biomechanical studies.*
5. 5. *Consider the attitudes of collaboration, consensus, negotiation, conflict resolution and respect for the views while working as a team.*
6. 6. *Foster spirit of research, developing in students the ability to analyze new problems with instrumental techniques presented.*

Develop communication skills and / or expression as well as the use of new learning technologies and resources.

DESCRIPTION OF CONTENTS

1. INTRODUCTION TO BIOMECHANICS

Unit One (Issues 1-3), establish the conceptual and historical framework of Biomechanics and analysis methodology used.

2. MECHANIC BASES: ANALYSIS OF PHYSICAL ACTIVITIES & SPORTS

Second unit (items 4-9) presents the basic content for the mechanical analysis (dynamic and kinematic) motion or rest of the body, as well as interaction with fluids and materials for the practice of physical activity and sport.



3. BIOMECHANICAL TECHNIQUES TO INSTRUMENTATION

Unit III (Items 10): Instrumental techniques not discussed in the workshops will be described.

4. BIOMECHANICAL ANALYSIS OF PHYSICAL ACTIVITIES & SPORTS

Fourth unit, is presented to students from the perspective of biomechanical analysis, kinematic and kinetic characteristics of human gestures often related to physical activity, and a small representation of biomechanical analysis in different sports and physical activities.

5. BIOMECHANICAL OF SPORTS EQUIPMENT

Finally, the Fifth Unit , aims to introduce students in the biomechanical study of materials and sports equipment, from the perspective of health and performance, specifically in footwear and sports surface (present in any physical activity / sports).

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	45,00	100
Laboratory practices	15,00	100
Attendance at events and external activities	2,00	0
Development of group work	10,00	0
Development of individual work	8,00	0
Study and independent work	20,00	0
Readings supplementary material	14,00	0
Preparation of evaluation activities	10,00	0
Preparing lectures	10,00	0
Preparation of practical classes and problem	8,00	0
Resolution of case studies	8,00	0
TOTAL	150,00	

TEACHING METHODOLOGY

As shown in the previous section, the development of the subject is structured around 4 face axes: Theoretical lessons, workshops, seminars and tutorials, as well as two non-contact areas: Study and autonomous and / or team work.



The theoretical lessons will be taught in the classroom, where the scientific and technical matter, bases highlighting the key to understanding the subject concepts are explained.

The practical lessons (workshops) are normally taught in the Laboratory of Biomechanics. Will last approximately 2 hours and the student may check (individually or collectively), procedures practical application, allowing familiar with tools used in sports biomechanics, develop their ability to analyze biomechanical variables and confront the actual resolution problems, and to strengthen and reaffirm the validity of the content covered in lectures.

Seminars: may be developed in the classroom, with the same resources of the lectures. Each seminar will consist of a small number of works, which will be presented by the students themselves. These monographs, allow introduce students in intellectual collaboration, preparing for team research, especially focused on the search and selection of information.

Tutorships: they will be held in the offices of professors and virtually by email (official user UV). They guide the student's interest in learning more about a particular subject matter, and especially to answer questions related to the subject itself.

EVALUATION

The minimum requirements to pass the subject are related to passing the theoretical and practical sections:

In relation to the theoretic section:

There will be a theoretical exam on the day of the official call.

Previous (partial) controls may be carried out, which eliminate material from the final exam.

Both the final and partial exams will be passed with 5 points (out of 10).

Within this part of theoretical content, you can also contemplate the presentations in class and / or exhibition seminars by the students.

In relation to the practical section:

Attendance, participation, as well as the presentation of the requested workshops ("Portafolios") will have a maximum score of 3 points.

The final grade for the course will be obtained as follows:

Final grade = (70%) Theoretical grade + (30%) Practical grade

** "The literal or partial copying of works by third parties presenting them as their own is considered an unacceptable conduct in the academic field, and on the other hand, due to the law of protection of intellectual property, total or partial reproductions of the works of others are usually prohibited. give rise to non-compliance with the corresponding offenses or criminal offenses. "*

**REFERENCES****Basic**

- Pérez-Soriano, P. & Llana, S. (2014). *Biomecánica Básica: Aplicada a la Actividad Física y el Deporte*. Barcelona, Paidotribo.
- Pérez-Soriano, P. (coord)(2018). *Metodología y Aplicación práctica de la Biomecánica deportiva*. Barcelona, Paidotribo.
- Izquierdo, M. (2008). *Biomecánica y Bases Neuromusculares de la Actividad Física y el Deporte*. Ed. Panamericana.
- Tipler, P.A. (1999). *Física para la ciencia y la tecnología*. Tomo I. Bilbao: Reverté.35:35
- Zatsiorsky, V. (2000). *Biomechanics in sport. Performance enhancement and injury prevention*. Volume IX of the enciclopedia of sports medicine. Oxford: Blackwell Science.
- Pérez, P., Llana, S. (2007). *Biomecánica aplicada a la actividad física y al deporte*. Colección aula deportiva técnica (Fundación Deportiva Municipal, Valencia).
- Aguado, X. (1993). *Eficacia y técnica deportiva*. Barcelona: INDE.
- Kreigbaum, E., Barthels, K.M. (1996). *Biomechanics. A qualitative approach for studying human movement*. Boston: Allyn & Bacon.
- Knudson, D. V.,(2007) *Fundamentals of Biomechanics*, Springer, New York.
- Kerr, A. (2010). *Introductory biomechanics + Cd-rom*. Churchill Livingstone.
- Aleksandar Subic (Editor) 2019. *Materials in Sports Equipment (2nd Edition)*. Woodhead Publishing, Elsevier. ISBN: 9780081025826

Additional

- Abbott, A.V., Wilson, D.G. (1995). *Human-powered vehicles*. Human Kinetics.
- Gutiérrez, M. (1998). *Biomecánica deportiva. Bases para el análisis*. Madrid: Ed. Síntesis.
- Hay, J.G. (1993). *The biomechanics of sports techniques*. New Jersey: Prentice Hall
- Kapandji, I.A. (1991). *Cuadernos de fisiología articular*. Barcelona: Masson
- McGinnis, P.M. (2005). *Biomechanics of Sport and Exercise*. 2nd Edition. Champaign, Illinois: Human Kinetics.
- Sprunt, K. (2000). *Sports mechanics (3ª Edición)*. Sport scotland.
- Whiting, W.C., Zernicke, R.F. (1998). *Biomechanics of musculoskeletal injury*. Champaign, Illinois: Human Kinetics
- Leveau, B.F. (2011). *Biomechanics of Human Motion: basics beyond for the health professions*. Slack Incorporated, NJ, USA
- Blankenship, D (2010). *Applied research and evaluation methods in recreation*. Human kinetics.
- Pitkin, M (2011). *Biomechanics for life. introduction to Sanomechanics*. Springer.
- Reilly, T (2009). *Ergonomics in sport and physical activity. Enhancing performance and improving safety*. Human Kinetics
- Perry, J., and Burnfield, J.M. (2010). *Gait analysis: normal and pathological function*. Slack Incorporated.
- Fucci, S. / Benigni, M. / Fornasari, V. (2003). *Biomecánica del aparato locomotor aplicada al acondicionamiento muscular*. Elsevier.
- Bartlett, R. (1999). *Sports Biomechanics: Reducing Injury and Improving Performance*. Taylor &



Francis.

- Werd, M., Knight, E., Langer, P. (2017). Athletic Footwear and Orthoses in Sports (2nd Edition). Medicine. Springer. ISBN-13: 9783319521343
- Gutiérrez (2015). Fundamentos de la Biomecánica deportiva. Síntesis.
- Dufour, M & Pillu, M (2006). Biomecánica funcional: cabeza, tronco, extremidades. Masson.
- Joseph Hamill PhD, Kathleen Knutzen PhD, Timothy Derrick (2017). Biomecánica básica. bases del movimiento humano 4ª ed. Lippincott Williams and Wilkins. Wolters Kluwer Health