



UCAM
UNIVERSIDAD
CATÓLICA DE MURCIA

Guía Docente 2018/2019

Biomechanics and Movement Analysis

Biomecánica y Análisis del Movimiento

Master's in High Performance Sport: Strength and
Conditioning

Mode: Semi-presencial

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Biomechanics and Movement Analysis

Module: **V**.

Subject matter: **Biomechanics and Movement Analysis**.

Requisite: **Mandatory**.

Nº of credits: **4.5**.

Academic term: **1st semester**

Professors: **Dr. João Paulo Vilas-Boas, Dr. Luis Alegre, Dr. Alberto Encarnación, Dr. Tom Comyns, and Dr. Fernando Pareja**

Email: **tfreitas@ucam.edu**

Office hours: **by appointment via email**

Coordinator: **D. Tomás T. Freitas**.

Brief Description

In this subject the contents included are: Kinematics; Image Measurement Techniques; Processing Kinematic Raw Data; Kinetics; Biomechanical Models; Force Transducers and Force Platforms, Work, Energy and Power Mechanics; Efficiency; Ineffective Movement: Causes; Energy Storage; Internal and External Work; Muscular Force-length, Electromyography (EMG) EMG Processing.

Breve descripción del módulo

En esta materia los contenidos que se incluyen son los siguientes: Cinemática; Técnicas de Medición de Imágenes; Procesamiento de Datos Cinemáticos en Crudo; Cinética; Modelos Biomecánicos; Transductores de Fuerza y Plataformas de Fuerza; Trabajo, Energía y Potencia Mecánica; Eficiencia; Causas de un Movimiento Ineficaz; Formas de Almacenamiento de Energía; Cálculo de Trabajo Interno y Externo; Características de Fuerza-Longitud Muscular; Electromiografía (EMG); Procesamiento de la EMG.

Pre-requisites

None.

Objectives

1. Identify biomechanical tools to evaluate sports technique.
2. Apply instruments that evaluate kinematics and kinetics in sports-related movements.
3. Apply and design assessment tests for different physical attributes related to performance in a particular sport specialty.

Competencies and Learning Outcomes

MECES1: Students will know how to apply the acquired knowledge and have the capacity to problem solve in new or unfamiliar settings within broader (or multidisciplinary) contexts related to their field of study.

MECES2: Students will be able to integrate knowledge and handle the complexity of formulating judgment based on information that may be incomplete or limited, including reflections on social and ethical responsibilities linked to the application of their knowledge and judgment.

MECES3: Students will know how to communicate their conclusions (and the knowledge and rationale underpinning them) to the public (specialists and non-specialists) in a clear and unambiguous manner.

MECES4: Students will possess learning skills that will allow them to continue studying in a way that is largely self-directed or autonomous.

MECES5: To have and understand knowledge that will provide them the foundation or opportunity to be original in the development and/or application of ideas, often within the research context.

G1: To acquire skills through the teaching-learning process that allows them to continue learning in the field of sports training and conditioning not only with established contacts with Master's Degree professors and professionals but also autonomously.

G2: To acquire and to consolidate the initiative, the entrepreneurial spirit to start up projects related to sports training and conditioning.

T1: Capacity for analysis and synthesis.

T2: Capacity for organization and planning.

T4: Decision making.

T5: Teamwork.

T7: Capable of interpersonal relationships

T8: Critical Thinking.

T9: Ethical commitment.

T10: Study autonomously.

T11: Adapting to new situations.

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T15: Capacity for reflection.

T16: Problem-solving.

U1: Consider the principles of Christian humanism as core values in the development of professional practice.

U2: Being able to project the acquired knowledge and skills to promote a society based on the values of freedom, justice, equality and pluralism.

S1: Be able to acquire advanced scientific training and applied to Sport Performance and conditioning.

S3: The student should be able to know the characteristics of measurement and instrumentation in science.

E4: To be able to apply the physiological, biomechanical, behavioral and social principles as the research object.

E5: Identify the risks arising from athlete's health status and from inappropriate practice of physical activities in the context of Sports Training and Conditioning.

E9: To identify different methods for evaluating both performance and health in the field of Performance and Conditioning.

E11: Realizar test para medir la fuerza, resistencia, flexibilidad y equilibrio en personas mayores en función de su historial médico. Perform tests that measure strength, endurance, flexibility and balance in the elderly based on their medical history.

Methodology

| Methodology | Hours | Work hours Required attendance | Work hours no attendance |
|------------------------------------|--------------|--------------------------------------|-----------------------------|
| Theoretical exposition | 8 | 22.5 hours (20 %) | |
| Discussion groups, seminars | 8 | | |
| Evaluation | 2 | | |
| Tutorial | 4.5 | | |
| Personal study | 45 | 90 hours (80 %) | |
| Preparation of work and exposition | 27 | | |
| Analysis of scientific articles | 9 | | |
| Literature searches | 9 | | |
| TOTAL | 112.5 | 22.5 | 90 |

Syllabus

Theoretical Teaching Program

Topic 1. Biological bases of CEA training; New research tendencies in program design oriented towards CEA.

Topic 2. Kinematics and Kinetics applied to sports.

Topic 3. Biomechanical models; inverse dynamics.

Topic 4. Anthropometric models and Thermography.

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Practical teaching program

Seminar 1. Kinematic analysis in nautical sports.

Seminar 2. Tools and examples for simple and sophisticated sports biomechanics.

Seminar 3. Calculation model of muscular force. Force platform applications in physical activity and sports. The encoder of the chronojump system.

Relationship with other subjects of the curriculum

This material is related to: Exercise Physiology, Biomechanics and Movement Analysis, Strength Training and Conditioning in the Elderly, and Program design as related to Strength and Conditioning.

Evaluation System

February/June/September Call:

The evaluation system of the acquisition of learning outcomes of each of the modules' compulsory subjects will be based, in general, with the following grade distribution:

- 20% for written tests, in which evaluate the topic contents presented through theoretical-practical presentation, reading and analysis of documents provided in the module.
- 20% for assessment on workshops, presentations and classroom discussions.
- 60% for assessment of dynamic course work developed in seminars and workshops

The weighting range established in the evaluation system is 5%, and it will be determined based on the type of evaluations given in the module.

The module will have 2 calls for turning in assigned work: a regular call (set at the end of the module) and an extraordinary call (set prior to the first call the final Master's Thesis work).

The scoring system will be as follows, set by R.D. 1.125/2003 of September 5th: Fail: 0-4,9; Pass: 5-6,9; Notable: 7-8,9; Outstanding: 9-10. The honorable mention of Distinction (Matrícula de honor) will be awarded by the professor to the student. Based on the number of students enrolled, only 5% will be eligible for this honorable mention, except for when the enrollment is under 20 in which case only one student will be granted this honor.

The honorable mention of Distinction (Matrícula de honor) will be awarded by the professor to the student. Based on the number of students enrolled, only 5% will be eligible for this honorable

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mention, except for when the enrollment is under 20 in which case only one student will be granted this honor.

To have a passing grade for this module, one must obtain at least half of the total score for each of the instruments of evaluation.

Bibliography

Basic Bibliography

- Bases Neuromusculares y Biomecánicas de la actividad física. Izquierdo, M. Panamericana. 2008.

Complementary bibliography

- Biomechanics: A Qualitative Approach for Studying Human Movement. Kreighbaum, E. y Barthels, K.M. Allyn & Bacon. 1996.
- Basic Biomechanics. Hall, S.J. Mosby. 1995.
- Biomechanical basis of human movement. Hamill, J. y Knutzen, K. Williams & Wilkins. 1995.

Related websites

<http://www.biomecanicadeportiva.com/>

<http://www.sportbiomechanics.com/>

<http://www.biomecanicaclinica.com/>

Study tips

- Pay attention to what the professor has to share with you at the start of the course. The professor will present the syllabus, bibliography and assignments, methodological approaches to follow, as well as other relevant material of interest that will help the learning process of the subject.
- Attend classes and actively participate in the classroom.
- Orient effort and study to the comprehension of the course contents.
- Refer to recommended literature for each topic and do not limit yourself to solely studying off of notes taken in class.

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- Utilize office hours, Campus Virtual or email of the professor to help clarify or resolve any questions or doubts you may have regarding the course or course material.

Educational materials

To be specified by the professor as required by the subject.

Educational materials used in the course to facilitate the acquisition of skills are:

- PowerPoint presentations that professors' use will serve as an outline or guide of the content presented in class (and not as detailed notes on the subject). Students will make their own notes using all the educational materials described herein.
- Scientific articles, shared through Campus Virtual, will be related to specific content taught in class. Forum and social networks (Twitter) will be used to raise questions that would require some critical thought and to provide practical application for each article.
- Supporting documents will be shared also through Campus Virtual or will be sought by students through information technology and communication. These documents should also be related to specific content presented in class.
- Conceptual maps and discussion reports for each one of the content topics.