IPG Polytechnic of Guarda School of Education, Communication and Sports	**SUBJECT DESCRIPTION**	MODELO PED.012.02

Course	**Master in Sports Science**			*Academic year*			**2021/2022**
Subject	**Exercise Biomechanics**			ECTS			5
Type of course	**Compulsory**						
Year	**1**	*Semester*	**1st semester**	*Student Workload:*			
Professor(s)	**Mário Jorge de Oliveira Costa**			*Total*	135	*Contact*	30
Disciplinary Area Coordinator	**Teresa de Jesus Trindade Moreira da Costa e Fonseca**						

PLANNED

1. LEARNING OBJECTIVES

At the end of the course unit the student should be able to:
1. Understand the procedures related to Sports Biomechanics investigation;
2. Develop laboratorial and field biomechanical tests.
3. Analyze and diagnose motor behaviour based in biomechanical principals;
4. Prescribe motor behaviours' based in biomechanical principals;

2. PROGRAMME

A – Biomechanics of Posture & Balance
- Posture and body alignment
- Pathologic postures
- Mechanical work, power and energy;
- Effectiveness vs Efficiency of motion;

B – Biomechanics of Running
- Definitions
- Gait cycle and walking theories
- Gait adaptations to running
- Biomechanical analysis of running;

C – Biomechanics of Football
- Definitions
- Equipment's of evaluation
- Biomechanical analysis of collective behaviours
- Biomechanical analysis of individual actions

D – Biomechanics of Strength Training
- Characterization of levers
- Torque and mechanical advantage
- Biomechanical analysis of basic strength exercises

E – Biomechanics of Musculoskeletal Injury
- Injury mechanisms;
- Determinant factors;
- Type of mechanical loads;
- Classification according with the injury mechanics (traction, compression, twist and sliding);

F – Inverse Dynamics
- Fundamentals;
- Types of inverse dynamics;
- Calculations;
- Applications in the sports context;

G – Biomechanical Instrumentation and Evaluation
- Posture analysis (SAPo software).
- Kinematical analysis (Kinovea Software and Optitrack System and Motive software);

3. COHERENCE BETWEEN PROGRAMME AND OBJECTIVES

The contents A, B, C, D, E and F are related to the skills 1 “Analyze and diagnose motor behavior based in biomechanical principals” and 2 “Prescribe motor behaviors’ based in biomechanical principals”. The content G is related to the skill 3 “Develop laboratorial and field biomechanical tests.

4. MAIN BYBLIOGRAPHY

Amadio, A. (1996). Fundamentos Biomecânicos para a Análise do Movimento Humano. Edição da Universidade de São Paulo. São Paulo.

Balzevich, A. (2011). Biomecânica Deportiva: Manual para la mejora del rendimento humano. Paidotribo, Barcelona.

Bartlet, R.M. (2007). Introduction to sports biomechanics: analyzing human movement patterns (2nd edition). Routledge, New York.

Hall, S. (2015). Biomecânica Básica (7ª edição). Guanabara Koogan.

Knudson, D. (2007) Fundamentals of Biomechanics (2nd edition). Springer, New York.

McGinnis, P.M. (2005). Biomechanics of Sport and Exercise (2nd Ed.). Champaign: Human Kinetics.

Payton, C.J., Bartlet, R.M. (2008). Biomechanical evaluation of movement in sport and exercise. Routledge, London.

Vilas-Boas, J.P (2016). Biomecânica do Desporto. Manual do Curso de treinadores de Desporto – Grau II. PNFT, Instituto Português do Desporto e da Juventude.

5. TEACHING METHODOLOGIES (INCLUDING EVALUATION)

Teaching Methodologies
Theoretical and practical sessions: develop students’ practical experience about sports technique. Laboratory sessions: develop students’ ability to implement evaluation tests.

Evaluation rules
The final evaluation will be composed by a written test (50%) and the redaction of a research project within the biomehcaical domain (50%). When failed to accomplish the minimum mark (10 values) the student executed a final exam (100%).

6. COHERENCE BETWEEN TEACHING METHODOLOGIES AND OBJECTIVES

Teaching methods were selected to maximize the acquisition of skills defined:
Lectures using multimedia apparatus. This methodology was used to present fundamental contents related to all the skills selected.
Applying the skills acquired during lectures, theoretical-practical classes and lab classes fulfilling work sheets and reports. This methodology was used to consolidate all the contents related to all the skills selected. At the same time it was done tutorial orientation.
Conduct Lab Works to develop and consolidate skills related to the biomechanical evaluation.

7. ATTENDANCE

It was follow regime of attendance in vigor at the School of Education, Communication and Sport.