TEACHING GUIDE

Biochemistry of Physical Activity and Sport
Science of Physical Activity and Sport Grade (2nd course)

1. SUBJECT DESCRIPTION

Grade:	Science of Physical Activity and Sport
Double Grade:	
Subject:	Biochemistry of Physical Activity and Sport
Module:	I, Scientific Basis of Human Movement
Department:	Fisiología, Anatomía y Biología Celular
Academic Year:	2014-2015
Semester:	Second semester
Total Credits:	**6**
Course:	**2**
Character:	Compulsory
Teaching & Learning language:	English

Teaching Model:	**C1**
a. Basic Teaching (EB):	**50%**
b. Practice and Development Teaching (EPD):	**50%**
c. Guided Activities (AD):	**NO**

TEACHING GUIDE

2. HEAD OF THE SUBJETC

Head of the subjetc	
Name:	Manuel Angel Ballesteros Simarro
Center:	Faculty of Sport
Department:	Fisiología, Anatomía y Biología Celular
Area:	Biología Celular (Cell Biology)
Category:	Associate Professor
Tutoring Hours:	Appointment by email
Office Number:	E22-Office 1.14
E-mail:	mbalsim@upo.es
Telephone:	954977637

3. CONTEXT IN THE TRAINING PLAN

3.1. Description of the objectives

Our main objective with this course is to provide students with an overview of Energy Metabolism and the integration of metabolic activities in the human body in motion, as well as modulation under new energy demands ascribed to Physical Activity.

3.2. Contributions to the training plan

The subject will primarily focus on bioenergy and Biological bases of sport that has already been introduced in previous subjects such as "Human Physiology" and "Motor System Functional Anatomy". We will underlined the metabolic and energetic factors that influence Sport and Physical Activity practice, focusing on the effects that physical exercise has on the structure and function of the human body. We are also introducing several aspects that shall subsequently applied in other subjects, such as “Physiology of sports training”, “Nutrition of the sportsman” and “Sport training related to physical health”

3.3. Recommendations or previous knowledge required

English language: correct expression both oral and written, competent understanding and reading.

Basic knowledge of biology.
Having passed the subjects "Motor System Functional Anatomy" and "Human Physiology"
User-level knowledge of virtual teaching platform WebCT

4. COMPETENCES

4.1 Degree competences that will be developed in the subject

a) Instrumental: From the beginning we will heighten both analysis and synthesis skills. Our subject has mainly an applied approach, we do not want our students to memorize concepts and formulas, but to understand and integrate the acquired knowledge. We will also exercise the ability to organize and plan during the laboratory practices. We will also work with basic computing tools and solve problems related to sport training from a scientific point of view.
b) Systemic: Practical and Development teaching classes and tutorials have among its objectives to promote independent learning under the teacher guidance, also to promote creativity and active involvement in all the academic activities. We will assert on boosting your initiative to resolve the challenges, complete assignments and empower your curiosity and encouragement for the application of scientific and technical knowledge.
c) Personal: During the course we will promote teamwork through group assignments both in the classroom and outside.

4.2. Module Competences that will be developed in the subject

a) To acquire the scientific foundations related to the branch of knowledge of the Health Sciences, relevant to the Sport and Physical Activity.
b) To become more familiar, understand and be able to apply physiological and mechanical factors that influence the practice of Physical Activity and Sport.
c) To identify the effects that physical exercise has on the structure and function of the human body.

4.3. Specific competences that will be developed in the subject

a) To acquire basic scientific training in the field of biochemistry that the future sport professional could put to use into physical activity and sport training.
b) To know and understand the biological, bioenergetics and metabolic aspects related to sport practice and physical activity as well as the diverse indicators of human movement.
c) To know and understand the effects of physical exercise on bioenergetics and metabolism of human body

5. CONTENTS OF THE SUBJECT (CURRICULUM)

The Curriculum consists of 3 Thematic Units to be developed in the sessions of Basic Teachings:

UNIT I: FUNDAMENTALS
In this thematic unit we will address basic aspects of biochemistry as an introduction to Sport and Physical Activity applied Biochemistry. These topics are:

1. Biomolecules.
2. Introduction to Metabolism and Bioenergetics.
3. Protein dynamics
4. Enzymes. Regulation of enzyme activity.
5. Biochemical aspects of Oxygen Transport.

UNIT II: ENERGY METABOLISM
In this thematic unit we will address energy metabolism applied to human phisical activity. These topics are:

1. ATP consumption in muscle and the biochemical mechanism of muscular contraction
2. Biochemical Mechanisms of rapid ATP recovery systems: The Creatine Phosphate System and ADP Regeneration (Myokinase)
3. An overview of Carbohydrate metabolism and relevance to Physical Activity.
4. Mobilization of reserves Glucose storage: The Glycogen. Control of Blood Glucose Levels.
5. Glycolysis: Inputs, outputs and final balance. The different stages of glycolysis. Energy Strategy.
6. Lactic Fermentation. Lactate regeneration and Cori cycle.
7. Regulation of Carbohydrates metabolism during Physical Activity and Sport.
8. Overview of Lipid metabolism and relevance to Physical Activity.
9. Lipid (fat, triglicerid) mobilization associated to Physical Activity
10. Energy use of fatty acids during exercise
11. Protein Metabolism related to Sport and Physical Activity: The Urea Cycle
12. Aerobic System overview and importance during physical activity
13. Mitochondria in muscle fibers: Structure and Function.
14. The citric acid cycle (Krebs cycle) and oxidative phosphorylation
15. Energy Balance of the Aerobic metabolism.

UNIT III: METABOLIC INTEGRATION.
In this thematic unit we will integrate the diferent subjects we have learned during the course in order to apply them to Sport and Physical Activity real scenarios. These topics are:

1. Energy Metabolism and Sports: An Overview.
2. Contribution of the different Energy systems and energy substrates during human physical activity connected to:
   2.1. The intensity of the exercise
   2.2. Duration of the exercise
   2.3. Training Regime
   2.4. Composition of muscle fibers
   2.5. Nutritional & Dietary Factors.
3. Metabolic and biochemical factors associated to fatigue
4. Baseline recovery of Energetic status after Sport Training.

6. METHODOLOGY AND RESOURCES

6.1 Student Workload

TOTAL NUMBER OF STUDENT WORKLOAD: 150 hours.
In-class hours: 53
-Basic Teachings (Attendance at lectures): 22.5
- Practices and development Teachings (Assistance to Practice): 22.5
-Specialised tutorials (face to face and/or online): 8
- Final Exam 2

Individual (autonomous) learning: 97
-Hours of study and preparation for basic teachings: 45
-Hours of study and preparation of practice and of development teachings, including team-work task: 45
-Performing assessment tests and / or exams: 7

6.2. Teaching Tecniques

6.2.1. Theoretical Lessons (EB)

Lectures will be taught in weekly sessions of an hour and a half, according to the schedule given by the Faculty of Sport.
In general, teachers will summarize the main aspects of each theory topics and focus on those aspects that are either most important or difficult to students, showing the proper way to work and learn from each of the topics. Our script of the lectures is as follows:

- Overview of the subject matter and importance within the overall framework of the subject.
- Development of the main points and questions.
- Debate.

6.2.2. Practices and development sessions (EPD)

EPD activities are directly related to Basic Teaching Curriculum and will focuse to explore both practical and applied aspects.
The Training and Development sessions of this course will last for one and a half hour every week at the assigned time by the Faculty of Sport.
The practical classes will focus on practical cases, problem support classes and presentations by students of asigned topics.
Students will have more information on these activities in the “Specific Teaching Guide”, which will be provided in the virtual classroom from the month of January 2015.

6.2.3. Tutoring Sessions

Each faculty member will establish office and tutoring times during the presentation in the first class. Students will also have the opportunity to participate in online mentoring through participation in the forums of the virtual platform. Students can also request a personal appointment to the Professor if they deem it necessary.

6.2.4. Online Teaching

OnlineTeaching organized in our virtual campus (WebCT-platform) is a key support for our subject. Teachers shall use this online platform for regular communication with students.
On this online platform, students can find:

- Teaching support of theory topics with summaries, presentations and self-assessment exercises.
- Information regarding practices: Registration, schedules, scripts, rules, calendars and tutorials.
- Virtual tutorials and Forums.
- Email service
- Educational Links.
- Agenda and course's curriculum.
- Teaching Guide
- Detailed learning resources, both bibliographic and virtual.

7. EVALUATION

The evaluation criteria are in accordance with with the provisions of the current regulations for the Evaluation of undergraduate students- Universidad Pablo de Olavide (06/03/2014, BUPO No. 7/2014) and are depicted in the following 3 articles:

ARTICLE 1. CONTINUOUS ASSESSMENT AND EXAMS

In general, we will take into account the use of classroom activities by performing ongoing evaluation activities that will be planned along the course as well as the realization of one or more written exams as we detail in the following sections:

1. Ratings obtained in the various activities that will take along the course (continuous assessment) will add a maximum of 4 points out of 10 of the total course grade. The continous assesment activities are as follow:

   1.1. Self-assessment questionnaires, wich will be performed in the virtual classroom: maximum of 1 point out of 10.

   1.2. Teamwork and applied activities, which will consist primarily of class exercises, task assigments and lectures. Such actividades be held during the sessions of Practice and Development (EPD). These will add a maximum o 3 points out of 10,

2. Written test examinations as a whole represent a maximum of 6 points out of 10 of the overall rating, and such tests will be designed to assess the knowledge and skills acquired during the course. The official academic calendar establishes a single examination test for this subject and can be done in a first o second call. However, in case of mutual agreement between the faculty and students and providing they do not interfere with the academic activities of this and other subjects of the course, the examination test may be divided into several midterns or partial examinations: A first set to be held halfway through the semester and a second part in the official date of the 1st call (25 May-8 June 2015). The faculty will establish the distribution of the total 6 points between these 2 parcial exams taking into consideration the theoretical and practical material to be evaluated. In addition, the faculty will also assign a minimal score for these parcial exams to be considered for the final grade.

If the student can not pass the first midterm, it may be summited to the entire theoretical and practical subjects of the course on the official date of the 1st or 2nd call

3. Overall course grade is obtained by the sum of all activities and examination tests in accordance with the provisions stated above, and the studen will pass the course so long as the total scores exceed for a minimum of 5 points. Qualitative final grade (Suspenso, Aprobado, Notable, Sobresaliente) and honors are established in the rules of student evaluation of college degree – Universidad Pablo de Olavide.

Important considerations to take into account in the evaluation:

A. Recovery of continuous assessment activities: The activities undertaken during the period of classroom teaching will not be counted if not delivered or performed within the deadline. Also, if these activities are performed during the classroom sessions, these will not be recorded if the student does not attend. The recovery of these activities may be conducted only in case of excused absence (labor, health or sports competition). In this case the student will communicate the contingency within one week from the date of delivery or completion, and the student shall be asked for written proof of the excused absence. Thereafter, the recovery will take place during in a tutoring session.

B. On the written exam: All exams taking place during the course will consist of a series of short questions reflecting clearly and concisely the acquired knowledge during the course by solving a metabolic problem or a specific biochemical situation applied for Sport and Physical Activity, in which the student must justify their answers. These questions will be based on the tasks and questionnaires performed throughout the course. In the examn, the scores for each of its constituent parts shall be marked, as well as the minimum qualification required to pass the test.

ARTICLE 2. COURSE RECOVERY AND SECOND CALL

Students who do not pass the course in 1st call may be submitted to the second, also called "recovery" in the guideline for the Evaluation of undergraduate students. 2nd call will take place between the 22nd and the 30th of Jun, 2015 and the criteria for this second call are depicted as follow:

1. If the student successfully passed the continuous assessment tasks carried out during the teaching period but failed the 1st call exam test, She/he will have the opportunity to perform a recovery examination covering all theoretical and practical content of the course. This exam will have the same percentage value as established for the 1st round (6 out of 10), thereby the final course grade will be calculated by adding the marks obtained in continuous assessment tests with those obtained in the 2nd call examination.

   If the student did passed one of the midterm exams, She/he has the option to pass the examination solely on the part of the subject which has failed, in accordance with the minimum qualifications established by the faculty for each partial test.

2. According the provisions of the current regulations for the Evaluation of undergraduate students-Universidad Pablo de Olavide (06/03/2014, BUPO No. 7/2014) Students may submit to a final exam encompassing the whole curriculum, either because they have not followed the established mode or continuous assessment or they expressly waive the qualifications obtained (Article 8, paragraphs b and c). Students who choose this option will be evaluated by an examination trial that shall cover all the competences and abilities listed in this guide. Thereby, such a test may be made in written, oral, or both at the discretion of the teacher. The score on this test will be the final grade for the course (100% of the grade) and the student will pass the grade after reaching a minimum of 50 points out of 100.

Students who choose this option must inform the coordinator teacher at least 10 days before the date of the announcement.

ARTICLE 3. GRADE REPEATERS

Students who fail the subject after both official calls have the following options:

1. Attend a extraordinary call in November, where she/he will be evaluated for the total subject curriculum in accordance to the competences contained in the teaching guide from the previous year, in which the student will be able to obtain 100% of the full grade.
2. Repeating the whole subject in the next or subsequent academic courses.

8. GENERAL BIBLIOGRAPHY

In principle, there is no a fully comprehensive text covering all the topics to be covered in this course. The following are the current and recommended books, all available in the Library.

General Bibligraphy:
- Alberts, B. et al. Essential cell biology : an introduction to the molecular biology of the cell. New York [etc.] : Garland Publishing, cop. 1998.
- Berg, Jeremy “Biochemistry”. New York : W. H. Freeman and Company, cop. 2002 M., Lubert. Bioquímica. Reverté, D.L. 1998.
- Elliott, William H. “Biochemistry and molecular biology”. Oxford [etc.] : Oxford University Press, 2002.

Specific Bibliography:
- Hargreaves, Mark. Exercise metabolism. Champaign, IL : Human Kinetics, cop. 2006.
- Maughan, Ron. Biochemistry of exercise and training. Oxford : Oxford University Press, 2008
- Mougios, Vassilis. Exercise biochemistry Champaign, IL : Human Kinetics, cop. 2006.
- Wilmore, Jack H. “Physiology of sport and exercise” Champaign (Illinois) : Human Kinetics, 2004

Journals available at the Library:
- International Journal of Sports Medicine
- Journal of Science and Medicine in Sport