COURSE DATA

DATA SUBJECT

Code: 43091
Name: Physiology of physical exercise
Cycle: Master's Degree
ECTS Credits: 4
Academic year: 2025-26

STUDY (S)

Degree	Center	Acad. year	Period
2141 - Master's Degree in Physiology	Facultat de Medicina i Odontologia	1	First quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
2141 - Master's Degree in Physiology	Optional subject	ELECTIVES

COORDINATION

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SUMMARY

Exercise Physiology is the science that studies the functioning of the human organs and systems during physical exercise, from the molecular and cellular level to the integral level of the person, the interrelationship between them and with the external environment, as well as the mechanisms of regulation and functional integration that make it possible to carry out physical exercise. In addition, it encompasses the study of both structural and functional modifications that chronic exercise, or physical training, causes.

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

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

OTHER REQUIREMENTS

There are no prerequisites for taking the subject.

COMPETENCES / LEARNING OUTCOMES

2141 - Master's Degree in Physiology

Discover the physiological adaptations and responses of the different devices and systems to physical exercise and identify its different applications for the prevention and treatment of diseases.

Know how to write and prepare presentations to present and defend them later.

Search, order, analyze and synthesize scientific information (databases, scientific articles, bibliographic repertoires), selecting the pertinent to focus current knowledge on a topic of scientific interest in Physiology.

Students should apply acquired knowledge to solve problems in unfamiliar contexts within their field of study, including multidisciplinary scenarios.

Students should be able to integrate knowledge and address the complexity of making informed judgments based on incomplete or limited information, including reflections on the social and ethical responsibilities associated with the application of their knowledge and judgments.

Students should communicate conclusions and underlying knowledge clearly and unambiguously to both specialized and non-specialized audiences.

Students should demonstrate self-directed learning skills for continued academic growth.

Students should possess and understand foundational knowledge that enables original thinking and research in the field.

To acquire a critical attitude that allows you to make reasoned judgments and defend them with rigor and tolerance.

DESCRIPTION OF CONTENTS

1. Responses and adaptations of the different boty systems to exercise

Neuromuscular adaptations to training
Responses and adaptations of the endocrine system to exercise
Cardiovascular and hematological responses and adaptations to physical exercise Responses and adaptations of the respiratory system to physical exercise
Metabolic responses and adaptations to physical exercise
Functional assessment of the athlete
Adaptations to hypoxia and hypothermia

Nutrition for physical exercise.
Energy nutrients and energy pathways in skeletal muscle fiber.
Utilization of energy substrates during exercise.
Interaction of energy systems during exercise.
The athlete's diet.
Metabolic flexibility.

2. Utilization of substrates and interaction of energy systems during exercise.

Nutrition for physical exercise.
Energy nutrients and energy pathways in skeletal muscle fiber.
Utilization of energy substrates during exercise.
Fasting as an exercise mimetic.

3. Physical exercise and oxidative stress

Physical exercise and oxidative stress
Free radicals and cell signaling in skeletal muscle
Supplementation with antioxidant vitamins in sports

4. Physical Exercise for the prevention and treatment of different diseases.

Evidences on the benefits of the prescription of physical exercise in different pathologies.
Physical exercise acts as a drug.
Physical exercise in the prevention and treatment of Senile Sarcopenia and Frailty
Physical exercise in the prevention and treatment of neurodegenerative diseases (i.e. Alzheimer's disease)
Physical exercise and environmental pollutants

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Tutorials	3,00
Theory	24,00
Other activities	0,00
Total hours	**27,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	2,00
Individual or group project	20,00
Independent study and work	20,00
Preparation of lessons	6,00
Preparation for assessment activities	15,00
Resolution of case studies	10,00
Total hours	**73,00**

TEACHING METHODOLOGY

- Theoretical classes

- Conferences provided by experts in the field.

- Debate and directed discussions on the main topics in exercise physiology

- Face-to-face and electronic tutoring with teachers.

EVALUATION

Evaluation system:

- Written exam consisting of 5 development questions: evaluation up to 10 points.

Minimum passing grade: 5 points.

REFERENCES

- McArdle WD, Katch FI & Katch VL. (2014). FISIOLOGÍA DEL EJERCICIO. NUTRICIÓN, RENDIMIENTO Y SALUD. Ed. Kluwer Health España.

- Powers SK & Howley ET. (2021). Exercise Physiology. Theory and Application to Fitness and Performance. New York.

- Gomez-Cabrera MC, Ristow M & Vina J. (2012). Antioxidant supplements in exercise: worse than useless? Am J Physiol Endocrinol Metab 302, E476-477; author reply E478-479.

- Gomez-Cabrera MC, Domenech E, Romagnoli M, Arduini A, Borras C, Pallardo FV, Sastre J & Vina J. (2008). Oral administration of vitamin C decreases muscle mitochondrial biogenesis and hampers training-induced adaptations in endurance performance. Am J Clin Nutr 87, 142-149.

- Vina J, Sanchis-Gomar F, Martinez-Bello V & Gomez-Cabrera MC. (2012). Exercise acts as a drug; the pharmacological benefits of exercise. Br J Pharmacol 167, 1-12.

- García-Domínguez E, Carretero A, Viña-Almunia A, Domenech-Fernandez J, Olaso-Gonzalez G, Viña J, Gomez-Cabrera MC. Glucose 6-P Dehydrogenase-An Antioxidant Enzyme with Regulatory Functions in Skeletal Muscle during Exercise. Cells. 2022 Sep 28;11(19):3041. doi: 10.3390 /cells11193041.

- De la Rosa A, Olaso-Gonzalez G, Arc-Chagnaud C, Millan F, Salvador-Pascual A, García-Lucerga C, Blasco-Lafarga C, Garcia-Dominguez E, Carretero A, Correas AG, Viña J, Gomez-Cabrera MC. Physical exercise in the prevention and treatment of Alzheimer's disease. J Sport Health Sci. 2020 Sep;9(5):394-404. doi: 10.1016/j.jshs.2020.01.004.

- Gomez-Cabrera MC, Arc-Chagnaud C, Salvador-Pascual A, Brioche T, Chopard A, Olaso-Gonzalez G, Viña J. Redox modulation of muscle mass and function. Redox Biol. 2020 Aug;35:101531. doi: 10.1016/j.redox.2020.101531.

- Nascimento CM, Ingles M, Salvador-Pascual A, Cominetti MR, Gomez-Cabrera MC, Viña J.

Sarcopenia, frailty and their prevention by exercise. Free Radic Biol Med. 2019 Feb 20;132:42-49. doi: 10.1016/j.freeradbiomed.2018.08.035.