Course Code	Course Title	ECTS Credits
SPSC-240	Biochemistry Of Exercise	6
Department	**Semester**	**Prerequisites**
Sports Science	Fall, Spring	SPSC-106, BIOL-110, CHEM-104
Type of Course	**Field**	**Language of Instruction**
Required	Science of Sports	Greek
Level of Course	**Year of Study**	**Lecturer**
1st Cycle	2nd	Dr Aphamis George
Mode of Delivery	**Work Placement**	**Co-requisites**
face-to-face	N/A	None
Recommended Optional Programme Components: N/A		

Objectives of the Course:

This course will provide a sound basis in biochemistry of exercise which will be taken forward and built upon in the 3rd and 4th year. It will specifically provide the ground work for the third year course in Sports Nutrition and fourth year course in Exercise Metabolism and Muscle Fatigue. The aim of this course is to ensure that the basics of biochemistry are covered and will seek to explain how processes at the molecular and biochemical level give rise to our ability to perform exercise, and how the energy for exercise is obtained from the metabolism of carbohydrates, fats and to much lesser extend from proteins. In the second part, the course investigates the biochemical strategies that maintain energy balance in exercising muscle. The structure of the ATP producing pathways and their kinetic characteristics in terms of maximum flux and flux capacity will be described. The role of signals representing exercise intensity and duration in the regulation of oxidative phosphorylation, glycolysis and creatine kinase reaction will be examined in depth. These mechanisms will be demonstrated by reference to specific examples of high power output (sprinting) and long duration (endurance) activities. The processes of fuel mobilization during exercise and of fuel storage at rest will be described.

Learning Outcomes:

By the end of the course students should be able to:

1. Understand and describe how proteins are formed, and give examples of functional proteins;
2. Understand and describe how carbohydrates are formed and recognise the sources of carbohydrate and the processes by which carbohydrates are used as fuel in exercise.
3. Understand and describe how lipids are formed and recognise the sources of fats and the processes by which fats are used as fuel in exercise.
4. Clearly understand muscle structure and the biochemical processes involved in muscle contraction.

5. Apply the biochemistry they have learned to write mini review/essays on fuel use in sprinting, middle distance and marathon running, and fuel use and protein synthesis in weightlifting.

Course Contents:

1. Introduction to biochemistry at molecular and cellular basis (the structure of skeletal muscle, muscle fibres and muscle cell).
2. The biochemical approach of muscle contraction (actin, myosin, cross-bridges function etc.)
3. Digestion and delivery of nutrients and macronutrients.
4. The biochemical structures of carbohydrates, lipids and proteins and their anabolic and catabolic formation at rest and during exercise.
5. The biochemical basis of metabolic reactions and ATP formation from carbohydrates, fats and proteins.
6. Glycolysis, Crebs cycle, oxidative phosphorylation, gluconeogenesis and the role of glucagon.
7. Lactic acid formation and clearance during exercise.
8. Regulation of carbohydrate, fats and proteins metabolism during exercise.
9. Interaction of carbohydrate and fat metabolism during exercise.
10. Biochemical adaptations to acute and chronic training.
11. Biochemistry of high, moderate and low intensity exercise.
12. Muscle adaptation to endurance training.
13. The biochemical basis of central fatigue during prolonged exercise.

Learning activities and Teaching Methods:

Lectures and some practical demonstration

Assessment Methods:

Midterm examination, Final examination, Coursework/mini review/essays, Attendance/participation

Required Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN
Vassilis Mougios	Exercise Biochemistry	Human Kinetics	2006	0736056386

Recommended Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN
Atko Viru, Mehis Viru	Biochemical Monitoring of Sport Training	Human Kinetics	2001	0736003487
Maughan, R.J and Gleeson, M	The Biochemical Basis of Sports Performance	Oxford University Press.	2004	0199269246