Global Learning Semesters
Course Syllabus
Course: SPSC-250 Biochemistry of Exercise
Department: Liberal Arts
Host Institution: Intercollege, Nicosia, Cyprus

Course Summary		
Course Code	**Course Title**	**Recommended Credit Hours**
SPSC-250	Biochemistry of Exercise	3
Semester Offered	**Contact Hours**	**Prerequisites**
Please contact us	42-45	None
Department	**Level of Course**	**Language of Instruction**
Liberal Arts	Lower Division	English

Course Description

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 mobilisation during exercise and of fuel storage at rest will be described.

Prerequisites

None

Topic Areas

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 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.

Assessment

Midterm Examination:	(30%)
Final Examination:	(45%)
Coursework/Mini Review/Essays:	(25%)
Attendance/Participation:	(10%)

Readings and Resources

Required Textbooks

1. Biochemistry and Molecular Biology Second Edition; Elliott, W.H. and Elliott, D.C. (2001). Oxford University Press.
2. The Biochemical Basis of Sports Performance; Maughan, R.J. and Gleeson, M. (2004). Oxford University Press.
3. Biochemistry of Exercise IX; Maughan, R.J. and Shirreffs S.M. editors (1994). Human Kinetics.