

HK 361

Physiology of Exercise

Credit Hours: 3

CATALOG DESCRIPTION: Study of energy systems and the effect of physical exercise on the muscular, circulatory, respiratory, and nervous systems; relationship of strength, flexibility, endurance, fatigue, training, and nutrition to the efficiency of human physical performance

PREREQUISITES: Human Anatomy (BSB 221) and Human Physiology (BSB 220)

TEXT: *Physiology of Sport and Exercise, 2nd edition* by Wilmore and Costill

PURPOSE OF THE COURSE: The purpose of this course is to study the physiological responses to exercise both acutely and over time with an emphasis on the cardiovascular system. Adaptations of specific physiological systems, including the cardiovascular and respiratory systems, will be presented. Energy production and hormonal regulation of exercise will also be emphasized. Practical application of these physiological principles will be presented.

COURSE OBJECTIVES:

At the end of the course, the student should be able to:

1. define aerobic and anaerobic metabolism.
2. describe the primary difference between aerobic and anaerobic metabolism and their relative importance to exercise programs.
3. discuss the physiological basis of the major components of cardiovascular fitness.
4. identify the role of aerobic and anaerobic systems in the performance of various physical activities and at various intensities.
5. describe the anatomy of the heart, respiratory and vascular system.
6. define the following terms: cardiac output, stroke volume, lactic acid, oxygen consumption, Valsalva maneuver
7. describe the basic properties of cardiac muscle and the normal pathways of the conduction system of the heart.

8. describe the roles of carbohydrates, fats, and proteins as fuel for aerobic and anaerobic performances.
9. describe the normal cardiorespiratory responses to an exercise bout in terms of heart rate, blood pressure, and oxygen consumption. Describe how those responses change with adaptation to chronic exercise training and how men and women may differ in response.
10. discuss the endocrine glands and their hormones.
11. understand endocrine response to exercise.
12. identify different physiological principles related to warm-up and cool-down.
13. define and describe the implications of lactate threshold (LT) and OBLA as they relates to physical conditioning programs and cardiovascular assessment.
14. explain the concept of detraining or reversibility of conditioning and its implications in fitness programs.
15. discuss the physical and psychological signs of overtraining and provide recommendations to deal with these problems.
16. describe the changes associated with chronic aerobic training for each of the variables: heart rate, stroke volume, cardiac output, pulmonary ventilation, tidal volume, respiratory rate, arteriovenous oxygen difference.
17. describe the response of the following variables to steady state submaximal exercise and to maximal exercise: heart rate, stroke volume, cardiac output, pulmonary ventilation, tidal volume, respiratory rate, arteriovenous oxygen difference, systolic, diastolic, and mean blood pressure.
18. explain the nature and function of hormones and the changes observed as a result of exercise.

COURSE OUTLINE:

WEEK	TOPIC
Week 1	Introduction to the course; The heart; The vascular system; the

	blood; CV response to exercise: heart rate, stroke volume, cardiac output, Mechanisms of action
Week 2	CV response to exercise: heart rate, stroke volume, cardiac output, Mechanisms of action cont.
Week 3	Overall changes in cardiac function with exercise; changes in blood flow; blood pressure changes; changes in blood composition; Mechanisms of action
Week 4	Respiratory regulation during exercise: pulmonary ventilation, pulmonary diffusion, transport of O ₂ and CO ₂ ; Gas exchange at the muscles, regulation of pulmonary ventilation, ventilation and energy metabolism, respiratory limitations to performance
Week 5	Review Unit A exam, Evaluating endurance capacity, CV adaptations to training,
Week 6	Respiratory adaptations to training, long term improvement in endurance
Week 7	Factors affecting the response to aerobic training; cardiorespiratory endurance and performance
Week 8	Review Unit B exam, Energy for cellular activity
Week 9	ATP production, measuring energy use during exercise, The ATP-PCr system, The glycolytic system
Week 10	The Krebs cycle, The electron transport system
Week 11	The oxidation of carbohydrate, The oxidation of fat, Protein

	metabolism
Week 12	Measuring energy during exercise, Estimates of anaerobic efforts, OBLA, EPOC, Causes of fatigue
Week 13	Adaptations to aerobic training, training the aerobic system, adaptations to anaerobic training, monitoring training changes; Review Exam C
Week 14	The nature of hormones, hormonal effects, on metabolism and energy, hormonal effects on fluid and electrolyte balance during exercise
Week 15	The endocrine glands and their hormones, the endocrine response to exercise
Week 16	The endocrine glands and their hormones, the endocrine response to exercise cont., course review
Week 17	Comprehensive Final Exam - Tues. Dec. 10, 11:30 — 2:30 p.m.

COURSE EVALUATION:

Course Requirements

Students are expected to:

1. attend and participate in all class sessions.
2. take and pass the three unit exams.
3. satisfactorily complete the assigned chapter questions.
4. take and pass the comprehensive final exam.

Requirement Descriptions

Attendance and Participation - Students are expected to attend all class meetings (on time). Students are expected to review the material to be presented prior to each class

meeting. Students are also expected to spend at least one hour of study out of class for every hour of in-class time. It is the responsibility of the student to acquire any missed information (i.e., note, handouts, etc.) from fellow class members.

Unit Exams - The course will be divided into the following four units: Unit A - Cardiorespiratory Control During Exercise (chapters 7 and 8) Unit B - Cardiorespiratory Adaptations During Training (chapter 9) Unit C - Energy for Movement; Metabolic Adaptations to Exercise (chapters 4 and 6) Unit D - Hormonal Regulation of Exercise (chapter 5) Each unit exam consists of approximately 40 multiple choice questions and two discussion questions. The exams will cover the material presented in class. **Missing an exam is not tolerated!** Any deviation from the scheduled exam date must be arranged prior to the exam. If an illness or unforeseen event occurs that prevents the student from taking the exam, the instructor must be notified before 5:00 p.m. on the day of the exam or the student will receive a "0" for the exam.

Chapter Questions - Four to five questions from your text will be assigned at the completion of selected chapters (units A — C). The instructor will provide clarification/direction statements for each question. The questions will be due one week from the date assigned. The total points for the chapter questions will equal 75.

Comprehensive Final Exam - The comprehensive final exam will consist of approximately 80 multiple choice questions and two discussion questions. All material presented in HK 361, Physiology of Exercise will be included in the final exam.

Final Grade

Course Requirement	Possible Points	Earned Points
Exam - Unit A	100	_____
Exam - Unit B	100	_____
Exam - Unit C	100	_____
Chapter Questions	75	_____
Final Exam	150	_____
TOTAL	525	_____

The final grade will be determined as a percentage of the total possible points (550). grade assignment will be as follows

A:	90 - 100%	D:	60 - 69%	I	Incomplete
B:	80 - 89%	F:	< 60%	W	Withdrawn
C:	70 - 79%	WF:	Withdraw Failing	WP	Withdraw Passing

IT IS THE RESPONSIBILITY OF STUDENTS WHO HAVE PROFESSIONALLY
DIAGNOSED DISABILITIES TO NOTIFY THE INSTRUCTOR SO THAT
NECESSARY AND APPROPRIATE MODIFICATIONS CAN BE MADE TO MEET
ANY SPECIAL LEARNING NEEDS.