

PHYSIOLOGY OF EXERCISE
KINE 3315
Fall, 2009

Instructor: Dr. Barry C. McKeown, Professor
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231 Exercise Science Research Laboratories (ESRL)
Maverick Activities Center

Meetings: Lecture Tuesday and Thursday (11:00 – 12:20) 206 MAC and laboratories on Thursday (9:00 – 11:50 & 12:30 – 2:20 pm); Friday (8:00 – 9:50, 10:00 – 11:50 & 12:00 – 1:50) in 150 ESRL

Office Hours: T & Th 9:30 a.m. - 11:00, 12:30 – 2:00 p.m. or by appointment

Credit: 3 semester credit hours

Textbook: Plowman, S.A. and D.L. Smith. Exercise Physiology for Health, Fitness and Performance (reprinted 2nd edition, Lippincott, Williams & Wilkins, 2008)

Physiology of Exercise Laboratory Manual: The University of Texas at Arlington, Fall 2009, B. C. McKeown

Prerequisites: KINE1400 Introduction to Exercise Science; Biology 2457 and 2458, Human Anatomy and Physiology I and II; or permission of instructor.

Purpose of the Course:

The classroom and laboratory experiences of this course are intended to provide the student with an opportunity to discuss, observe and become aware of the acute and chronic responses of the human body to physical activity. Mechanisms of neuromuscular, respiratory, cardiovascular, and metabolic control and adaptation during and following activity will be studied.

Course Objectives:

Upon successful completion of this course, the student should have achieved the following:

- I. Developed an understanding of the immediate and long-term responses of the systems of the body to physical activity.
- II. Developed an understanding of the body's physiological abilities and limitations.
- III. Developed an understanding of the research processes and limitations, procedures and interpretation of physical performance measurement.
- IV. Familiarization with the physiological basis of physical training and the practical application of these techniques to teaching and coaching.

Subject Matter to be Presented:

I. Introduction: (Ch 1, 2)

- A. Sports Medicine
- B. Exercise Physiology
- C. Kinesiology (Exercise and Sport Studies)
- D. Professional Organizations
 - i. American College of Sports Medicine (ACSM)
 - ii. Association for Worksite Health Promotion (AWHP)
 - iii. American Alliance for Health, Physical Education, Recreation and Dance (AAHPERD)
- E. Control systems
 - i. Homeostasis, control systems, feedback mechanisms
 - ii. Neuroendocrine control of exercise

II. Metabolic System (Ch 3, 4, 5)

- A. Cellular respiration
- B. Anaerobic metabolism
- C. Aerobic metabolism
- D. Fuel for physical activity
- E. Replenishment of energy stores
- F. Lactic acid reduction
- G. Assessment of energy expenditure, calorimetry

III. Neuromuscular-skeletal System (Ch 18, 19, 20, 21, 22)

- A. Skeletal system
- B. Skeletal muscle system
 - i. Myofibril structure and function
 - ii. Motor unit classifications
 - iii. Neuronal structure and function
- C. Chemistry and mechanics of muscle contraction
- D. Muscle fatigue and soreness
- E. Local muscular components of physical performance and fitness

IV. Cardio-Respiratory System (Ch 10, 11)

- A. Pulmonary ventilation and lung mechanics
 - i. Standard lung volumes
 - ii. Anaerobic threshold
 - iii. Oxygen cost of ventilation
- B. Gas exchange and transport during physical activity

V. Cardiovascular System (Ch 12, 13)

- A. Hemodynamic adjustments and blood flow distribution
 - i. Oxygen transport system
 - 1. Cardiac output
 - 2. Arterial-venous oxygen difference
 - ii. Blood pressure
- B. Cardiac adjustments
 - i. Innervation
 - ii. Heart rate
 - iii. Stroke volume

V. Body Composition (Ch. 8)

VII. Training Principles and Adaptations

- A. Training principles
- B. Training methods
- C. Training effects
 - i. Physical performance
 - ii. Health and fitness

Principle Learning Activities:

- A. Class Lecture and Discussion
- B. Textbook Assignments
- C. Laboratory Experiences
- D. Supplemental Readings

Evaluation:

- A. Written Examinations (60%)**
 - Exam 1 Bioenergetics (10%)**
 - Exam 2 Neuromuscular (10%)**
 - Exam 3 Cardio-Respiratory (10%)**
 - Exam 4 Cardiovascular (10%)**
 - Exam 5 Body Composition (10%)**
 - Exam 6 Training Effects (10%)**
- B. Quizzes (10%)**
- C. Laboratory Experiences (20%)**
- D. Research Paper (10%)**

Tuesday, December 8, 2009: 11:00 – 1:30

Assessment of Performance in Course

- 90% = A**
- 80% = B**
- 70% = C**
- 60% = D**

1.2.7	Knowledge of how heart rate, blood pressure and oxygen consumption responses change with adaptation to chronic exercise training
1.2.8	Knowledge of the physiological adaptations associated with strength training.
1.2.10	Knowledge of the physiological principles related to warm-up and cool-down.
1.2.11	Knowledge of the common theories of muscle fatigue and delayed onset muscle soreness (DOMS)
2.2.0	Knowledge of exercise physiology including the role of aerobic and anaerobic metabolism, muscle physiology, cardiovascular physiology, and respiratory physiology at rest and during exercise. In addition, demonstrate an understanding of the components of physical fitness, the effects of aerobic and strength and/or resistance training on the fitness components and the effects of chronic disease
2.2.1	Knowledge of the physiological adaptations that occur at rest and during submaximal and maximal exercise following chronic aerobic and anaerobic exercise training.
2.2.2	Knowledge of the differences in Cardiorespiratory response to acute graded exercise between conditioned and unconditioned individuals.
2.2.3	Knowledge of the structure of the skeletal muscle fiber and the basic mechanism of contraction.
2.2.4	Knowledge of the characteristics of fast and slow twitch fibers
2.2.5	Knowledge of the sliding filament theory of muscle contraction.

2.2.6	Knowledge of twitch, summation, and tetanus with respect to muscle contraction.
2.2.10	Knowledge of the basic properties of cardiac muscle and the normal pathways of conduction in the heart.
2.2.11	Knowledge of the response of the following variables to acute exercise: heart rate, stroke volume, cardiac output, pulmonary ventilation, tidal volume, respiratory rate and arteriovenous oxygen difference.
2.2.15	Knowledge of and ability to describe the implications of ventilatory threshold (anaerobic threshold) as it relates to exercise training and cardiorespiratory assessment.
2.2.16	Knowledge of and ability to describe the physiological adaptations of the respiratory system that occur at rest and during submaximal and maximal exercise following chronic aerobic and anaerobic training.
2.4.0	Knowledge of the pathophysiology of atherosclerosis and how this process is influenced by physical activity.
2.4.2	Knowledge of the atherosclerotic process, the factors involved in its genesis and progression, and the potential role of exercise training in treatment.
1.6.3	Skill to measure pulse rate accurately both at rest and during exercise.
1.7.5	Ability to list the effects of temperature, humidity, altitude, and pollution on the physiological response to exercise.
1.2.1	Ability to define aerobic and anaerobic metabolism.
2.2.8	Ability to define muscular fatigue as it relates to task, intensity, duration and the accumulative effects of exercise.

*Quality of written assignments will be enhanced by following correct writing techniques which will include, but is not limited to correct spelling, sentence structure, paragraph usage, capital letters, punctuation and noun-verb agreement. All written work including exams, quizzes, laboratory assignments and papers will be evaluated according to these rules of writing with the incorrect parts appropriately noted. Each final assessment will reflect a one-fourth point decrement in evaluation per incorrect notation.

There will be no make-up opportunities for examinations unless the absence was due to a **university-approved excuse**. If the absence is due to either a university activity or non-university excused absence (e.g. illness) **you must notify me by phone or email prior to the day that you will miss if you wish to make up any work missed**. Then, the documentation for the absence should be presented to the instructor at the next class appearance, BEFORE class begins. All make-up examinations will be administered by arrangement. If you have to miss a lecture or laboratory session, you are responsible for obtaining class notes from another student. This is important, since considerable material included in examinations will be presented during class sessions.

It is anticipated that all assignments will be completed by the **DUE DATE** and given to the instructor that day at the beginning of class. If an excused absence creates a situation where the assignment cannot be turned in on the due date, the assignment is due in class of the day of the **NEXT CLASS** appearance. Grades on late assignments will be reduced by 50% of the actual grade received.

Departmental Lecture

There will be two departmental lectures. (The Anderson Sport Performance Lecture and The UTA-American College of Sports Medicine Lecture) scheduled during the Enrichment Hour (12:00 Noon Monday or Wednesday) that are **required labs**. Pick up a program that provides background of the speaker, write your name at the top and turn it in to the instructor along with a summary of the lecture **BEFORE** you leave the auditorium. If you cannot attend, there will be an assigned article by the speaker for you to review (the same format as for class).

The 12:00 Noon Monday or Wednesday Exercise Science Seminars will provide interesting information that may prove useful to you in your career. You may earn 5 points per seminar attended (up to 10 points) which may be applied to your quiz grade by attending these seminars. Write the presenter's name and topic on a sheet of paper and take notes on the topic. These reviews are to be given to me **IMMEDIATELY** after the presentation.

Department of Kinesiology – Drop Policy

*It is the responsibility of the student to **add or drop classes or withdraw from school** within the appropriate time frame established by the University Registrar. (The departments are not allowed nor obligated to add or drop students from classes.) Deadlines can be found in the current Schedule of Classes. **Deadlines may differ for Graduate Students and Undergraduate Students.***

Americans with Disabilities Act

If you require an accommodation based on disability, I would like to meet with you in the privacy of my office the first week of the semester to be sure you are appropriately accommodated.

Grade Grievance Deadline Policy

The student has one calendar year from the date a grade is assigned to initiate a grievance. The normal channels are: Department Chair or Program Director; Academic Dean; and the Provost.

Student Support Services: The University supports a variety of student success programs to help you connect with the University and achieve academic success. They include learning assistance, developmental education, advising and mentoring, admission and transition, and federally funded programs. Students requiring assistance academically, personally, or socially should contact the Office of Student Success Programs at 817-272-6107 for more information and appropriate referrals.

Academic Dishonesty: Academic dishonesty is a completely unacceptable mode of conduct and will not be tolerated in any form at The University of Texas at Arlington. All persons involved in academic dishonesty will be disciplined in accordance with University regulations and procedures. Discipline may include suspension or expulsion from the University.

“Academic dishonesty includes, but is not limited to, cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in whole or in part to another person, taking an examination for another person, any act designed to give unfair advantage to a student or the attempt to commit such acts.” (Regents’ Rules and Regulations, Part One, Chapter VI, Section 3, Subsection 3.2, Subdivision 3.22).

Bomb Threats: If anyone is tempted to call in a bomb threat, be aware that UTA will attempt to trace the phone call and prosecute all responsible parties. Every effort will be made to avoid cancellation of presentations/tests caused by bomb threats. Unannounced alternate sites will be available for these classes. Your instructor will make you aware of alternate class sites in the event that your classroom is not available.

Library Information: Helen Hough is the Department of Kinesiology Librarian liaison. She can be reached at 817-272-7429 and by e-mail at hough@uta.edu. You will find online databases for researching Exercise and Sport Studies at: <http://www.uta.edu/library/mavinfo/sport.html>