



Fayetteville State University
School of Education
Department of Health, Physical Education and Human Services

1. LOCATOR INFORMATION

Semester: Fall 2009
 Credit Hours: 3
 Course Number and Name: PEDU 462—Physiology of Exercise
 Course Location and Meeting Time: Th 6:00-8:50 pm
 Office Hours: _____
 Instructor: Dr. Dennis Royal
 Office Location: HPEC 331
 Office Telephone: 672-1115
 e-mail: drroyal1.1@netzero.net

FSU Policy on Electronic Mail: Fayetteville State University provides to each student, free of charge, an electronic mail account (username@broncos.uncfsu.edu) that is easily accessible via the Internet. The university has established FSU email as the primary mode of correspondence between university officials and enrolled students. Inquiries and requests from students pertaining to academic records, grades, bills, financial aid, and other matters of a confidential nature must be submitted via FSU email. Inquiries or requests from personal email accounts are not assured a response. The university maintains open-use computer laboratories throughout the campus that can be used to access electronic mail.

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2. COURSE DESCRIPTION

A study of the physiological effects of exercise on the various body systems, with emphasis on the musculoskeletal, cardiovascular, and respiratory systems, and on laboratory techniques for monitoring physiological parameters.

3. TEXTBOOK

Powers, Scott K. and Edward T. Howley: Exercise Physiology: Theory and Application to Fitness and Performance. McGraw-Hill, 2007, 6th edition. ISBN 0-07-302863-0

4. SCHOOL OF EDUCATION’S CONCEPTUAL FRAMEWORK

The conceptual framework defines the unit’s vision which underscores the school’s purpose for preparing its candidates for teaching and leadership roles in global society. The unit prepares candidates who support student learning, within the context of family and community participation, for a diverse, technological and global society. We achieve this vision through teaching, research, and service. Our conceptual framework serves as a lens through which we view our education professional in the physical education program. The themes of our conceptual framework include knowledgeable and reflective education professionals; working with families and communities; respect for diversity and individual worth; technological competence and educational applications; and caring dispositions and ethical responsibility.

5. COURSE GOALS AND OBJECTIVES

Upon completion of this course, it is expected that students will gain the knowledge and ability to:

1. Apply basic physiological concepts to the teaching of physical education.
2. Analyze theoretical concepts of exercise on performance and fitness.
3. Apply basic physiological principles of exercise to curriculum planning and design.
4. Understand the scientific base of physical education and the interrelationship of physiological concepts to facilitating learning.

The course activities, experiences and sequence are intended to provide opportunities for students to accomplish the following in oral and/or written form at a level which demonstrates competence. Upon completion of this course, students should, with eighty-percent, be able to:

1. Describe factors influencing physical fitness in the United States over the past century.
2. Define the terms homeostasis and steady state, and explain what is meant by the gain of the control system.
3. Explain the term negative feedback.
4. Discuss the function of the cell membrane, nucleus, and mitochondria.
5. Define the following terms: (1) endergonic reactions, (2) exergonic reactions, (3) coupled reactions, and (4) bioenergetics.
6. Describe the role of enzymes as catalysts in cellular chemical reactions.
7. List and discuss the nutrients that are used as fuels during exercise.
8. Identify the high-energy phosphates.
9. Discuss the biochemical pathways involved in anaerobic ATP productions.
10. Discuss the aerobic production of ATP.
11. Discuss the relationship between exercise intensity/duration and bioenergetic pathways that are most responsible for the production of ATP during various types of exercise.
12. Define the terms oxygen deficit and lactate threshold.
13. List the factors that regulate fuel selection during different types of exercise.
14. Explain why fat metabolism is dependent on carbohydrate metabolism.
15. Discuss the general organization of the nervous system.
16. Describe the structure and function of a nerve.
17. Define depolarization, action potential, and repolarization.
18. Discuss the role of position receptors in the control of the movement.
19. Explain the set point theory of obesity, and give an example of physiological and behavioral control system.
20. Describe the pattern of change in body weight and caloric intake over the adult years.
21. Discuss the changes in body composition when weight is lost by diet alone versus diet plus exercise.
22. Discuss the concept of designing a sport-training program based on an analysis of the energy systems utilized by the activity.
23. List and discuss the general principles of physical conditioning for improved sport performance.
24. Define the terms overload, specificity, and reversibility.
25. Outline the principles of training for the improvement of strength.
26. Discuss the role of gender differences in the development of strength.
27. Discuss the guidelines associated with planning a training program designed to improve the anaerobic power of athletes.
28. List the factors that contribute to delayed-onset muscle soreness.
29. Discuss the use of static and ballistic stretching to improve flexibility.
30. List and discuss several common training errors.
31. Describe the role of the vestibular apparatus in maintaining equilibrium.
32. Outline the steps leading to muscle shortening.
33. Define and discuss the terms concentric, isometric, muscle twitch, summation, and tetanus.
34. Discuss the major biochemical and mechanical properties of human skeletal muscle fiber types.
35. Give an overview and design and function of the circulatory system.
36. Describe the cardiac cycle and the associated electrical activity recorded via the electrocardiogram.
37. Discuss the pattern of redistribution of blood flow during exercise.
38. Outline the circulatory responses to various types of exercise.
39. Identify factors that regulate local blood flow during exercise.
40. List the major muscles involved in inspiration and expiration at rest and during exercise.
41. Explain how gases are transported across the blood-gas interface in the lung.
42. Discuss the major transportation modes of O₂ and CO₂ in the blood.
43. Identify the location and function of chemoreceptors and mechanoreceptors that are thought to play a role in the regulation of breathing.
44. Discuss the neural-humoral theory of respiratory control during exercise.
45. Describe the two-component model of body composition and the assumption made about the density values for the fat-free mass and the fat mass.
46. Explain how a sum of skinfolds can be used to estimate a percent of body fatness value.

47. List the recommended percent of body fatness values for health and fitness for males and females, and explain the concern for both high and low values.
48. Distinguish between obesity due to hyperplasia of fat cells and that due to hypertrophy of fat cells.
49. Describe the roles of genetics and environment in the development of obesity.

6. NCDPI, NCATE OR SPECIALTY AREA STANDARDS

Include the NCDPI Specialty Area Standards, the NCATE Standards, and the assessment(s). Only include the standard or standards you will address in this course.

Standards used in this course	NCDPI Physical Education Standards	Assessment(s)
	<p>1. Physical Education teachers understand physical education content, sub-disciplinary concepts, and tools of inquiry related to the development of a physically educated person. This standard represents the discipline specific content and skill knowledge.</p> <p>Indicator 4: Describe and apply bioscience and psycho-social concepts to skillful movement, physical activity, and fitness. Indicator 5: Understand and debate current physical education/activity issues and laws based on historical, philosophical, sociological, psychological, and economical perspectives.</p>	<p>Applied Project Lab Activities Chapter Test Review Keywords Evaluate Abstract Lab Report</p>
	<p>2. A physical education teacher understands how individuals learn and develop in order to provide opportunities that support physical, cognitive, social, and emotional development. The focus of this standard is application of growth and development concepts to specific teaching experiences.</p> <p>Indicator 2: Understand the biological, psychological, sociological, experiential, and environmental factors that impact the ability to learn and refine movement skills.</p>	<p>Lab Activities Chapter Test Review Keywords Evaluate Abstract Lab Report Applied Project</p>
	<p>5. A physical education teacher plans and implements a variety of developmentally appropriate instructional strategies to develop physically educated individuals based on local, state, and national content standards (e.g. Physical Education, K-12). This standard deals specifically with pedagogical knowledge and application. The core of this standard will be a series of sequential and progressive field experiences that allow teacher candidates to refine, extend, and apply their teaching skills.</p> <p>Indicator 5: Apply pedagogical and sub-disciplinary knowledge in developing and implementing effective learning environments and experiences. Indicator 6: Provide learning experiences that allow learners to integrate knowledge and skills from multiple content areas. Indicator 7: Select and utilize teaching resources and curriculum materials. Indicator 8: Select developmentally appropriate instructional cues and prompts to link physical education/activity concepts to appropriate learning experiences. Indicator 9: Develop a repertoire of direct and indirect instructional strategies to accommodate student learning in movement settings.</p>	<p>Applied Project Lab Activities Review Keyword Evaluate Abstract Lab Report Chapter Test</p>
	<p>7. A physical education teacher uses a variety of technologies to enhance learning, as well as personal and professional productivity.</p> <p>Indicator 1: Demonstrate knowledge of current technologies and their application in physical education.</p>	<p>Chapter Test Review Keywords Evaluate Abstract Lab Report Lab Activities Applied Project</p>
	<p>8. A physical education teacher understands how</p>	<p>Chapter Test</p>

Standards used in this course	NCDPI Physical Education Standards	Assessment(s)
	<p>individuals differ in their approaches to learning, and therefore creates appropriate instruction adapted to these differences. Through this standard, teacher candidates demonstrate their ability to plan and implement learning experiences that are sensitive to diverse learners.</p> <p>Indicator 2: Identify and/or use appropriate strategies, services, and resources to meet diverse needs of all learners.</p>	Review Keywords Evaluate Abstract Lab Report Lab Activities Applied Project
	<p>9. A physical education teacher is a reflective practitioner who evaluates the effects of his/her actions on other (e.g., learners, parents/guardians, and fellow professionals) and seeks opportunities to grow professionally. This standard can be met through a series of learning experiences that promote self-reflection on the part of a teacher candidates.</p> <p>Indicator 2: Use available resources to develop as a physical education professional.</p>	Chapter Test Review Keywords Evaluate Abstract Lab Report Lab Activities Applied Project

7. CORE STANDARDS

Include the NCDPI Core Standards and the assessment(s). Only include the standard or standards you will address in this course.

Standards Used in this Course	NCDPI Core Standards	Assessment(s)
X	1. Teachers know the content they teach.	Readings, applied projects and chapter questions (with rubrics), course lecture/class discussion board topics, chapter questions (with rubrics) and course lectures, and readings (with rubrics)
X	2. Teachers know how to teach students.	Applied projects, course lecture/class discussion and discussion board topics, chapter questions (with rubrics) and course lectures, and readings (with rubrics)
X	3. Teachers are successful in teaching a diverse population of students.	Applied projects (with rubrics) re: inclusion, accommodations, collaboration of students at the k-12.
X	4. Teachers are leaders.	Applied projects, course lecture and discussion board topics, chapter questions (with rubrics) and course lectures, and readings (with rubrics)
X	5. Teachers are reflective about their practice.	Analyze applied projects and discussion board (with rubrics).
X	6. Teachers respect and care about students.	Applied projects, course lecture and discussion board topics, chapter questions (with rubrics) and course lectures, and readings (with rubrics)

8. DIVERSITY

Include the NCDPI Diversity Standards and the assessment(s). Only include the standard or standards you will address in this course.

Diversity Standards Used in this Course	NCDPI Diversity Standards	Assessment(s)
	1. Teachers understand the central concepts,	Applied projects, course lecture

Diversity Standards Used in this Course	NCDPI Diversity Standards	Assessment(s)
X	tools of inquiry, and structures of the discipline(s) they teach and can create classroom environments and learning experiences that make these aspects of subject matter accessible, meaningful and culturally relevant for diverse learners.	and discussion board topics, chapter questions (with rubrics) and course lectures and readings (with rubrics).
X	2. Teachers understand how students' cognitive, physical, socio cultural, linguistic, emotional, and moral development influences learning and address these factors when making instructional decisions.	Applied projects, course lecture & discussion board topics, chapter questions (with rubrics) & course lectures, and readings (with rubrics)
X	3. Teachers work collaboratively to develop linkages with parents/caretakers, school colleagues, community members and agencies that enhance the educational experiences and well being of diverse learners.	Applied projects and discussion board topics, chapter questions (with rubrics)
X	4. Teachers acknowledge and understand that diversity exists in society and utilize this diversity to strengthen the classroom environment to meet the needs of the individual learners.	Applied projects, course lecture & discussion board topics, chapter questions (with rubrics) & course lectures, and readings (with rubrics)
X	5. Teachers of diverse students demonstrate leadership by contributing to the growth and development of their colleagues, their school and the advancement of educational equity.	Applied projects, course lectures, and readings (with rubrics) Discussion board (with rubrics)
X	6. Teachers of diverse students are reflective practitioners who are committed to educational equity.	Applied projects, course lectures, and readings (with rubrics) & Discussion board (with rubrics)

9. TECHNOLOGY

This course will help strengthen and enhances the candidates' technological competence and skill in using technology. Candidates will use a variety of technologies to enhance their knowledge of technology in this course. Some technologies for this course may include: productivity tool (Power Point, presentation software), Internet, web page construction, e-mail on-line course applications, grade book, video camera. Check all that apply for this course. Please include any technologies that you use that are not listed.

	Technological Applications for this Course
X	Productivity tool (Power Point)
X	Presentation software
X	Internet
X	Web page construction
X	e-mail
X	On-line applications
X	Grade book
X	Video Camera
X	Scanner
	Excel
X	Smart board
	Lap top and LCD panel
	Music Stereo and CD

Include the NCDPI Technology Standards and the assessment(s). Only include the standard or standards you will address in this course.

Technology Standards Used in this Course	NCDPI Technology Standards	Assessment(s)
X	1. Teachers demonstrate a sound understanding of technology operations and concepts	Blackboard Usage

Technology Standards Used in this Course	NCDPI Technology Standards	Assessment(s)
X	2. Teachers plan and design effective learning environments and experiences supported by technology.	Unit and Lesson Plans
X	3. Teachers implement curriculum plans that include methods and strategies for applying technology to maximize student learning.	Instructional Planning
	4. Teachers apply technology to facilitate a variety of effective assessment and evaluation strategies.	
X	5. Teachers use technology to enhance their productivity and professional practice.	Blackboard Usage
X	6. Teachers understand the social, ethical, legal and human issues surrounding the use of technology in PK-12 schools and apply those principles in practice.	Unit and Lesson Plans Research

10. DISPOSITIONS

Directions: Check all that apply. Dispositions will be addressed through readings, modeling, reflecting, field experiences, discussion and other approaches. This course will seek to enhance and strengthen the dispositions listed below.

Professional Competence		Professional Responsibilities	
X	Appreciates and engages in self-reflections	X	Dresses appropriately for the setting
X	Shows a commitment to ongoing learning	X	Is punctual
X	Desires to learn and apply new technologies	X	Attends class regularly and participates in the class
X	Is receptive to new ideas and feedback	X	Completes assignments and tasks in a timely manner
X	Writes and speaks clearly and effectively	X	Willing to go beyond required assignments
X	uses culturally sensitive language when communicating with families	X	Shows initiative and motivation
X	Respects the privacy of students and their families	X	Assumes fair share of responsibilities
Professional Dispositions and Qualities		Professional Integrity	
X	Believe all children can learn	X	Displays high and ethical professional standards
X	Understands the culture of students and their families	X	Is honest and dependable
X	Values and respects diversity and individual differences	X	Is courteous and respectful
X	Demonstrates flexibility and adaptability	X	Has a positive professional attitude
X	Treats all students fairly and equitably	X	Accepts and uses constructive criticism
X	Is sensitive to the feelings of others	X	Maintains emotional control and appropriate behavior
X	Interacts appropriately and positively with others		

11. GENERAL REQUIREMENTS

1. Textbook: Powers, Scott K. and Edward T. Howley: Exercise Physiology: Theory and Application to Fitness and Performance. New York: McGraw-Hill, 2003, Fifth Edition.
2. Attendance will be required in accordance with University policy.
3. All assignments must be typewritten and submitted on time. **NO EXCEPTIONS!**
4. Active participation in all assigned activities and class discussions is mandatory.
5. **Approved Department of Health, Physical Education and Human Services' student major's uniform is required for participation in all laboratory activities.**

12. EVALUATION CRITERIA

- A. Grades will be determined by a variety of means including course assignments, laboratory participation and reports, chapter tests, mid-term and final examinations, and topic assignments including written reports.
- B. Each of the abovementioned activities will carry specific point totals from 10 to 100 points. Points distribution for each activity is as follows:

<u>ASSIGNMENTS</u>	<u>POINT TOTALS</u>
1. Five Abstracts (20 points each)	100
2. Laboratory Reports (25 points each)	100
3. Chapter Tests (25 points each)	300
4. Mid-Term and Final Examinations (100 points each)	200
5. Chapter I – Web Addresses of five Professional HPE Societies	20
6. Chapter II – Everyday Life Control Systems	10
7. Chapter III – Anaerobic vs Aerobic ATP Production	20
8. Chapter IV – Exercise Intensity and Fuel Selection	20
9. Chapter VII – Definition of Key Words	40
10. Chapter VIII – Mechanics of Muscle Contraction	50
11. Chapter IX – Effects of Exercise on Venous Return	10
12. Chapter XVIII – Diet Alone vs Diet and Exercise	10
13. Chapter XXI – Steroids and Performance	40
14. Chapter XVI – Physical Exercise Program for Ages 10 – 12	<u>80</u>
	1,000

C. Grading Symbols and numerical Equivalents:

A = 920 – 1,000 pts.

B = 830 – 919

C = 730 – 829

D = 640 – 729

E = 639 and Below

13. COURSE OUTLINE (with Assignment Schedule)

Weeks 1 & 2

Direction on Topic Assignment, Syllabus Review, Course Requirement, Attendance Policy and Practicum Requirement

Lecture and Discussion – Chapter 1: Physiology of Exercise in the United States – Its Past – Its Future

Assignments:

Read Chapter 1 and Answer Study Questions to be discussed in class (page 12)

Research the Web address of five research societies and journals

Answer sample questions online (www.mhhe.com/powers62) (www.mhhe.com/support)

Chapter 1 Test (Written)

Weeks 3 & 4

Lecture and Discussion Chapter 2 – Control of Internal Environment

Assignments:

Read Chapter 2 and Answer Study Questions to be discussed in Class (pp. 21 – 22)

Review Key Terms (p. 14)

Identify and explain two control systems used in everyday life other than biological

Chapter 2 Test

Weeks 5 & 6

Lecture and Discussion Chapter 3 – Bioenergetics

Assignments:

Read Chapter 3 and answer study questions to be discussed in class (p. 49)

Review Key Terms (p. 23)

Abstract #1

Chapter 3 Test

Weeks 7 & 8

Lecture and Discussion Chapter 4 – The Nervous System

Assignments:

Read Chapter 4 and study questions to be discussed in class (p. 69)

Abstract #22

Chapter 4 Test

Weeks 9 & 10

Lecture and Discussion Chapter 7 – The Nervous System

Assignments:

Read Chapter 7 and answer study questions to be discussed in class (p. 138)

Review Key Terms (p. 120)

Abstract #3

Lab # 1 – Reaction Time

Review Mid-Term Examination

Mid-Term Examination

Weeks 11 & 12

Lecture and Discussion Chapter 8 – Skeletal Muscles

Assignments:

Read Chapter 8 and answer study questions to be discussed in class (p.165)

Abstract #4

Review Key Terms (p.141)

Lab #2 Muscle Fatigue

Lab Report #1

Chapter 8 Test

Weeks 13 & 14

Lecture and Discussion Chapter 9 – Circulatory Response to Exercise

Assignments:

Read Chapter 9 and answer study questions to be discussed in class (p. 196)

Review Key Terms (p. 170)

Lab #2 Report

Test: Trace the blood flow through the heart

Lab #3 Measure HR and Blood Pressure of Classmate using the LSU Step Test

Chapter 9 Test

Weeks 15 & 16

Lecture and Discussion Chapter 18 – Body Composition and Nutrition

Assignments:

Read Chapter 18 and answer questions to be discussed in class (p. 399)

Abstract #5

Lab #3 Report

Lab #4 – Determine Body Composition of Classmates and Calculate the Optimal Body Weight

One Page Paper on “Diet Alone vs Diet and Exercise” relative to weight control

Chapter 18 Test

Week 17

Lecture and Discussion Chapter 21 – Training for Performance

Assignments:

Read Chapter 21 and answer questions to be discussed in class (p.459)

Lab Report #4

1-page paper on Steroids and Performance

Chapter 21 Test

Week 18

Lecture and Discussion Chapter 16 – Exercise Prescriptions for Health and Fitness

Assignments:

Read Chapter 16 and answer study questions for discussion in class (p.334)

Review Key Terms

Physical Fitness Program for Ages 10-12

Final Exam

14. **TEACHING STRATEGIES**

The objectives and competencies of this course will be accomplished through the following procedures:

1. Lectures and demonstrations (taken from course text and assigned readings and bibliographic entries)
2. Study of assigned text (selected topics in the course text will be emphasized)
3. Selected readings (bibliographic and web-based references will be utilized to construct lectures and major examinations.
4. Independent and dependent research (see Specific Course Requirements)
5. In-class written examinations and quizzes, and web-based test will be utilized
6. Written and oral reports
7. Multimedia presentations by the instructor and assigned student groups

15. **DISABLED STUDENT SERVICES:** In accordance with Section 504 of the 1973 Rehabilitation Act and the Americans with Disabilities Act (ACA) of 1990, if you have a disability or think you have a disability to please contact the Center for Personal Development in the Spaulding Building, Room 155 (1st Floor); 910-672-1203.

ABSENTEE POLICY

In addition to the University's policy on absenteeism, any unexcused absence above the allowable minimum will result in one (1) point being deducted from the student's final grade average.

Example: Final grade average 92 = A; 3 unexcused absences = minus 3 points; 3 points deducted (92 – 3 = 89) = B grade.

Excused absences include **DOCUMENTED** emergencies, medical or otherwise; University service, i.e., athletics, band, choir, etc., or instructors approval. **This policy includes all levels of classes (100 thru 400 level.)**

16. **REFERENCES (Suggested Readings, Internet and/or Multi-media Resources)**

American College of Sport Medicine Metabolic Calculations Tutorial (CD-ROM). L. Kaminiskly. 2000.

American College of Sports Medicine. 2006. *ACSM's Guidelines for Exercise Testing and Prescriptions*, 7th ed. Baltimore: Lippincott, Williams, & Wilkins.

American College of Sports Medicine. 2006. *ACSM's Resource Manual Guidelines for Exercise Testing and Prescription*, 5th ed. Baltimore: Lippincott, Williams, & Wilkins.

American College of Sports Medicine. 2006. *ACSM's Resource Manual Guidelines for Exercise Testing and Prescription*, 4th ed. Baltimore: Lippincott, Williams, & Wilkins.

Anderson, S., and P. Kippelen. 2005. Exercise-induced bronchoconstriction: Pathogenesis. *Current Allergy and Asthma Reports* 5:116-22.

Bassett, D.R., Jr. 2002. Scientific contributions of A.V. Hill: Exercise physiology pioneer. *Journal of Applied Physiology* 93: 1567-82.

- Bergeron, M. et al. 2005. Youth football: Heat stress and injury risk. *Medicine and Science in Sports and Exercise* 37: 1421-30.
- Brooks, G.T. Fahey, and K. Baldwin, 2005. *Exercise Physiology: Human Bioenergetics and Its Applications*, 4th ed. New York: McGraw-Hill Companies.
- Cross, K., and C. Serenelli. 2003. Training and equipment to prevent head and neck injuries. *Clinics in Sports Medicine* 22: 639-67.
- Fox, S. 2006 *Human Physiology*, 9th ed. New York: McGraw-Hill Companies.
- Hartgens, F., and H. Kuipers. 2004. Effects of androgenic anabolic steroids in athletes. *Sports Medicine* 34(8): 513-54.
- Maughan, R., D. King, and T. Lea. 2004. Dietary supplements. *Journal of Sports Sciences* 22: 95-113.
- Pette, D. 2002. The adaptive potential of skeletal muscle fibers. *Canadian Journal of Applied Physiology* 27(4): 423-48.
- Widmaier, E., H. Raff, and K. Strang. 2006. *Vander's Human Physiology*. 10th ed. New York. McGraw-Hill Companies.