DRAFT SYLLABUS
BIOLOGY 395 – EXTREME PHYSIOLOGY
INTERSESSION, DECEMBER, 2021-JANUARY 2022

COURSE: Biology 395 – Extreme Physiology Travel Course
Credit value: 3.0 (Combined Lecture and Laboratory)
Biology Curriculum Course Group Satisfied: Organismal
Prerequisites: General Physiology (BIOL 245/245L) or Advanced Human Anatomy & Physiology II (PSIO 221)
For more information visit: http://sites.scranton.edu/extremephysiology/

LOCATION: Tucson and Flagstaff, AZ, and other locations in Arizona

TEXTS and other INSTRUCTIONAL MATERIALS:
1) Assigned readings and journal articles (sample Bibliography attached)
2) Instructor-provided PowerPoint presentations
3) Quantitative Circulatory Physiology (QCP) Modeling Software (copyright Robert Hester, Biological Simulators, Inc. Jackson MS 39236)

INSTRUCTORS: Dr. Terrence Sweeney; LSC 275; phone: 941-7623; terrence.sweeney@scranton.edu
and Prof. Tara Fay; LSC 254; phone: 941-4395; tara.fay@scranton.edu

COURSE DESCRIPTION:

This travel course will expose the student, serving as both subject and investigator, to the stunning and diverse environments of Arizona, as she/he assesses cardiovascular and respiratory conditioning and tracks his/her improvement through a 25-day period of extreme environmental and physical challenges. Accompanying instruction will explore the ongoing physiological adaptation.

STUDENT LEARNING OUTCOMES:

Upon successful completion of the course, the student will be able to:

- record and analyze quantitative measures of human cardiovascular and respiratory performance;
- demonstrate and document the improvements in personal cardiovascular and respiratory performance that are attainable through a sustained period of aerobic and environmental challenges;
- describe the synergism of nutrition and training in the enhancement of human performance;
- identify the mechanisms of physiological adaptation to the environmental challenges posed by an arid environment or high altitude;
- describe the adaptive mechanisms employed by species native to arid and high altitude environments that allow these species to survive extreme environmental challenges; and
- cogently present information and ideas published in the primary literature.

COURSE POLICIES:

Course Enrollment cap: 10 students

The grading scale used is as follows:

A = 94 – 100	B = 84 – 86	C = 74 – 76	D = 60 – 64
A^- = 90 – 93	B^- = 80 – 83	C^- = 70 – 73	F = below 60
B^+ = 87 – 89	C^+ = 77 – 79	D^+ = 65 – 69	

Student grade will be determined from performance on tasks and deliverables described below.

Final Grade Breakdown:

Description	Contribution to Final Letter Grade (%)
Presentation of Human Performance Data	20
Presentation of Primary Literature Synopsis	25
Human Performance Equipment Operation	10
Final Exam	30
Participation/Cooperation in Household Functions	15

TENTATIVE SCHEDULE:

Date:

12/28/21 Students arrive in Tucson, AZ

12/29 Course officially begins
- Introductory Lecture
  - Resting Parameters, HR, BP, RR, RMV, SO_2, body weight
  - Endurance: 1.5-mile timed run

1/3/22 Completion of Laboratory Human Performance Testing
- VO_2max; Wingate Test Anaerobic Performance Assessment

12/29-1/10 Training & class instruction in Tucson
- Training Schedule
  - Each student is to keep a daily log of exercise regimen and nutritional intake
  - Part I: Mandatory Group Exercise Regimen
    - Varied daily schedule of defined exercise (e.g., cycling, hiking, running, swimming)
  - Part II: Individualized Exercise Regimen
    - Optional additional exercise (logged and perhaps in smaller groups)
- Tentative Lecture Schedule / Topics
  - Exercise Physiology
  - Cardiovascular Physiology, examined using *QCP* Modeling Software
  - Respiratory Physiology
  - Nutritional Demands of Prolonged Exercise
  - Comparative Physiology of Desert Animals
  - Group discussions of student conditioning data
  - Faculty mentoring of students on relevant journal articles/reviews
- Trips / Sites (most likely incorporated into daily mandatory exercise)
  - Saguaro National Park

Arizona Sonoran Desert Museum
Chiracahua Mountains
Sabino Canyon Recreational Area
Mount Lemon

1/10 Pre-High Altitude Update of Conditioning
Resting Parameters, HR, BP, RR, RMV, SO_2, hematocrit
Endurance: 1.5-mile run time

1/11 Relocation to Flagstaff, AZ

1/12 Recording of Initial Changes with relocation to high altitude
Resting HR, BP, RR, RMV, SO_2
Endurance: 1.5-mile run time
Survey for Acute Mountain Sickness

1/12 - 1/17 Training & class instruction in Flagstaff
Training Schedule
Each student is to keep a daily log of exercise regimen
Part I: Mandatory Group Exercise Regimen
Varied daily schedule of defined distance cycling, hiking, X-C skiing, etc.
Part II: Individualized Exercise Regimen
Optional additional exercise (logged and perhaps in smaller groups)
Lecture Schedule / Topics
Physiological Adaptations to High Altitude
Comparative Physiology of High Altitude Animals
Group discussions of student conditioning data
Student presentations of relevant journal articles/reviews
Trips / Sites (most likely incorporated into daily mandatory exercise)
Grand Canyon Hike
Snowbowl Ski Resort - Ultra-high altitude Respiratory Measurements
Sedona / Oak Creek Canyon
Sunset Crater National Monument/ Walnut Canyon / Wapatke Ruins
Museum of Northern Arizona

1/17 Update of Conditioning after week in Flagstaff
Resting Parameters, HR, BP, RR, RMV, SO_2, hematocrit

1/18 Return to Tucson, AZ

1/19 Recording of Initial Changes with relocation to low altitude
HR, BP, RR, RMV, SO_2, hematocrit

1/19 - 1/20 Final Update of Conditioning
Resting Parameters, HR, BP, RR, RMV, SO_2, body weight, VO_2max
Endurance: 1.5-mile run time

1/20 Student Presentation of Human Performance Data, Course Lecture Wrap-up & Review

1/21 Final Exam

1/22 Return to Pennsylvania

SAMPLE BIBLIOGRAPHY OF PRIMARY LITERATURE ASSIGNMENTS:

Carter, R. III, D. E. Watenpaugh, and M. L. Smith. Genome and Hormones: Gender Differences in Physiology Selected Contribution: Gender differences in cardiovascular regulation during recovery from exercise. *J Appl Physiol*. **91:** 1902 – 1907, 2001.

Fu, Q., A. Arbab-Zadeh, M. A. Perhonen, R. Zhang, J. H. Zuckerman, and B. D. Levine. Hemodynamics of orthostatic intolerance: implications for gender differences. *Am. J. Physiol. Heart Circ. Physiol*. **286:** H449–H457, 2004.

Gottshalk, C. W. and M. Mylle. Micropuncture study of the mammalian urinary concentrating mechanism: evidence for the countercurrent hypothesis. *Am. J. Physiol*. **196 (4):** 927-936, 1959.

Sun, D., A.N. Huang, A. Koller and G. Kaley. Decreased Arteriolar Sensitivity to Shear Stress in Adult Rats is Reversed by Chronic Exercise Activity. *Microcirculation* **9:** 91–97, 2002.

Tuan, T-C, T-G Hsu, M-C Fong, C-F Hsu, K K C Tsai, C-Y Lee and C-W Kong. Deleterious effects of short-term, high-intensity exercise on immune function: evidence from leucocyte mitochondrial alterations and apoptosis. *Br. J. Sports Med*. **42:** 11-15, 2008.