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| Instructor: Dr. Carol Gibbons Kroeker | Room: CHC 105 |
| Phone: TBA | Days: Mon. / Wed. / Fri. |
| Email: kcagibbo@ucalgary.ca | Time: 10:00-10:50 |
| ckroeker@ambrose.edu | Labs: T/R, KNB 152 |
| Office: KNB 253 | Course Website: Blackboard |
| Office Hours: M/W/F 10-11:00, or later W 9:30-10:00, or by appointment | |

Course Description: This course builds upon fundamental principles of human systems physiology, with a focus on how the integration of these physiological systems provides the means by which our bodies maintain homeostasis from the systemic down to the cellular level. Lecture material ranges from cellular processes to the whole organism and interactions with the environment. It will discuss how physiological systems affect each other, particularly in conditions such as exercise or physiological stress.

- Course Objectives:**
1. To gain an understanding of the integrative nature of human physiology and how this interaction relates to the concept of homeostasis and its mechanisms.
 2. To describe the interrelationships between various systems in the human body, and the clinical relevance of these relationships in disease.
 3. To analyse the effects of exercise and extreme environments on the human body.
 4. To learn laboratory techniques essential to research in physiology and physiology-related fields.
 5. To collaborate with peers to design and carry out experiments and to be able to present this in written and oral formats.
 6. To provide a framework for problem-solving using the principles of integrative physiology.
 7. To gain an appreciation for critically analyzing published scientific literature, including the relationships between hypothesis development, hypothesis testing through experimentation, and drawing logical conclusions from experimental results.

- Texts :**
- 1) Human Physiology: An integrated approach, 6th edition, by Dee Unglaub Silverthorn. Benjamin Cummings, 2011 (recommended – not required).
 - 2) Kinesiology 323 Lab Manual (Powerlab; Blackboard)

Contacting the Instructor:

Students requiring assistance are encouraged to speak with their instructor during class or office hours. Should you wish to meet with the instructor outside of office hours, please phone or email the instructor to make an appointment.

Email, while commonly used, does limit the effectiveness of communications and may not be the best way for instructors to answer student questions. Therefore, the instructor may request a telephone call or personal meeting. Your instructor will inform you as to his/her expectations about emails.

Grading Scale:

| Grade | Percent | Grade Point Value | Description |
|-------|---------|-------------------|---|
| A+ | 96-100 | 4.00 | Outstanding |
| A | 92-95 | 4.00 | Excellent - superior performance, showing comprehensive understanding of subject matter. |
| A- | 88-91 | 3.70 | |
| B+ | 83-87 | 3.30 | |
| B | 78-82 | 3.00 | Good-clearly above average performance with knowledge of subject matter generally complete. |
| B- | 73-77 | 2.70 | |
| C+ | 68-72 | 2.30 | |
| C | 64-67 | 2.00 | Satisfactory – basic understanding of the subject matter. Grade point average below 2.00 is not sufficient for promotion. |
| C- | 60-63 | 1.70 | Minimum grade required if needed as a prerequisite course |
| D+ | 55-59 | 1.30 | |
| D | 51-54 | 1.00 | Minimal pass – marginal performance; generally insufficient preparation for subsequent courses in the same subject. |
| F | <50 | 0 | Fail – unsatisfactory performance or failure to meet course requirements. |

Evaluation of Course Content:

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|----------------------------------|-----|
| Midterm Exam | 35% |
| Laboratory reports / assignments | 25% |
| Final Exam | 40% |

This course consists of 3 hours of lectures per week, plus 2 hours per week of labs and tutorials. The midterm and final exam will be a combination of multiple choice questions, as well as short and long answer questions. While many questions will be based on lecture material, the textbook reading will absolutely help in the understanding of this material. Attendance at lectures will help ensure success on course exams and assignments. Attendance at all labs is mandatory.

Late Policy:

There will be a 10% deduction in grade per day that an assignment or lab report is handed in late. No assignments will be accepted past one week late. If there are extenuating circumstances resulting in the lateness, please contact the instructor.

Final Examination: The final exam will be a cumulative exam, covering information from the entire course. The date and time will be determined by the registrar's office.

Additional Course Information:

SUPPLEMENTARY RESOURCES:

- i. Fundamentals of Anatomy and Physiology – by Martini and Nath – 8th ed (2009)
- ii. Human Physiology – from cells to systems – 1st Canadian edition - by Sherwood and Kell (2010)
- iii. Principles of Human Anatomy – by Tortora and Neilsen (12 ed, 2011)
- iv. Principles of Anatomy and Physiology – 13th ed – by Tortora and Derrickson (2010)
- v. Exercise Physiology – 6th ed – McArdle, Katch and Katch

Some Laboratory sessions will involve exercise. The demands of this activity can be harmful to a student with physical limitations. It is the student's responsibility to inform the instructor of any physical limitations (including a recent positive PAR-Q) **prior to** participating in any activity class. Appropriate activity modifications will be made to accommodate these students.

Course Content:

TENTATIVE LECTURE SCHEDULE

| Date (Week of) | Topic | Textbook Chapter |
|----------------|--|-------------------|
| Jan. 8 | Cellular Physiology / homeostasis | 1-3 (Marieb 1-3) |
| | Metabolism | 4-6 (M 24) |
| 14 | Control of Metabolism / Energy Balance | 22, 23 (M 24) |
| | Blood | 16 (M 17) |
| 21 | Immunity | 24 (M 21) |
| 28 | Cardiovascular function | 14-15 (M 18-19) |
| Feb. 4 | Cardiovascular Function | 14-15 (M 18-19) |
| 11 | Respiratory Function / Cardio-pulmonary int. | 17-18 (M 22) |
| 18 | Reading Week – no lectures | |
| 25 | Renal system | 17-18 (M25) |
| Mar. 4 | Renal interactions – cardiovascular; Acid-Base | 19, 20 (M 26) |
| 11 | Muscle | 12, 13 (M 9) |
| 18 | Physiology of Movement | 12, 13 (M 9 / 10) |
| 25 | Exercise / steroids | 25 |
| Apr. 1 | Thermal and altitude stress | |
| Apr. 8 | Space physiology, pregnancy, dehydration | |
| 15 | Review | |
| 19-30 | Final Exam Period (check schedule for exam time) | |

Silverthorn textbook chapters are listed first– if you choose to use your Marieb (259/260) text instead – those chapters are listed in parentheses.

TENTATIVE LABORATORY SCHEDULE

| Lab | | Lab Date | Topic | Lab/tutorial |
|-----|------|----------|--|--------------|
| 1 | Jan | 8-10 | No labs | |
| | | 15-17 | Introduction to Lab Techniques | L-1 |
| 2 | | 22-24 | Metabolism | T-1 |
| 3 | | 29-31 | Blood and Immunity | L-2 |
| 4 | Feb. | 5-7 | Immunity / Cardio-respiratory interactions | T-2 |
| 5 | | 12-14 | Cardiovascular Lab | L-3 |
| 6 | | 19-21 | No labs – Reading Weed | |
| | | 26-28 | Midterm Review Session | T-3 |
| 7 | Mar. | 5-7 | Respiratory Lab | L-4 |
| 8 | | 12-14 | Renal Lab | L - 5 |
| 9 | | 19-21 | Cardio-Renal-Respiratory Interactions | T - 4 |
| 10 | | 26-28 | Skeletal Muscle Lab | L-6 |
| 11 | Apr. | 2-4 | Muscle / Special Topics | T-6 |
| 12 | | 9-11 | Final Review Session | T-5 |
| | | 16 | No labs | |

Attendance at laboratory sessions is **COMPULSORY**. Any lab missed without a valid excuse cannot be made up. Labs will involve the use of body fluids so proper lab techniques and safety precautions must be taken. Lab coats and gloves should be worn for these labs. All students are expected to participate fully in the lab exercises unless there is a physical or medical limitation (it is the student's responsibility to inform the lab instructor of these limitations and provide appropriate documentation). Lab manual will be available on-line.

Detailed Course Content

Section 1 - Cellular Physiology;

- 1.1 Homeostasis;
- 1.2 Energy use and production in biological systems / cellular energy systems
- 1.3 Intracellular communication (receptors and second messenger pathways)
- 1.4 Cell-to-cell communication (paracrine signals, cytokines,)
- 1.5 Endocrine control vs. neural control

Section 2 – Metabolism;

- 2.1 Glucoregulation;
- 2.2 Lipid metabolism (transport, depots, metabolism)
- 2.3 Protein metabolism (transport, metabolism);
- 2.4 Stress responses (fight or flight, fasting)
- 2.5 Energy balance and endocrine effects – TH, Cortisol, Epinephrine, Insulin

Section 3 – Blood and Immunity

- 3.1 – Properties of blood
- 3.2 - Regulation of hematopoiesis (erythropoietin); Anemia, Polycythemia
- 3.3 – The immune response

3.4 – Immune and Blood dysfunction

Section 4 – Cardiopulmonary Function and Regulation;

- 4.1 Cardiac electrophysiology and contractile function (Frank-Starling, contractility)
- 4.2 Regulation of cardiac output and mean arterial pressure
- 4.3 Principles of microvascular perfusion (concept of the microvascular unit, Fahreus effect and microvascular perfusion) and the diffusion of O₂ from blood to tissue;
- 4.4 Regulation of tissue blood flow (central versus peripheral factors, neural versus chemical versus mechanical regulators)
- 4.5 Lung Mechanics and alveolar ventilation, Blood gases
- 4.6 Blood Gas Regulation, Control of breathing (central vs peripheral chemoreceptors)
- 4.7 Function in disease states – Congestive Heart Failure, COPD

Section 5 – Renal System, body fluids, and electrolytes; Cardiorenal interactions

- 5.1 Acid/Base Regulation (ventilation, buffer systems);
- 5.2 Starling Forces and cellular fluid regulation;
- 5.3 Neuroendocrine regulation of fluid volume, electrolytes (Vasopression, Aldosterone, Renin-Angiotensin System); Effects on Blood pressure
- 5.4 Renal Failure – body-wide effects

Section 6 – Physiology of Movement (Brain to Muscle Fiber);

- 6.1 Motor control (motor cortex, efferent & afferent pathways, spinal cord reflexes)
- 6.2 Motor unit function and microvascular recruitment (microvascular versus motor unit domains);
- 6.3 Muscle energy systems in relation to ATP synthesis (where is ATP used in muscle, coupling ATP utilization to its resynthesis, kinetics of aerobic metabolism);
- 6.4 Coordination of blood flow with local demand (metabo-reflex, sympatholysis);
- 6.5 Cardiopulmonary responses to movement (feed-forward and feedback systems, neurohumoral signals) / The exercise state

Section 7 – Special Problems in Integrative Physiology;

- 7.1 Exercise State
- 7.2 Orthostatic stress (blood loss, dehydration, spaceflight)
- 7.3 High altitude / Thermal stress and thermoregulation
- 7.5 Anabolic steroid effects / Caffeine
- 7.6 Pregnancy

Classroom Etiquette:

It is expected that students will take an active role in the learning process. This includes: (a) regular class attendance, (b) reading course material in advance of class, and (c) engaging in discussions during class. It also includes active participation in all laboratory and tutorial sessions.

In respect to the professor and to your fellow students, we ask that you:

- a) Turn your phone off during class and that you don't use it for texting during lecture or lab
- b) Not have conversations with the people beside you during lecture – it is very distracting to the people around you
- c) Use your laptops for lecture material and assignments only – that you are not using the internet or facebook during class time.
- d) Arrive to lecture and lab on time
- e) Don't come to class or lab with your ipod or equivalent.

These will help maximize the learning experience for you and your fellow students (and keep your professor in a good mood).

Supplementary Course Information

In accordance with the University of Calgary Calendar

**Academic
Accommodation
Awareness Information:**

It is the student's responsibility to request academic accommodation. If you are a student with a documented disability who may require academic accommodation and have not registered with the Disability Resource Centre, please contact their office at 220-8237. You are also required to discuss your needs with your instructor no later than fourteen (14) days after the commencement of this course. Students who have not registered with the Disability Resource Centre are not eligible for formal academic accommodation.

Plagiarism/Cheating/Other Academic Misconduct:
(see Calendar)

A single offence of cheating, plagiarism, or other academic misconduct is a serious act that will not be tolerated in the Faculty of Kinesiology. Penalties for such acts will be determined by the Dean and may result in a failing grade, probation, suspension, or expulsion. Any student who is uncertain if an action falls into this category should consult the instructor and/or the Calendar.

Midterm Exam Policy:

The Faculty of Kinesiology policy is that all students are expected to write midterm exams on the dates listed on the course outline. Special accommodation may be granted by the instructor in exceptional circumstances only which include illness, participation in athletic events (varsity, national or international), domestic affliction, and religious conviction. It is the student's responsibility to supply proper documentation and/or notification prior to the originally scheduled midterm to support their circumstance. Personal travel plans and arrangements are not valid reasons for requesting a special accommodation for a midterm exam. Failure to comply with this policy will result in a grade of zero for the midterm and possible failure in the course.

FOIP Policy:

Please note that the University is under the jurisdiction of the provincial Freedom of Information and Protection of Privacy (FOIP) Act. Please refer to the website for details: <http://www.ucalgary.ca/secretariat/privacy>

**Internet and Electronic
Communication Device
Information:**

Any surfing of the Internet during lectures that is not directly related to the class discussion is distracting and strictly forbidden. Additionally, the use of any electronic devices (e.g., cellular phones, Blackberrys) for e-mailing, texting, etc. is strictly prohibited. Please turn OFF your phone before the beginning of each lecture.

**Emergency Meeting
Place:**

For classes in the Kinesiology buildings Primary assembly point is the MacEwan Student Centre - North Courtyard and the Alternate assembly point is University Theatres Lobby

Safewalk Information:

Safewalk volunteers walk people safely to their destination on campus (including Health Sciences, Children's Hospital, McMahon Stadium, and University LRT station). This service is free and available to students, staff and campus visitors. Call 403-220-5333 (24 hours a day/7 days a week/365 days a year).

Student's Union:

The Kinesiology Representative is Calindy Ramsden - E-mail: kinesrep@su.ucalgary.ca