

## **CAPS 305 Course Syllabus**

### ***CAPS 305 Integrated Human Health and Disease (3 Credits)***

#### ***Academic Calendar Description:***

An integrated study of advanced physiological processes and the consequences of dysregulation in disease pathophysiology [3-0-0]

#### ***Prerequisites***

*CAPS 205 or CAPS 206*

*Corequisites: None*

#### ***Other Requirements:***

*This course is open to CAPS Majors and Honors students. Other 3<sup>rd</sup> year students without these prerequisites may be considered at the discretion of the Course Director.*

***Instructional Schedule:*** 3 weekly 50 min sessions

### **Student Expectations**

Attend all classes and all exams in person. Read all assigned literature. Prepare any requested materials for presentations in class. Actively contribute to all class discussions.

### **Assignments**

Once before the midterm exam and once after, students will identify (from online databases discussed in class) a gene and/or variant that contributes to a disorder related to one of the week's topics, including an explanation of how it affects the physiology being described. Each is worth 5% of the final grade and will have no more than 400 characters including spaces.

### **Learning Activities**

All classes are to be attended in person. Sessions and literature will be provided prior to class. Readings may be required in advance to facilitate class discussions for all students.

### **Learning Materials**

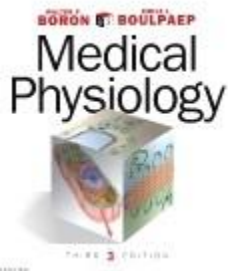
All learning material is taken from a combination of textbooks, online resources (provided via CANVAS). All lecture materials will be provided in PDF format on CANVAS prior to the start of term.

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### Recommended Texts:



Boron and Boulpaep, 3rd Edition, 2017

### Approach to Readings – Navigating information

**Background:** In this age, you have access to an abundance of information through a variety of media, most notably via online searching. We endeavor to develop your critical reading skills and encourage/help you make decisions regarding the relevance of the resource material you consume, and to develop a confidence that you can effectively be a self-learner. This is a valuable skill set as a scholar, and will be needed as an independent learner throughout the remainder of the CAPS program. Original literature may also be assigned.

#### Approach:

- Assigned readings in this course will be deliberately general, consisting of the identification of relevant chapters in a recommended text
- We ask that you cross-reference the lecture handout material with the textbook headings in the identified chapters.
- Through this process you will have to make decisions about the relevance of material in the text in relation to the vetted, and paired down, material in course handouts and sessions.
- The remainder of the textbook material not directly covered in course sessions will serve as a peer-reviewed resource to help students fill their personal knowledge-gaps in physiology.

### Course Structure

3 weekly 50-minute sessions. Each session comprises in-person classes. In person teaching. Session-based teaching with all materials provided at the start of term on CANVAS.

### Course Director Edwin Moore

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**Office Location:** Life Sciences Institute room 2.359

### Other Instructional Staff

Barry Mason

Christina Hull

Victor Viau

Elizabeth Rideout

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TA's to be updated annually

## **Acknowledgement**

UBC's Point Grey Campus is located on the traditional, ancestral, and unceded territory of the xwməθkwəy̓ əm (Musqueam) people. The land it is situated on has always been a place of learning for the Musqueam people, who for millennia have passed on in their culture, history, and traditions from one generation to the next on this site.

## **Learning Outcomes**

At the successful completion of this course, students will be able to:

1. Assess cardiac function by interpreting pressure-volume loops in health and disease.
2. Compare and contrast adaptive and maladaptive responses to cardiac stressors.
3. Apply knowledge of the normal hormonal regulation of energy and glucose homeostasis to explain how dysregulation of these hormones leads to metabolic disease.
4. Compare and contrast the role of sex- and gender-based differences, and other factors that contribute to individual differences, in the pathophysiological mechanisms of disease.
5. Apply knowledge of these mechanisms towards explaining the structure and function of the hypothalamic-pituitary-adrenal axis.
6. Apply knowledge of steroid physiology to understand the glucocorticoid basis for adaptive and maladaptive responses.

## **Schedule of Topics**

### **COURSE INTRODUCTION (Dr. Mason)**

#### Week 1. Advanced Principles in Physiological Systems

Allostasis and homeostasis  
Decompensation and dynamic correction strategies  
Sex differences and dimensions of human diversity

#### Week 2. Autonomic System as Control Center

Sympathetic and Parasympathetic integration centres  
Central and peripheral sensor physiology  
Autonomic dysregulation in spinal cord injury and diabetic neuropathy

### **MODULE 1: METABOLISM AND METABOLIC DISEASES (Dr. Rideout)**

#### Week 3. An integrated perspective on metabolic disease and treatment

Ozempic as a treatment for people living with metabolic conditions  
Glucose homeostasis and diabetes

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Body fat regulation and obesity

### Week 4. An integrated perspective on regulating glucose homeostasis in health and disease.

Hormones that regulate glucose homeostasis  
Beta cell function and dysfunction in diabetes  
Insulin resistance and diabetes

### Week 5. An integrated perspective on body fat regulation in health and disease.

Hormones that regulate body fat  
Adipose control of body fat in health and disease  
Central control of body fat in health and disease

### Week 6. An integrated perspective on factors that influence diabetes, obesity, and treatment outcomes.

Introduction to gut hormones  
Targeting gut hormones to treat obesity and diabetes  
IN CLASS MID TERM EXAM

## **MODULE 2: CARDIOVASCULAR HOMEOSTASIS AND DISEASE (Dr. Moore)**

### Week 7. Hypertension; basic and applied physiology.

Blood pressure regulation; central and peripheral control.  
Cardiac and vascular function curves, pressure-volume loops and their application to CV disease.  
Essential, renal and pulmonary hypertension: integrated physiology

### Week 8. Heart Failure

Unregulated hypertension and an introduction to heart failure.  
Integrated physiology – whole body response to heart failure.  
Cardiac hypertrophy: physiological vs pathological

### Week 9. Integrated perspectives on CV health and disease

Introduction to exercise physiology  
Male and female: Similarities and differences in response to disease and exercise  
Stem cells and cardiovascular disease – the future?

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## **MODULE 3: NEUROENDOCRINOLOGY OF STRESS (Dr. Viau)**

### Week 10: Understanding interactions between the nervous and endocrine systems

Neuroendocrinology: Basic Concepts  
Hypothalamic-Pituitary-Endocrine Integration  
The Hypothalamic-Pituitary-Adrenal (HPA) axis

### Week 11: Components of the HPA axis and regulation

The Paraventricular Nucleus of the Hypothalamus  
The Anterior Pituitary Corticotrope  
The Adrenal Gland

### Week 12: Determinants of adaptive and maladaptive responses to stress

Stress and the HPA axis  
Stress: From Adaptation to Disease  
Understanding Stress Vulnerability and Resilience

### **Assessments of Learning**

Assessment is in the form of two in-class quizzes, and two invigilated exams. The exams include material not covered by a prior exam.

Assignments 1&2	10%
Quiz #1	15%
Midterm Exam	30%
Quiz #2	15%
End of Term Exam	30%

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### Grading Rubric for Assignments

Category	Outstanding	Meets Standards	Below Required Standards	Inc. *	Score
Disorder selection (Approved symbol only)	5 Identify a common disorder directly relating to the topic in class (but not a disorder discussed in class)	3 Identify a disorder relating to topic in class (can be disorder discussed in class)	1 Disorder has no relation to the topic of the class	0	5
Gene selection	5 Identify a gene that is a major contributor to disorder by multiple criteria.	3 Gene has some supporting evidence for a role in disorder	1 Gene has no role in disorder	0	5
Gene variation selected	5 Variant is a major contributor to disorder by multiple criteria	3 Variant has some supporting evidence for a role in disorder.	1 Variant has no role in disorder	0	5
Description of contribution to disorder	5 Generate an accurate, concise description of how the gene's disruption contributes to the disorder.	3 Generate a description that provides some support for how the gene contributes to the disorder	1 Description is not accurate or does not describe how the gene variant contributes to the named disorder.	0	5

### University Policies

UBC provides resources to support student learning and to maintain healthy lifestyles but recognizes that sometimes crises arise and so there are additional resources to access including those for survivors of sexual violence. UBC values respect for the person and ideas of all members of the academic community. Harassment and discrimination are not tolerated nor is suppression of academic freedom. UBC provides appropriate accommodation for students with disabilities and for religious observances. UBC values academic honesty and students are expected to acknowledge the ideas generated by others and to uphold the highest academic standards in all their actions. Details of the policies and how to access support are available at the Policies and Resources section of the UBC Senate website.

### **Academic Integrity**

The academic enterprise is founded on honesty, civility, and integrity. As members of this enterprise, all students are expected to know, understand, and follow the codes of conduct regarding academic integrity. At the most basic level, this means submitting only original work done by you and acknowledging all sources of information or ideas and attributing them to others as required. This also means you should not cheat, copy, or mislead others about what is your work. Violations of academic integrity (i.e., misconduct) lead to the breakdown of the academic enterprise, and therefore serious consequences arise, and harsh sanctions are imposed. For example, incidences of plagiarism or cheating may result in a mark of zero on the assignment or exam and more serious consequences may apply if the matter is referred to the President's Advisory Committee on Student Discipline. Careful records are kept in order to monitor and prevent recurrences.

A more detailed description of academic integrity, including the University's policies and procedures, may be found in the Discipline for Academic Misconduct section of the UBC Academic Calendar.

No assignment may be submitted to any other instructor of any course for a grade. The minimum penalty for plagiarism in any assignment is a zero for the paper; the maximum penalty is a zero for the course.

### **UBC Grading Standards**

#### Undergraduate Grading Scale

Percentage (%)	Letter Grade
90-100	A+
85-89	A
80-84	A-
76-79	B+
72-75	B
68-71	B-
64-67	C+
60-63	C
55-59	C-
50-54	D
0-49	F

### **Learning Resources**

All learning resources will be accessible on CANVAS from the start of each term

### **Copyright**

All materials of this course (course handouts, lecture slides, assessments, course readings, etc.) are the intellectual property of Barry Mason and Christina Hull or licensed to be used in this

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