

CAPS 205 Course Syllabus

CAPS 205. Fundamentals of Physiology in Human Health and Disease I (3 Credits)

Academic Calendar Description:

The principles of physiological regulation of neuronal, muscle, blood and fluids, and cardiovascular systems in the human body with practical applications in health and disease. [3-0-0] Credit will only be granted for one of CAPS 301 or CAPS 205

Prerequisites

BIOL 112, CHEM 123, MATH 101, and 100-level PHYS beyond PHYS 100.

Corequisites: None

Instructional Schedule: 3 x 50 min sessions each week

Course Overview

Principles of normal physiology and common human disorders across neuromuscular, cardiovascular, blood and fluid systems will be integrated to explain the maintenance of organism homeostasis in the presence of physiological stressors. Emphasis will be placed on the application of common physiology principles to gain understanding of each system's integrated roles in the body.

Student Expectations

Students are required to read all online modules, using session objectives to guide learning topics. Students are expected to complete all examinations and achieve an overall grade of 50% to pass the course.

Learning Activities

This course will be comprised of a combination of synchronous and asynchronous sessions. Supportive material will be provided prior to each session. Advanced study may be required to facilitate in-class discussions.

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.

Recommended Text: Human Physiology, Sherwood and Ward, 5th Canadian Edition, 2021

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.

Approach to using supplementary materials:

- Assigned readings in this course will be deliberately general, consisting of the identification of relevant chapters in the recommended text
- We ask that you cross-reference the lecture handout material with the textbook headings in the identified chapters.
- The textbook has a greater breadth and scope of material than does CAPS 205/206.
- 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

There will be three 50-min sessions per week. Each session consists of an online module accessed via the course CANVAS site, and both asynchronous and in-person classes.

Course Co-Directors

Dr. Barry Mason barry.mason@ubc.ca

Dr. Christina Hull christina.hull@ubc.ca

Learning Outcomes

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

1. Apply a systematic approach to understanding the physiological roles of organ systems in-whole body homeostasis by identifying and describing:
 - The input to the system and how this is being measured
 - The structures, and mechanisms for input processing
 - The action taken in response to the input.
 - The physiological compensation to the measured input
2. Predict physiological responses to variable inputs into each of the physiological systems covered in this course.
3. Apply principles of normal physiology to disorders of normal function for the systems covered in this course; Nervous system, Muscle, Blood, Body fluids and Cardiovascular.

Schedule of Topics (36 50-min Sessions Total):

Introduction to Physiological Principles (1 Session)

- Think like a physiologist
- input measurement, integration in regulation centre, system output, compensation,

Module 1. Foundations of electrical signaling (5 sessions)

- Establishing Resting Membrane Potential (RMP)
- Mechanisms of Action Potential generation and propagation
- Synaptic Transmission and dendritic summation

Assigned readings for module 1.

Human Physiology, Sherwood and Ward, 5th Canadian Edition, 2021. Excitable Membranes: Chapter 3

Module 2. Organisation of Nervous System (3 Sessions)

- Characterizing the organization, embryological development and function of Peripheral Nervous System, Spinal Nerves, Cranial Nerves, Autonomic Nerves
- Characterizing the organisation and function of CNS, spinal cord, brainstem, brain and cerebellum
- Describe simple neuronal circuits and discuss monosynaptic and polysynaptic spinal reflexes.
- Applying principles of normal physiology to predict and explain disruptions of nervous system function

Assigned readings for modules 2-5.

Human Physiology, Sherwood and Ward, 5th Canadian Edition, 2021. Peripheral and Central Nervous Systems: Chapters 4 and 5
Muscular System: Chapter 8

Module 3. Sensory systems (4 sessions)

- Describe the mechanisms of Sensory Transduction; sensory receptor types, generator potentials, coding of sensory information
- Describe the sensory modalities of Touch and Proprioception, how these modalities code information about the environment, the neuronal pathways to the primary and secondary sensory cortex
- Describe the sensory modalities of Pain and temperature, how these modalities code information about the environment, the neuronal pathways to the primary and secondary sensory cortex
- Applying principles of normal physiology to predict and explain disruptions of sensory system function

Assigned readings or modules 2-5.

Human Physiology, Sherwood and Ward, 5th Canadian Edition, 2021. Peripheral and Central Nervous Systems: Chapters 4 and 5
Muscular System: Chapter 8

Module 4. Motor systems (4 sessions)

- Describe the organization and function of Voluntary Movement Systems
- Describe the pathway of voluntary movement in the corticospinal system including motor cortex, upper motor neuron, lower motor neuron
- Describe the basic neuronal circuitry and function of, Basal Ganglia, and Cerebellum
- Describe the basic neuronal circuitry and function of Involuntary Motor Systems including Reticulospinal, Vestibulospinal systems
- Applying principles of normal physiology to predict and explain disruptions of motor system function

Assigned readings or modules 2-5.

Human Physiology, Sherwood and Ward, 5th Canadian Edition, 2021. Peripheral and Central Nervous Systems: Chapters 4 and 5
Muscular System: Chapter 8

Session: Midterm exam (1 Session)

Module 5. Muscle (4 sessions)

- Describe The components and function of Neuromuscular Junction
- Describe the cyto-organization and function of Skeletal Muscle and the mechanism of force generation, including excitation contraction coupling and length tension relationships
- Applying principles of normal physiology to predict and explain disruptions of muscular system function

Assigned readings for module 5.

Human Physiology, Sherwood and Ward, 5th Canadian Edition, 2021. Peripheral and Central Nervous Systems:

Chapters 4 and

5 Muscular System:

Chapter 8

Module 6. Blood and Fluid Compartments (5 sessions)

- Describe body water content and body solute contents, identifying major differences & similarities in major compartments
 - Discuss transport of body fluids between different fluid compartments and consider how differences in selective permeability are involved in regulating transport.
 - Outline the composition of blood and describe its functions
 - Define hematocrit and discuss how changes in hematocrit provide insight into certain blood disorders
 - Discuss the functional role(s) of the various proteins found in blood plasma
 - Explain the overall process of hematopoiesis and identify actors involved in differentiation
 - Explain the process of erythropoiesis, outline the stimuli for erythropoietin synthesis, and describe how it acts to promote erythropoiesis
 - Outline the handling of iron and describe its incorporation into heme during hemoglobin synthesis
 - Describe the basic structure of hemoglobin and briefly differentiate adult and fetal hemoglobin
 - Describe the disorders associated with abnormal hemoglobin synthesis and discuss factors influencing the severity of these disorders
 - Explain the pathway of erythrocyte degradation and excretion, outline the fates of the various components of hemoglobin metabolism
 - Outline the maturation of megakaryocytes and the generation of platelets
 - Outline the three components of the hemostatic response and discuss how these components influence one another
Describe the platelet response to vascular injury and explain how the response is isolated to the site of injury
 - Describe the initiation and amplification of the clotting/coagulation cascade
 - Outline the factors involved in the prevention of hemostasis (anticoagulation). Describe the common disorders of hemostasis and
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consider the complications associated with these disorders

Assigned readings for module 6.

Human Physiology, Sherwood and Ward, 5th Canadian Edition, 2021. Blood and Fluids: Chapter 11 and Chapter 15

Module 7. Cardiovascular System, (7 sessions)

- Characterize the structural organization of the heart and trace the flow of blood as it moves through the heart.
- identify diastole and systole, and discuss the phases of the cardiac cycle.
- Describe the different types of action potentials in heart tissues.
- Characterize how the autonomic nervous system regulates heart physiology
- Relate normal heart physiology to the ECG identifying the assigning characteristics of the waveform to phases of the cardiac cycle.
- Describe the structure and function of arteries/arterioles and describe the factors that influence vascular diameter including coronary blood flow.
- Discuss the regulation of Cardiac Output, including the Starling Law of the heart.
- Define the Starling Forces and capillary hydrostatic pressure and describe the net fluid movement across a capillary.
- Describe the regulation of peripheral blood pressure identifying systolic, diastolic and pulse pressure and the use of carotid and aortic baroreceptors.

Assigned readings for module 7.

Human Physiology, Sherwood and Ward, 5th Canadian Edition, 2021. Cardiovascular System: Chapters 9 and 10

Module 8. Selected Systems Integration (2 sessions)

- Apply the principles of normal physiology and describe the integrated physiological mechanisms in response to hemorrhage. Identify the variable being measured, the control centres involved and the compensation to identified stressors.

Assessments of Learning

Assessment is in the form of 2 invigilated exams, covering sessions not covered by a prior exam, and two assignments detailed below.

Assignments x 2 @ 10% each; submitted to Canvas	20%
Midterm Exam (MCQ)	30%
Final Exam (Comprehensive; MCQ and short answer questions)	50%

Assignment Details and Rubric

Each student will choose a disease condition from a provided list. For each condition, students will draw and label a diagram outlining the normal physiological processes of that relevant system, and identify sites of dysregulation that result in the signs and symptoms of the disease condition. Students will then **record themselves** verbally describing both the normal physiology, and what processes are not normal in the disease state, using the diagram as a visual aid (e.g. voice over PowerPoint), explaining the signs and symptoms of the disease. The intended audience for the discussion is a hypothetical family member who is experiencing the disease condition.

Grading Rubric for Physiology of Disease Assignments (worth 10% of grade)

Category	Outstanding	Meets Standards	Below Required Standards	Inc.*	Score
Normal Physiology Discussion	5 A clear, concise and accurate verbal discussion of the normal physiology of the relevant system	3 A clear, and accurate verbal discussion of the normal physiology of the relevant system	1 The discussion of the normal physiology of the relevant system is neither clear nor accurate	0	5
Dysregulation Leading to Symptoms Discussion	5 A clear, concise and accurate verbal discussion of the abnormal physiology leading to the disease condition of the relevant system	3 A clear, and accurate verbal discussion of the abnormal physiology leading to the disease condition of the relevant system	1 The discussion of the abnormal physiology leading to the disease condition of the relevant system is neither clear nor accurate	0	5

	5	3	1	0	5
Diagram used to explain normal and abnormal physiology of relevant system	A clear, concise and accurate diagram of the normal physiology of the relevant system; identification of what went wrong in the disease state	A somewhat clear, and accurate diagram of the normal physiology of the relevant system; identification of what went wrong in the disease state	The diagram of the normal and abnormal physiology of the relevant system is neither clear nor accurate		

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

Land Acknowledgements

UBC's Point Grey Campus is located on the traditional, ancestral, and unceded territory of the xwməθkwəy̓əm (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.

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