

ANP1105E Fall 2016 Course Outline/Objectives

ANATOMY & PHYSIOLOGY I: Basic Cellular Physiology & the Anatomy and Physiology of the Cardiovascular, Lymphatic & Respiratory Systems

Dr. Frank Feiner

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This is the first of three ANP courses offered within the Faculty of Health Sciences. This course provides an introduction to tissue and cell morphology, biochemistry of the cell and physiological concepts including diffusion, osmosis, membrane transport and homeostasis. The physiology of nerve and muscle cells will be examined followed by in-depth study of the anatomy and physiology of blood and the cardiovascular, lymphatic and respiratory systems. This is a 3-credit course, with 3 hours of lectures per week during the fall term.

There will be three exams throughout the duration of the course, as indicated in the detailed outline below. Please note that Exam 1 will deal with all material from the Structural Organization of the Human Body up through the Cellular Physiology of Nerve and Muscle. Exam 2 will deal with Homeostasis, Blood and the Heart. Finally, Exam 3 (the final exam) will concentrate on Blood Vessels & Hemodynamics as well as the Lymphatic and Respiratory systems. However 15-20% of the final exam will be composed of questions dealing with material covered in the first two sections of the course.

Please carefully read [Justification of absence from an examination](#). *If you have to miss any exam due to illness, you must obtain documentation from your doctor or the U of O Health Services, dated as soon as medically possible before or after the exam, in order to have permission to write a deferred exam. For the final exam, the MD note must come from the U of O Health Services. The MD note must include 1. the start date of illness, 2. the return to studies date, and 3. the medical consultation date. Notes missing any of this information will NOT be accepted. If you obtain the MD note after the exam, it must certify that you were ill on the exam date. eMail the note within 5 working days (unless documented circumstances prevent this) of the exam date to Dr Feiner. **Deferred exams will be held only on Sunday Oct 30 during Reading Week (Exam 1), Sunday Dec 4 (Exam 2), and during Winter 2017 Reading Week (Feb 19-25, Date TBA, Exam 3).** If you do not write the regular exam or the deferred exam, you will obtain a zero for that section of the course.*

There are several opportunities for help before an exam – these will be discussed in the first lecture – but almost none after it!

Supplemental exams are available for those students who fail an ANP course but obtain an E (40-49%). Students who fail with an F (0-39%) are not eligible and must repeat the course. The supplemental exam score will replace the original final exam score in the new calculation of the student's final grade. While both final grades will appear on the student's transcript, only the supplemental mark will be used for grade point calculations. The supplemental exam will take place during winter term Reading Week (Feb 19-25, 2017) and the regulations regarding illness on exam day indicated above also apply to this exam. If you want to write a supplemental exam and are *eligible*, you must register through the undergraduate studies office of your faculty. You will have to pay supplemental examination fees. If you don't write the exam and you haven't informed your faculty that you will not be present for it one day in advance (or do not follow university regulations if sick on exam day), you will receive the grade "INC" which is equivalent to a failure.

INSTRUCTOR: Frank Feiner, PhD, MD fFeiner@uottawa.ca. Office hours by appointment

TEXTBOOK: E.N. Marieb and K. Hoehn: **Human Anatomy & Physiology** (10th edition, 2015, ISBN 978-0-321-92704-0) Benjamin Cummings. *This is available at the [main bookstore at the downtown campus](#) (UCU Bldg), the [Agora bookstore](#) and the [Health Sciences Bookstore in the General Hospital](#). The 9th edition of the text is **not** recommended. **You will need the book AND the online access code for Mastering A&P that is packaged with it in order to be able to do the online assignments (see below).** Instructions are posted on the course website.*

WEBSITE: Go to [university's home page](#); at the bottom left side of the page click **Students-uoZone**

1. On the Students page, under **Virtual Campus** click **Login to Blackboard Learn**
2. Enter your username (**student number**) and your **uoZone password**
3. Click **Login** and this will bring you to a list of courses for which you have online access.
4. Select **ANP1105E**

LECTURES:

Tuesdays	2:30 PM – 4:00 PM	MRT 218
Fridays	4:00 PM – 5:30 PM	MRT 218

Exam Schedule and Determination of Course Final Grade		
Exam 1 (Topics 1 and 2)	Tuesday, October 4	25% final mark
Exam 2 (Topic 3 and Topic 4, Parts 1 and 2)	Friday, November 4	25% final mark
MasteringA&P Online Homework	<i>See Below</i>	10% final mark
Final Exam (Topic 4, Part 3 and Topics 5 and 6)	TBA	40% final mark
Total		100%

1. **Structural Organization of the Human Body** (Sep 9, 13)
 - 1.1. Describe the levels of structural organization that make up the human body
 - 1.2. Cells: summarize the major organelles and structures found in body cells
 - 1.3. Tissues: describe the different tissues of the human body

Assignment #1 (Cells and Tissues) – *see below*

2. **Cellular Physiology of Nerve and Muscle** (Sep 16, 20, 23, 27, 30)
 - 2.1. Membrane Transport:
 - 2.1.1. Describe the structure of the plasma membrane
 - 2.1.2. Describe and differentiate among the various types of transport across the plasma membrane
 - 2.1.3. Describe osmosis and explain its role in fluid homeostasis
 - 2.2. Neurons:
 - 2.2.1. Identify the different regions of the neuron and associate each region with the functions of reception, propagation and transmission of nerve impulses
 - 2.2.2. Explain the phenomena (diffusion of ions, types of ion channels) that are responsible for the electrical activity of neurons (resting membrane potential and action potential)
 - 2.2.3. Describe the factors that influence propagation of the action potential along an axon
 - 2.2.4. Mechanisms of synaptic transmission (synapse, post-synaptic potentials, synaptic integration)

Assignment #2 (Membrane Transport & Neuron) – *see below*

- 2.3. Muscles:
 - 2.3.1. Microscopic structure of skeletal muscle fibers; cellular mechanisms of excitation-contraction coupling
 - 2.3.2. Describe the neuromuscular junction
 - 2.3.3. Describe the contractile properties of skeletal muscle (motor unit, isotonic & isometric contractions, spatial & temporal summation, etc)
 - 2.3.4. Associate various muscle types with their metabolism and their speed of contraction and rate of fatigue
 - 2.3.5. Compare the properties of smooth muscle with those of skeletal muscle

Assignment #3 (Muscle) – *see below*

MIDTERM EXAM #1: Tuesday, October 4 during class

3. **Homeostasis: Introduction to the Autonomic Nervous System and Endocrine System** (Oct 7, 11)
 - 3.1. Define and identify the main characteristics of homeostasis
 - 3.2. Nervous system:
 - 3.2.1. Compare somatic and autonomic nervous systems
 - 3.2.2. Functional differences between the sympathetic and parasympathetic divisions of the ANS
 - 3.3. Endocrine system:
 - 3.3.1. Distinguish between exocrine and endocrine glands, and localize the major endocrine glands
 - 3.3.2. Describe the different structural classes of hormones and their mechanisms of action
 - 3.3.3. Describe the functional organization of the hypothalamic-pituitary axis

Assignment #4 (Homeostasis: Autonomic Nervous System/Endocrine) – *see below*

4. **Cardiovascular System** (Oct 11, 14, 18, 21. **[Reading Week Oct 23 – 29]** Nov 1, 4, 8, 11, 15, 18, 22)

4.1. Blood:

- 4.1.1. Describe the composition of blood (plasma & formed elements)
- 4.1.2. Erythrocytes:
 - 4.1.2.1. Describe the structure and function of RBCs; structure and properties of hemoglobin
 - 4.1.2.2. Describe erythropoiesis, mechanisms of control, and life cycle of erythrocytes
- 4.1.3. Hemostasis:
 - 4.1.3.1. Explain the principal steps and justify the role of platelets and clotting factors in this process
 - 4.1.3.2. Explain the fibrinolytic system and recognize the action of the major anticoagulants
- 4.1.4. Differentiate among the various blood types and explain the basis of transfusion reactions

4.2. The Heart:

- 4.2.1. Describe the internal and external anatomy of the heart
- 4.2.2. Trace the pathway followed by blood in both the pulmonary and systemic circuits
- 4.2.3. Describe the organization of the coronary circulation
- 4.2.4. Compare the physiological properties of cardiac muscle cells with those of skeletal muscle cells
- 4.2.5. Compare the electrical properties of contractile cardiac muscle cells with those of autorhythmic cardiac muscle cells
- 4.2.6. Explain how the intrinsic conduction system of the heart allows it to function as a pump.
- 4.2.7. Explain what is an ECG tracing and the nature of the information it is providing
- 4.2.8. Explain the events occurring during each phase of the cardiac cycle
- 4.2.9. Define cardiac output in terms of heart rate and stroke volume
- 4.2.10. Describe in detail the mechanisms for the regulation of heart rate & stroke volume

Assignment #5 (Blood and the Heart) – see below

Midterm EXAM #2: Friday, November 4 during class

4.3. Blood vessels and hemodynamics:

- 4.3.1. Compare and contrast the structure of the walls of arteries, capillaries and veins
- 4.3.2. Compare the 3 types of arterial vessels
- 4.3.3. Define microcirculation and compare the 3 types of capillaries
- 4.3.4. Describe the structure and functions of the venules and veins
- 4.3.5. Define blood flow, blood pressure, resistance, peripheral resistance
- 4.3.6. Illustrate the changes in blood pressure throughout the various vessels of the circulatory system
- 4.3.7. Explain the factors that affect resistance and justify the importance of arterioles in the control of peripheral resistance
- 4.3.8. Define systolic and diastolic arterial pressure, pulse pressure and mean arterial pressure
- 4.3.9. Identify and justify the value for mean capillary blood pressure
- 4.3.10. Express blood pressure in terms of cardiac output and peripheral resistance
- 4.3.11. Describe the short-term neural and chemical mechanisms for the regulation of blood pressure
- 4.3.12. Describe the role of the kidneys in the long-term regulation of blood pressure
- 4.3.13. Define and explain the mechanisms of autoregulation with regard to local blood flow
- 4.3.14. Explain the forces that act to influence capillary exchange
- 4.3.15. Identify the principal arteries and veins of the cardiovascular system: *You will be responsible for arteries and vein up to the level of the wrist and ankle, to each organ and to the brain (to and including the circle of Willis). If you begin early and review often, then you will find it is not as daunting as it looks. However, there will be little “learning time” during the lectures, so it will be up to you to put in the time.*

Assignment #6 (Blood Vessels) – see below

5. The Lymphatic System (Nov 18)

- 5.1. Describe the structure and main functions of the vessels and organs of the lymphatic system
- 5.2. Explain the origin of lymph as well as its transport

6. The Respiratory System (Nov 22, 25, 29, Dec. 2)

- 6.1. Describe the structures of each one of the components of the conduction and respiratory zones
- 6.2. Describe the gross structure of the lungs and the pleural coverings

Assignment #7 (Lymphatic System. Respiratory 1 – see below

- 6.3. Define & explain the following: intrapulmonary, intrapleural & transpleural pressures
- 6.4. Explain the roles of the diaphragm & accessory muscles during inspiration & expiration (quiet & forced)
- 6.5. Explain the 3 factors that influence pulmonary ventilation
- 6.6. Describe how lung volumes & capacities are measured; indicate their physiological significance
- 6.7. Define dead space and indicate its importance in minute and alveolar ventilation
- 6.8. Explain the mechanisms underlying non-respiratory air movements
- 6.9. State Dalton's Law and use it to describe the composition of atmospheric and alveolar air
- 6.10. Explain the factors that influence the movement of gases at the air-liquid interface
- 6.11. List and describe 3 factors that influence the exchange of air and carbon dioxide (lungs)
- 6.12. Describe the partial pressure gradients that drive oxygen and carbon dioxide movement (tissues)
- 6.13. Describe completely the transport of oxygen in the blood
- 6.14. Explain the sigmoidal nature of the oxygen-hemoglobin dissociation curve
- 6.15. Describe completely the 3 ways in which carbon dioxide is transported in the blood
- 6.16. Explain the Bohr and Haldane effects
- 6.17. Associate carbon dioxide levels with blood pH; explain how respiration can regulate blood pH
- 6.18. Describe how respiration is controlled by the nervous system
- 6.19. Indicate the effects of the following on respiration: Hering Breuer reflex, hypothalamus, cortex
- 6.20. List the 3 principal chemical factors that influence respiration; explain their mechanisms of action
- 6.21. Discuss the mechanisms controlling respiration during intense exercise

Assignment #8 (Respiratory 2 – see below

There will be no lecture on Tuesday, December 6

Final EXAM: Date, time and place TBA

Lecture and Exam Schedule**

Lecture	Date	Topic
01]	Fri Sep 9	Introduction
02]	Tues Sep 13	Tissues
03]	Fri Sep 16	Membrane Transport
04]	Tues Sep 20	Nerves 1
05]	Fri Sep 23	Nerves 2
06]	Tues Sep 27	Muscles 1
07]	Fri Sep 30	Muscles 2
	Tues Oct 4	Midterm 1
08]	Fri Oct 7	Homeostasis: ANS, Endocrine 1
09]	Tues Oct 11	Endocrine 2, Blood 1
10]	Fri Oct 14	Blood 2
11]	Tues Oct 18	Heart 1
12]	Fri Oct 21	Heart 2
	Sun Oct 23 – Sat Oct 29	Reading Week
13]	Tues Nov 1	Heart 3
	Fri Nov 4	Midterm 2
14]	Tues Nov 8	Blood Vessels 1
15]	Fri Nov 11	Blood Vessels 2
16]	Tues Nov 15	Blood Vessels 3
17]	Fri Nov 18	Blood Vessels 4, Lymphatics
18]	Tues Nov 22	Respiratory 1
19]	Fri Nov 25	Respiratory 2
20]	Tues Nov 29	Respiratory 3
21]	Fri Dec 2	Respiratory 4
	Tues Dec 6	No lecture
	TBA	Final Exam

Assignment Schedule**

Don't forget to do the Intro Assignment first (no credit but great way to start off)!

Penalty is 2% per hour late

Assignment Name	Posted (By 10 PM)	Due (11:59 PM)
1. Cells and Tissues	Tues Sep 13	Thurs Sep 22
2. Membrane Transport	Fri Sep 16	Thurs Sep 22
3. Nerves	Fri Sep 23	Thurs Sep 29
4. Muscle	Fri Sep 30	Mon Oct 10
5. Homeostasis/ANS/Endocrine	Tues Oct 11	Mon Oct 31
6. Blood and the Heart	Tues Nov 1	Thurs Nov 17
7. Blood Vessels	Fri Nov 18	Thurs Nov 24
8. Lymphatic System & Respiratory 1	Fri Nov 25	Thurs Dec 1
9. Respiratory 2	Fri Dec 2	Fri Dec 9

**** Lecture content, assignment availability/due dates may change slightly, depending on our progress through the lecture material. Specifics will be given at the end of each lecture and posted to Blackboard**